McHENRY WESTERN LAKE COUNTY EMS SYSTEM
Paramedics, EMT, PHRN and ECRN
Optional #7
July 2020
12 LEAD ECG's

The purpose of this CE is to provide a quick review of 12 Lead ECG interpretations and allow you to work on your skills by reviewing and interpreting some ECGs.

All EMS providers should be very comfortable with how to place the electrodes and what we are looking for when we acquire a 12 lead ECG. We all know that if the electrodes are not placed in the correct position, we will not get a proper tracing and you will not get a proper view of the heart.

So…who gets a 12 lead ECG?
After assessment of history/family history/risk factors and any of the following signs and symptoms:

- Chest Pain
- SOB
- Nausea/Weakness/general malaise
- Sweating disproportionate to environment
- Dizziness
- Syncope/near syncope
- Palpitations
- Dysrhythmias
- Chest Pain Equivalents

If you are thinking "should I get a 12 lead" then do a 12 lead

Acquisition & Transmission

ECG quality begins with skin preparation and electrodes
Hair removal

- Clipper over razor
  - Lessens risk of cuts
  - Quicker
  - Disposable blade clippers available

Skin preparation

- Helps obtain a strong signal
- When measured from skin, heart's electrical signal about 0.0001 - 0.003 volts
- Skin oils reduce adhesion of electrode and hinder penetration of electrode gel
- Dead, dried skin cells do not conduct well
- Rubbing skin with a gauze pad can reduce skin oil and remove some of dead skin cells

Age & Quality of Electrodes & Cables
Patient Movement

- Make patient as comfortable as possible
- Supine preferred (30 degree angle)
- Look for subtle movement toe tapping, shivering
- Look for muscle tension hand grasping rail, head raised to "watch" causes muscle tremors

Cable Movement

- Enough "slack" in cables to avoid tugging on the electrodes
- Many cables have clip that can attach to patient's clothes or bed sheet

Vehicle Movement

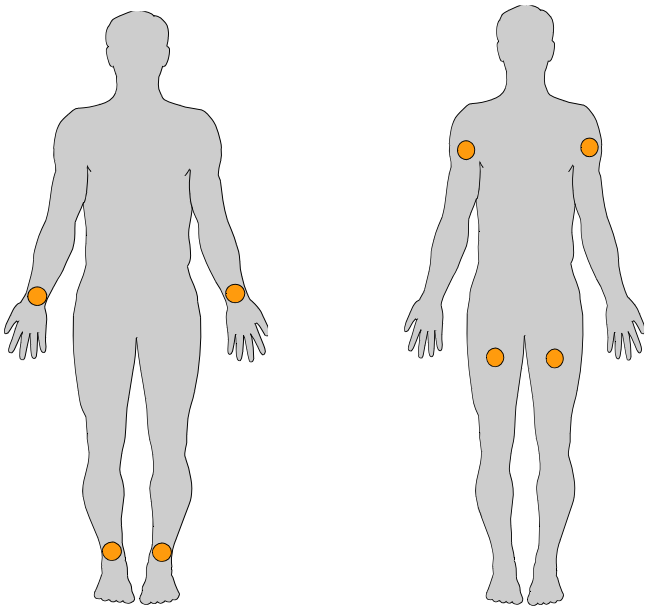
- Acquisition in a moving vehicle is NOT recommended. Pull ambulance over for 10-20 seconds during acquisition

Electromagnetic Interference (EMI)

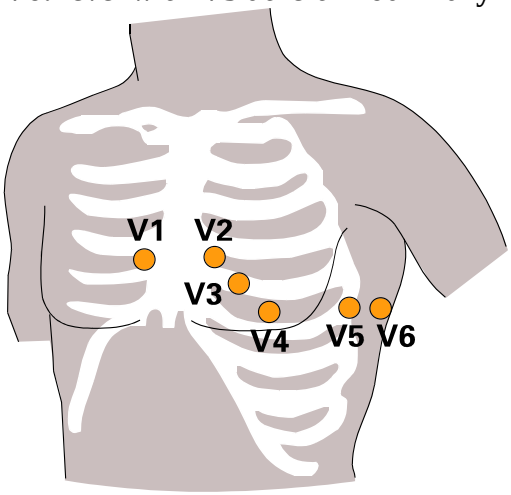
- Can interfere with electronic equipment
- 60 cycle interference is a type of EMI
- Look for nearby cell phones, radios or electrical devices
- No contact between cables & power cords
- Turn off or move away from AC devices
- Use shielded cables; inspect for cracks

Electrode Placement

- Limb leads should not be placed on the trunk but on the extremities



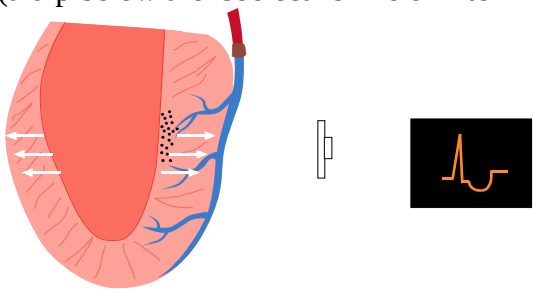
V1: fourth intercostal space to right of sternum
V2: fourth intercostal space to left of sternum
V3: directly between leads V2 and V4
V4: fifth intercostal space at left midclavicular line
V5: level with V4 at left anterior axillary line
V6: level with V5 at left midaxillary line



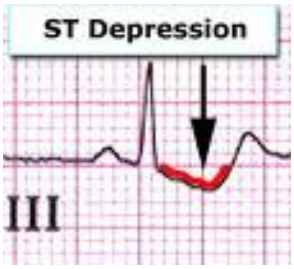
So I have my 12 Lead, what am I looking for?

Myocardial Ischemia

- ⇒ Results from myocardial tissue hypoxia (low level of oxygen)
- ⇒ Results in altered repolarization
- ⇒ Seen as ST depression (a dip below the isoelectric line of 1 to 2 millimeters)

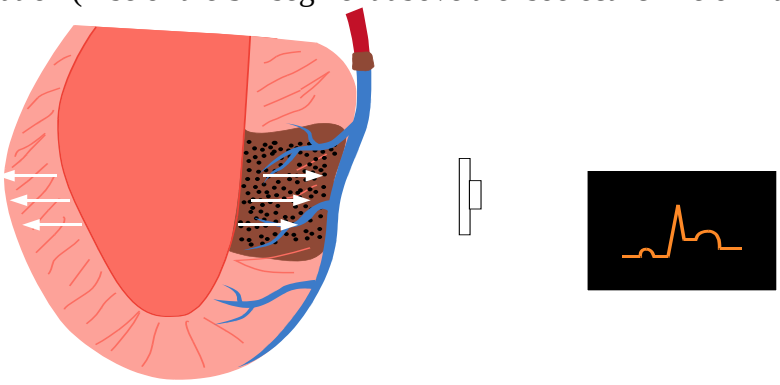


- ⇒ May also produce T wave inversion
- ⇒ At this point there is no irreversible injury to the myocardium
- ⇒ May also be caused by: ventricular hypertrophy, intraventricular conduction defects, medications (digoxin)

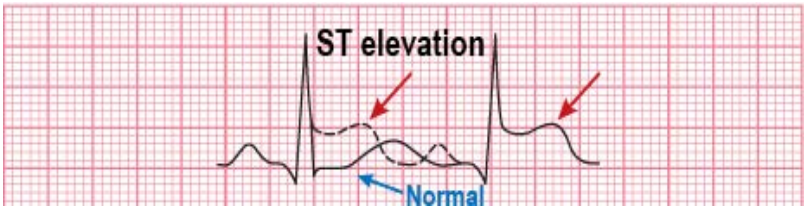


Myocardial Injury

- ⇒ Results from myocardial hypoxia that was not treated and now has progressed from ischemia to injury of the myocardial tissues
- ⇒ Results in altered repolarization
- ⇒ Seen as ST elevation (rise of the ST segment above the isoelectric line of 1 to 2 millimeters



- ⇒ Tissue damage at this point is not irreparable.
- ⇒ Most common cause is secondary to an acute MI
- ⇒ Other causes include: coronary artery vasospasm, pericarditis, ventricular aneurysm, early repolarization (in young children)

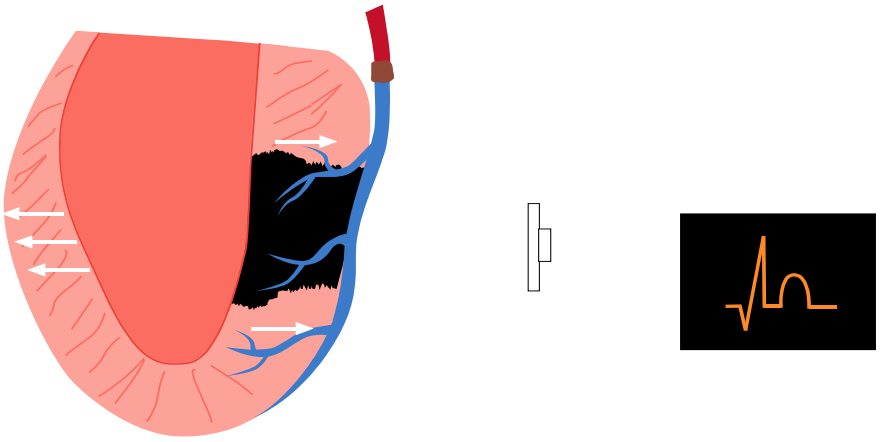


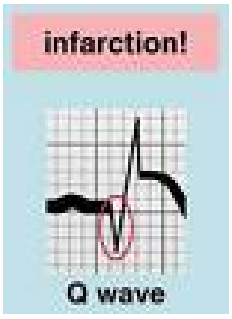
Infarct

Pathological Q waves: some injury patterns, if left untreated, may develop infarction patterns, or pathological Q waves. A pathological Q wave signifies infarction, or death of the tissue. A q wave is considered pathological if it is more than 0.04 seconds wide, or one third of the R wave height. The combination of a Q wave and ST segment elevation represents an acute myocardial infarction.

The following are the ECG indicators of infarct (necrosis or death):

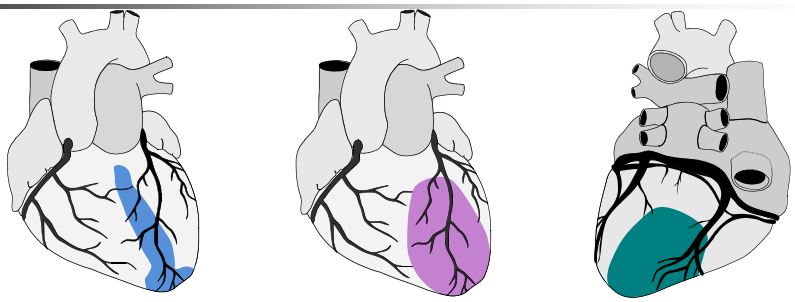
- ⇒ Pathologic Q waves
- ⇒ Greater than 0.04 sec wide or one-third of R wave height.
- ⇒ When seen with ST elevation, indicates acute ongoing myocardial infarction.





Lead Groups

Localization



I	aVR	V1	V4
II	aVL	V2	V5
III	aVF	V3	V6

Inferior: II, III, AVF
Septal: V1, V2
Anterior: V3, V4
Lateral: I, AVL, V5, V6

Just as we use an organized assessment to look for injures with a trauma patient, we must use an organized approach when "assessing" a 12-Lead ECG for injuries. This assessment of a 12-Lead is accomplished by using the phrase "I See All Leads." This phrase can be divided into sections by the first letter of each word, representing the order of lead groups to look at for the ST changes related to an acute MI:

I	Inferior Leads	II, III, aVF
S	Septal Leads	V1, V2
A	Anterior Leads	V3, V4
L	Lateral Leads	V5, V6, aVL

This system was developed to establish a starting point for the beginning of a systematic assessment of a 12 Lead. The familiarity of Lead II would always have clinicians looking there first. Therefore, with Lead II representing the inferior lead group, the other leads were added in a logical progression around the 12 Lead ECG to develop ISAL. The phrase also reminds the provider to look at all leads.

When assessing a 12 Lead ECG for evidence of an AMI, start in the inferior leads (II, III, aVF) looking of evidence of ST segment elevation. If you see the elevation, write it down. Next, move to the septal lead (V1, V2) again inspecting for ST segment elevation. If you see it, write it down. Continue first looking at the anterior leads then at the lateral leads for ST segment elevation. Again leads you see ST elevation in. Then look to see if there are any reciprocal changes.

Acute MI Recognition

What to look for

- ⇒ ST segment elevation
- ⇒ One millimeter or more (one small box)
- ⇒ Specific changes must appear in two anatomically contiguous leads

⇒ In the absence of a Left Bundle Branch Block

Reciprocal Changes

Remember that ST depression in the presence of ST elevation is considered reciprocal changes and can be used to reinforce your field impression of an acute MI. For an inferior wall MI where you see elevation in lead II, III or aVF, you may see a reciprocal change of ST depression in Lead I and aVL. For an Anterior wall MI where you see elevation in V3 and V4, you may see reciprocal changes in Lead II, III or aVF. For a lateral wall MI where you see elevation in Lead I, aVL, V5 or V6, you may see reciprocal changes in Lead II, III or aVF.

Remember
A normal 12 lead ECG does NOT rule out AMI

In Summary:

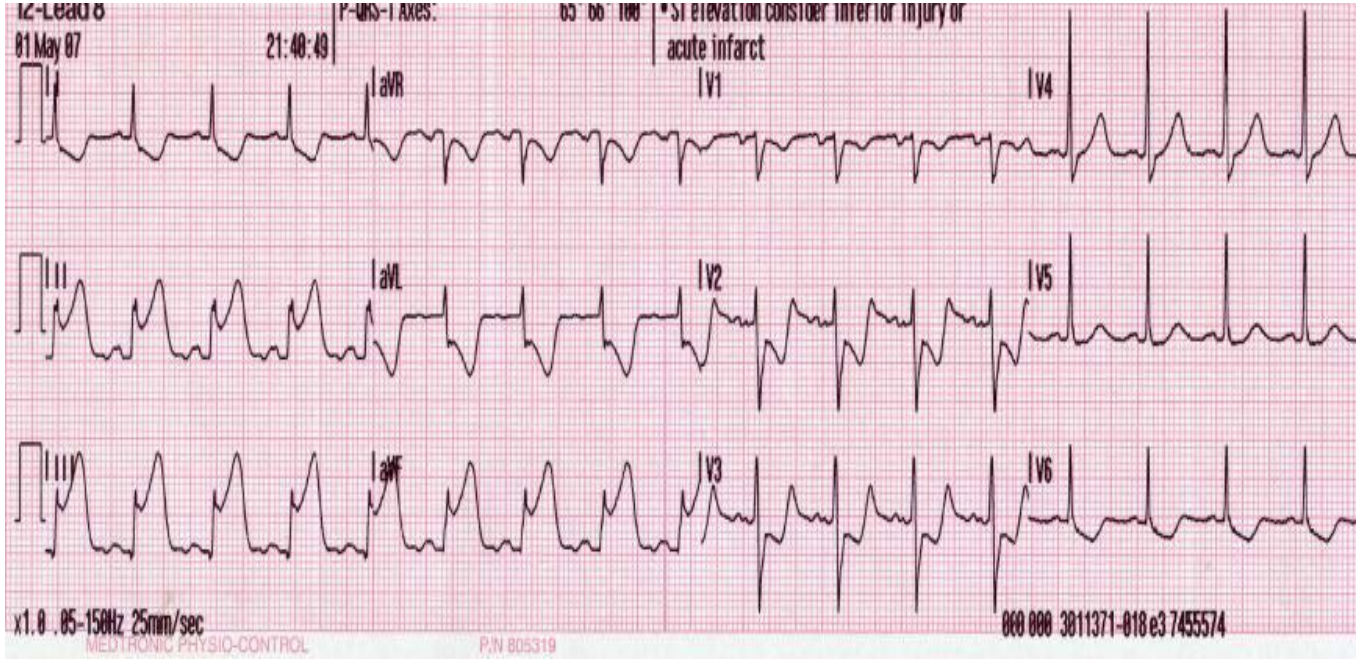
It is important to use a systematic approach when analyzing a 12 lead. The familiarity of Lead II would always have clinicians looking there first. Therefore, with Lead II representing the inferior lead group, the other leads were added in a logical progression around the 12 Lead ECG to develop ISAL (I SEE ALL LEADS) (Inferior, septal, anterior, lateral). The phrase also reminds the provider to look at all leads.

When assessing a 12 Lead ECG for evidence of an AMI, start in the inferior leads (II, III, aVF) looking for evidence of ST segment elevation depression or T wave inversion. If you see changes, write it down. Next, move to the septal lead (V1, V2) again inspecting for changes. If you see it, write it down. Continue first looking at the anterior leads then at the lateral leads for changes. Again documenting leads you see ST elevation, depression or T wave inversion in. Then look to see if there are any reciprocal changes. Remember…we are looking for the STEMI or ST elevated Myocardial Infarction. The goal is to get the patient to the cath lab as soon as possible and doing very good field interpretation leads to better patient outcomes.

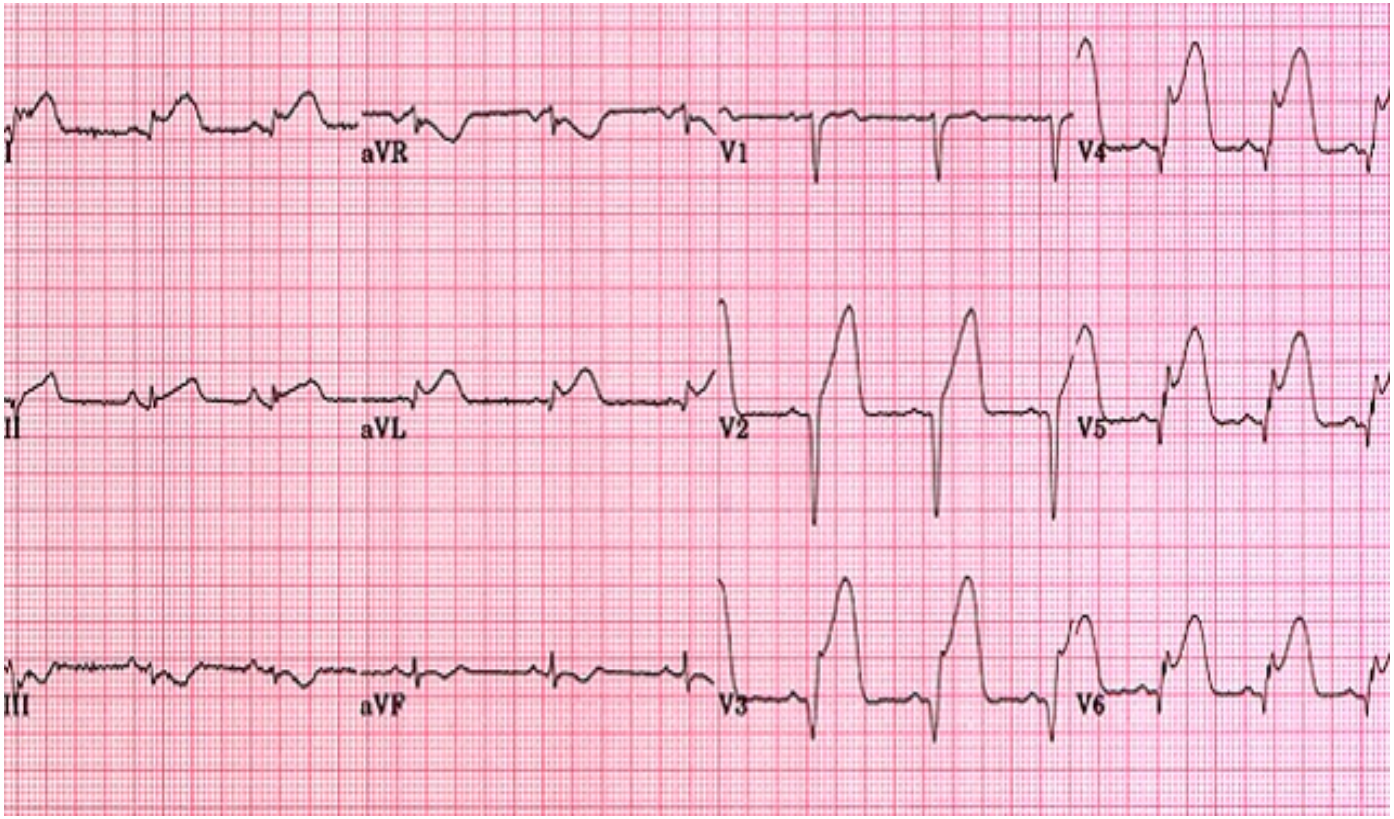
McHENRY WESTERN LAKE COUNTY EMS SYSTEM
Paramedics, EMT, PHRN and ECRN
Optional #7
July 2020
12 LEAD ECG's

For each ECG below identify any ST elevation, ST depression and your interpretation. Please write answers on answer sheet.

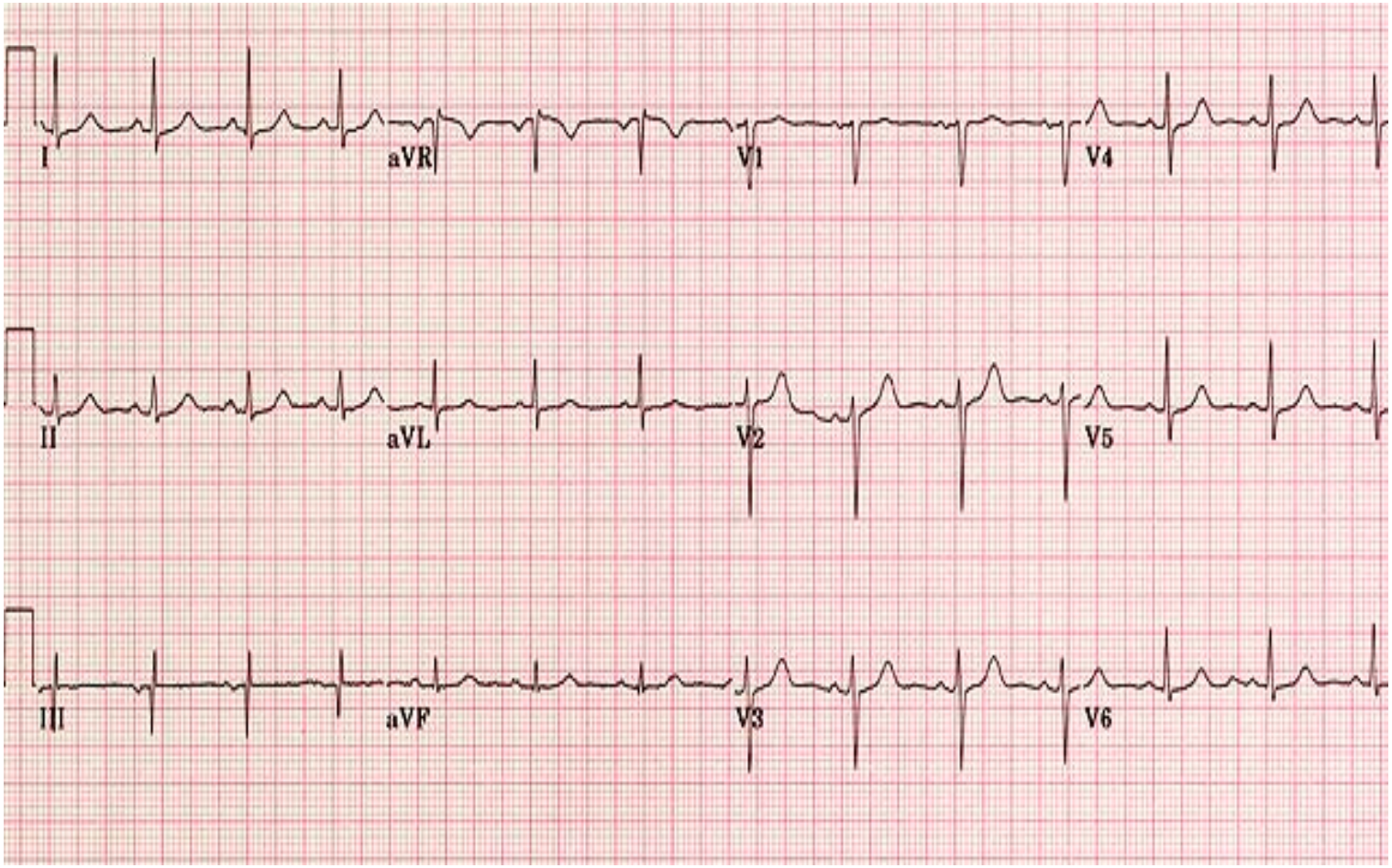
1.



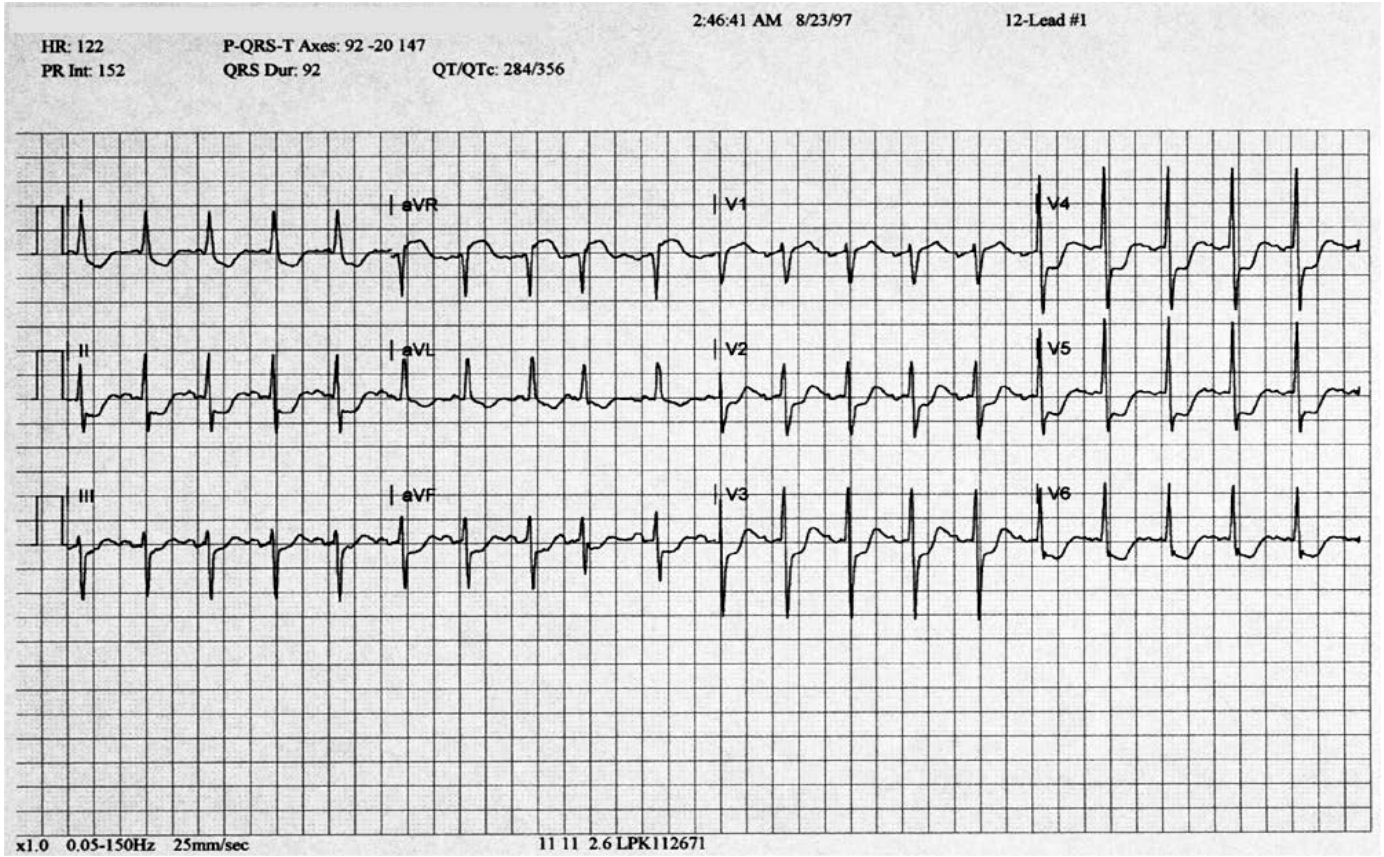
2.



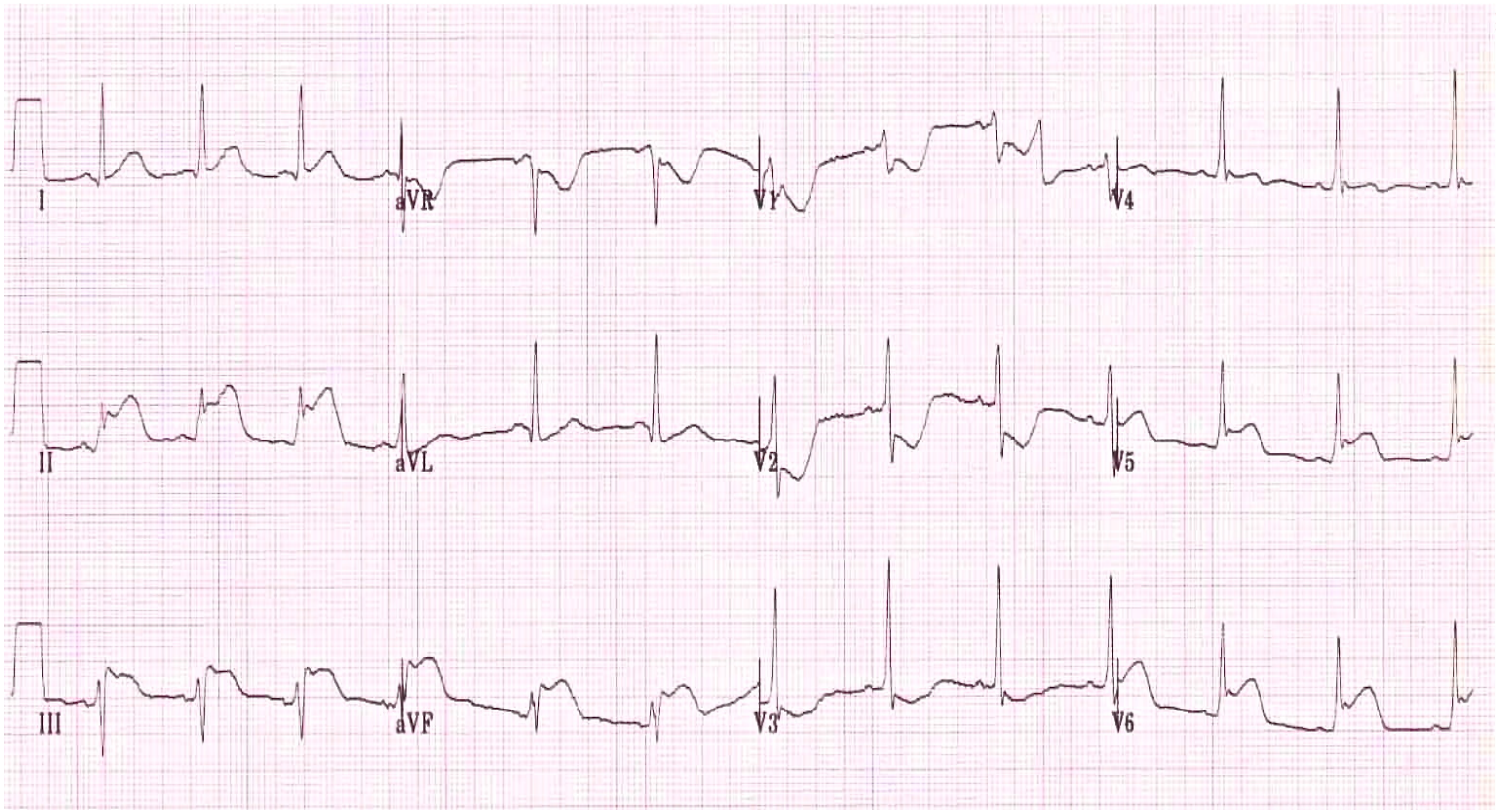
3.



4.


2:46:41 AM 8/23/97
12-Lead #1
HR: 122
PR Int: 152
P-QRS-T Axes: 92 -20 147
QRS Dur: 92
QT/QTc: 284/356
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6
x1.0 0.05-150Hz 25mm/sec
11 11 2.6 LPK112671

5.



McHENRY WESTERN LAKE COUNTY EMS SYSTEM
Paramedics, EMT, PHRN and ECRN
Optional #7
July 2020
12 LEAD ECG's

Name: _____ (please print)
Department_____
Date: _____
Level or Practice: _____

EMT's may begin Quiz at question #6. All others please complete entire quiz.

1. ST elevation: _____
   ST depression: _____
   Interpretation: _____

2. ST elevation: _____
   ST depression: _____
   Interpretation: _____

3. ST elevation: _____
   ST depression: _____
   Interpretation: _____

4. ST elevation: _____
   ST depression: _____
   Interpretation:
   _____

5. ST elevation: _____
   STdepression: _____
   Interpretation:_____

6. What is EMI and what can be done to alleviate it?

7. In the spaces provided, indicate where the electrodes should be placed on the patient.

V1: _____

V2: _____

V3: _____

V4: _____

V5: _____

V6: _____

8. For an Anterior wall MI where you see elevation in V3 and V4 , you may see reciprocal changes in what three leads? _____, _____, and _____

9. What does the word STEMI stand for?

10. When doing a 12 lead ECG we are looking for the 3 “I’s”. What are those?

a) _____

b) _____

c) _____

11. Give 5 signs and symptoms that the patient may have that would require you to perform a 12 lead ECG.

1)_____
2)_____
3)_____
4)_____
5)_____

12. You would like to make your patient as comfortable as possible to perform your ECG. The patient should be supine and at what angle?

a) 25 degree
b) 45 degree
c) 35 degree
d) 30 degree

13. The White, Black, Red and Green leads should not be placed on the _____ but instead placed on the _____.

14. If you have to perform hair removal to acquire your ECG, it is best to use a _____ device because it disposable and lessens the risk of cuts.

15. The goal with a STEMI is to get our patient to a _____ as soon as possible.

If you are NOT a member of the McHenry Western Lake County EMS System, Please include your address on each optional quiz turned into our office. Our mailing address is: Northwestern Medicine – McHenry Hospital EMS, 4201 Medical Center Drive, McHenry, Illinois 60050. We will forward to your home address verification of your continuing education hours.

If you ARE a member of our EMS System, your credit will be added to your Image Trend record. Please refer to Image Trend to see your current list of continuing education credits. Any questions regarding this can be addressed to Cindy Tabert at 224-654-0160. Please fax your quiz to Cindy Tabert at 224-654-0165 or send by email to cynthia.tabert@nm.org