

ST-ELEVATION MYOCARDIAL INFARCTION (STEMI) TRIAGE PROTOCOL

Acute myocardial infarctions (AMIs) are one of the diseases identified as *acute coronary syndromes* (ACS). The 12-lead ECG in ACS may include ST-segment elevation myocardial infarction (STEMI), ST-segment depression, and nondiagnostic ST-segment and T-wave abnormalities. Treatment of ACS, particularly STEMI, is extremely time-sensitive. The prehospital caretakers of ACS patients can have a big impact on patient outcome if they provide efficient triage, stabilization, and referral for cardiology care. It is critical that BLS and ALS providers who care for ACS patients in the field, emergency department and hospital be aware of the principles and priorities of assessment and stabilization of these patients. Patients with STEMI usually have complete blockage of a coronary vessel. The treatment is reperfusion through administration of fibrinolytics (pharmacologic reperfusion) or primary PCI (mechanical reperfusion).

1. Perform general patient management
- .2. Support life-threatening problems associated with airway, breathing, and circulation.
3. Treat dysrhythmias. Be prepared to initiate CPR and defibrillation, if necessary.
4. Obtain a 12-lead ECG in accordance with **12-LEAD ECG ACQUISITION**.
 - a. If able, transmit the 12-lead ECG to the receiving facility as soon as possible.
 - b. If unable to transmit the 12-lead ECG, contact Medical Control at the receiving facility and advise the ECG machine interpretation.
5. Triage the patient into one of the following two categories based on the 12-lead ECG machine interpretation and clinical presentation:

CATEGORY 1

DIRECT TRANSPORT TO CARDIAC CATHETERIZATION FACILITY.

1. 12-lead ECG interpretation with an "ACUTE MI" or "...INFARCT, ACUTE" statement. If capable, transmit ECG.
2. Contact Medical Control at the receiving facility as soon as practical to provide a complete patient report.
3. If the transport time to the cardiac catheterization facility is greater than 30 minutes, consider rendezvous with air medical support, after consult with Medical Control. **Do not delay patient transport.**
4. If transport time to the cardiac catheterization facility is greater than 90 minutes, transport to the closest hospital.

CATEGORY 2

TRANSPORT TO CLOSEST HOSPITAL

1. Any hemodynamically unstable patient (SBP less than 90 mmHg, altered mental status, bradycardia, respiratory distress, etc.)
2. If transport time to the cardiac catheterization facility is greater than 90 minutes, transport to the closest hospital.
3. If the transport time to the cardiac catheterization facility is greater than 30 minutes, consider rendezvous with air medical support, after consult with Medical Control. **Do not delay patient transport.**

6. Have out and ready to place defibrillation electrodes to a patient with an indicated myocardial infarction. Be prepared to defibrillate if needed.

7. Perform ongoing assessment as indicated. Notify the receiving medical facility of any changes in the patient's condition.

Key Points: STEMI TRIAGE

- Pre-designated landing zones for helicopters are preferred. The landing zone should be selected in such a way that the helicopter would be expected to arrive before the ambulance that is transporting the patient.
- Refer to the **CHEST PAIN (NON-TRAUMATIC)** protocol and contact Medical Control for additional **MORPHINE** dosing for continuing chest pain.
- In some cases, with short transport times, transport to the closest facility may be advantageous for the administration of fibrinolytics based on the time of onset of signs and symptoms.
- If time permits, EMS providers may complete the **FIBRINOLYTIC CHECKLIST**. Do not delay patient treatment, ongoing monitoring and transport to complete the fibrinolytic checklist.

12 LEAD ECG ACQUISITION

Out-of-hospital 12-lead ECGs and advance notification to the receiving facility speeds the diagnosis, shortens the time to fibrinolysis or catheterization, and may be associated with decreased mortality rates. The reduction in door-to-reperfusion therapy interval in most studies ranges from 10 to 60 minutes.

TRAINING

Providers shall complete training for 12-lead ECG acquisition prior to utilizing this protocol and ECG machines.

INDICATIONS (any of the following)

1. Chest pain
2. Dyspnea
3. Palpitations
4. Syncope
5. General weakness or dizziness
6. Activation of an implantable cardioverter defibrillator (ICD)
7. Other

PRECAUTIONS

1. Treatment of lethal dysrhythmias (e.g., VF, pulseless VT) and life threatening problems associated with airway, breathing, and circulation should be initiated prior to obtaining a 12-lead ECG.
2. Treatments such as oxygen, aspirin and nitroglycerin, or requesting advanced life support, should never be delayed to acquire a 12-lead ECG. Ideally, 12-lead acquisition and treatment of the patient should occur concurrently.
3. Keep time on the scene to a minimum by moving the patient to ambulance prior to ECG if possible.
4. Dirt, oil, sweat and other materials on the skin can interfere with obtaining a quality tracing.
5. Being in a moving vehicle and engine vibration can interfere with obtaining a quality tracing.

PROCEDURE

1. Prepare all of the equipment and ensure the cable is in good repair. Check to make sure there are adequate leads and materials for prepping the skin.
2. Prep the skin by first drying sweat or water. Lightly buff the electrode placement areas with an alcohol prep or the abrasive pad which may be found on the removable cover of some electrodes.
3. Place the four limb leads in accordance with manufacturer's recommendations. Limb lead electrodes are typically placed on the deltoid area and the lower leg or thigh as shown in Figure 5.1-A. Move limb leads proximally if artifact is experienced. Avoid placing limb leads on the torso unless necessary to minimize artifact. Avoid placing limb leads over bony prominences.
4. Place the precordial leads (a.k.a. chest or V leads) in accordance with manufacturer's recommendations. Precordial leads are typically placed as shown in Figure 5.1-B. Proper placement is important for accurate diagnosis. Leads locations are identified as V₁ through V₆.
 - a. Locating the V₁ position (fourth intercostal space) is critically important because it is the reference point for locating the placement of the remaining V leads. To locate the V₁ position:
 - i. Place your finger at the notch in the top of the sternum.
 - ii. Move your finger slowly downward about 1.5 inches (3.8 centimeters) until you feel a slight horizontal ridge or elevation. This is the Angle of Louis where the manubrium joins the body of the sternum.
 - iii. Locate the second intercostal space on the patient's right side, lateral to and just below the Angle of Louis.
 - iv. Move your finger down two more intercostal spaces to the fourth intercostal space, which is the V₁ position.
 - v. Place V₁ by attaching the positive electrode to the identified location.
 - b. Place V₂ by attaching the positive electrode to the left of the sternum at the further intercostal space.
 - c. Place V₄ by attaching the positive electrode at the midclavicular line at the fifth intercostal space (Note: V₄ must be placed prior to V₃).
 - d. Place V₃ by attaching the positive electrode in the line midway between lead V₂ and V₄.
 - e. Place V₅ by attaching the positive electrode at the anterior axillary line as the same level as V₄.
 - f. Place V₆ by attaching the positive electrode to the midaxillary line at the same level as V₄.

CAUTION: When placing electrodes on female patients, always place leads V3-V6 under the breast rather than on the breast.

CAUTION: Never use the nipples as reference points for locating the electrodes for male or female patients, because nipple locations may vary widely.

5. Ensure that all leads are attached.
6. Turn on the machine.
7. Record the tracing by following the machine specific acquisition procedure and function.
8. Document on the tracing the patient's name and the date and time the tracing was obtained.
9. Refer to the [ST-ELEVATION MYOCARDIAL INFARCTION \(STEMI\) TRIAGE](#).

CONSIDERATIONS

1. Perform the 12-lead ECG as soon as possible.
2. For a patient with 12-lead indicated myocardial infarction, follow the [ST-ELEVATION MYOCARDIAL INFARCTION \(STEMI\) TRIAGE](#).
3. Acquire an additional 12-lead ECG every 15 minutes or if the patient's clinical condition changes.

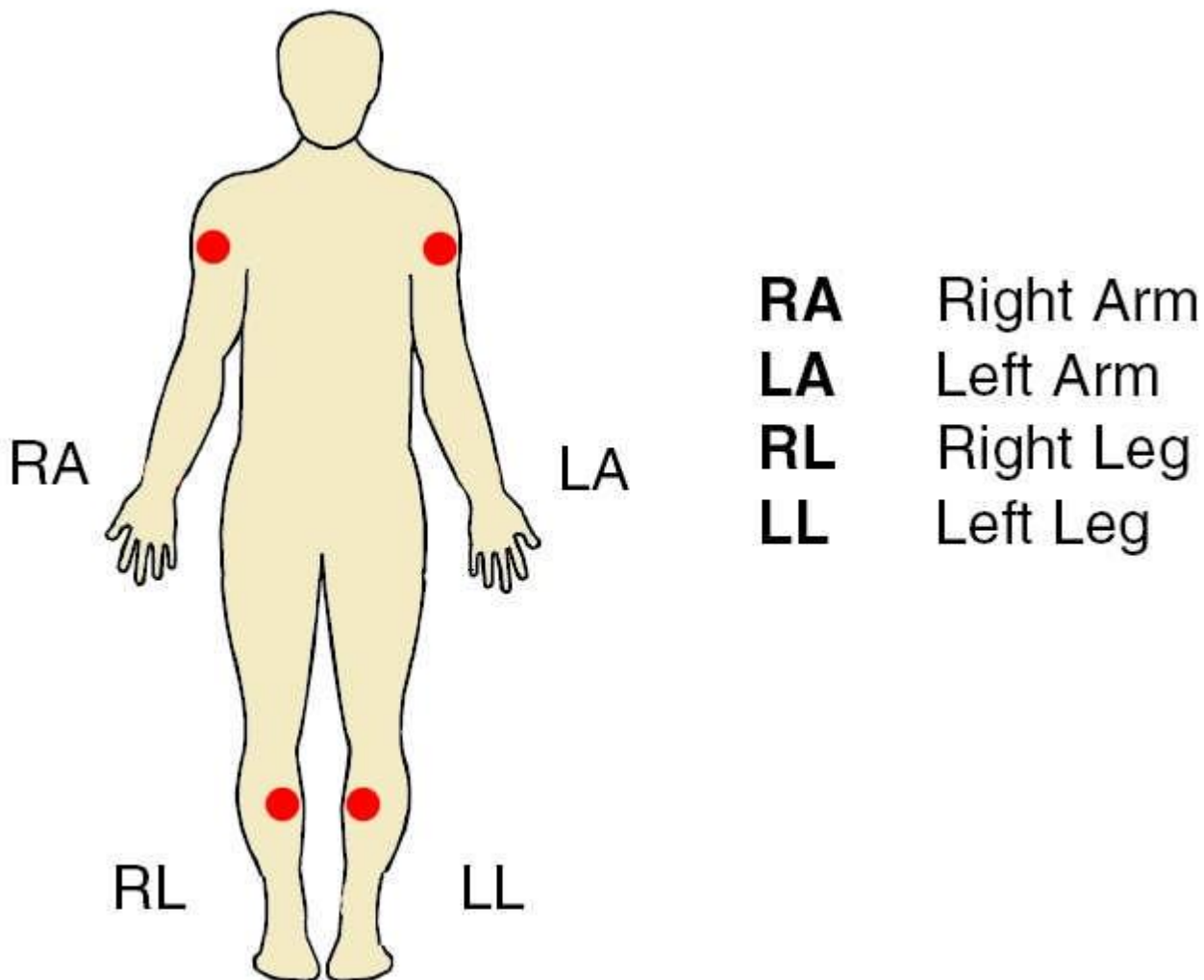


Figure 5.1-A Limb Lead Electrode Placement for 12-lead ECG

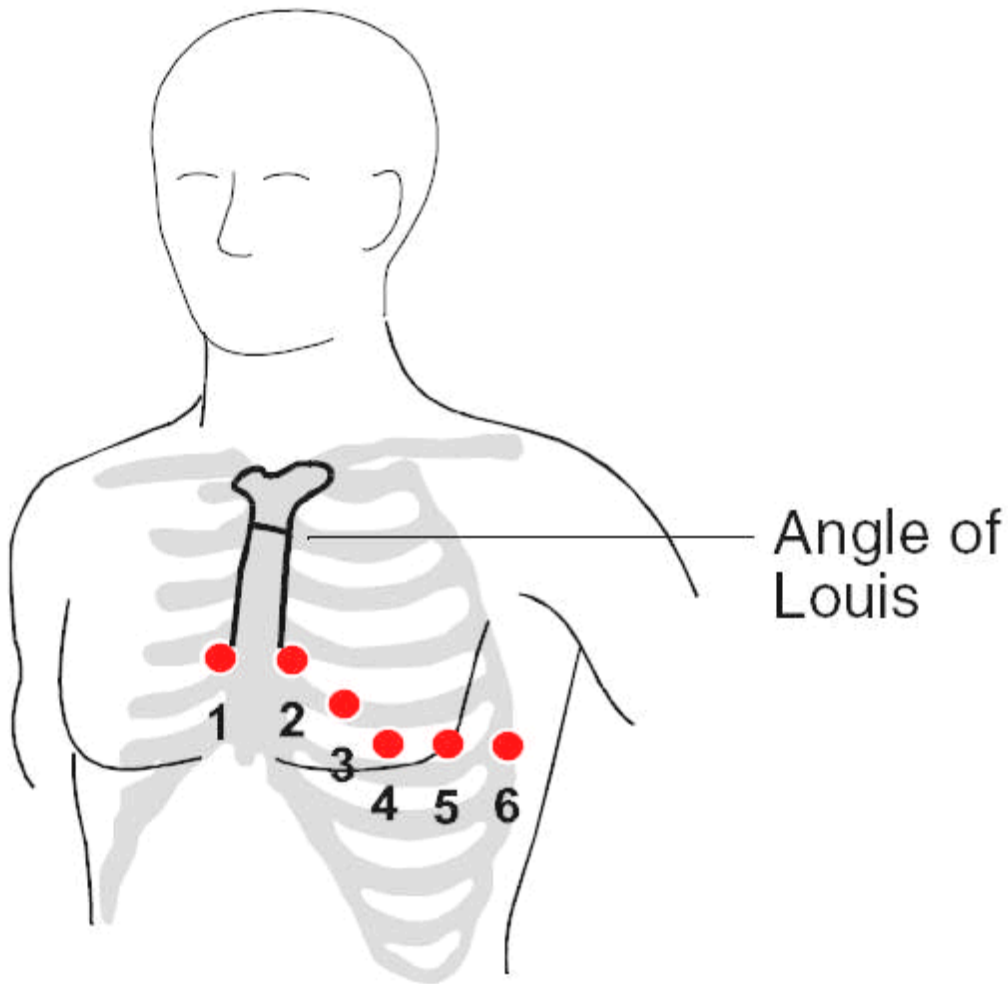


Figure 5.1-B Precordial Lead Electrode Placement

LEAD	LEAD LOCATION
V ₁	Fourth intercostal space to the right of the sternum
V ₂	Fourth intercostal space to the left of the sternum
V ₃	Directly between leads V ₂ and V ₄
V ₄	Fifth intercostal space at midclavicular line
V ₅	Level with V ₄ at left anterior axillary line
V ₆	Level with V ₅ at left midaxillary line

FIBRINOLYTIC CHECKLIST

INCIDENT DATA

Date _____ Agency _____ Unit # _____

Patient Name _____ Age _____ DOB _____

Time of Onset of Symptoms _____

INDICATIONS FOR USE OF CHECKLIST

- Patient experiencing chest discomfort for greater than 15 minutes and less than 12 hours, **AND...**
- 12-lead ECG shows STEMI or presumably new LBBB.

Are there any contraindications to fibrinolysis?

- | | | | | |
|---------------------------------------------------------------------------------------------|--------------------------|-----|--------------------------|----|
| 1. Systolic BP greater than 180 mm Hg | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| 2. Diastolic BP greater than 110 mm Hg | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| 3. Right vs. left arm systolic BP difference greater than 15 mm Hg | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| 4. History of structural central nervous system disease | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| 5. Significant closed head/facial trauma within the previous 3 months | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| 6. Recent (w/in 6 weeks) major trauma, surgery (including laser eye surgery), GI/GU bleed | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| 7. Bleeding or clotting problem or on blood thinners | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| 8. CPR greater than 10 minutes | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| 9. Pregnant female | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| 10. Serious systemic disease (eg, advanced/terminal cancer, severe liver or kidney disease) | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |

Is patient at high risk?

- | | | | | |
|---------------------------------------------------------------------------------|--------------------------|-----|--------------------------|----|
| Heart rate greater than or equal to 100 bpm AND systolic BP less than 100 mm Hg | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| Pulmonary edema (rales) | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| Signs of shock (cool, clammy) | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |
| Contraindications to fibrinolytic therapy | <input type="checkbox"/> | YES | <input type="checkbox"/> | NO |

Treatment Times

12-Lead _____	MSO4 _____
Oxygen _____	MSO4 _____
ASA _____	MSO4 _____
Nitro _____	Zofran _____
Nitro _____	Other _____
Nitro _____	Other _____

Comments

CHEST PAIN (NON-TRAUMATIC)

Non-traumatic chest pain is a common pre-hospital patient complaint. It should be considered life threatening until proven otherwise. The pain or discomfort is often associated with acute myocardial infarction or angina pectoris which is a sign of inadequate oxygen supply to the heart muscle. Common signs and symptoms associated with the pain are dyspnea, diaphoresis, nausea, vomiting, weakness, fatigue, anxiety and restlessness.

1. Perform general patient management.
2. Support life-threatening problems associated with airway, breathing, and circulation.
3. Treat dysrhythmias. Be prepared to initiate CPR and defibrillation, if necessary.
4. Administer oxygen at 4 L/min. Use higher flow rates or a non-rebreather mask at 10-15 L/min. as necessary. Maintain O₂ saturation greater than 90%.
5. Obtain patient history. Reassure the patient.
6. Transport as soon as feasible.
7. Place patient on cardiac monitor.
 - a. Obtain a 12 Lead ECG in accordance with **12-LEAD ECG ACQUISITION**.
 - b. Consider ALS rendezvous, especially when the 12-lead indicates the patient is experiencing an acute myocardial infarction; apply defibrillation electrodes; be prepared to defibrillate if needed.
 - c. When a 12 lead ECG indicates "ACUTE MI" or "...INFARCT, ACUTE," consider air medical support if the transport time to the cardiac catheterization facility is greater than 60 minutes.
 - d. Follow the **ST-ELEVATION MYOCARDIAL INFARCTION (STEMI) TRIAGE** guidelines.
8. Give **ASPIRIN** 162 mg PO.
9. Establish an INT or IV of normal saline at KVO.
10. Give **NITROGLYCERIN**.
 - a. Assist patient with **PRESCRIBED NITROGLYCERIN**. (EMT-B and EMT-I'90)
 - b. Give nitroglycerin 0.4 mg SL, If the pain persists, repeat nitroglycerin 0.4 mg SL in 3 to 5 minutes (up to total of three SL doses).
11. If pain persists following administration of nitroglycerin SL, apply one (1) inch of nitroglycerin paste.
12. If pain persists following administration of a minimum of two (2) nitroglycerin, consider **MORPHINE** 2-5 mg IV at 5min intervals, titrated to effect.
13. If the patient is experiencing Nausea and/or Vomiting, Give **ONDANSETRON** 4 mg IVP over 2 min. May repeat once in 15 minutes.
14. Perform ongoing assessment as indicated.
15. If time permits, complete the **FIBRINOLYTIC CHECKLIST**. Do not delay patient treatment, ongoing monitoring or transport to complete the fibrinolytic checklist

Key Points: CHEST PAIN (NON-TRAUMATIC)

- Ideally, 12-lead acquisition and treatment of the patient (i.e. administration of oxygen, aspirin, etc.) should occur concurrently.
- If the patient has taken nitroglycerin before without problems, nitroglycerin may be administered sublingually before an INT or IV is established. If the patient has never taken nitroglycerin, an IV must be initiated prior to nitroglycerin administration.
- Bradycardia with hypotension may be due to inferior wall MI associated with right ventricular MI. In this instance, pacing and IV fluids may improve patient's hemodynamic status. Provided that SBP is greater than 100 mmHg, chest pain relief is warranted as specified in this protocol. Avoid use of nitroglycerin.
- Avoid nitroglycerin with hypotension (SBP less than 100 mmHg) or bradycardia (less than 60/min.).
- Administration of nitroglycerin is contraindicated in patients who are using anti-impotence agents since these agents have been shown to potentiate the hypotensive effects of organic nitrates.
- AMI is probable when there is:
 1. A minimum of 2 mm of ST elevation in two or more related precordial leads or 1 mm of ST elevation in two or more related limb leads on the 12 lead ECG with history suggestive of AMI.
 2. A left bundle branch block (LBBB) on the ECG with signs/symptoms and history is suggestive of AMI.
- Transport performing interventions en route. **Time is muscle!**
- The **FIBRINOLYTIC CHECKLIST**