Pre-Hospital 12 Leads

When to Acquire 12 Lead ECG in the Pre-Hospital setting & How to properly Acquire 12 Lead ECG’s
Why Are We Recording 12 Leads

• “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 12 Leads

- "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.
Inclusion Criteria for acquiring 12 lead

The adult patient who presents with a primary chief complaint of non-traumatic chest pain, presumed by the technician to be ischemic in nature. Also for EMT-P ‘s with patients in V-Tach who are “stable”.

Exclusion Criteria

- Patients in extremis where care takes precedent
- Unmanageable airway
- Cardiac Arrest
- Complete Heart Block
- Technological Failure of Equipment?
Exclusion Criteria

SVT Protocol # 8
Exclusion Criteria

Bradycardia Protocol # 7
Exclusion Criteria

At no time should the 12-lead ECG application delay routine patient care or delay transport of the patient with suspected AMI or Unstable Ventricular Tachycardia with a pulse!
Clinical Presentations

- CLASSICAL - CENTRAL ANTERIOR CHEST, DULL, FULLNESS, PRESSURE, TIGHTNESS, CRUSHING, RADIATES TO ARM, BACK/NECK

- ATYPICAL PAIN - MUSCULOSKELETAL, POSITIONAL OR PLEURITIC FEATURES. CAN BE UNILATERAL. DESCRIBED AS SHARP OR STABBING OR EPIEGASTRIC—FEMALES

- ANGINAL EQUIVALENTS - DYSPNEA, PALPITATIONS, SYNCOPE, WEAKNESS-DKA
Identification of “High Risk” Patients

- Associated Signs/Symptoms
  - Diaphoresis
  - Nausea
  - Vomiting
  - Shortness of Breath
  - Lightheaded
  - Syncope
  - Palpitations
Identification of “High Risk” Patients

• Cardiac Risk Factors
  ✐ Hypertension
  ✐ Diabetes
  ✐ High Cholesterol
  ✐ Tobacco Use (now or in past)
  ✐ Cocaine Use (within 1 week or in distant past)
Identification of “High Risk” Patients

- Past Medical History
  - AMI
  - Angina
  - CHF
  - Arrhythmia
  - On Cardiac Meds ?????
Identification of “High Risk” Patients

• Consider the Silent MI
  ➤ History of Diabetes
  ➤ Atypical Presentation
  ➤ “Go With Your Gut”
Treatment Options

- Oxygen: High Flow via NRB
- IV NS: KVO
- Nitroglycerin: 0.4 mg q 5 min x 3
- Aspirin: 324 mg x 1 (4 x 81mg)
- Morphine: 2-5 mg titrate to effect

What about fluids?

- It may be preferred. *It’s better to maintain a pressure to treat APE than it would be to withhold fluids for fear of causing APE.*
Chest Pain/Discomfort: SUSPECTED M.I / ST Elevation M.I.

• STANDING ORDERS

• Begin cardiac monitoring, record and evaluate lead II.
• Aspirin 324 mg PO if not taken prior to EMS arrival.
• Perform 12 Lead if Trained, Equipped, and authorized, and no exclusion criteria are present.
• IV of NS at KVO
• IV must be established prior to giving NTG
  
  *may omit IV NS if BLS criteria for assisting with NTG are met*

• IF HEART RATE IS BETWEEN 60-120 AND SYSTOLIC BP AT LEAST 120 AND PATIENT HAS A HISTORY OF HEART DISEASE:

  • NTG 1/150 gr. (0.4mg SL)

• Contact Medical Control and prepare to transmit 12 lead..

Continued.
Chest Pain/Discomfort:
SUSPECTED M.I / ST Elevation M.I.

- IF NO 12-LEAD ECG available, and chest pain/discomfort persists and the SBP remains at least 120, Nitroglycerin 1/150 gr. (0.4mg SL).*, may be repeated q five (5) minutes to a maximum of three (3) total doses WHILE ENROUTE TO THE HOSPITAL. If chest pain / discomfort is completely resolved, contact Medical Control on the post-call signal 34.

**EMT-CC must contact Medical Control if:**
- 12-Lead ECG available, be prepared to transmit.
- If NO 12-Lead ECG available, and Sign/symptoms of ischemic chest pain after 3 NTG are not improving or the systolic BP drops by more than (>) 20% baseline SPB.

**EMT-P must contact Medical Control if evidence of STEMI² for hospital destination decision.** If no evidence of STEMI², continue with standing orders.

*NOTE: Nitroglycerin Should Be Withheld When a Patient Admits to Taking Viagra (sildenafil citrate), Levitra (vardenafil), Cialis (tadalafil), or Other Similar Medication within the Last 72 Hours, UNLESS SO ORDERED BY A MEDICAL CONTROL PHYSICIAN.
Ventricular Tachycardia with a Pulse

• EMT-CC: No Standing Orders -
  Contact Medical Control: Physician may ask for a 12 lead or lead II to be transmitted.

• EMT-P: you must Obtain 12-lead Electrocardiogram if Patient is stable.
  If the patient is unstable then follow unstable Ventricular Tachycardia with a pulse standing orders.
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 \( V_1 \)** The electrode is at the fourth intercostal space just to the right of the sternum.

**Lead \( V_2 \)** The electrode is at the fourth intercostal space just to the left of the sternum.

**Lead \( V_3 \)** The electrode is at the line midway between leads \( V_2 \) and \( V_4 \).

**Lead \( V_4 \)** The electrode is at the midclavicular line in the fifth interspace.

**Lead \( V_5 \)** The electrode is at the anterior axillary line at the same level as lead \( V_4 \).

**Lead \( V_6 \)** The electrode is at the midaxillary line at the same level as lead \( V_4 \).
12-Lead Electrode Application

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

Locate the 2nd IC space (immediately below 2nd 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
12-Lead Electrode Application

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. You can read it, so now you should 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 a 12 lead.
- Hand out guides for Rosetta & Other ECG Transmission devices.

- 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)
The End…

Suffolk County Department of Health Services
Division of Emergency Medical Services
PO Box 6100 | Hauppauge, New York 11788-0099 |

Tel: (631) 853-5800  Fax: (631) 853-8307