VHAC
Virginia Heart Attack Coalition

12 Lead ECG Fundamentals Course

VHAC ECG EDUCATION COMMITTEE

CME Credits Provided by:

Multi-Lead Medics™

BON SECOURS

Proud partner of VCSQI

Course Objectives

- Define electrocardiogram (ECG)
- Identify reasons for obtaining a 12-Lead ECG and 15-lead ECG
- Demonstrate proper electrode placement and how to obtain a 12-lead ECG and 15-lead ECG
- Discuss ECG segments
- Identify STEMI ECG criteria and STEMI Mimics

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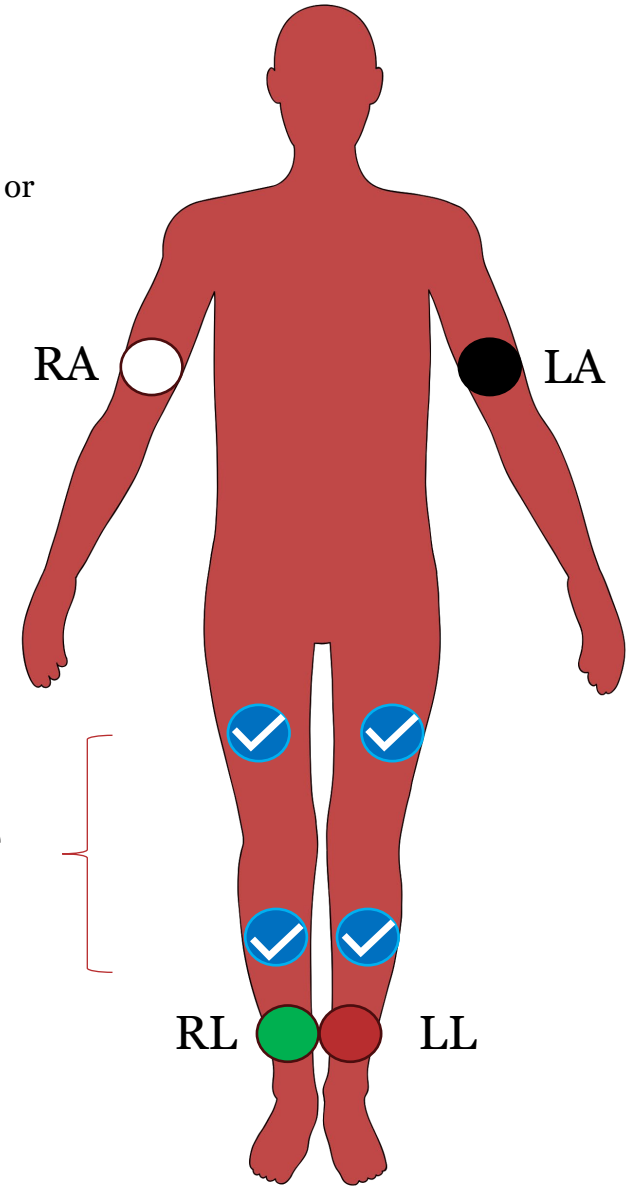
Identifying a STEMI…

Starts with acquiring and understanding the ECG…when to obtain, proper lead placement, time and amplitude, waves, intervals and segments.

Proper 12-Lead ECG Electrode Placement (Left)

RA (White) = Right Arm (place on upper arm/deltoid)
LA (Black) = Left Arm (place on upper arm/deltoid)
RL (Green) = Right Leg (above ankle, calf, or thigh)
LL (Red)= Left Leg (above ankle, calf, or thigh)



Limb Lead Placement Guidelines

- Right and Left Arm (RA/LA): Place electrodes above the elbow on the deltoid area, not on the forearm or wrist.
- Right and Left Leg (RL/LL): Place electrodes on the thigh or calf, below the hip but above the ankle.

DO NOT PLACE LIMB ELECTRODES ON THE TORSO.

This can cause inaccurate readings by altering **ST segments**, **QRS axis**, and other key ECG findings.

KEY REMINDERS

- Maintain **symmetry** — electrodes should be placed in the same anatomical plane on both sides.
- **Exceptions** apply only in specific clinical cases (e.g., **amputation**, **burns**, **trauma**, or **emergent instability**).

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Skin Preparation and Patient Readiness for ECG

- Ensure **privacy** whenever possible
- **Expose** the chest and identify key anatomical landmarks clearly
- **Inspect** the skin: It must be clean, dry, and free of oils, lotions, or debris
  - Remove dirt or residue using a clean cloth or bath wipe; dry with sterile gauze.
  - For excessive sweat, use an alcohol wipe, and allow the skin to dry completely before applying electrodes.
  - Clip—Do Not Shave—excessive hair to ensure proper adhesion and reduce skin irritation
- **Prep** the skin using an abrasive pad (either integrated with the electrode or applied separately) to improve conductivity.
- Always use fresh, unopened electrodes to ensure effective signal quality.

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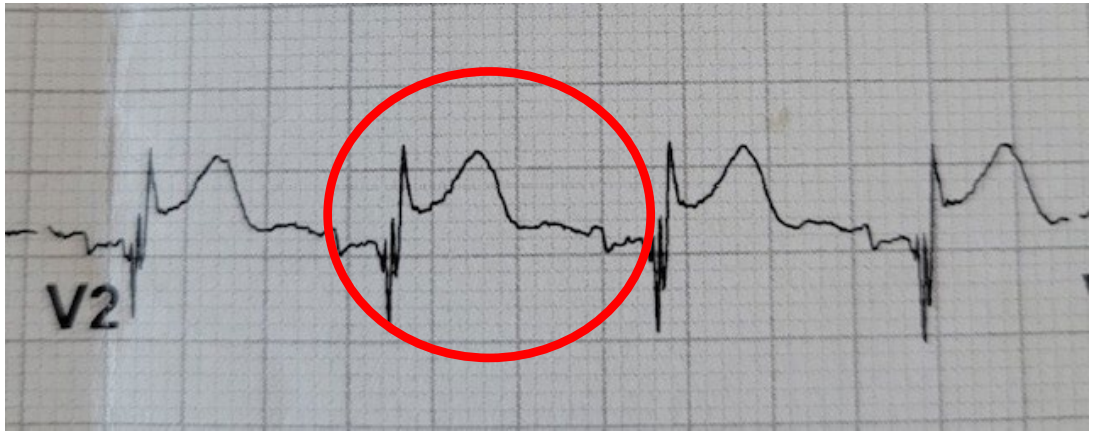
ECG Leads: PLACMENT MATTERS

Initial ECG

The cath lab team was activated on this 12-lead tracing (note the ST elevation in V2).



Follow-Up ECG

Electrodes were then placed correctly. No intervention needed.

THIS IS WHY PROPER LEAD PLACEMENT IS VITAL!

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It only takes 21 cents and 20 seconds to acquire a 15 lead!

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15-Lead ECG

Reasons for 15- Lead

- All normal 12-lead with symptoms of ACS
- ST Depression found in V1-V3 alone
- Suspected Inferior Infarct
- Suspected Posterior wall MI (LCx)

Why?

- 23% Increase in sensitivity for RCA infarction compared to traditional 12-lead
- 86% increase in sensitivity with Circumflex infarction compared to traditional 12-lead
- Help guide practice in cautious use of nitroglycerin administration before PTA at PCI center

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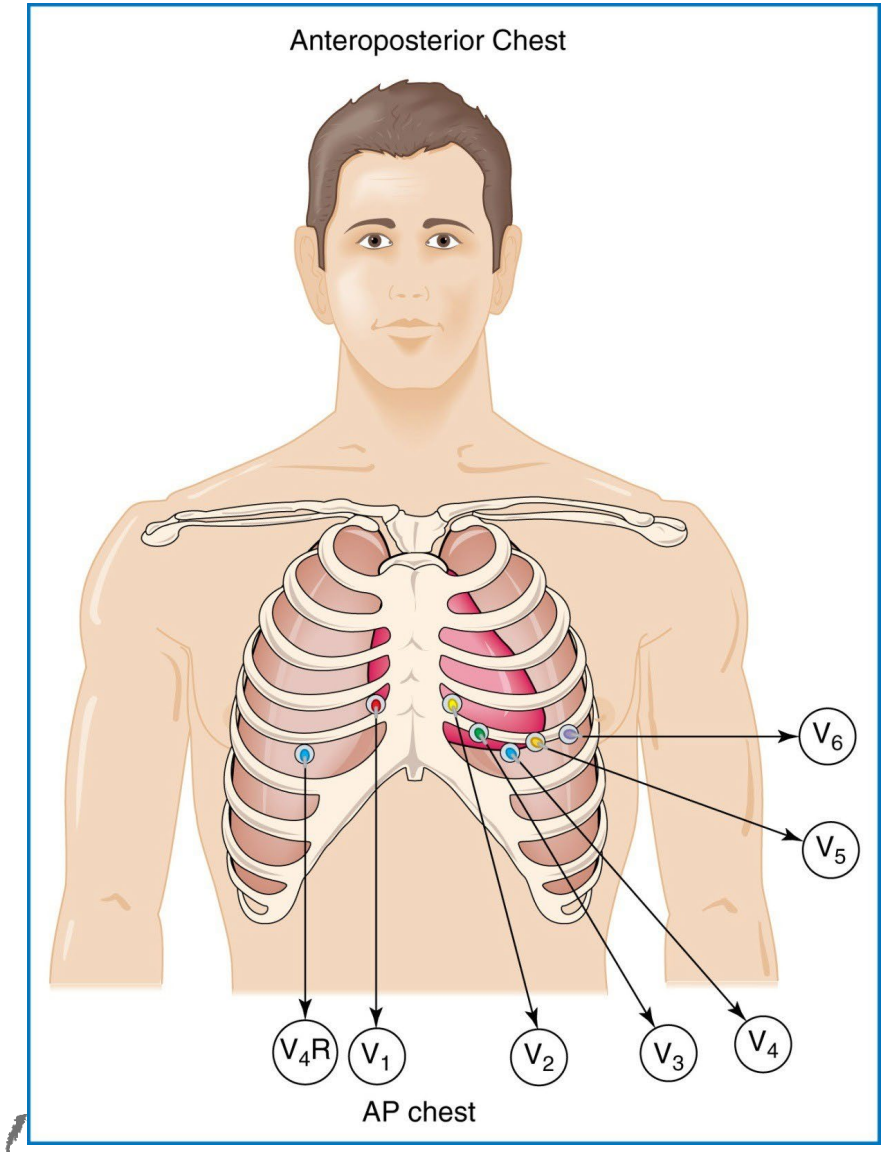
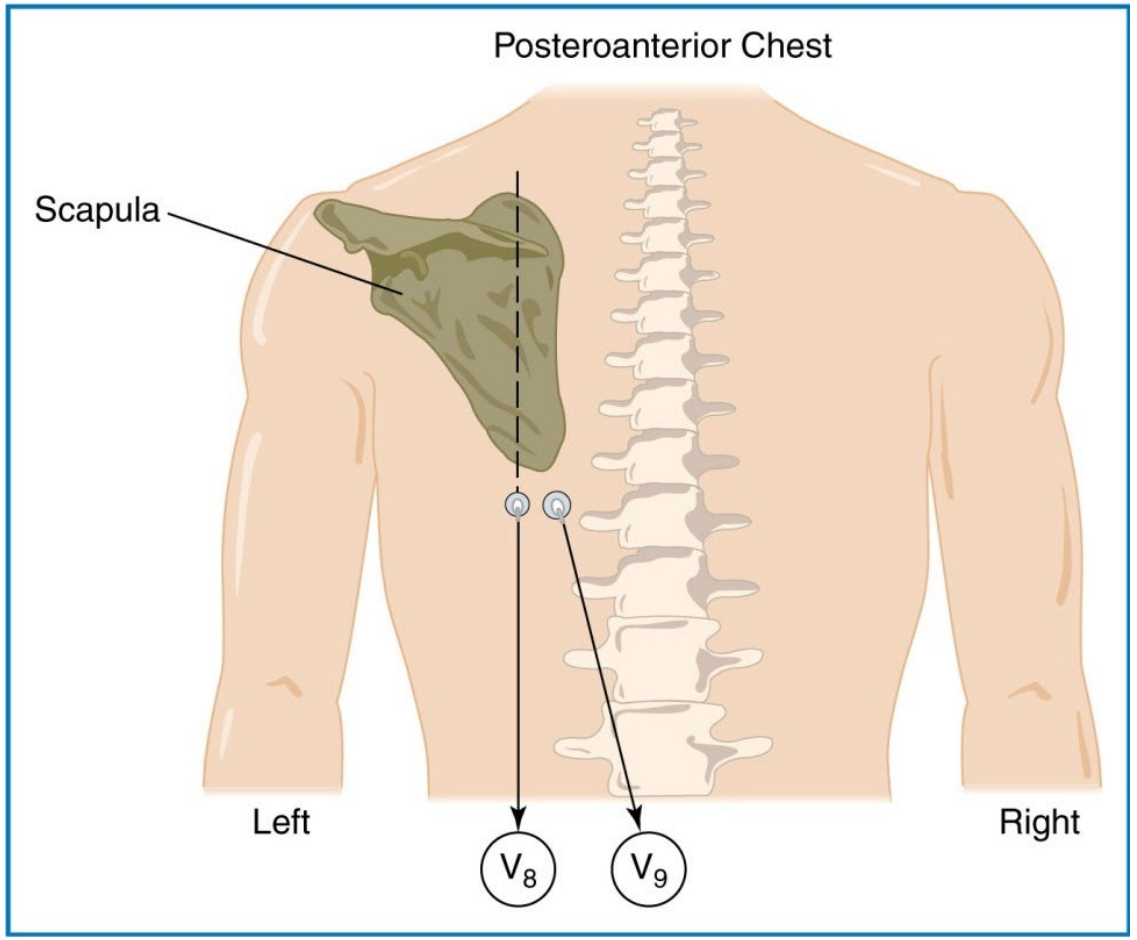
15-Lead ECG


Anteroposterior Chest
V6
V5
V4R
V1
V2
V3
V4
AP chest


Posteroanterior Chest
Scapula
Left
Right
V8
V9

12 lead? 15 Lead? Right Sided Leads?

- Obtain a clean, high-quality ECG as quickly as possible, promptly transmit and call report (name and DOB).
- If high suspicion for STEMI and the ECG is not diagnostic and there is ST depression in V1 and V2, consider performing posterior leads (a 15 Lead ECG).
- Consider performing right sided leads (specifically V4R), in the setting of an inferior STEMI, can be used to diagnose RV infarction.

GET IT >>> TRANSMIT IT >>> REPORT IT

Best Practice: Include name and DOB.

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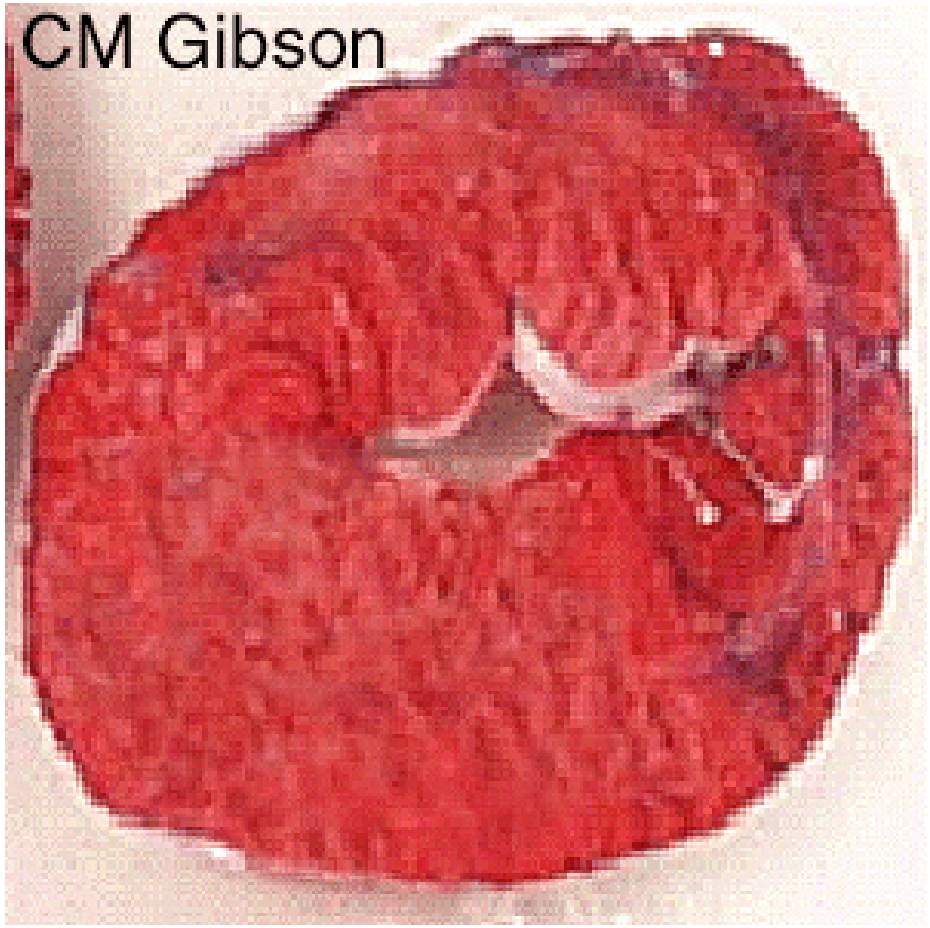
Bottom Line: The old mantra rings true!



Courtesy of C Granger and Jollis.

Time is Muscle
Time is Life

System saves time!
System saves muscle!
Systems saves lives!

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Every 30-minute Delay=7.5% Increased Mortality!!

Source: Anderson et al., *Circulation*, 2025

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Treatment Delayed is Treatment Denied

Recognize the Signs

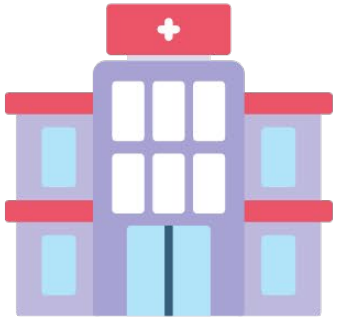
Chest pain, arm discomfort, shortness of breath—know the red flags.

Alert Emergency Services

Call 911 right away—don't wait it out.

Care Starts with EMS

Paramedics begin life-saving interventions en route.



Enter the Emergency Department

Immediate assessment and triage begin.

Definitive Treatment in Cath Lab

Restoring blood flow saves heart muscle.

EVERY MINUTE COUNTS: BLOOD FLOW TREATMENT DELAYED

EMS Plays a Crucial Role!!!

Do the ECG –
AT THE SCENE

Activate (Transmit and/or Read the ECG) -
AT THE SCENE

We need the *NAME, DOB and Patient Report* -
AT THE SCENE

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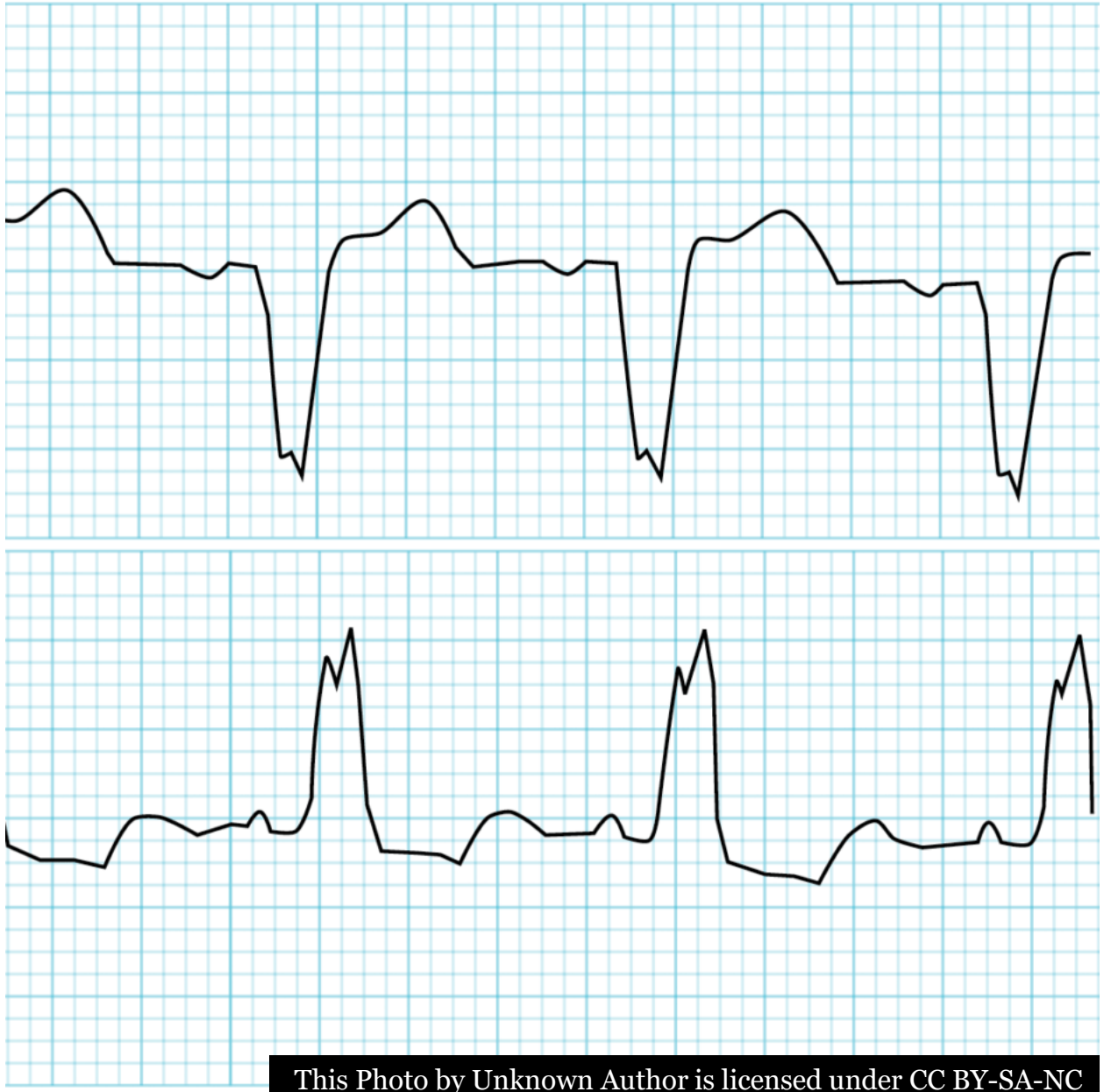


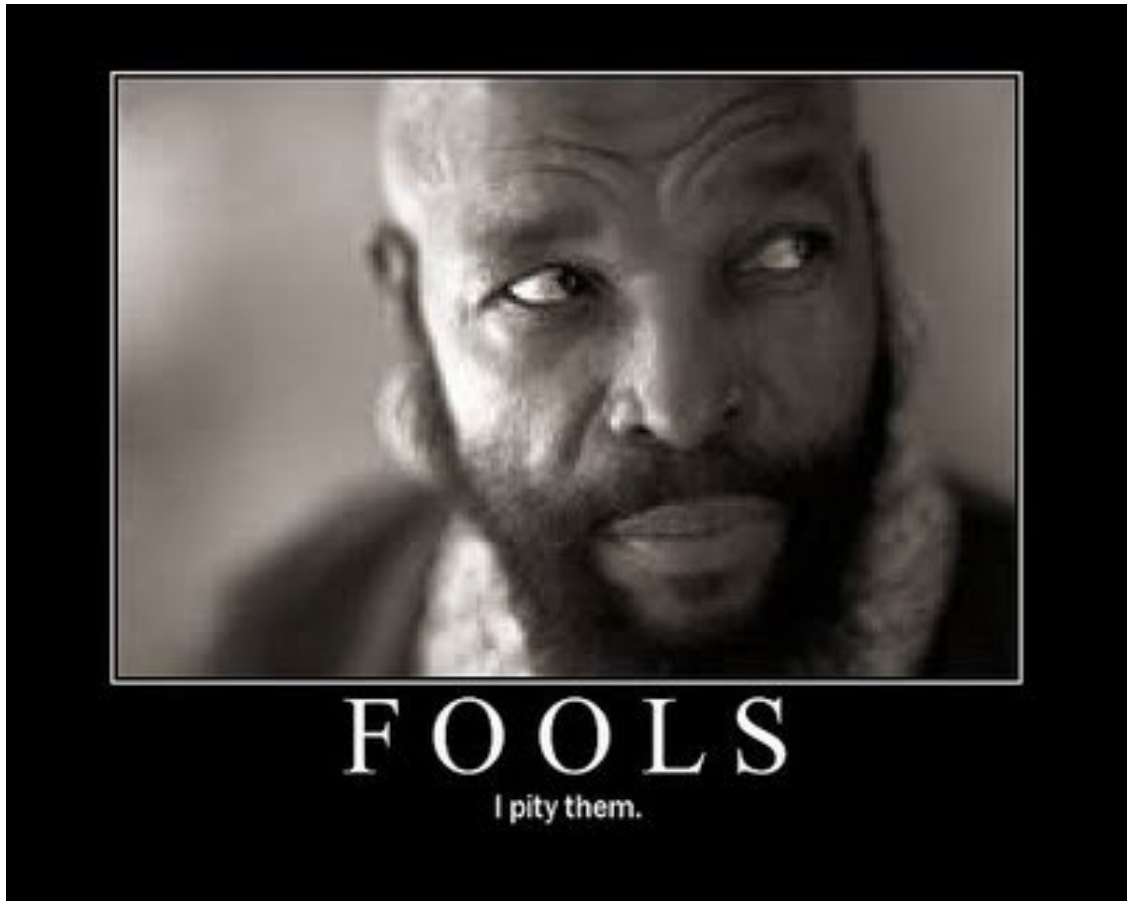
STEMI Mimics

Additional Discussion and Examples for Advanced Classes

Most Common STEMI Mimics

- **RBBB/LBBB**
- **Pericarditis**
- **LVH**

…Fast and Wide!!!



Take Home Points

- Obtain an **ECG (<10 minutes), Transmit, Call report (with Name/DOB) to MedComm (<10 minutes)**; Do it right away and from the scene
- Administer ASA and (consider) NTG
- Minimize Scene Time
- STEMI ECGs are not hard, it takes understanding and practice
- Time is muscle and life — and EMS plays a critical role in the delivery of this care. ACC/AHA Guideline goal <90 minutes for FMC2B. Faster is better – *VHAC Drive to 75!*
- VHAC and VCSQI are committed to improving the care of MI patients across the Commonwealth

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Thank You

Contact info@VCSQI.org with any question or concerns.

CLINICAL
WORKGROUP
RESOURCES

SCAN ME