



Factors Affecting ECG Trace Quality

Monitor

- CMRR (Common Mode Rejection Ratio) used to separate ECG from other signals
- Filters
- Bandwidth (frequency response)
- Amplifier noise
- Ground loops
- Saturation distortion (e.g. defibrillation recovery)
- Input impedance
- Differential input (required to generate ECG tracing)

Skin

- Impedance
- Diaphoresis
- Dryness
- Oilyness
- EMG, respiration and other biopotentials (physiological electrical signals)
- Skin preparation techniques
- Obesity
- Skin stretch
- Motion artifact

Electrodes

- Adhesion
- Conductor
- Gel
- Backing
- Size
- Design
- Motion
- Shelf life
- Application technique
- Electrical/mechanical properties
- Location on the body

Environment

- Electrical field (60 Hz)
- Humidity
- Temperature
- Static electricity
- Magnetic field
- Radiofrequency
- Vicinity of other machines (nebulizers, fans, power cords, etc.)

Cables & Lead Wires

- Mechanical/electrical properties of materials
- Shielded cable and shielded lead wires
- Open lead wires (avoid loops)
- Triboelectric effect (generated by cable movement)



Proper ECG Electrode Placement

3-Lead Placement Monitoring Electrodes

RA: Second intercostal space lateral right side
LA: Second intercostal space lateral left side
LL: Lower left lateral chest or left leg

5-Lead Placement Monitoring Electrodes

RA: Second intercostal space lateral right side
LA: Second intercostal space lateral left side
LL: Lower left lateral chest or left leg
RL: Lower right lateral chest or right leg
V2: Fourth intercostal space to the left of the sternum

12-Lead Placement Resting Electrodes

RA: Second intercostal space lateral right side
LA: Second intercostal space lateral left side
LL: Lower left lateral chest or left leg
RL: Lower right lateral chest or right leg
V1: Fourth intercostal space to the right of the sternum
V2: Fourth intercostal space to the left of the sternum
V3: Between V2 and V4
V4: Fifth intercostal space along the mid-clavicular line
V5: Fifth intercostal space between V4 and V6
V6: Fifth intercostal space along the mid-axillary line

Troubleshooting ECG Traces

Troubleshoot each artifact in order, starting with 1

Artifacts	Skin Impedance	Muscle Movement	Electrical Continuity	Electrodes	Cabling	Interference	Equipment
No Base Line 			2 Check all connections/perform continuity check	4 Check for dry-out	3 Check for proper cable		1 Check lead switch and ECG machine set-up
Base Line Wander 	3 Abrade skin	1 Stop patient movement	2 Check ground connections	4 Use same type of electrode at all sites	6 Check for proper cable	5 Check for static build-up	
AC Noise 	3 Abrade skin	6 May be untreatable involuntary muscle tremor	1 Check ground connections	5 Check for dry-out	7 May need fully shielded cable and lead wires	2 Keep cable away from AC cord	4 Turn off fluorescent lights and/or other equipment
Intermittent Signal 			1 Check for loose connections	2 Check for loose electrode or dry-out	4 Perform continuity check	3 Check for static build-up	
Motion Artifact 	2 Abrade skin	1 Move electrodes off muscle mass	3 Check for loose connections	4 Check for loose electrode or dry-out	7 Perform continuity check	5 Turn off fluorescent lights and/or other equipment	6 Check for proper EKG machine set-up
Low Amplitude 	3 Abrade skin		1 Check all connections	4 Check for dry-out		5 Turn off radio, TV and/or other equipment	2 Check gain settings



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