Pre-Hospital 12 Lead

Acquiring 12 Lead ECG in the Pre-Hospital setting
Why Are We Recording 12 Lead

• “One of the primary methods to speed the recognition of myocardial infarction rests in the hands of the non-physician to recognize myocardial infarction” - AHA
  – 12-Lead EKG is a “vital sign”

• When using the 12 lead ECG to look for evidence of ischemia or infarction, we are not so much interested in a single 12 lead recording (though it may be conclusive on its own), but how it changes over time - we are comparing recordings. If these records were not all made the same way the reliability of comparison is lost.
Why Are We Transmitting the 12 Lead

- “The 12 lead ECG is at the center of the decision pathway in the management of ischemic chest pain and is the only means of identifying STEMI.” - AHA

- In patients with STEMI who present 3 hours or less from onset of symptoms, treatment is more time sensitive. In these “early presenters,” any possible benefit from primary PCI will be lost in prolonged transfers. – AHA

- EMT-CC are sending a 12 lead ECG to identify STEMI patients. If Medical Control identifies the 12 lead as a STEMI patient then you will be directed to a Medical Facility that can do PCI.

- EMT-P if evidence of STEMI you are required to send and contact Medical Control to be directed to a Medical Facility that can do PCI.
ACUTE CORONARY SYNDROME
ENTRY PROTOCOL

• Follow NYS BLS protocols for Adult Related Cardiac Problem without assisting or administering the patient’s own prescribed Nitroglycerin.
• Chewable Aspirin 324 mg PO unless the patient has already taken Aspirin for this current episode.
• Cardiac Monitor
• Obtain a 12 lead EKG (if STEMI transmit as soon as possible).
• IV NS to KVO or Saline Lock

• 12 lead must be transmitted to Medical Control. EMT-CC

Note: At the time that you send a 12 lead to Medical Control or shortly after you have sent it you must contact Medical Control.

Proceed to the proper Acute Coronary Syndrome:
• STEMI - confirmed
• Acute Coronary Syndrome - suspected
Preparation of Skin

- Dry chest wall and limbs
- Oily skin is dried with alcohol
- Shave excessive hair
  (if needed and with patient consent)

Please do not leave electrodes pre-attached to the patient cable. Attach the electrodes just prior to placement on patient. If you attach the electrode and leave them on the cables then the gel will dry out and the electrodes will be useless.
Lead Placement

- Place Limb Leads on inside of wrists / ankles
  - RA
  - RL
  - LA
  - LL

Placed at least 10 cm from heart
So what are the correct positions for the limb electrodes?

- According to the American Heart Association, "The electrodes may be placed on any part of the arms or of the left leg as long as they are below the shoulders in the former and below the inguinal fold anteriorly and the gluteal fold posteriorly in the latter. Any other placement necessary by deformed or missing extremities must be noted on the record."

Chest Lead Placement

- Locate Suprasternal Notch
- Locate “Angle of Louis” (sternum & 2nd Rib)
- Locate 2nd ICS on the RIGHT side of the sternum

**Lead V₁** The electrode is at the fourth intercostal space just to the right of the sternum.

**Lead V₂** The electrode is at the fourth intercostal space just to the left of the sternum.

**Lead V₃** The electrode is at the line midway between leads V₂ and V₄.

**Lead V₄** The electrode is at the midclavicular line in the fifth interspace.

**Lead V₅** The electrode is at the anterior axillary line at the same level as lead V₄.

**Lead V₆** The electrode is at the midaxillary line at the same level as lead V₄.
12-Lead Electrode Application

Follow the angle of Louis to patient’s right until it articulates with 2\textsuperscript{nd} rib

Locate the 2\textsuperscript{nd} IC space (immediately below 2\textsuperscript{nd} rib)
12-Lead Electrode Application

From the 2nd IC space, the 3rd and 4th IC spaces can be found

V₁ is positioned in the 4th IC space just right of the sternum
12-Lead Electrode Application

Place V₂ electrode in the 4th IC space just left of sternum

5th Rib

4th Rib
From $V_2$ position, locate 5th IC space, follow to the midclavicular line

Position $V_4$ electrode in 5th IC space in midclavicular line
12-Lead Electrode Application

Position $V_3$ halfway between $V_2$ & $V_4$

$V_5$ is positioned in anterior axillary line, level with $V_4$
12-Lead Electrode Application

Position $V_6$ in the midaxillary line, level with $V_4$
Lead Placement is Important

• The most important aspect of a 12 lead ECG recording is consistency of the recording technique, but positioning of electrodes comes a close second.
Lead Placement is Important
Patient Position

- Place patient in position of comfort
  - Sitting Upright
- Limbs flaccid, supported whenever possible
- Patient must be still
- Attach lead wire to electrode first
- No contact with the patient during signal acquisition
- OK to move after signal acquisition
Acquisition of 12 Lead

- Encourage the patient to remain as still as possible.
- Press “12 LEAD” button.
- The 12-Lead/Age menu will appear.
- Select the patient’s age.
- If the monitor detects noise (such as patient motion or a disconnected electrode), the 12 Lead acquisition is interrupted. Take appropriate action and press the 12 LEAD button again.
Lead Placement for a Right-sided ECG

V1 & V2 are the same as Left-side ECG but,

V3R to V6R are on the Right-side.
Special Issues - Women

- Patient Care vs. Modesty Concerns
  Please be sensitive when exposing or touching the breast. If possible, the bra should be left on.

- Private Location, Maximum Privacy
- Female Crew-member When Possible
  If you assist the female patient with displacement of her breast, always use the back of your hand and never the palm.

- Apply Leads Below Breast
  If needed, encourage the female patient to assist you in displacing her left breast.
12-Lead Acquisition and Transmission

Validating the 12-Lead ECG (i.e. leads correctly placed):

• In Lead I, the P, QRS and T should all be positively deflected. If they are all negative, **Right Arm** and **Left Arm** electrodes are inverted.

• In V Leads, a normal ECG should show R wave progression. R waves should get progressively taller from V1-V6. Misplaced V Leads will disrupt progression.
12-Lead Acquisition and Transmission

- QRS Complex should transition from predominately negative to predominately positive at V2, V3 or V4. If it does not, this may indicate improper V Lead placement.
Troubleshooting

• Noisy ECG
  Electrodes are connected
  Cable is motionless
  Stop Vehicle
  Verify filter setting (50-60 Hz)

• Change Filter setting to .05-40 Hz 4x3 — retry 15 seconds after defibrillation
Troubleshooting
Common Technical Problems

• Wandering Baseline
  – Deep inhalations / exhalations
  – Acceleration / deceleration forces of moving ambulance
  – Moving lead wire is the most common cause
Common Technical Problems

- Electromagnetic Interference
  - Power cord to nearby electronic device
  - Computer
  - Strobe Light
  - Two-way radio
  - Cable damage
Is This a Good One?

Yes it is because You can read it!

So now you can send it!
How to properly Send 12 Lead ECG’s
Troubleshooting Transmission

• Check with your agency for how your ECG monitor is set up to transmit a12 lead.

• Hand out guides for Rosetta & Other ECG Transmission devises.

• 12 leads can be transmitted to Medical Control by Phone, Fax or by the 800 radio.

• Learn how to transmitted 12 lead before you need to!
Recordkeeping

- 12-lead ECG Attached to PCR (pink copy)
- Reprint or Photocopy for Agency Retention the (white copy)