BLS 12 LEAD ECG ACQUISITION AND TRANSMISSION

State of Connecticut

Department of Public Health/OEMS

Model Training Presentation

December 2014

Goal

To decrease the time of BLS first medical contact to appropriate, definitive care for patients with chest pain / chest pain equivalent and ECG changes as determined by an emergency department physician

Cognitive Objectives/Competencies

By the end of this program the EMT will:

- Analyze the purpose of 12 lead ECG acquisitions in patients experiencing signs and symptoms of acute coronary syndrome.
- Discuss five or more indications for the acquisition and transmission of a 12 lead ECG per AHA guidelines and local guidelines.
- Recognize the importance for anatomically consistent and proper 12 lead ECG lead placement.

Cognitive Objectives/Competencies

By the end of this program the EMT will:

- Discuss the procedure for transmission of acquired 12 Lead ECG per local protocol and device specific attributes.

- Explain the proper procedure for the acquisition of a 12 lead ECG per program guidelines.

- List four causes of low quality ECG recordings and identify the appropriate corrective actions for each, as recommended per class instruction (or manufacturer guidelines).

Cognitive Objectives/Competencies

By the end of this program the EMT will:

- Formulate effective plans to manage patients' anatomical variations which may interfere with ECG placement in three given scenarios.

Affective Objectives/Competencies

By the end of this program the EMT will:

- Appreciate the impact of early acquisition and transmission of ECG's on patient outcomes in the management of Acute Coronary Syndromes.

- Value the importance of the acquisition and transmission of ECG's in improving outcomes in the system of care for acute coronary syndrome, per AHA recommendations and program guidelines.

Psychomotor Objectives/Competencies

By the end of this program the EMT will:

- Performs proper limb and chest lead placement on three simulated patients for the acquisition of a clear 12 lead ECG.
- Propose solutions to barriers that arise which can prevent proper 12 lead ECG acquisitions in three given scenarios.
- In response to acquired 12 lead ECG, the student will verbalize a proper destination decision according to the locally approved guideline.

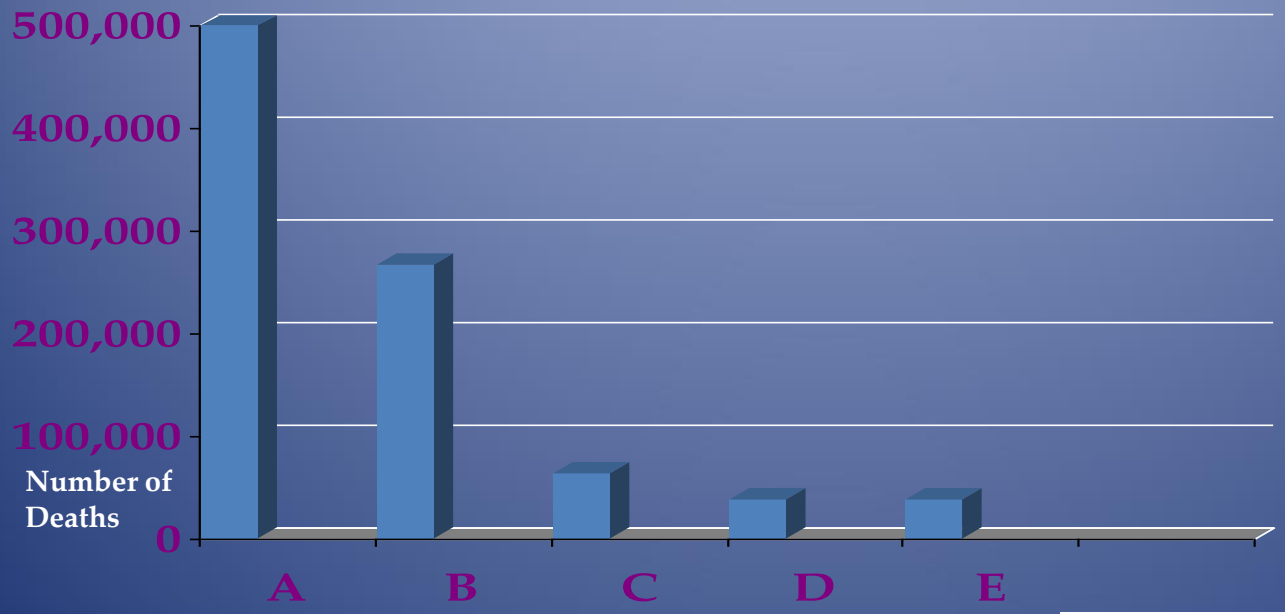
Psychomotor Objectives/Competencies

By the end of this program the EMT will:

- In response to a presented case scenario, the student will correct a circumstance/problem which impedes the clear quality of the 12 lead ECG.

- In response to acquired 12 lead ECG, the student will demonstrate the process identified in local protocols for transmission.

Heart disease: The #1 cause of death in America



A Total CVD
B Cancer
C Chronic Lower Respiratory Diseases
D Diabetes Mellitus
E Alzheimer's Disease

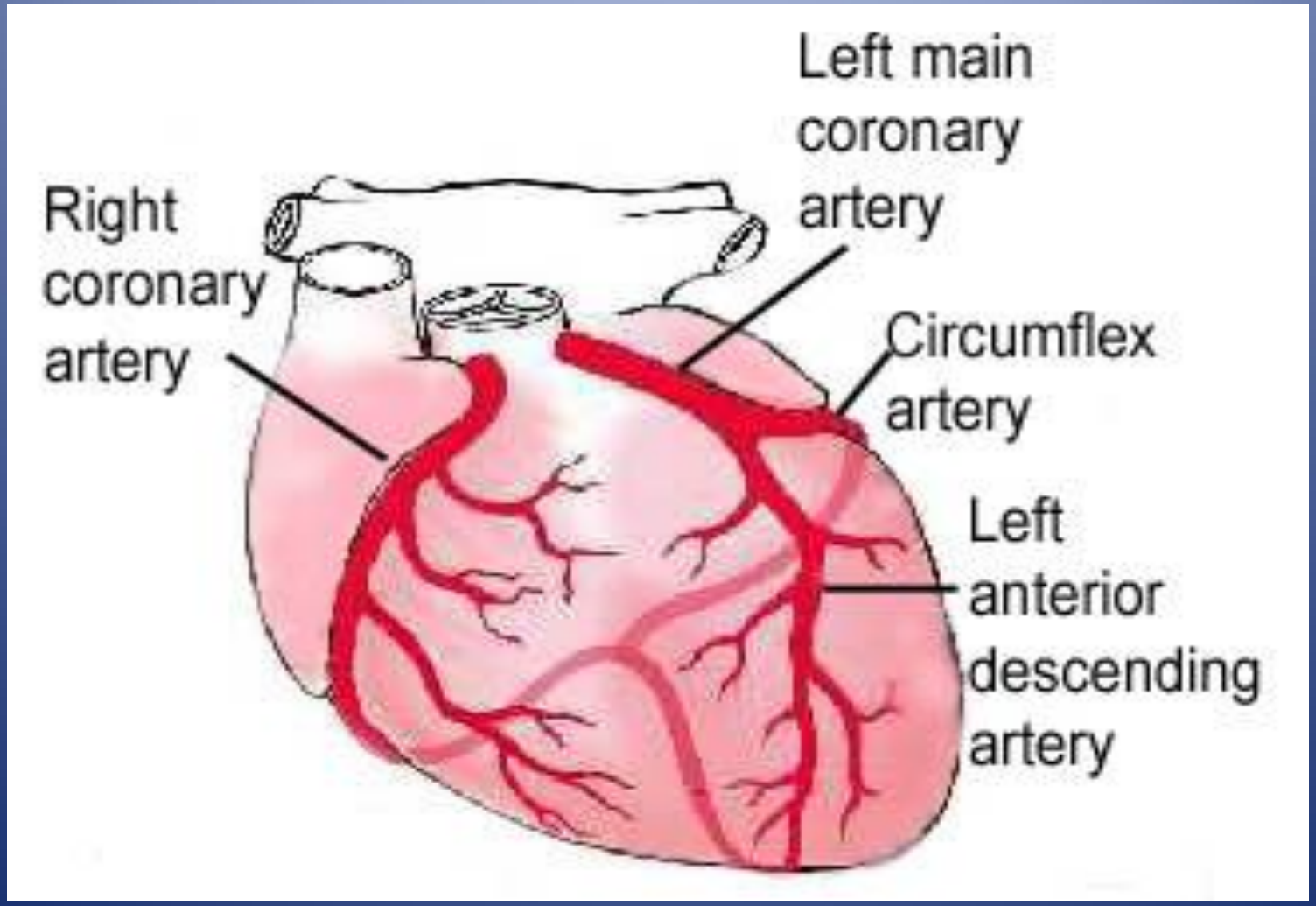
CDC/NCHS.

Heart Disease and Stroke Statistics - 2004 Update American Heart Association (AHA)

Coronary Artery Disease

- Characterized by inadequate blood flow to the heart muscle.
- Earlier restoration of blood flow may reduce damage to the heart muscle and reduce the likelihood of sudden cardiac death.

Coronary Artery Blood Flow



AHA Guidance

- All pre-hospital EMS providers should perform and evaluate 12-lead ECGs in the field
- Electrocardiographs with validated computer-generated interpretation algorithms are recommended for this purpose
- If the ECG shows evidence of acute injury or ischemia, pre-hospital providers should relay the ECG to a predetermined medical control facility and/or receiving hospital

Value of Early Acquisition and Transmission of 12 Lead ECG

- Triage of patients to most appropriate receiving center for definitive care
- Capture of dynamic (changing) injury patterns
- Earlier activation of hospital intervention teams
- Result is earlier definitive care
- Time is muscle!

Indications for 12 lead ECG Acquisition

- Chest Pain, Pressure, or Discomfort
- Radiating pain to neck, shoulder, back, or either arm
- Shortness of Breath/Difficulty Breathing
- Nausea, Vomiting
- Epigastric Pain
- Sweating incongruent with environment
- Abnormal heart rate
- Syncope / Near syncope
- Profound weakness
- Previous cardiac history
- Other cardiac risk factors (HTN, Smoker, Obesity, pertinent family history)

Recognizing Atypical Presentations of ACS

- Approximately 33% of patients with acute myocardial infarction do not complain of chest pain at time of presentation to the hospital
- Populations less likely to complain of chest pain include:
  - Women
  - Diabetics
  - Older patients
  - Patients with a prior history of heart failure

Canto JG, Shlipak MG, Rogers WJ, et. al. Prevalence, Clinical Characteristics, and Mortality Among Patients With Myocardial Infarction Presenting Without Chest Pain *JAMA*. 2000;283(24):3223-3229.

Procedure for 12 lead ECG Acquisition

1. Acquire a 12-lead on all patients suspected of acute coronary syndrome at first contact if clinical condition allows

2. Explain to patient that a 12 lead ECG should be acquired and transmitted to the Physician

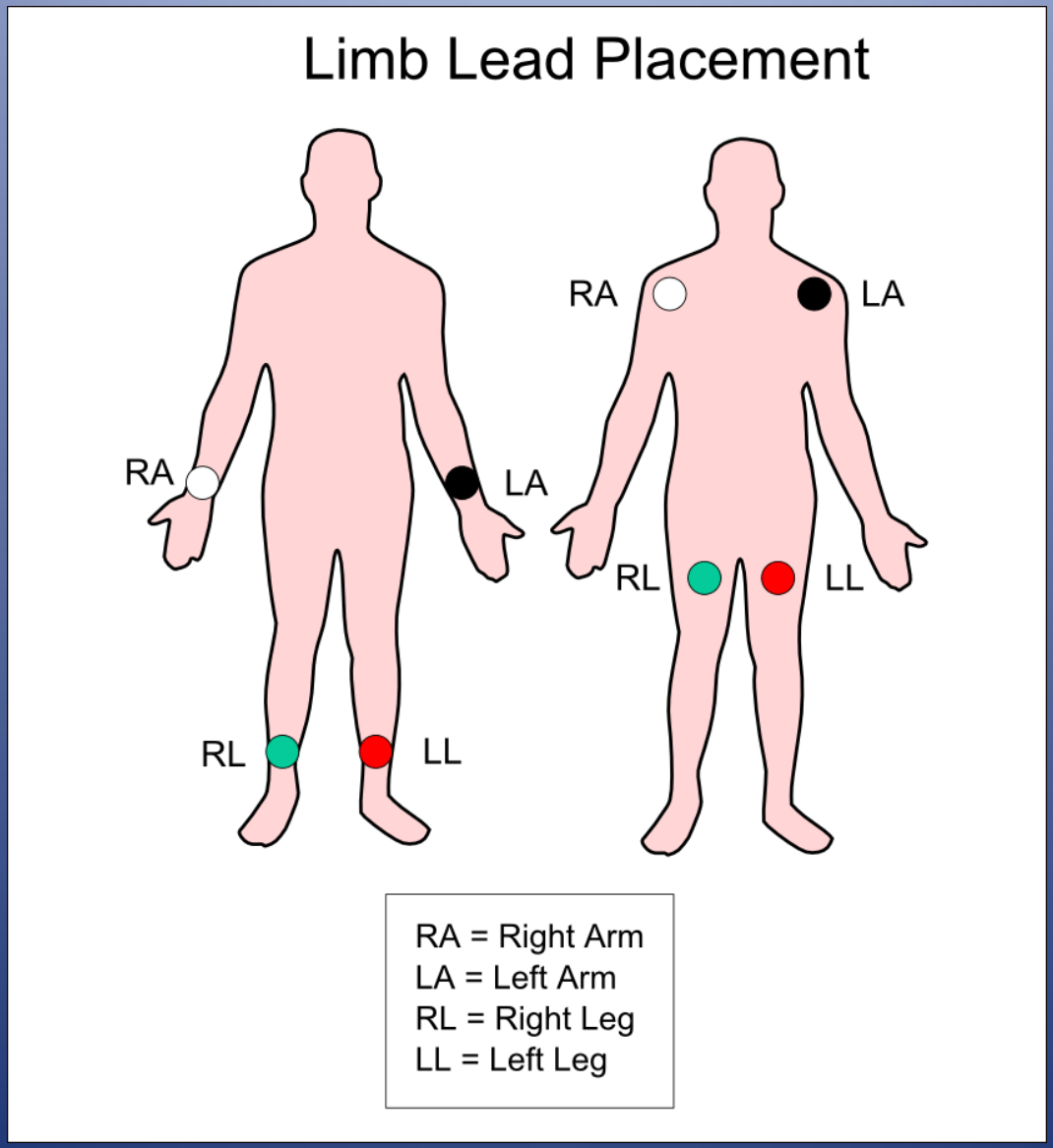
3. Place patient in position of comfort (semi-fowler's or supine preferred)

4. Expose patient chest retaining patient modesty with sheet, gown or other method

Procedure for 12 lead ECG Acquisition (continued)

5. Attach 12 lead ECG electrodes per placement guideline
   - Keep patient warm to avoid shivering
   - Do not touch gel on electrode (need complete attachment to skin)
   - Remove body hair as needed (clippers strongly recommended instead of razors)
   - Dry skin if patient diaphoretic
   - Gently rough skin with towel or electrode backing to improve skin conductance
   - Avoid close proximity to 60 Hz Alternating Current (AC) electrical devices

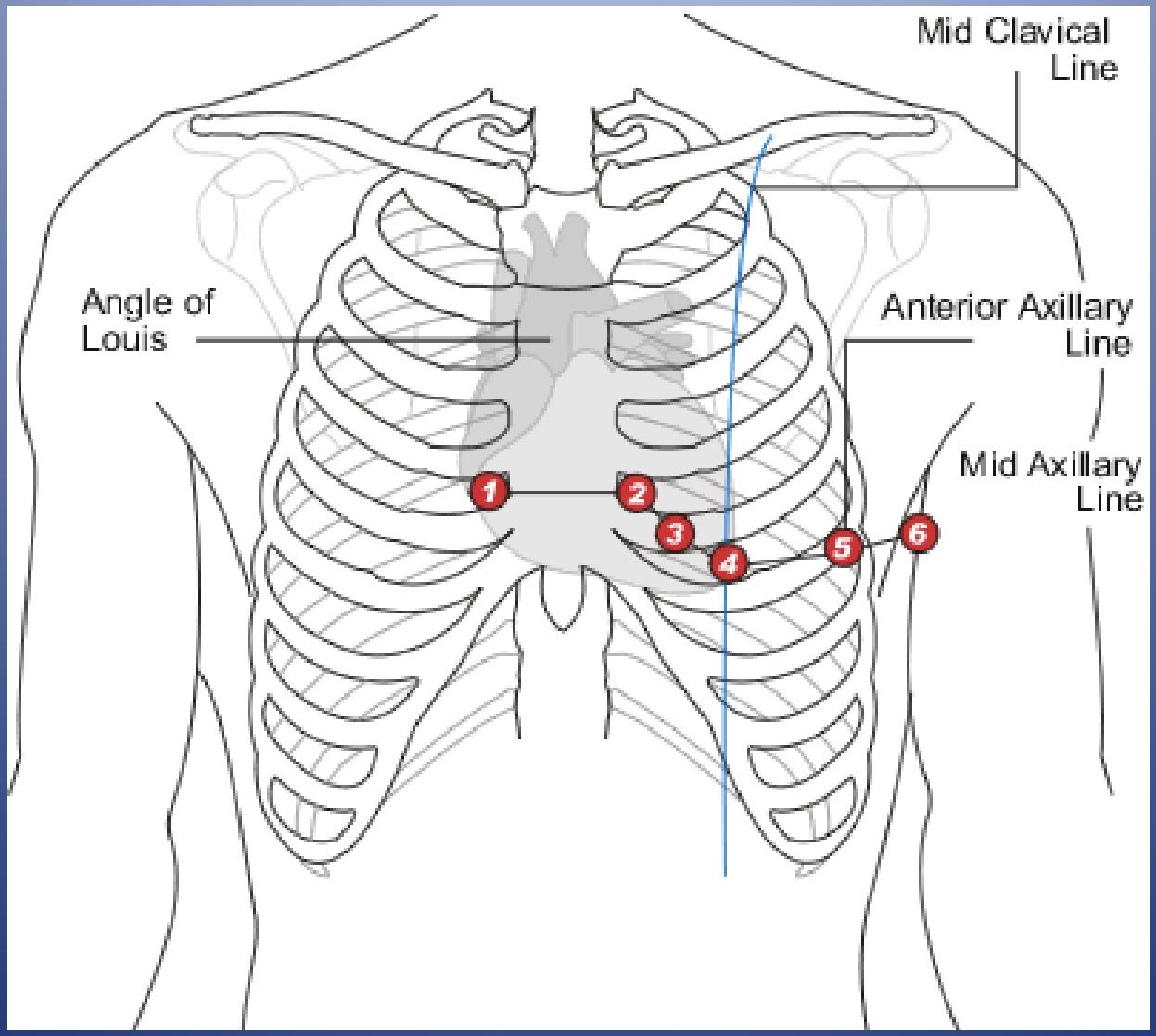
Limb Electrode Placement



Limb Electrode Placement

- White – Right Wrist or Arm
- Black – Left Wrist or Arm
- Red – Left Leg
- Green – Right Leg

Chest Electrode Placement



Chest Electrode Placement

- V1 - 4th Intercostal Space (ICS) just right of sternum
- V2 - 4th ICS just left of sternum
- V3 – Directly between V2 and V3
- V4 – 5th ICS at left mid-clavicular line
- V5 – Level with V4 at left anterior axillary line
- V6 – Level with V4 at left mid-axillary line

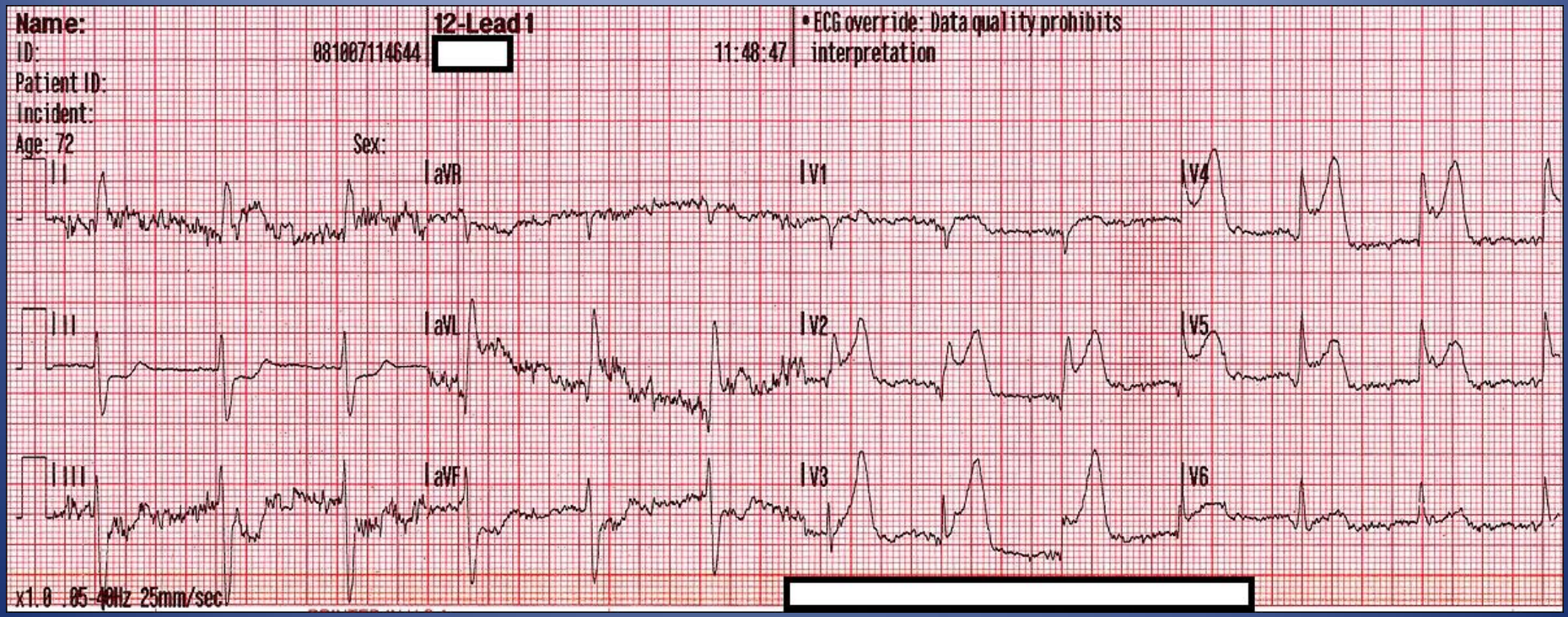
Special Considerations

- Pendulous breast tissue should be lifted in a professional manner to place chest leads on the chest wall (not over the breast tissue)

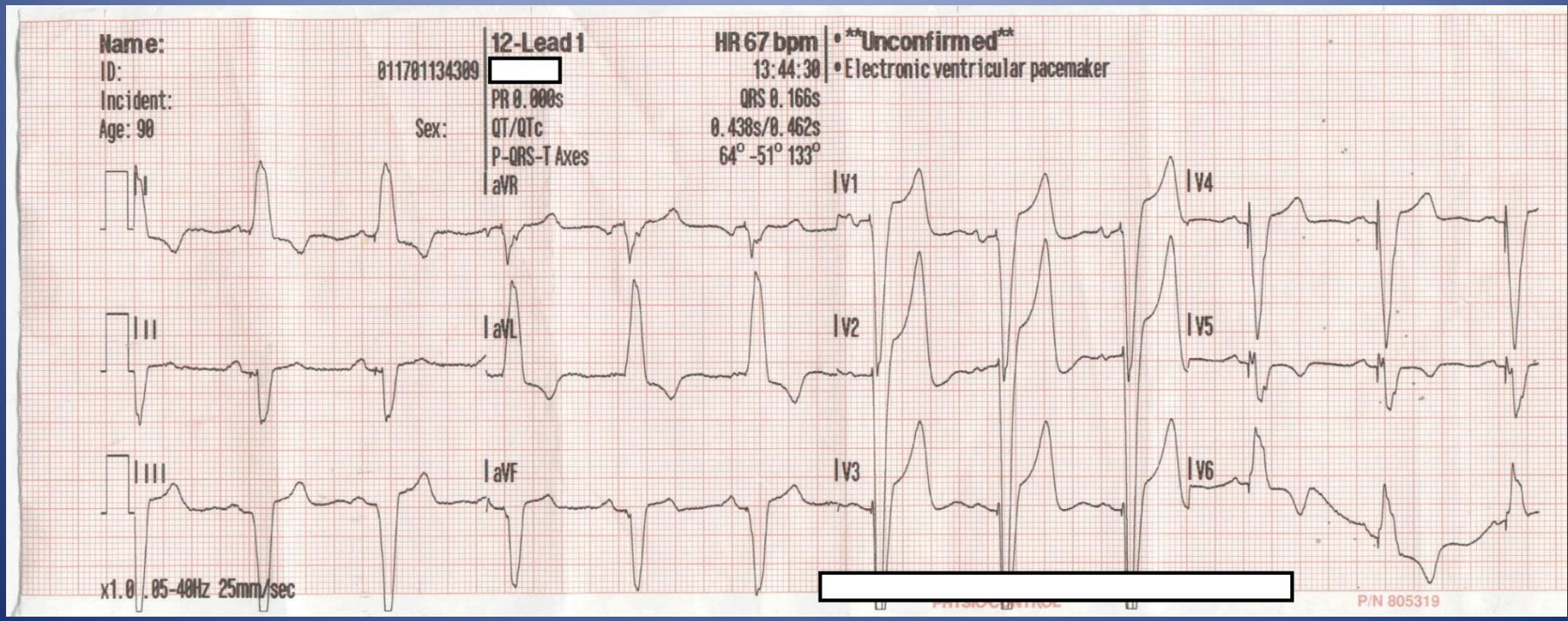
- Skeletal muscle contractions, poor electrode conductance, patient movement or 60 Hertz AC electrical appliances may interfere with quality ECG acquisition

Electrical Interference (60 Hz)

Skeletal Muscle Artifact



Wandering Baseline



Procedure for 12 lead EKG Acquisition (continued)

6. Verify that all leads are securely attached

7. Have patient relax and limit movement
   - Avoid having patient rest arms on metal stretcher

8. Acquire 12 lead EKG and transmit to pre designated hospital

12 Lead ECG Transmission

- Discuss Device-Specific Procedure
- Enter a minimum of the following into the device prior to transmission:
  - Age
  - Gender
  - Recommended – Patient Name
- If technologically possible, print or electronically transfer copy of ECG for inclusion in prehospital patient care report

Procedure for 12 lead EKG Acquisition

9. Consult with Medical Direction as directed by local guideline
    - Possible Physician Orders (not limited to):
        - Transport to STEMI Center
        - Aspirin Protocol

10. If alternate destination (i.e. PCI Center) is ordered, provide clear explanation of reasons to patient and family

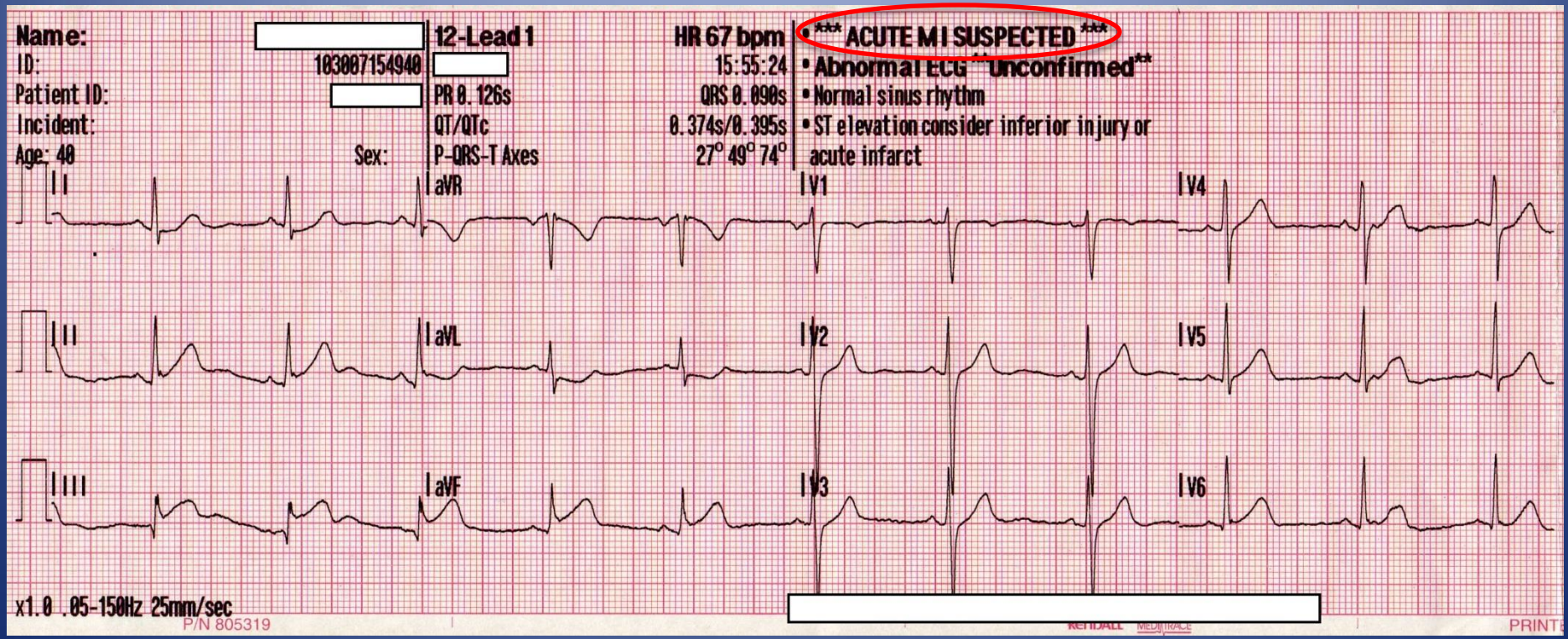
Procedure for 12 lead EKG Acquisition

11. Contact Receiving PCI Hospital to advise of “Cardiac Alert” or “STEMI Alert” as appropriate

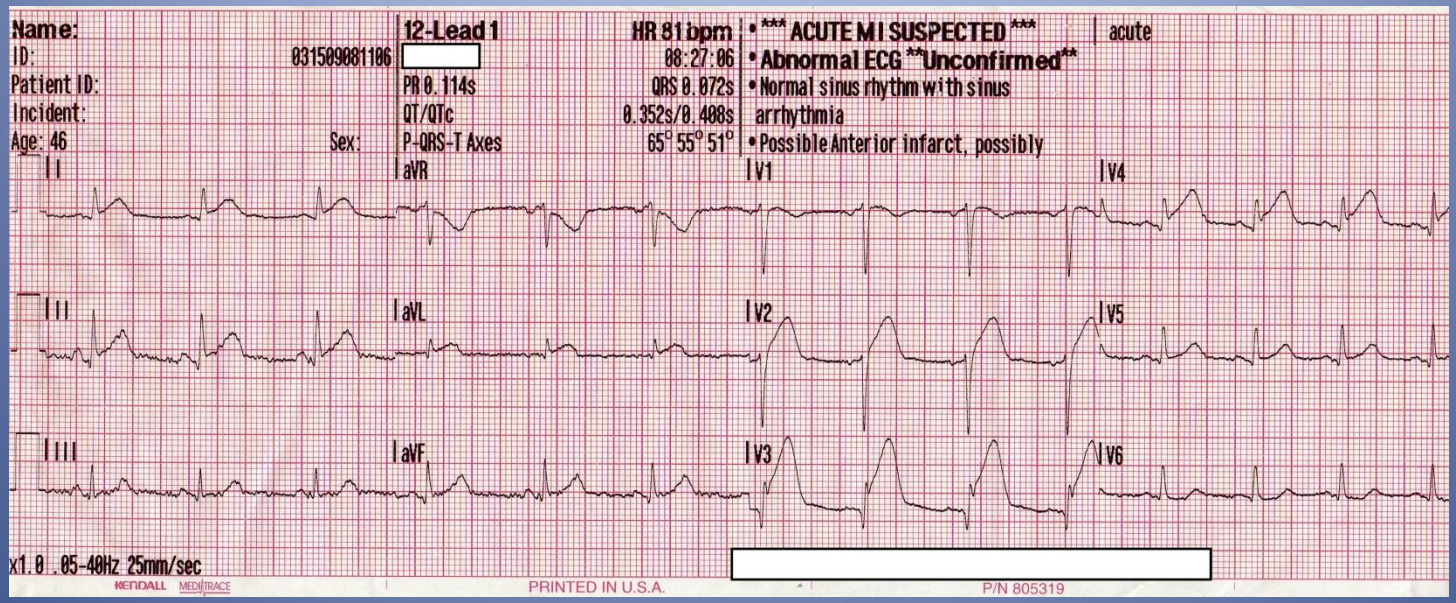
12. Monitor patient for changes in clinical condition

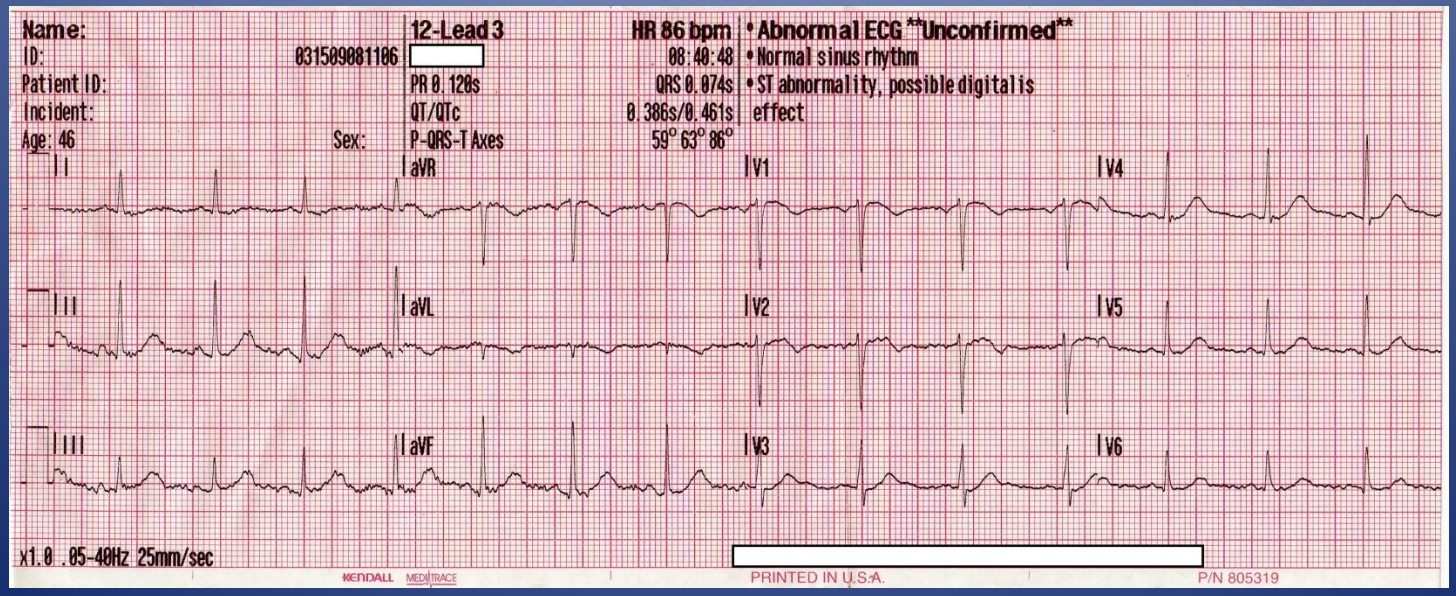
13. Prepare to repeat 12 Lead EKG at 10 minute intervals or for change in patient condition

Example of “Acute MI Suspected” ECG



ECG Changes During Transport

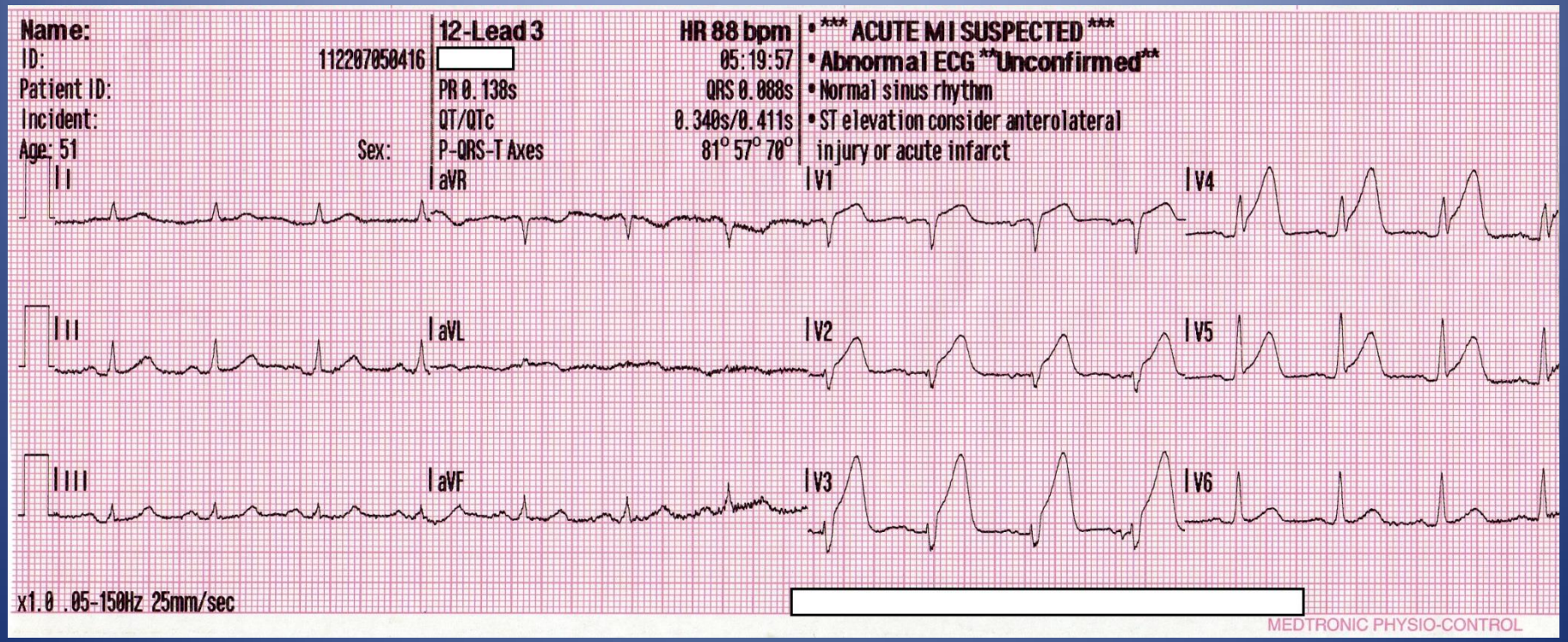




Case Study

- 51 Y/o Male, dispatch for “back pain”
- Patient found writhing on floor on hands and knees
- Intermittent pain for last 36-48 hours after shoveling snow
- Pain woke patient at 0500
- Profusely diaphoretic
- Pain primarily between shoulder blades, also in chest and arms
- Denies N/V or SOB
- 12 lead acquired and transmitted to hospital

Case Study


Name:
ID: 112207050416
Patient ID:
Incident:
Age: 51 Sex:
12-Lead 3
PR 0.138s
QT/QTc
P-QRS-T Axes
HR 88 bpm
05:19:57
QRS 0.088s
0.340s/0.411s
81° 57° 70°
*** ACUTE MI SUSPECTED ***
Abnormal ECG **Unconfirmed**
Normal sinus rhythm
ST elevation consider anterolateral injury or acute infarct
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
x1.0 .05-150Hz 25mm/sec
MEDTRONIC PHYSIO-CONTROL

Case Study (continued)

- Bypass of local hospital to primary PCI center per medical direction
- Scene time <15 minutes
- Early notification made to receiving hospital
- Oxygen and aspirin by BLS
- IV, nitro and morphine by paramedic with decrease in patient discomfort

Case Study (continued)

- On-call Coronary Intervention Team pre-activated and enroute to hospital
- Patient sustained V-Tach cardiac arrest shortly after hospital arrival with successful defibrillation
- PCI performed
  - 100% blockage of left anterior descending coronary artery
  - Blood flow restored and stent placed
- Patient discharged home two days later

IMPORTANT:

- **A normal 12 Lead EKG does not rule out the possibility of ischemic cardiac disease**

- **12 Lead ECG MUST NOT be used to screen patients (rule out Acute Coronary Syndrome) or to cancel paramedic response**

QUESTIONS?

Thank You

Special thanks to those who have shared their training materials with us to help develop this program:

- To Western Connecticut Health Network EMS Clinical Coordinator, Blair Balmforth

- State of CT EMS Advisory Board, Education and Training Committee

Skill Practice & Assessment