

# Hot Topics in Cardiac Arrest

Should the patient go  
To the Cath Lab ?

# STEMI & CARDIAC RESUSCITATION IDEAL SYSTEM

## Cardiac Arrest

- Unresponsive
- Not breathing normally



## Community

- Hands Only CPR | Bystander CPR
- Early activation of 911
- Apply AED before EMS arrival



## EMS ON-SCENE

- Minimize interruptions of CPR
- Encourage 12-lead ECG after ROSC
- Consider Destination Protocol



## EMS Triage Plan

## Receiving Hospital (PCI-capable)

- Initiate hypothermia <6 hrs from onset of arrest
- Consider early PCI
- Defer Prognosis assessment for 3 days
- Consider need for ICD before discharge



## Interhospital transfer

## Referral Hospital (non PCI-capable)

- Initiate hypothermia <6 hrs from onset of arrest
- Consider transfer to resuscitation receiving center if unconscious and hemodynamically stable



# MISSION: LIFELINE®



YOU CAN MAKE THE DIFFERENCE BETWEEN  
AN EVENT THAT KILLS AND ONE THAT DOESN'T.

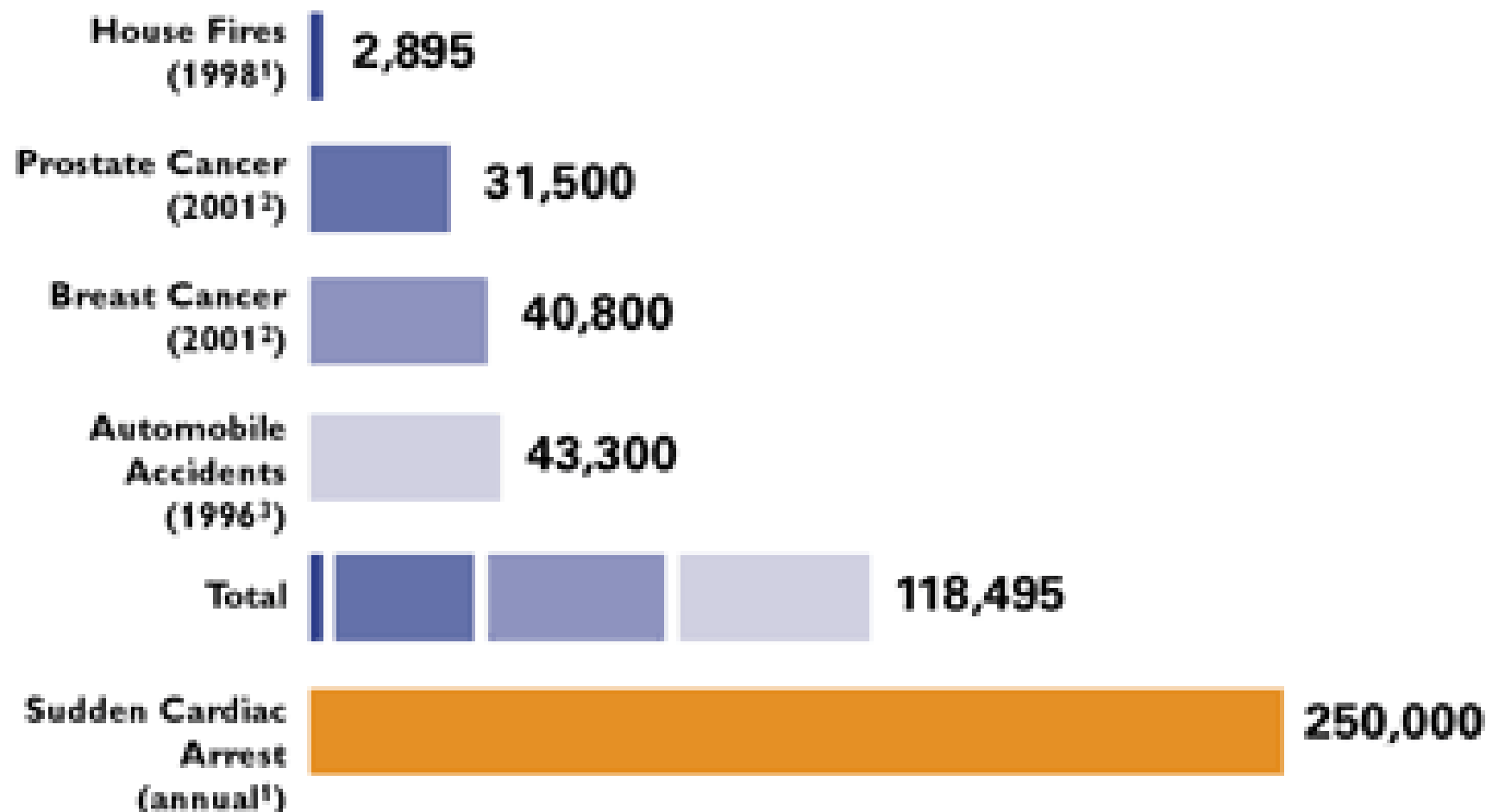
**STEMI AND CARDIAC RESUSCITATION  
SYSTEMS OF CARE.**



*STEMI and Cardiac Resuscitation Systems of Care*



## COMMON CAUSES OF DEATH IN THE U.S.



Sources: 1. <http://www.americanheart.org>; 2. <http://www.cancer.org>; 3. U.S. Statistical Abstract of the United States, 1998, Table 138; 4. <http://www.americanheart.org>

# Tim Russert 1950-2008

Host of NBC's "Meet the Press"



**Sudden Cardiac Arrest : Autopsy showed plaque rupture in his LAD  
( per LA Times, June 23, 2008 )**

# James Gandolfini 1961 – 2013

## “ Sopranos “ Actor Dies of SCA



**Sudden Cardiac Arrest : Autopsy showed Actor died of a MI**

# North Carolina Sudden Cardiac Arrest ( SCA ) Data

5-8,000 Cases per year

35 % obtain ROSC (Return of Spontaneous Circulation)

20 % reach Emergency Room

11 % admitted to Hospital

< 5 % survive to discharge

ST Elevation  
Mycardial Infarction  
Approach

“ STEMI ”



# STEMI and Sudden Cardiac Arrest

Co-Incidence not coincidence

Often seen in approx. 60 % of cases

# Paris PROCAT Registry

( Dumas et al, 2010 Circulation Interv 3:200 )

- Single center experience, 2003-2008
- 714 patients with BOTH
  - OHCA = out-of-hospital cardiac arrest
  - ROSC = return of spontaneous circulation
- 60% with presumed “primary” cardiac arrest
- 40% with “secondary” cardiac arrest
  - Drowning, CNS, Overdose, Trauma, Respiratory

# Paris PROCAT

60% went to the Cath Lab

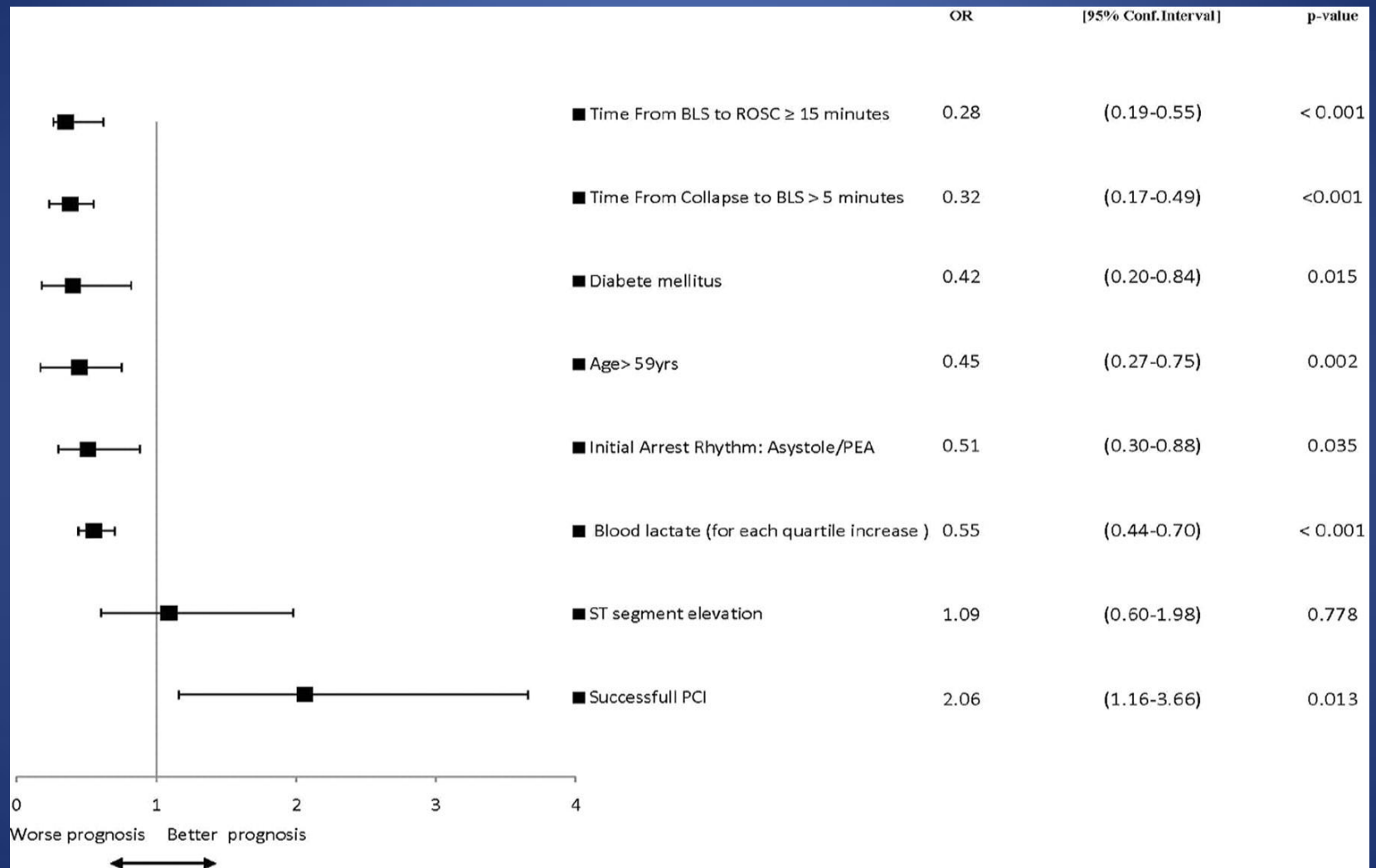
**31% of Post-ROSC  
EKG were STEMI ( + )**

- 96% had one coronary stenosis > 50%
- 74 % had successful PCI

**69% of Post-ROSC  
EKG were STEMI ( - )**

- 58% had one coronary stenosis > 50%
- 25 % had successful PCI

# Multivariable logistic regression analysis of early predictors of survival in patients with OHCA without obvious extracardiac causes.



Dumas F et al. Circ Cardiovasc Interv 2010;3:200-207

# Better Prognostic Signs

Time from collapse to BLS < 5 minutes

Time from BLS to ROSC < 15 minutes

Non-Diabetic

Age < 59 y/o

Initial Arrest Rhythm Not Astyole / PEA

Presence of ST Elevation

Successful PCI

# Invasive Cath Approach warranted in Sudden Cardiac Arrest for;

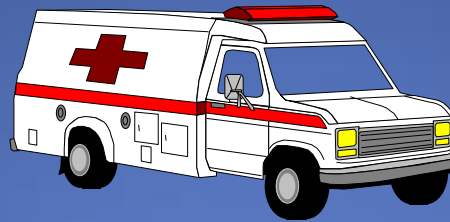
**STEMI, New LBBB, Suspected MI as causative of SCA**

Studies suggesting Invasive approach consideration for all independent of post SCA Neuro Status, but appropriate use criteria, hazard adjustment of 19 times higher mortality and 45 % patients do not make it to discharge alive

# Options for Transport of Patients With STEMI and Initial Reperfusion Treatment



**Call 9-1-1  
Call fast**



**Onset of  
symptoms of  
STEMI**

**9-1-1  
EMS  
Dispatch**

## EMS on-scene

- Encourage 12-lead ECGs.
- Consider prehospital fibrinolytic if capable and EMS-to-needle within 30 min.

**Hospital fibrinolysis:**

**Door-to-Needle  
within 30 min.**

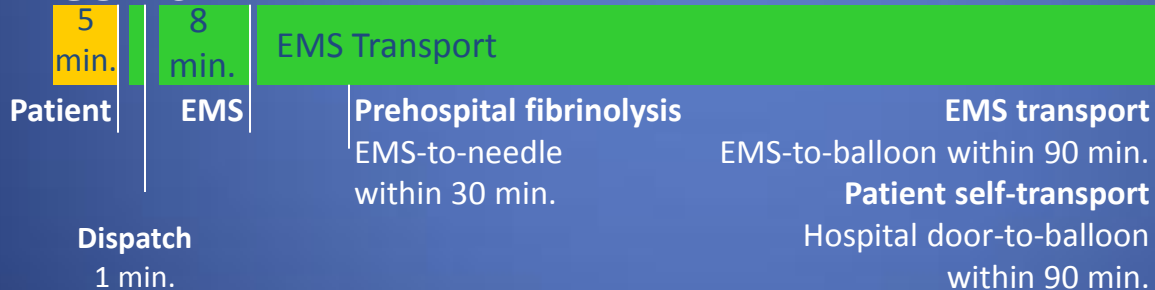
**Not PCI  
capable**

**EMS  
Triage  
Plan**

**PCI  
capable**

**Inter-  
Hospital  
Transfer**

## GOALS



**Golden Hour = first 60 min.**

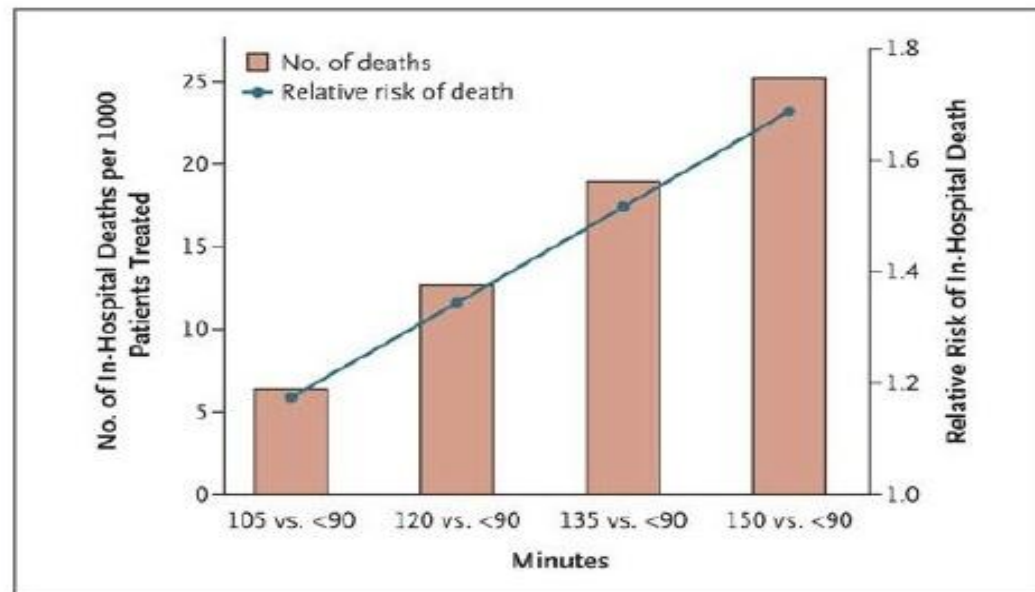
**Total ischemic time: within 120 min.**

# Time is Therapy for Code STEMI

- The sooner you identify a STEMI the sooner the hospital can be alerted.
- Ideally, the activation can occur in the field for EMS.
- This is especially important on nights, weekends, holidays to allow time for cath lab activation of personnel from home
- The concept is parallel processing



# Increase Mortality by 1 % every 10 minutes



N Engl J Med 2007;357:1631-1638

*Significant increase in mortality for every 15 minutes of delay!*

# When to perform EKG ?

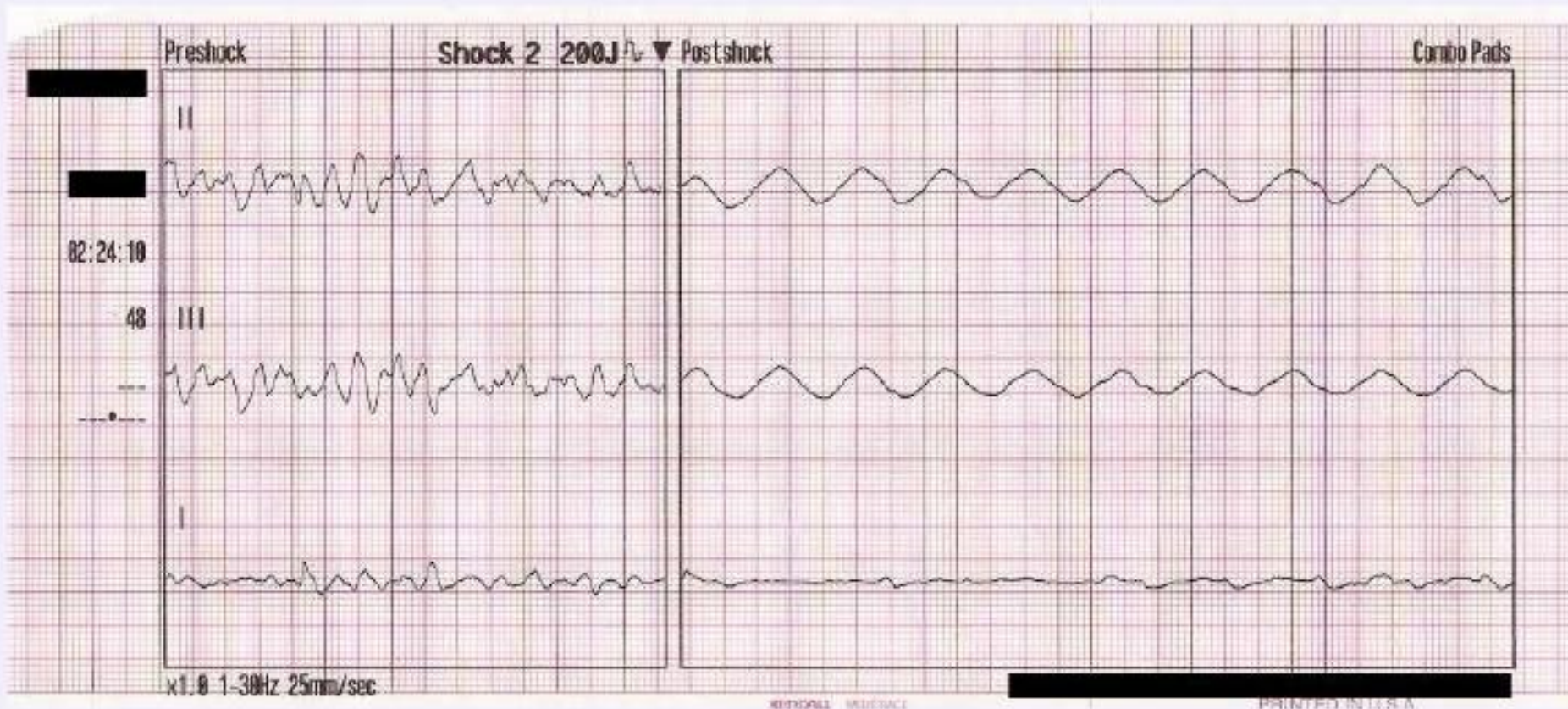
With the FIRST set of vitals and before Oxygen and Nitroglycerin ( Unless in Respiratory Distress )

Ideally, the 12 Lead EKG should be captured within 5 minutes of making patient contact ( the “at patient time” ).

# Where to perform EKG ?

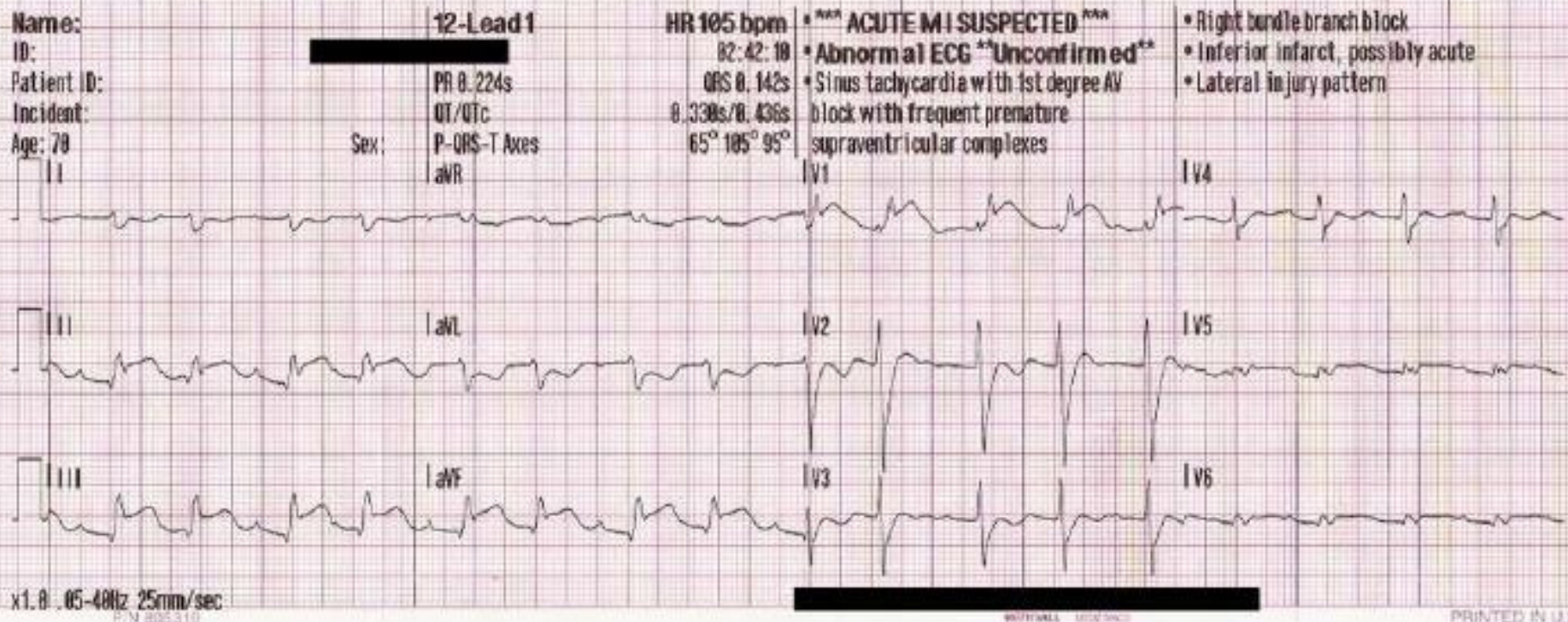
Do this As Soon As Possible

On the scene, prior to relocating the patient to the ambulance, as feasible.



*This patient was observed to collapse from sudden cardiac arrest. The initial rhythm was ventricular fibrillation. After 2 shocks and continuous chest compressions the patient experienced return of spontaneous circulation (ROSC)*





*The post-arrest 12-lead ECG showed acute inferior STEMI. It was immediately transmitted to the LIFENET Receiving Station.*

The 3 Lead EKG Looks Good....

▼ Initial Rhythm

03:21:25

97



1.0 1-30Hz 25mm/sec

The 12 Lead EKG can wait until she is loaded into the Ambulance...right ?



Name:

ID:

Patient ID:

Incident:

Age: 82

12-Lead I

Sex:

P-QRS-T Axes

avR

HR 94 bpm

83:33:34

PR 0.148s

QT/QTc

0.348s/0.425s

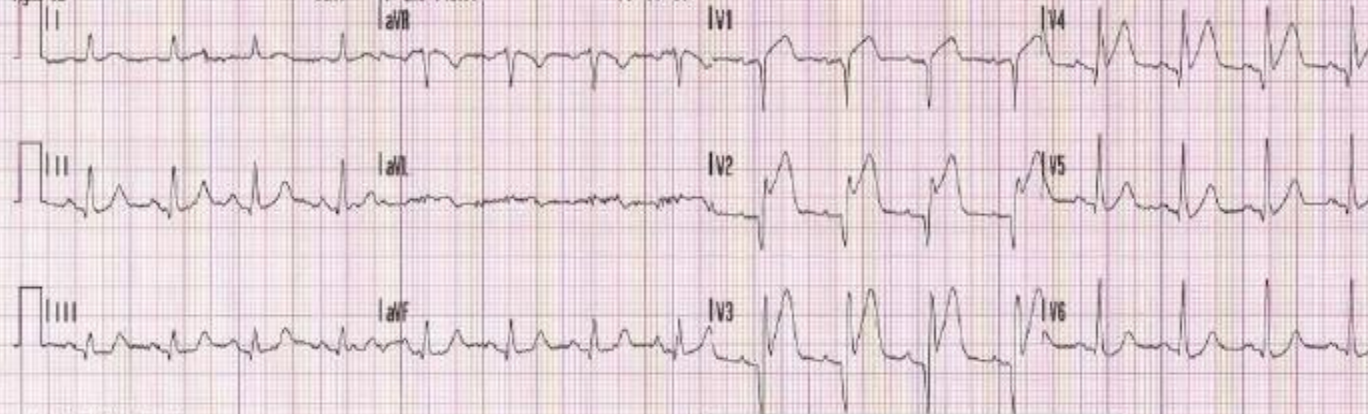
76° 51° 69°

\*\*\* ACUTE MI SUSPECTED \*\*\*

\* Abnormal ECG \* Unconfirmed \*\*

\* Normal sinus rhythm

\* Interseptal infarct, possibly acute



x1.0 05-40Hz 25mm/sec

RECALL 05-01-01

PRINTED IN U.S.A.

Wrong

You would have missed an Acute  
Anteroseptal STEMI

The Old Concept :

Put the patient on the  
monitor

# The New Concept

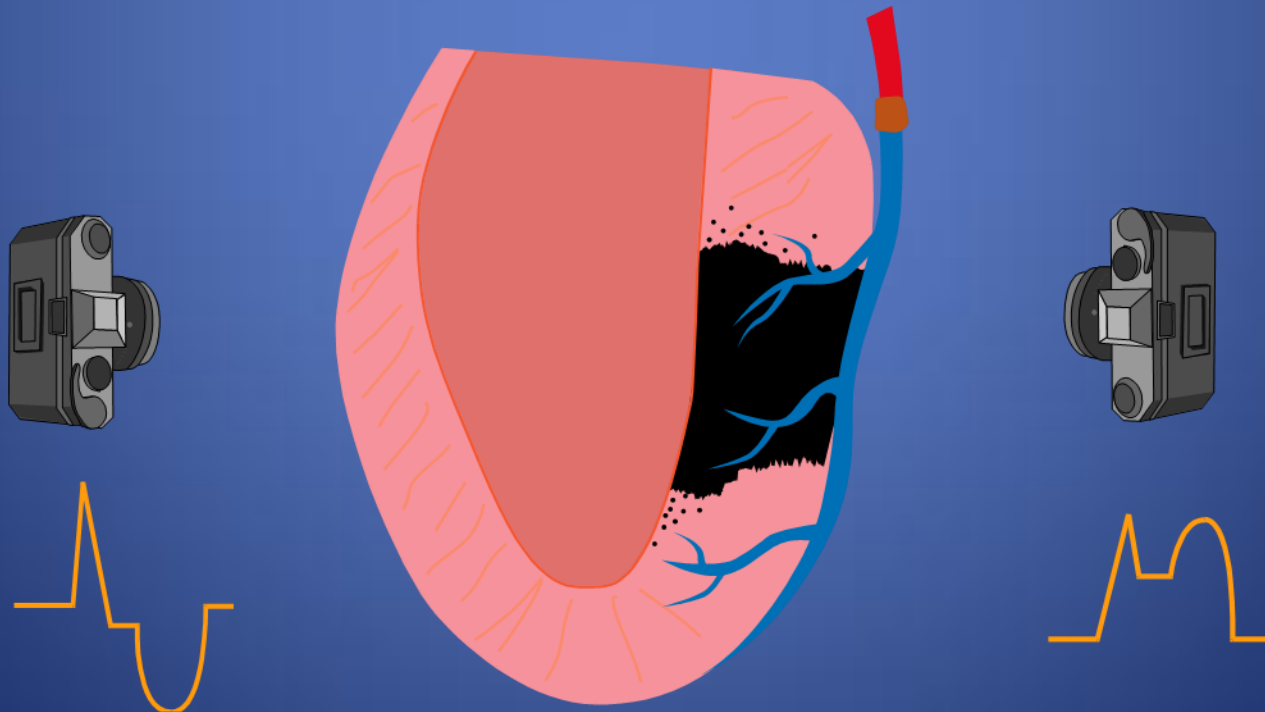
Get a 12 Lead EKG on the  
patient FIRST

# STEMI recognition

- Defined as 1mm ST segment elevation in 2 consecutive limb leads or
- 2 mm ST segment elevation in 2 consecutive precordial leads
- Must be present in anatomically contiguous leads
- Confounders: RBBB, LBBB, Repolarization, Ventricular Paced Rhythm, mimickers

# Reciprocal changes

- Makes STE more likely to represent AMI
- Stems from reflection of ischemia or infarction

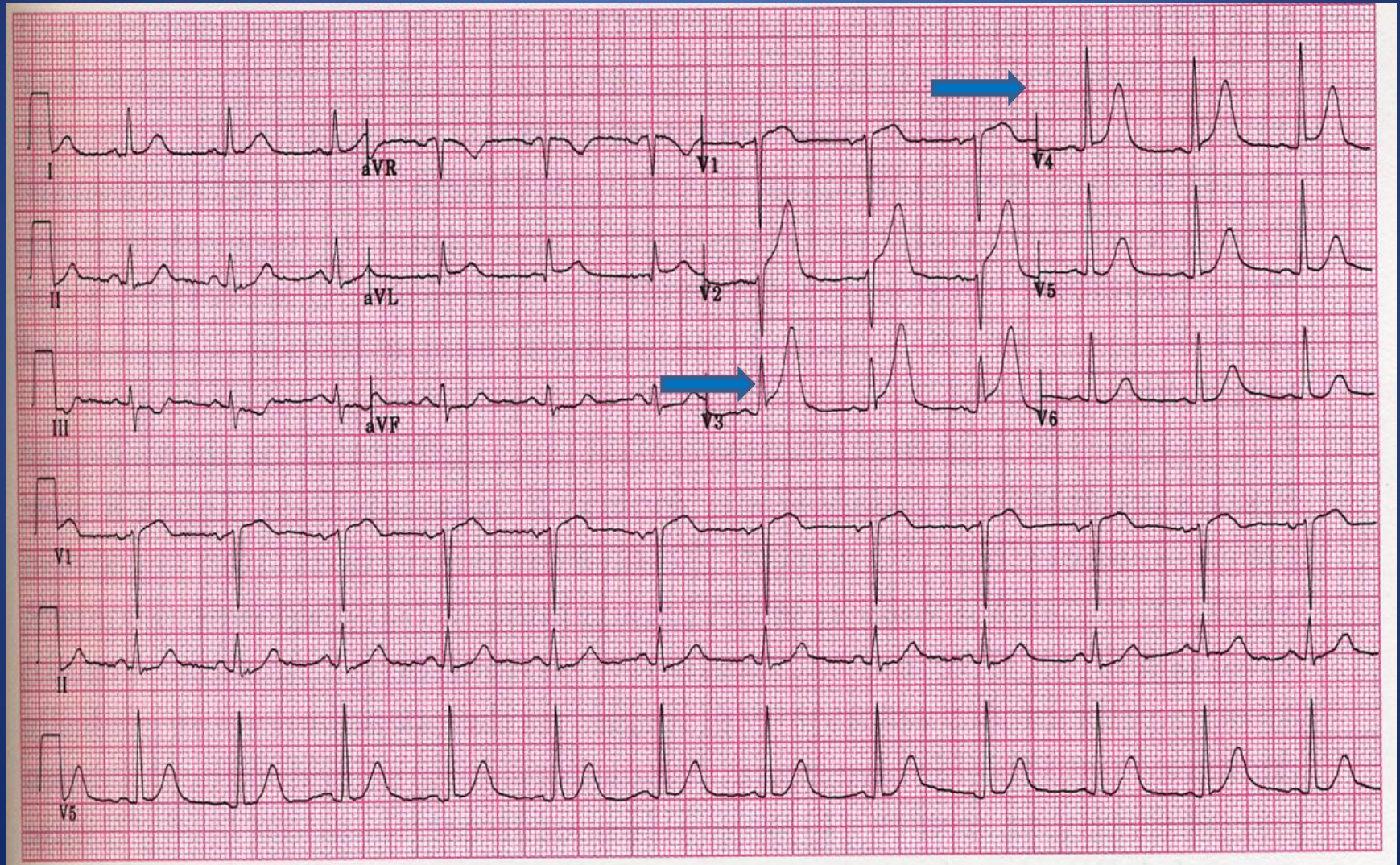


# Lead Summary

I Lateral  Circumflex Artery	aVR	V1 Septal  Left Anterior Descending Artery	V4 Anterior  Right Coronary Artery
II Inferior  Right Coronary Artery	aVL Lateral  Circumflex Artery	V2 Septal  Left Anterior Descending Artery	V5 Lateral  Circumflex Artery
III Inferior  Right Coronary Artery	AVF Inferior  Right Coronary Artery	V3 Anterior  Right Coronary Artery	V6 Lateral  Circumflex Artery

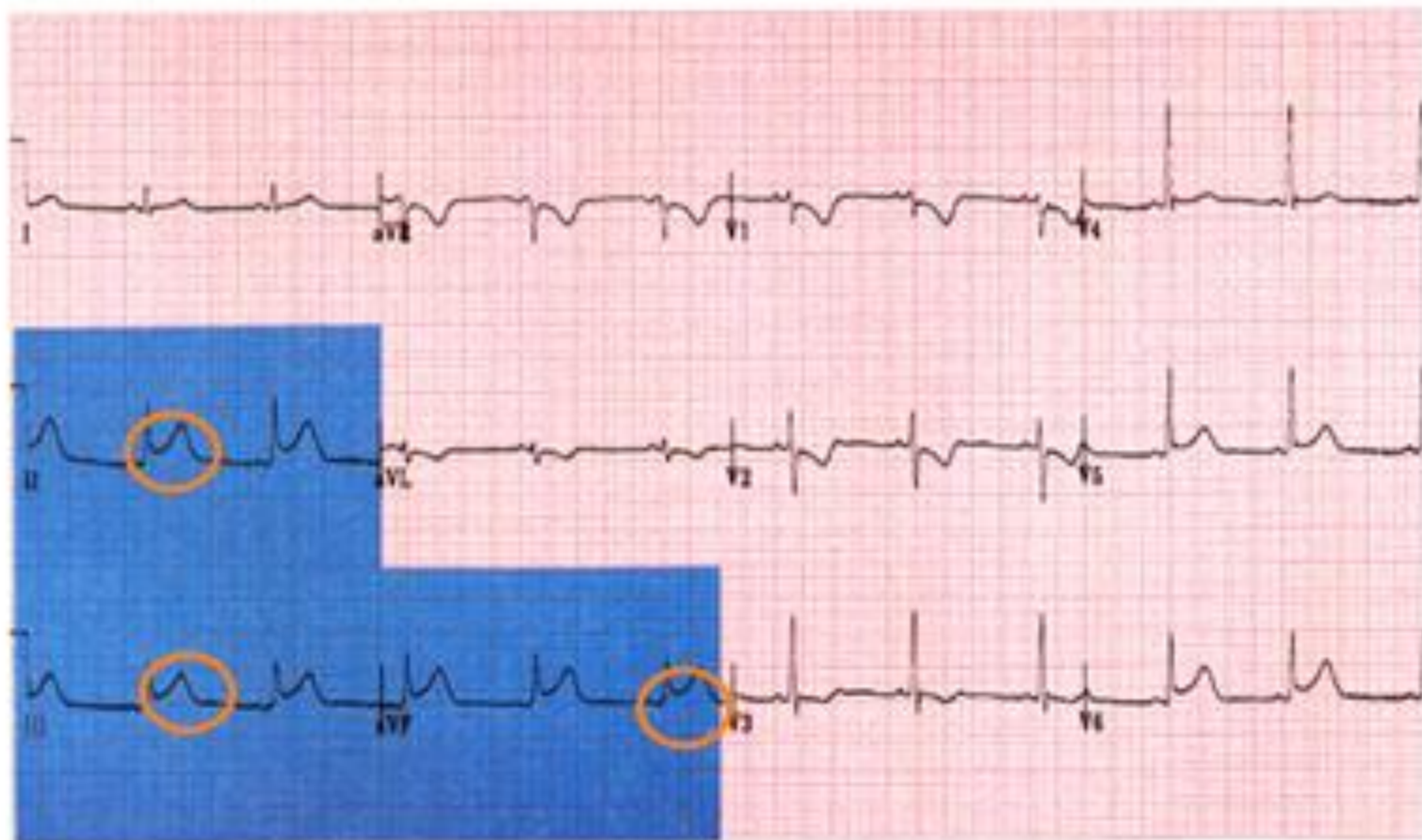


# ST elevation in Anterior Leads V3 & V4





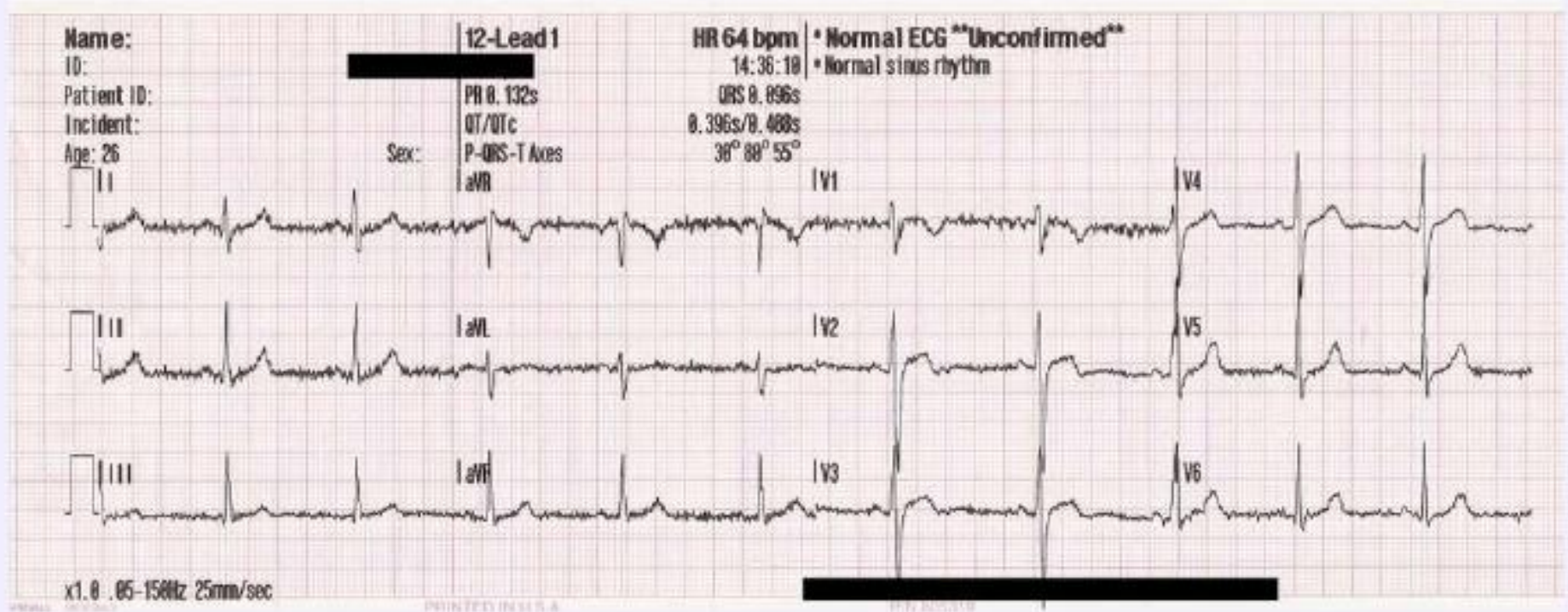
# Inferior MI



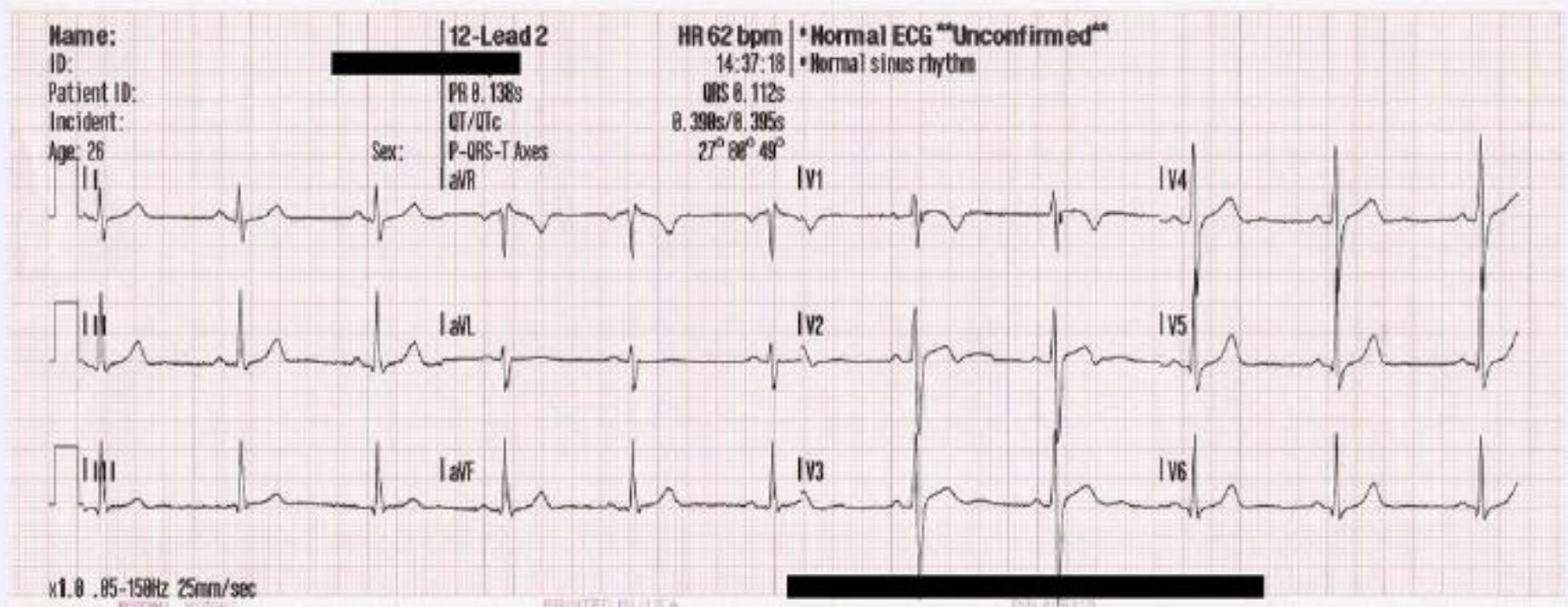
# Lateral MI





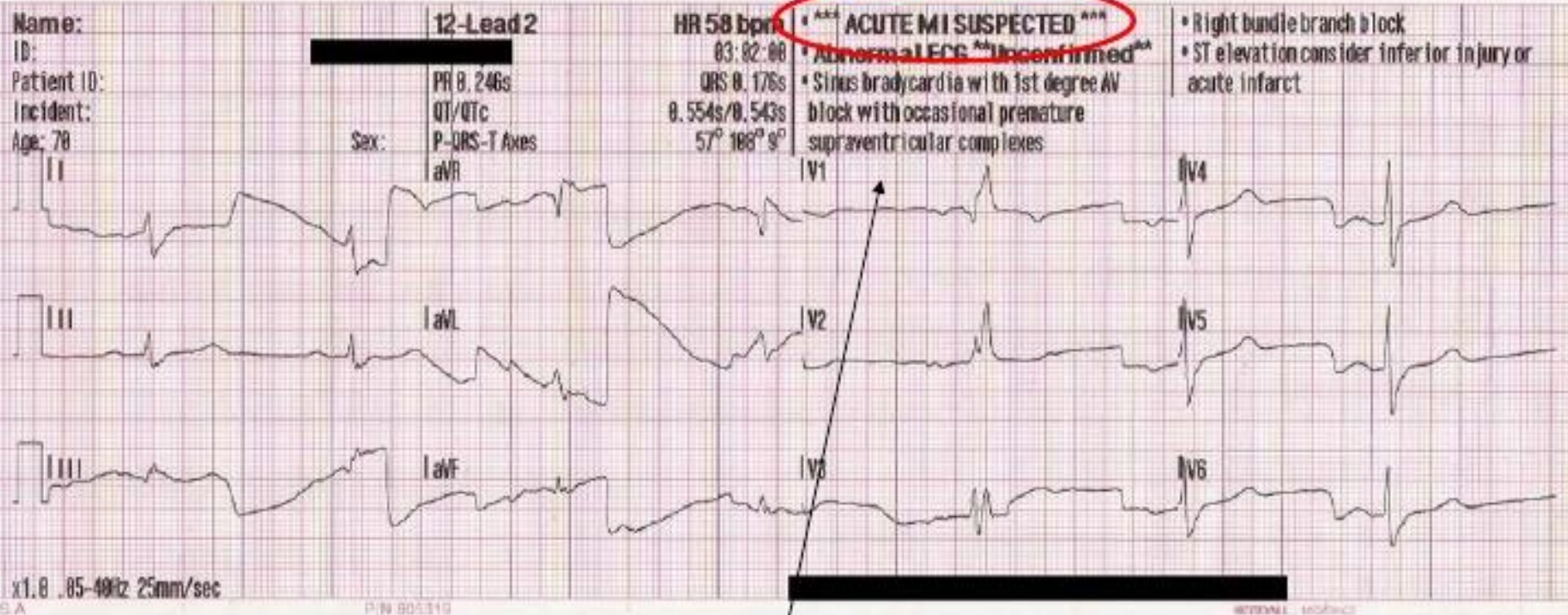


*This 12-lead ECG was obtained from a firefighter during training at the fire station. It was cold at the station (they don't call it the "Ice House" for nothing) and you can see muscle tremor artifact in the ECG.*



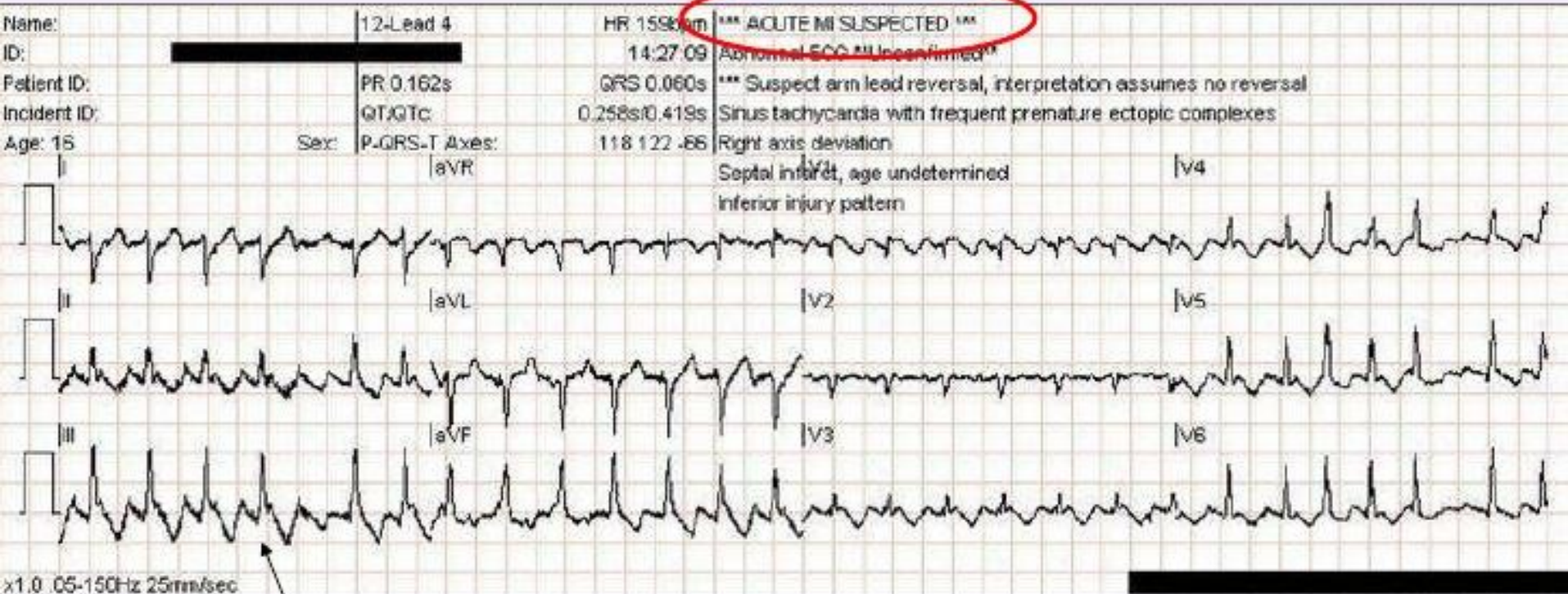
*The second 12-lead ECG was captured after placing a single towel over the firefighter. What a difference!*





*Here poor data quality is triggering the \*\*\*ACUTE MI SUSPECTED\*\*\* message. This message has a high specificity for acute STEMI, but only when the patient has signs and symptoms of ACS and the data quality is excellent! The STEMI Alert should not be called from the field based on this 12-lead ECG.*





*Here the data quality is good, but flutter waves are triggering the \*\*\*ACUTE MI SUSPECTED\*\*\* message. A STEMI Alert should not be called from the field. False positive messages are more common for tachycardias, especially with rates > 140.*

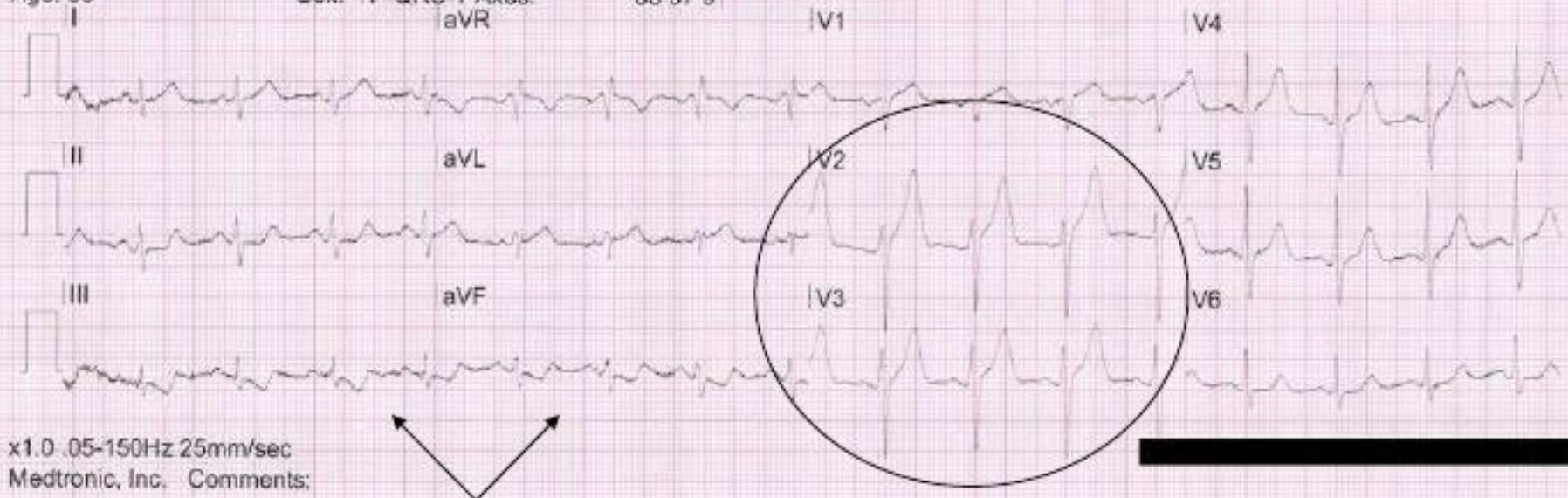


## 12-Lead 1

Name:  
Patient ID:   
Incident ID:  
Responder: 000

Device:  
Configuration:  
Received:  
Viewed:

Name: 12-Lead 1 HR 97bpm Normal ECG \*\*Unconfirmed\*\*  
ID: 11:41:42 AM Normal sinus rhythm  
Patient ID: PR 0.128s QRS 0.088s  
Incident ID: QT/QTc: 0.344s/0.436s  
Age: 53 Sex: P-QRS-T Axes: 63 37 9



x1.0 .05-150Hz 25mm/sec  
Medtronic, Inc. Comments:

*For this borderline case found on the LIFENET Receiving Station, it is questionable as to whether or not 2 mm of ST-segment elevation are present in leads V2 and V3. However, reciprocal changes appear to be present in leads III and aVF. What should the treating paramedic do?*

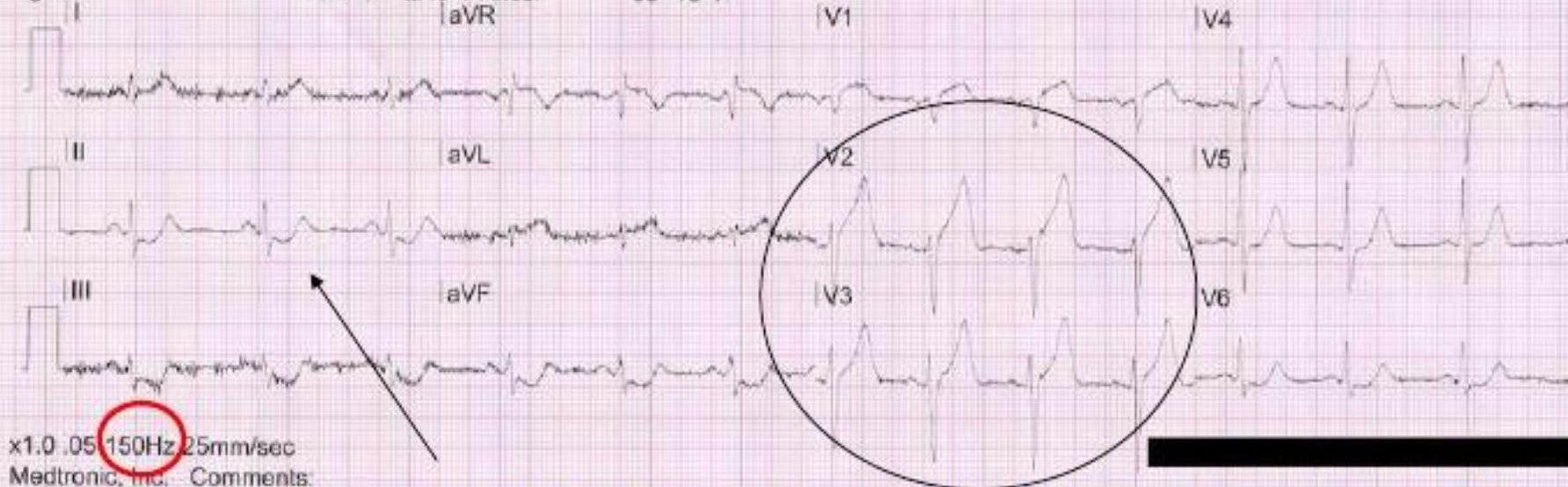


## 12-Lead 2

Name:  
Patient ID:  
Incident ID:  
Responder: 000

Device:  
Configuration:  
Received:  
Viewed:

Name: 12-Lead 2  
ID:   
Patient ID:   
Incident ID:   
Age: 53  
Sex:   
PR 0.126s  
QT/QTc:   
P-QRS-T Axes: 69 -18 4  
HR 81bpm  
11:46:08 AM  
QRS 0.086s  
0.350s/0.406s  
\*\*\* ACUTE MI SUSPECTED \*\*\*  
Abnormal ECG \*\*Unconfirmed\*\*  
Normal sinus rhythm with sinus arrhythmia  
ST elevation consider anterior injury or acute infarct



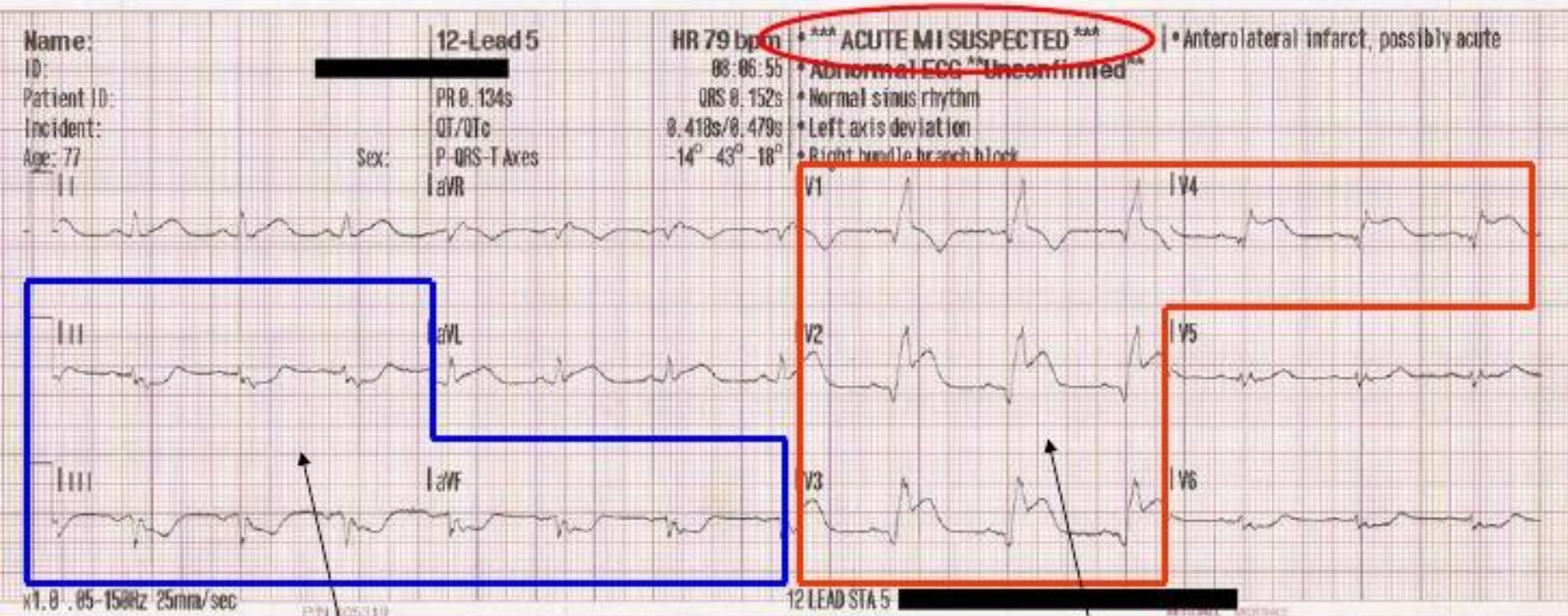
*Answer: Perform serial ECGs! Less than 5 minutes later, this evolving STEMI triggers the \*\*\*ACUTE MI SUSPECTED\*\*\* message (you will note that the R waves are smaller in lead V2 and V3 and reciprocal changes are now apparent in lead II).*

*You will note some 60 cycle interference. That's because the LIFENET's high frequency/low pass filter is set to 150 Hz. We will try to get this reprogrammed to 40 Hz to match the LP12s.*

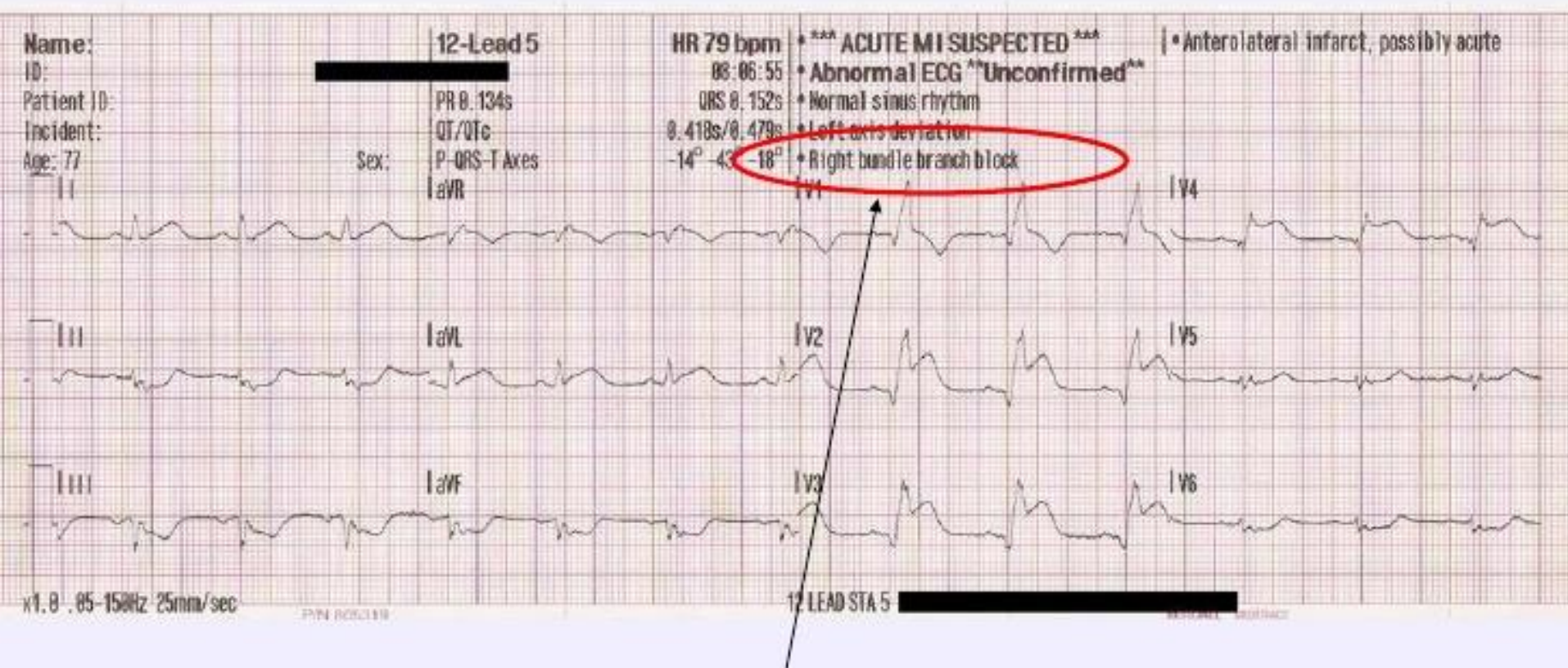


*The vast majority of the time, calling a STEMI Alert will be a simple decision!*

Interpretive statement says \*\*\*ACUTE MI SUSPECTED\*\*\*







*Generally speaking, RBBB does not distort the ST-segment the same way that LBBB or paced rhythm does!*

*If you're not sure, transmit the ECG  
without calling the STEMI Alert!*