



# 12/15-Lead ECG Protocol

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## Preamble

Rapid diagnosis of acute myocardial infarction is essential to initiating appropriate treatment and improving outcomes. In selected practice environments prehospital ECG's may facilitate emergency department treatment or may facilitate primary triage to appropriate cardiac care centers.

## Requirements

- 1) Fully licensed Technician-Paramedic.
- 2) Certification in 12/15-lead protocol by the medical director.

## Indications

Chest pain suggestive of cardiac ischemia  
(See appendix)

## Procedure

1. The EMS personnel identifies the medical indications for 12 lead ECG and explains the procedure to the patient.
2. The EMS personnel ensures that the 12 lead ECG patient cable includes both the 4 lead and 6 lead sections.
3. The EMS personnel inserts the 12 lead ECG patient cable into the ECG connector on the defibrillator/monitor.
4. The EMS personnel snaps ECG electrodes onto the 10 lead patient cable.
5. The EMS personnel places the patient supine with the head slightly elevated and ensures that the patient's arms and legs are well supported.
6. The EMS personnel exposes the chest and limb areas where electrodes will be placed.

7. The EMS personnel places the electrodes of the limb leads as follows:

Right arm and left arm leads – Right and left shoulder

Right leg and left leg leads - Preferably midway between the ankle and the knee

In situations of muscular artifact on limb leads, the EMS personnel moves the leg electrodes into the position used for cardiac arrest (right and left hip).

8. The EMS personnel places the precordial or chest leads as follows:

NOTE: The EMS personnel can refer to the lead placement diagram for chest lead placement.

V1 - In the 4th intercostal space at the right sternal border, not more than 3 cm from the sternal border

V2 - In the 4th intercostal space at the left sternal border, not more than 3 cm from the sternal border

V3 - In a straight line, midway between V2 and V4 (locate V4 first)

V4 - In the 5th intercostal space in the left midclavicular line

V5 - At the same level and in a straight line from V4 in the left anterior axillary line

V6 - At the same level and in a straight line from V4 and Vs in the left mid-axillary line

9. When placing lead V4 on a female, the EMS personnel lifts the breast up and places the electrode on the chest wall, not on top of the breast.

10. The EMS personnel presses the "12 lead" button on the front panel. The screen may display "enter patient age" at which point the EMS personnel enters the patient's age using the selector knob or uses the default age of 40 years. The monitor may require the patient's age because the criterion for ECG interpretation is different for patients less than 17 years than adult patients.

11. The EMS personnel asks the patient to keep still with their muscles as relaxed as possible and to breath normally during the 12 lead ECG recording which takes approximately 10 seconds.

12. The EMS personnel is aware that when the "12 lead" button is pressed that the monitor automatically adjusts to diagnostic mode and standardizes the ECG to record a 1 mv signal. The monitor records all leads simultaneously and "Acquiring ECG" appears on the display during the recording.

13. If there are technical problems, e.g., lead off or artifact (muscular or electrical) during the 12 lead ECG recording, the monitor will automatically indicate on the display that there is a problem. The EMS personnel checks the contact of the ECG electrodes with the patient's skin, checks that all leads are connected, and attempts to reduce muscular or electrical interference as much as possible. If a 12 lead ECG is required despite the presence of artifact, the EMS personnel must press the "12 lead" button again to obtain a 12 lead recording when the display indicates ECG technical problems or ECG noise due to artifact.

NOTE: The resulting 12 lead ECG will not provide an interpretive diagnosis. If patient motion and resulting artifact ceases, the 12 lead will resume as normal.

14. If certified to interpret 12-lead ECG's, the EMS personnel checks the 3 channel 12 lead ECG (tracing) for its quality and ECG evidence of acute myocardial infarction (AMI).

15. The EMS personnel is aware that the 15 lead ECG is used to enhance the traditional 12 lead ECG with leads reflecting the right ventricle and posterior heart. The indications for 15 lead ECG are:

- Cardiac chest pain greater than 15 minutes with normal 12 lead ECG
- 12 lead ECG showing ST depression in V1 and V2 with prominent R waves
- 12 lead ECG showing signs of acute inferior MI

16. To attain the additional 3 leads for a 15 lead ECG, the EMS personnel removes the patient cables from precordial electrode positions V4, V5 and V6, leaving V1, V2, V3, and the limb leads intact.

The EMS personnel then places three ECG electrodes in the following positions:

- V4R - 5th intercostal space right midclavicular line
- V8 - 5th intercostal space midscapula on the left
- V9 - 5th intercostal space immediately left of the vertebral column

The EMS personnel attaches the patient cables for V1, V2, and V3 as follows:

- V4 cable for V4R position
- V5 cable for V8 position
- V6 cable for V9 position

17. The EMS personnel presses the 12 lead ECG button to obtain the recording.

18. The EMS personnel labels the second 12 lead recording, identifying V4 as the V4R tracing, V5 as the V8 tracing, and V6 as the V9 tracing.

## **Documentation Requirements**

1. The EMS personnel writes or inputs the patient name and incident number on the 12 lead ECG tracing.

NOTE: The date and time of 12 lead ECG is automatically indicated on the tracing. The EMS personnel documents the ID number of the 12 lead tracing on the patient care report, in case the tracing becomes detached from the patient care report.

## **Certification Requirements**

1. Attend in-depth classes and lectures on pulmonary edema, including anatomy, physiology, and pathophysiology of the cardiorespiratory system.
2. Attend in-depth classes in the operation of the appropriate monitor and performance of 12/15-lead ECG.
3. Pass a written and practical examination.

## **Recertification Requirements**

1. Review class and recertification is done every 12 months.
2. A record will be kept to document all cases where this protocol is used.

## **Decertification**

1. Decertification is at the discretion of the Medical Director or the Provincial Medical Director, Emergency Medical Services, Manitoba Health & Healthy Living.

## **Quality Assurance Requirements**

1. Appropriate quality assurance policies must be in place. The Medical Director or designate must review all instances where this protocol is used. As a minimum, the following must be assessed:
  - i) appropriateness of implementation
  - ii) adherence to protocol
  - iii) any deviation from the protocol
  - iv) corrective measures taken, if indicated
2. Yearly statistics for protocol use compiled and forwarded to Emergency Medical Services, Manitoba Health & Healthy Living.

## **Appendix**

Factors indicating that chest pain is consistent with cardiac ischemia

- dull central chest pain
- radiation to arms/neck/jaw
- dyspnea
- diaphoresis
- nausea/vomiting

Note: Patients may present with atypical symptoms different from those listed above. Absence of the above symptoms does not rule out cardiac ischemia.