Mindray

ECG Lead Placement Procedure

Objectives

- Best practice lead placement techniques for arrhythmia analysis
- Reduce alarms that result from ECG noise and other signal interference

ECG Lead Placement Procedure

Site preparation and ECG electrode placement directly impact the quality of an ECG signal. Optimizing an ECG signal is imperative for accurate monitoring.

The processes involved in successful lead placement include:

- Skin Preparation
- Electrode Patches
- Lead Placement Methods: AHA

Skin Preparation

Proper skin preparation is essential to obtain accurate ECG data. Electrode sites should be clean, dry and should provide a smooth flat surface. Incidental electrical activity and inaccurate readings may occur due to incorrect skin preparation. The following skin preparation is recommended for secure patch application:

1. Clip the chest hair in a 2-4 inch diameter of the electrode site.
2. Use a dry gauze pad to remove excess skin oils, skin cells and residue from the electrode sites. Never rub the skin until it is raw or bleeding.

   NOTE: Prepare the electrode site with alcohol only if the skin is extremely greasy. If alcohol is used as a drying agent, always allow the skin to dry before placing the electrode patch on the skin.

Electrode Patches

NOTE: Store electrode patches at room temperature in a sealed package until just prior to use.

NOTE: Avoid more than one type of electrode on a patient because of variations in electrical resistance.

NOTE: Avoid placing electrode patches directly over boney prominences or over any areas that move during activity such as shoulders or arms because muscle motion produces electrical activity. If an electrode patch is placed over a large muscle such as the pectorals, the monitor may detect this additional muscle activity which could lead to false arrhythmia calls.

ECG Lead Placement Procedure

1. Peel the backing off of the electrode patch only when it is ready for use to prevent evaporation of the contact gel medium. Visually inspect the contact gel medium for moistness. If the gel medium is not moist, do not use the electrode patch. Dry electrode patches are not conductive.

   NOTE: If using the snap type electrode wires, attach the electrode patch to the lead wire before placing patch on the patient.

2. Attach the electrode patch to the skin at the prepared site. Smooth the electrode patch down in a circular motion to ensure proper skin contact. If using soft gel electrodes, never push down directly over the contact gel medium as this may displace the gel and cause monitoring artifact. If using hard gel electrodes, it is recommended that during application, the center of the electrode should be slightly pressed onto the skin to ensure direct contact. Consult the electrode patch manufacturer's instructions for specific use.

3. Secure the lead wires to the patient according to hospital standard.

   WARNING: As with all medical equipment, carefully route cables and connections to reduce the possibility of entanglement or strangulation.

   NOTE: It is recommended that electrode patches be changed at least every 24 hours to maintain proper contact with the skin. Some patients may require electrodes to be changed more often. Electrode patches are disposable and should not be reused or reapplied. Try to avoid reusing the exact same electrode site during reapplication. If an electrode becomes wet with fluid, change the electrode patch.

Lead Placement Methods: AHA

The lead placement procedure that is utilized has a direct impact on the quality of an ECG waveform. The algorithm works best when a patient's R wave is significantly larger than the P or T waves to avoid difficulty in identifying the appropriate waves. On some patients, electrode patch placement and/or the ECG lead viewed may need to be adjusted to obtain a more prominent R wave.

The following section outlines lead placement procedures for the American Heart Association (AHA).

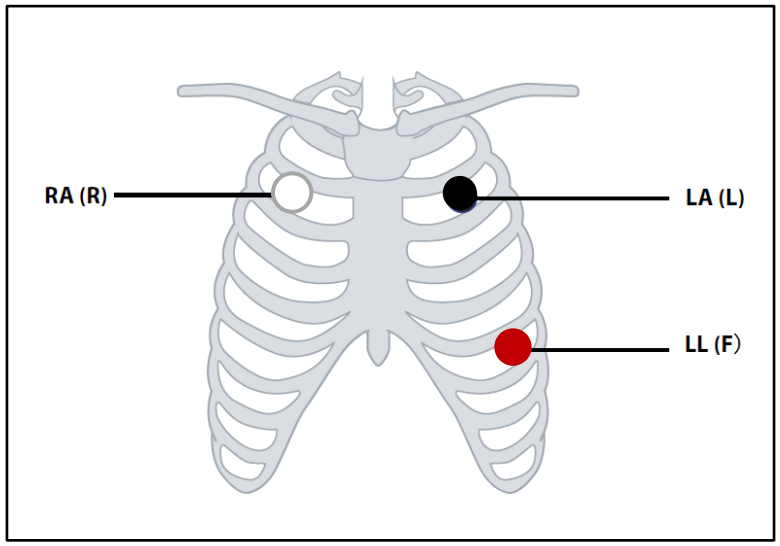
3-wire Lead Set

A 3-wire lead set can monitor one of three ECG vectors (I, II, or III).

The recommended 3-wire ECG lead placement is as follows.

3-wire Lead Placement (AHA)

- Place RA (white) electrode under right clavicle, 2nd ICS, mid-clavicular line within the rib cage frame.
- Place LA (black) electrode under left clavicle, 2nd ICS, mid-clavicular line within the rib cage frame.
- Place LL (red) electrode on the lower left abdomen within the rib cage frame.



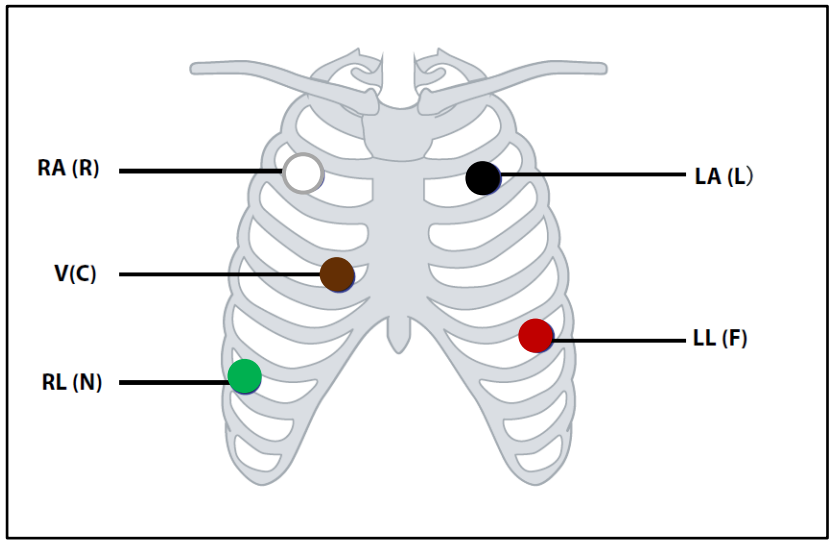
ECG Lead Placement Procedure

5-wire Lead Set

A 5-wire lead set can monitor seven ECG vectors (I, II, III, aVR, aVL, aVF, and V) simultaneously. The recommended 5-wire ECG lead placement is as follows.

5-wire Lead Placement (AHA)

- Place RA (white) electrode under the right clavicle, 2nd ICS, mid-clavicular line within the rib cage frame.
- Place LA (black) electrode under the left clavicle, 2nd ICS, mid-clavicular line within the rib cage frame.
- Place LL (red) electrode on the lower left abdomen within the rib cage frame.
- Place RL (green) electrode on lower right abdomen within the rib cage frame.
- Place V (brown) chest lead in the proper positioning for desired lead V1-V6.

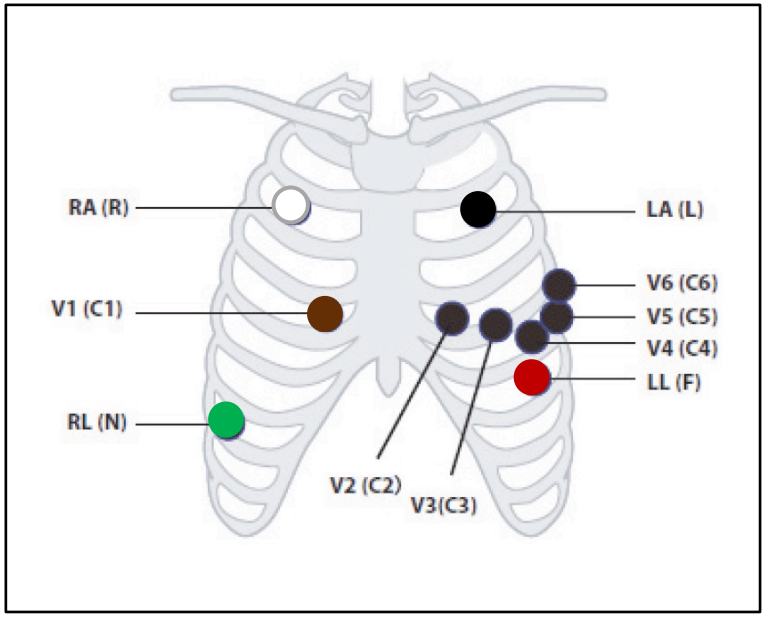


Note: for an optional 6 lead wire set, the second V chest lead is placed in the desired secondary V1-6 position

ECG Lead Placement Procedure

12 Lead utilizes a 10-wire ECG lead set that can monitor 12 ECG vectors (I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, and V6) simultaneously. The recommended AHA lead placement is as follows.

12 Lead Placement (AHA)



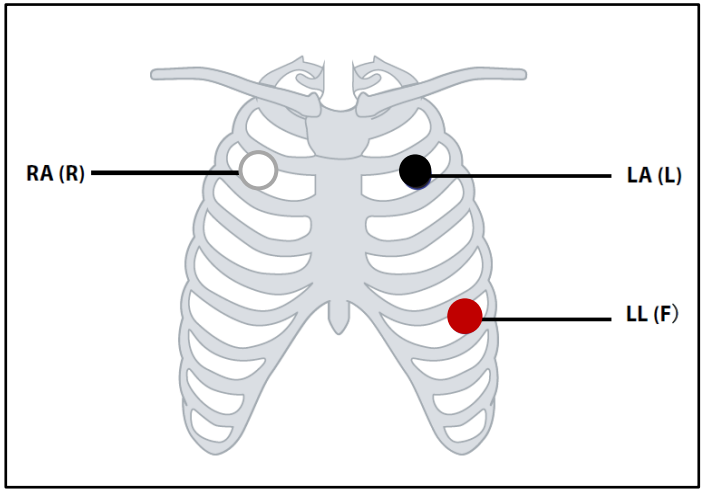
- Place RA (white) electrode under the right clavicle, mid-clavicular line within the rib cage frame.
- Place LA (black) electrode under the left clavicle, mid-clavicular line within the rib cage frame.
- Place LL (red) electrode on the lower left abdomen within the rib cage frame.
- Place RL (green) electrode on lower right abdomen within the rib cage frame.
- Place V1 (brown) chest lead in the fourth intercostal space, right sternal border.
- Place V2 (brown) chest lead in the fourth intercostal space, left sternal border.
- Place V3 (brown) chest lead midway between V2 and V4 on a straight line.
- Place V4 (brown) chest lead in the fifth intercostal space, mid-clavicular line.
- Place V5 (brown) chest lead in the fifth intercostal space, anterior axillary line.
- Place V6 (brown) chest lead in the fifth intercostal space, mid-axillary line.

Lead II Monitoring

The recommended lead placement for Lead II monitoring is as follows.

Lead II Monitoring (AHA)

- Place RA (white) electrode under right clavicle, mid-clavicular line within the rib cage frame.
- Place LA (black) electrode under left clavicle, mid-clavicular line within the rib cage frame.
- Place LL (red) electrode on the lower left abdomen within the rib cage frame.



Select the ECG Lead II at the bedside monitor. Lead II is the direct electrical line between the RA (white) electrode and the LL (red) electrode.

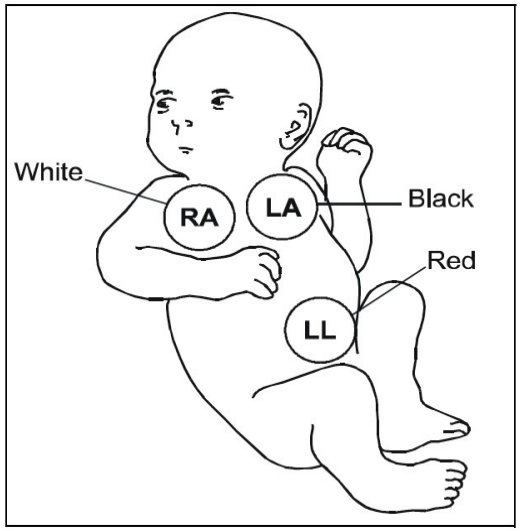
ECG Lead Placement Procedure

Neonatal Electrode Placement

When using a 3-wire lead set, ECG lead placement on a neonate is usually directed towards obtaining the best possible respiration data through the ECG thoracic impedance technique. Thoracic impedance is usually measured between the Right Arm and Left Arm electrode patches. These patches should be placed on the chest directly across from each other to optimize the measurement of the neonate's chest movement. The recommended lead placement for neonate monitoring is as follows.

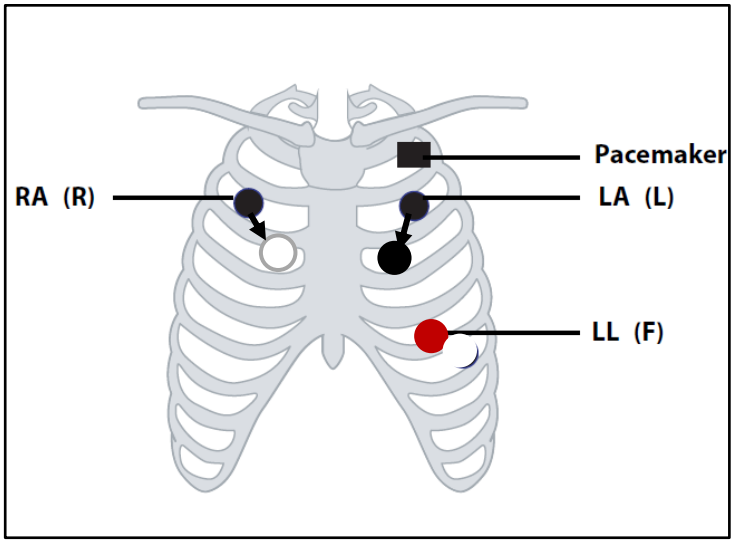
Neonatal 3-wire Lead Placement (AHA)

- Place RA (white) electrode under patient left clavicle, mid-clavicular line within the rib cage frame.
- Place LA (black) electrode right sternal border, fourth intercostal space within the rib cage frame.
- Place LL (red) electrode on the patient's lower left abdomen within the rib cage frame.

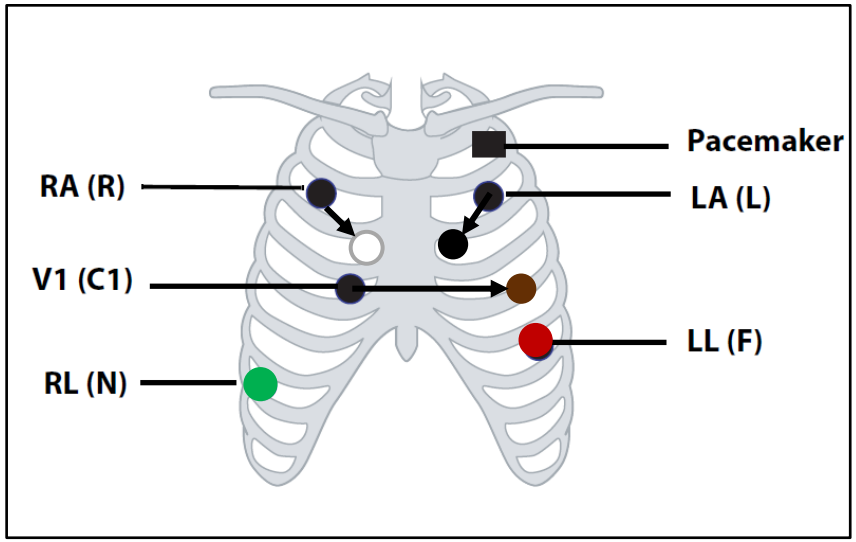


Monitoring a Pacemaker Patient

The recommended lead placement for a pacemaker patient is as follows.



Placement for a Pacemaker Patient – 3-wire Lead (AHA)



Placement for a Pacemaker Patient – 5-wire Lead (AHA)

ECG Lead Placement Procedure

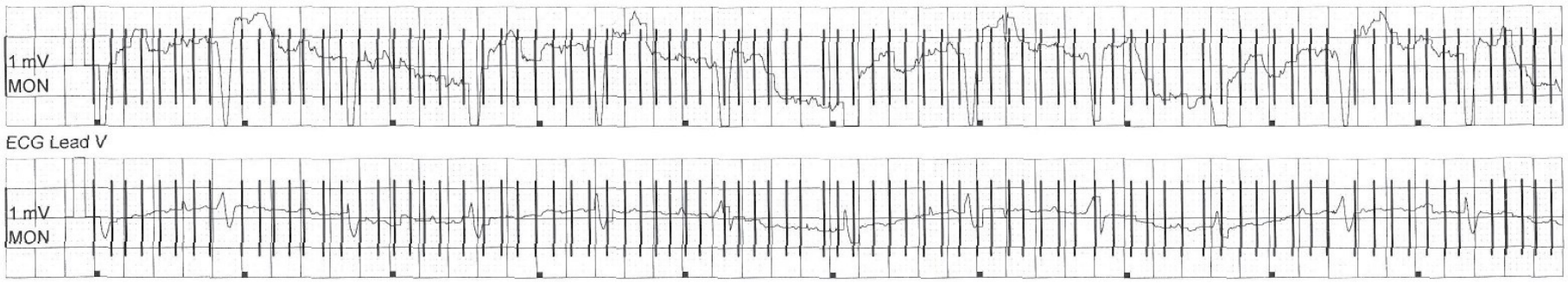
A Pacemaker patient usually requires a different electrode patch placement configuration than a non-pacemaker patient.

Do not place an ECG electrode directly over the pacemaker generator. Place the electrode patches 3-5 inches away from the pacemaker generator area to avoid electrical interference. If the electrode patches are placed closer to pacemaker generator, the ECG will contain artifact, sometimes called "picket fence syndrome." For example, if the pacemaker generator is located in the right subclavian area, relocate the Right Arm (white) electrode closer in towards the center of the chest.

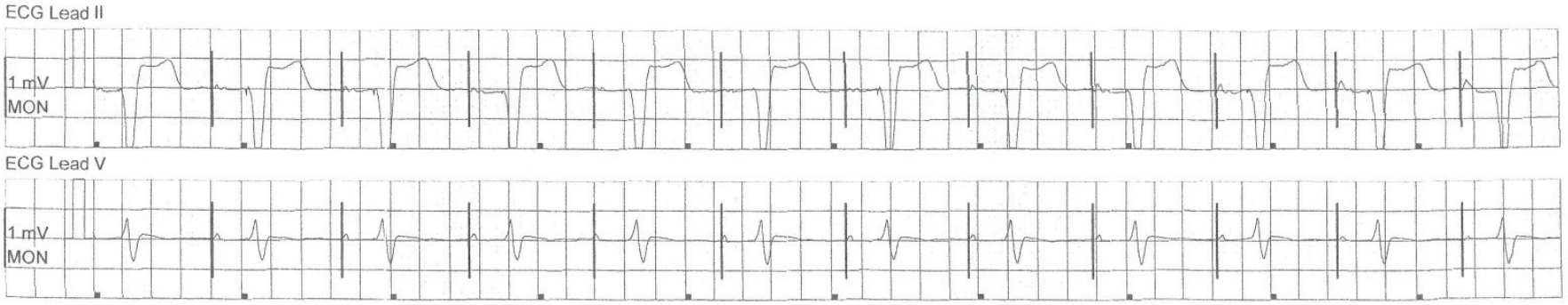
WARNING: PACEMAKER PATIENTS – Indication of the heart-rate may be adversely affected by cardiac pacemaker pulses or by cardiac arrhythmias. Keep pacemaker patients under close surveillance.

CAUTION: Some pacemakers may contain a respiratory sensor that may produce artifact on an ECG waveform.

Example of “Picket Fencing”– electrode too close to pacer



Corrected Lead Placement



ECG Lead Placement Procedure

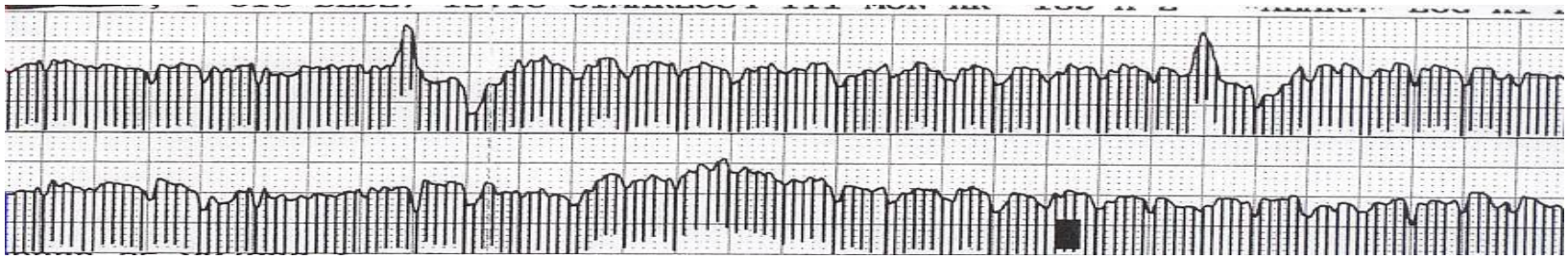
Artifact

Scenario: In these clinical scenarios either the pacemaker detection is turned on but the patient does not have a pacemaker or the patient has a pacemaker and the lead closest to the pacemaker is too close. The monitor is picking up an electrical signal from an alternative source.

Problem: ELECTRICAL INTERFERENCE

Solution: Turn the pacemaker detection off if no pacemaker or move electrode 3-5 inches down and away from pacemaker.

- Does patient have a TENS unit or other nerve stimulator?
- TENS units transmit electrical impulses; avoid placing ECG electrode patches near TENS electrodes. ECG electrode patches may need to be repositioned and the ECG "lead viewed" may need to be adjusted until the optimum ECG tracing is obtained.



ECG Lead Placement Procedure

Artifact

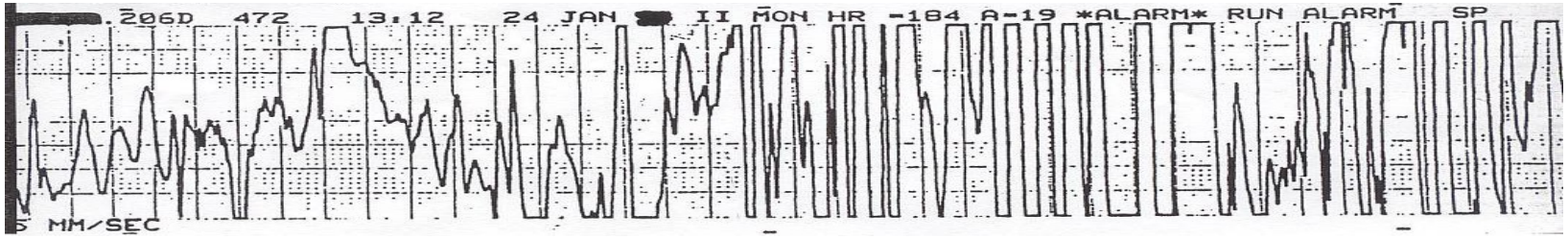
Scenario: The ECG tracing is “Railing” all over the place. Monitor is constantly alarming.

Problem: POSSIBLE BROKEN LEAD WIRES

Solution: To target the broken lead wire, verify the leads you are able to monitor in.

Examples:

- If you can monitor in Lead I but not Lead II > check left leg wire
- If you can monitor in Lead III but not Lead I > check right arm lead wire



Artifact

Scenario: The patient is febrile, diaphoretic or the electrodes are dried out

Problem: DRY OR NON-ADHERING ELECTRODES

Solution: Change electrodes daily and PRN

- Prepare skin for electrode application