TIPS FOR OPTIMIZING ECG RELATED MONITORING

ECG electrodes are the most common cause for nuisance alarms (see attached). ***One missing lead or poor lead contact can produce any or all of the following repetitive alarms:***

1. *ECG rhythm*
2. Heart Rate
3. Respiratory rate monitoring or detection issues
4. QTC monitoring
5. ST monitoring

Optimize Electrode Contact:

1. **PREP THE SKIN**

   Never underestimate the importance/time saving/aggravation reducing nature of doing good skin preparation. Consider how much of a difference proper prep and electrode quality matters with EEG.

   - Change electrodes daily (during bath) and PRN
   - Apply electrodes to intact skin only
   - Do not use soaps or detergents (which can diminish contact) or alcohol (which dries the skin and increases resistance).
   - If hair removal is required, clip area (don't shave). Shaving causes microabrasions that can reduce contact and lead to skin breakdown.
   - Scrub skin with a wet washcloth to remove oils and debris, then vigorously rub the area with a dry washcloth.
   - If the patient is sweaty or you are having difficulty establishing contact, apply a small amount of NuPrep to area (then rub dry).
   - If these efforts fail to eliminate artifact, foam electrodes or EEG electrodes (much more expensive) can be considered.

2. **APPLY THE LEADS**

   - Turn pacemaker mode ON if the patient has a pacemaker. This will enable the pace pulse rejection. If a patient has a pacemaker and the pacemaker mode is not turned on, it may count the pacemaker spikes as additional QRS beats and fail to recognize bradycardias.
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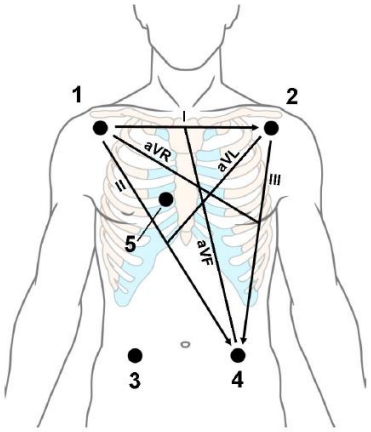
   - When using button type ECG leads, always connect the electrode to the lead before applying the lead to the patient (if you press down on the electrode, you may lose some of the contact gel).
   - Be sure that limb and chest leads are in the correct position (e.g., RA in the right arm position).
   - When using 5 leads, the V lead viewed depends upon where the V electrode (brown) is positioned. Usually, it is placed in the V1 position (4^{th} intercostal space to the right of the sternum). If placed in V1, the Philips monitor can provide an MCL (modified chest lead) view.

Standard 5-Lead Placement

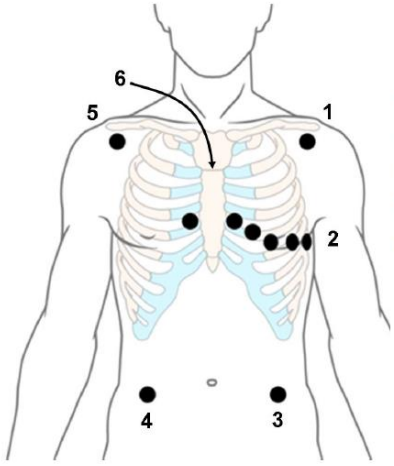


1 RA placement: directly below the clavicle and near the right shoulder
2 LA placement: directly below the clavicle and near the left shoulder
3 RL placement: on the right lower abdomen
4 LL placement: on the left lower abdomen
5 V placement: on the chest, the position depends on your required lead selection. If configured, the label of the chest lead will be displayed with its exact position (V1 to V6R)

- When using 10 leads (for 12 lead ECG monitoring), the extra cable will add the remaining 5 chest leads (for a total of 6). Leave the brown electrode of you standard leads in the V1 position, and position V2-V6 in the appropriate positions.
- To initiate 12 lead ECG monitoring, just connect the extra 5 leads and monitoring begins automatically.
- When you wish to stop 12 lead ECG monitoring you have to discontinue monitoring.

Chest electrodes:
V1 - on the 4th intercostal space at the right sternal border
V2 - on the 4th intercostal space at the left sternal border
V3 - midway between the V2 and V4 electrode positions
V4 - on the 5th intercostal space at the left midclavicular line
V5 - on the left anterior axillary line, horizontal with the V4 electrode position
V6 - on the left midaxillary line, horizontal with the V4 electrode position

Modified 12-Lead ECG



1 LA
2 V1-V6
3 LL
4 RL
5 RA
6 Angle of Louis

3. PICK THE BEST LEAD FOR YOUR PRIMARY ECG

- Pick a primary lead that has the tallest R wave or deepest S wave. Avoid biphasic QRS complexes if possible.
- If you have a biphasic QRS, pick one where the sum of the waves is mostly positive or mostly negative (not neutral). If the R and S are the same size, the monitor sees this as zero.
- If the ECG is setup to "Multi-lead" configuration, the monitor will use both the primary and secondary leads to try to compute HR and analyze ECG rhythm.
- If the ECG is setup to "single-lead" configuration, only the primary lead is used.
- If the P or T wave is > 0.2 mV (2 small boxes high), the monitor may have difficulty with HR or arrhythmia analysis.
- To find the best lead, go to Change Screen and choose 12 lead ECG. All of your available lead will appear. You should see at least 7 (5 leads connected) or 12 (if extra 5 leads connected).
- Touch the primary ECG wave and change the primary lead to your preferred lead.
- **Increasing the gain on the ECG does not improve detection** (just makes it look bigger to you)
- If you change your lead, go to arrhythmia and choose "RELEARN" to reestablish the new baseline rhythm.
- Reposition electrodes away from diaphragm is baseline is wandering.

4. PACEMAKER

- Turn pacemaker mode ON if the patient has a pacemaker. This will enable the pace pulse rejection. If a patient has a pacemaker and the pacemaker mode is not turned on, it may count the pacemaker spikes as additional QRS beats and fail to recognize bradycardias.
- Some pacemaker beats are difficult to recognize. Select "Review" from the Central Station to determine if the pace pulses are being detected properly. Notice that the beat detection is identified above the ECG (e.g., N for native or normal), P for paced.

5. OTHER TROUBLESHOOTING

- Be sure that the cable isn't pulling or dangling over the bedside
- Be sure cables are not in contact with the ventilator tubing or other electronic devices
- If you have picked the best primary lead but continue to have problems, go to ECG setup (touch the primary ECG wave) and change the mode to "single-lead".
- Make sure that the ECG filter is in "monitor" and not "diagnostic mode"

6. ARRHYTHMIA MONITORING

- Arrhythmia detection is pretty good, but not perfect.
- You need good electrode function for arrhythmia detection to work well.
- Arrhythmia monitoring defaults to ON. You need to customize for each patient based on their underlying rhythm. For example: If the patient has chronic atrial fibrillation, touch the ECG and choose "arrhythmia". Scroll to the last page to disable atrial fibrillation and

irregular heart rate. If the patient is in normal sinus rhythm, leave the atrial fibrillation on so that you would receipt prompt notification if the rhythm changes.

- You can disable all yellow alarms. You cannot disable red alarms. The only way to disable red alarms is to turn all alarms off (this should only be done while a resuscitation is being performed or withdrawal of life support).

7. ST ANALYSIS

- Use ST analysis if your patient has/is suspected of having an Acute Coronary Event. Connect the second 5 leads to get continuous 12 lead monitoring and ST analysis of all views.
- Prep the skin well, skin prep matters the most for ST analysis
- Choose the leads where you want to monitor ST segments and set alarms. A + sign indicates an ST above baseline and – is ST below baseline.
- Choose the best QRS height or depth for you dominant lead and "RELEARN" to before initiating monitoring. Remember that every time your relearn you RESET your ST segment monitoring from a new baseline.
- If you do not want ST segment analysis, touch the ECG and choose ST analysis. Scroll to the last page and turn all ST segments off (don't turn each lead off individually).

6. **Respiratory alarms**

- The white and red leads are used for respiratory monitoring. Position the red lead on the mid axillary line as close to hip as possible.
- If any other leads are off or have poor contact, respiratory monitoring may not work.
- If you have trouble with detection, touch the respiratory rate waveform and choose detection. Adjust the dotted line so that it is midway beween the top and bottom of the waves (so it intersects every breath).