STAT 12 Lead ECG Workshop: Basics & ACS

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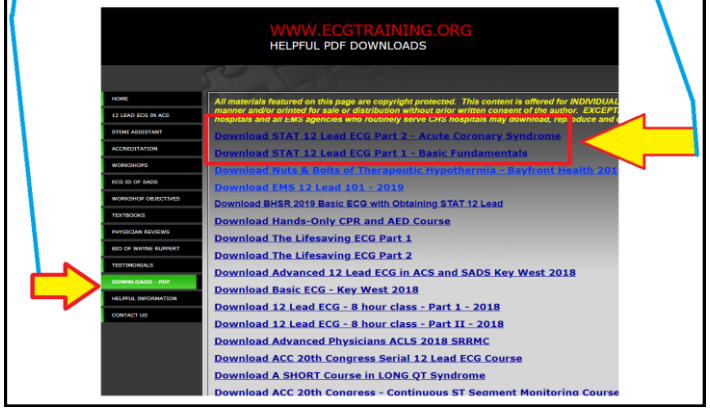

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THE ECG in PERSPECTIVE:

PROBLEMS with ECG:

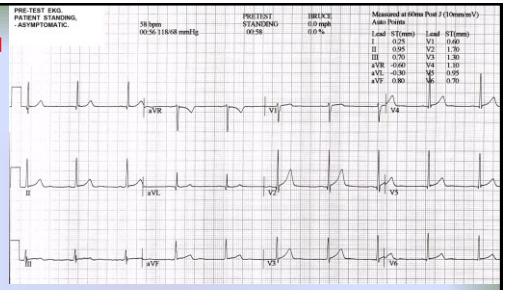
↓ **SENSITIVITY**
(FALSE NEGATIVES)

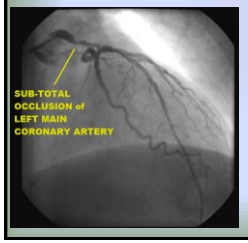
↓ **SPECIFICITY**
(FALSE POSITIVES)

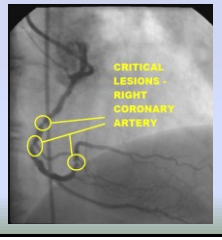
PROBLEMS WITH SENSITIVITY . . .

NORMAL ECG.

But . . . . .







LETHAL TRIPLE VESSEL DISEASE

PROBLEMS WITH SPECIFICITY . . .

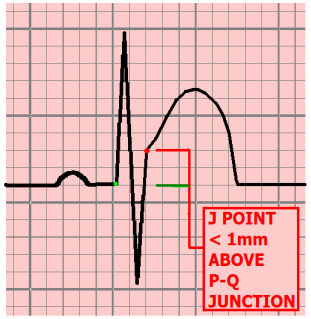
S-T SEGMENT ELEVATION - COMMON ETIOLOGIES:

CONDITION:

- **ACUTE INFARCTION (STEMI)**

PROBLEMS WITH SPECIFICITY . . .

S-T SEGMENT ELEVATION - COMMON ETIOLOGIES:



CONDITION:

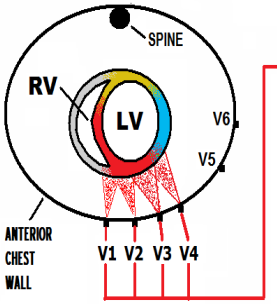
- **ACUTE INFARCTION**
- **HYPERKALEMIA**
- **BRUGADA SYNDROME**
- **PULMONARY EMBOLUS**
- **INTRACRANIAL BLEED**
- **MYOCARDITIS / PERICARDITIS**
- **L. VENT. HYPERTROPHY**
- **PRINZMETAL'S ANGINA**
- **L. BUNDLE BRANCH BLOCK**
- **PACED RHYTHM**
- **EARLY REPOLARIZATION & "MALE PATTERN" S-T ELEV.**

The QUADRAD of ACS

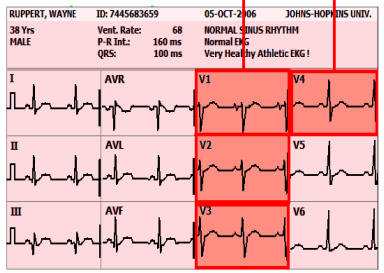
- ☐ PRESENTING SYMPTOMS
- ☐ ECG ABNORMALITIES
- ☐ RISK FACTOR PROFILE
- ☐ CARDIAC MARKERS

A POSITIVE finding in TWO or MORE of the above categories indicates it is EXTREMELY LIKELY that ACS is present . . . . steps must be AGGRESSIVELY TAKEN to definitively RULE OUT the PRESENCE of ACS !

V1 - V4 VIEW THE ANTERIOR-SEPTAL WALL of the LEFT VENTRICLE



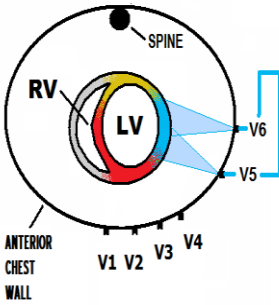
V1, V2 - ANTERIOR / SEPTAL
V3, V4 - ANTERIOR

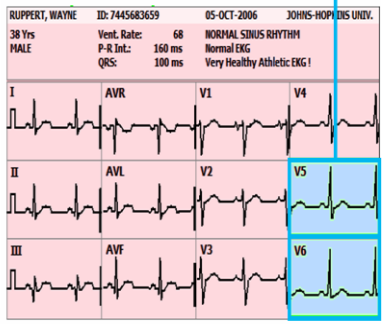


Leads V1-V4:

- V1 – V4 view the _____ of the Left Ventricle.
- V1 and V2 also view the _____
- V1 – V3 view the _____ via Reciprocal Changes.

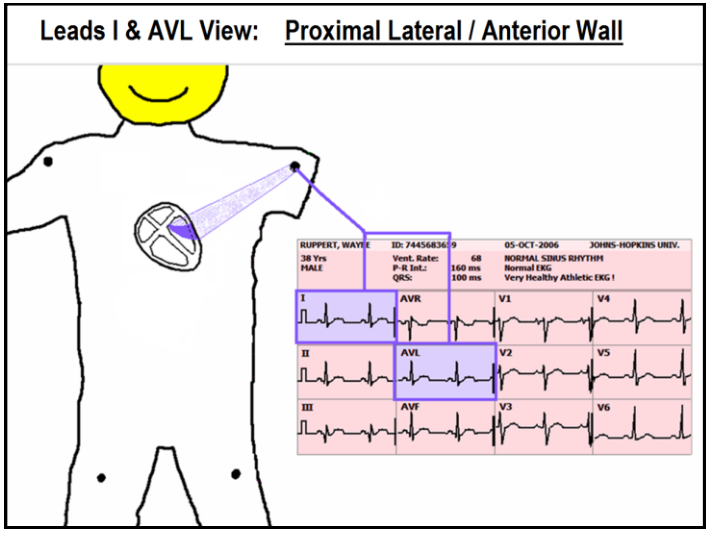
V5 - V6 VIEW THE LATERAL WALL of the LEFT VENTRICLE





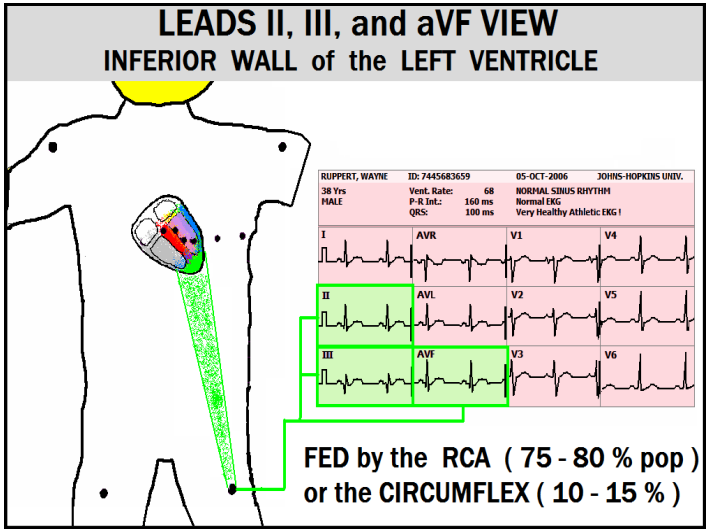
Leads V5 & V6:

- V5 & V6 view the _____of the Left Ventricle.



Leads I and AVL:

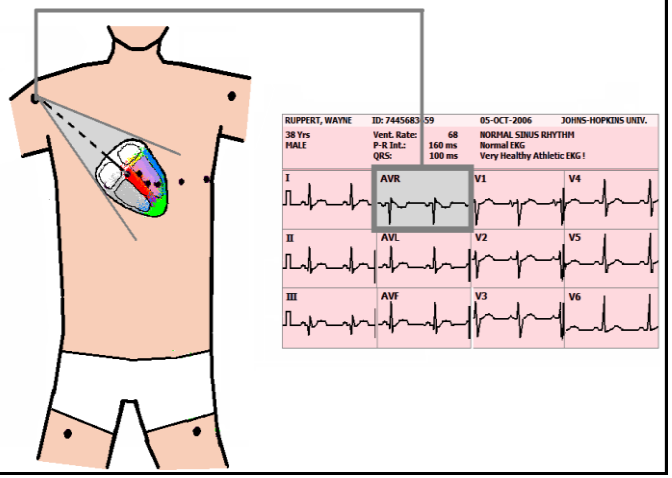
- Leads I and AVL view the **PROXIMAL aspect** of the _____ and _____ **WALLS**
- I and AVL can be associated with EITHER the _____, the _____, or BOTH.



Leads II, III, and AVF:

- Leads, II, III, and AVF view the _____ of the Left Ventricle.

Lead AVR Views the BASILAR SEPTUM (region of the Bundle of His)



Lead AVR:

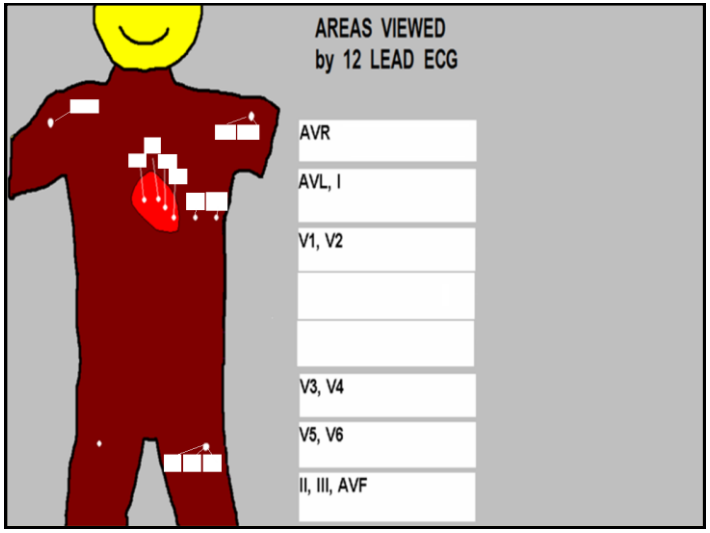
- Lead AVR views the _____.
- The _____is the area where the _____ is typically located.

Lead AVR:

- **ST Elevation in Lead AVR during Acute STEMI is associated with _____ _____ obstruction, which has a __% mortality Rate.**
- **ST Elevation of Lead AVR when STEMI is NOT present is often associated with _____ _____ disease, and/or CRITICAL OCCLUSION of the _____ _____: both require Coronary Artery Bypass Graft (CABG) Surgery!!**

What REGION of the HEART does EACH LEAD VIEW ? ?

Lead I views:	Lead AVR views:	Lead V1 views:	Lead V4 views:
Lead II views:	Lead AVL views:	Lead V2 views:	Lead V5 views:
Lead III view:	Lead AVF views:	Lead V3 views:	Lead V6 views:

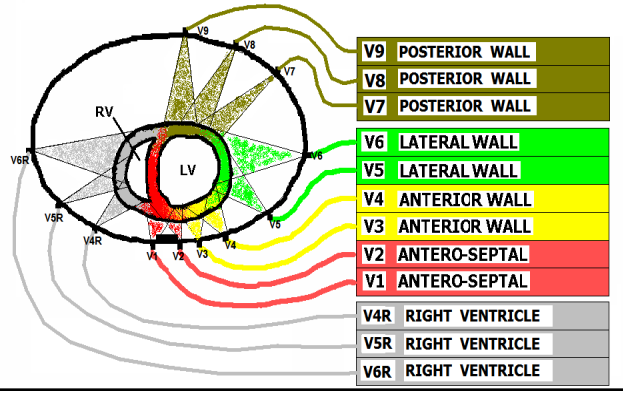


The TWO major BLIND SPOTS of the 12 Lead ECG are the _____and the _____.

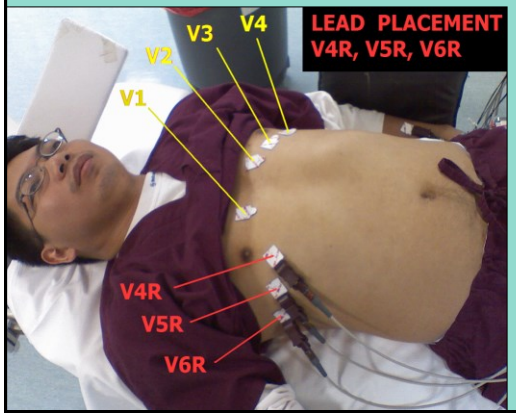
THE 18 LEAD ECG COVERS THE ENTIRE HEART . .

CHEST LEADS V1 - V6 *PLUS* V4R, V5R, V6R, and V7, V8, V9

WHAT EACH LEAD "SEES" . . .



LEAD PLACEMENT for obtaining RIGHT VENTRICULAR ECG:

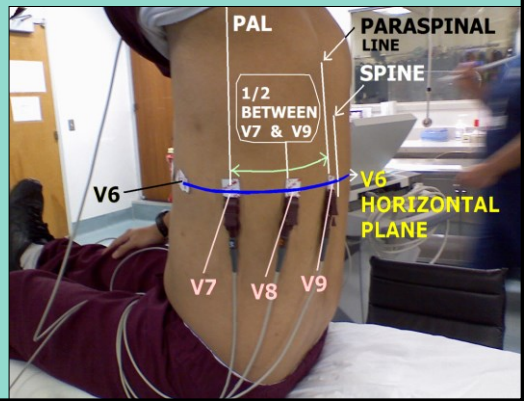


V4R – V6R

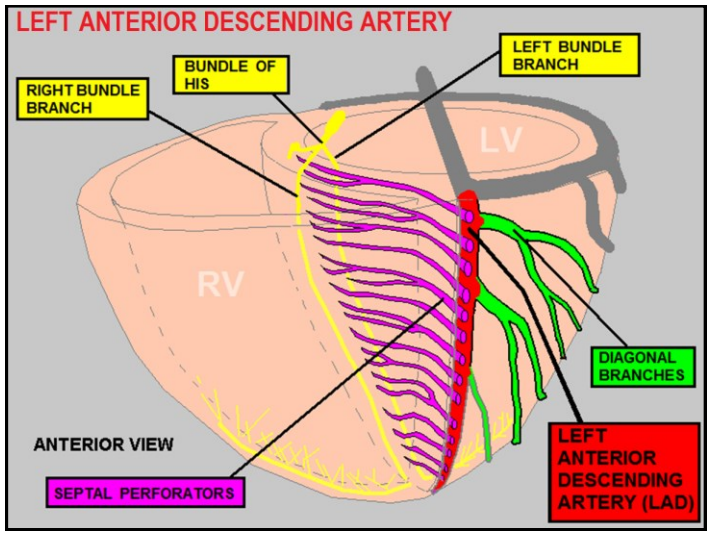
The INDICATION for obtaining a RIGHT VENTRICULAR ECG is _____.

LEAD PLACEMENT for obtaining a POSTERIOR ECG.

Leads V7 – V9



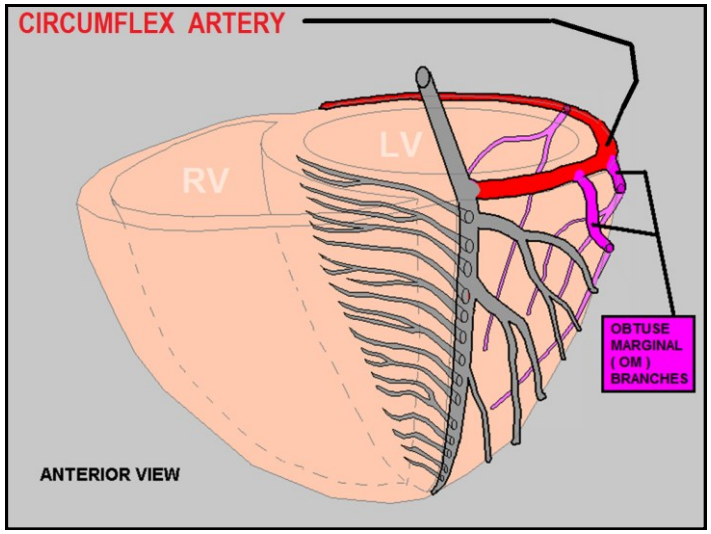
The INDICATION for obtaining a POSTERIOR LEAD ECG is _____.



Left Anterior Descending Artery

The LAD supplies blood to the ANTERIOR and SEPTAL walls, and includes the following CRITICAL STRUCTURES:

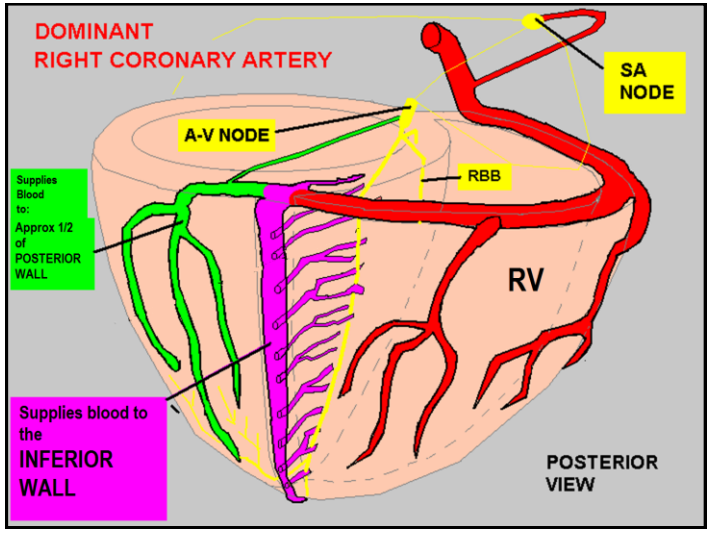
- Approximately ____of the Left Ventricle
- _____
- _____



Circumflex (Cx) Artery

In patients with a Right Dominant coronary artery system, the Circumflex supplies blood to:

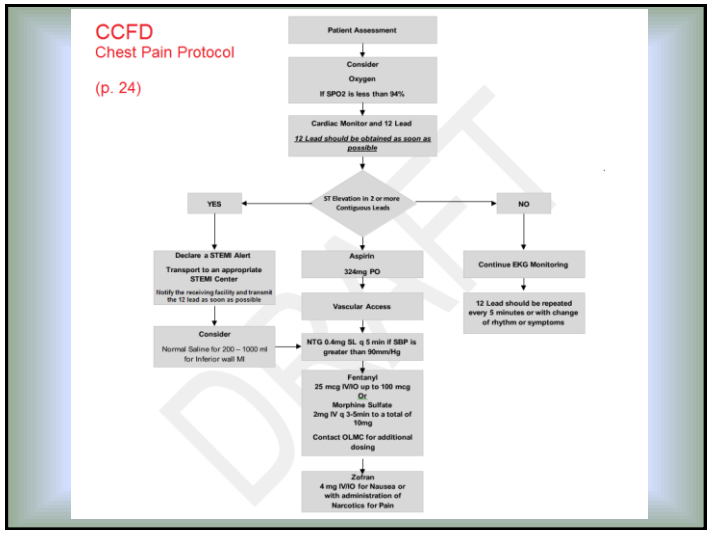
- Approximately 20-30% of the Left Ventricle, which includes:
  - _____of Left Ventricle
  - _____
- On rare occasion, the _____



Right Coronary Artery (RCA)

In patients with a RIGHT DOMINANT system, the RCA supplies blood to the following cardiac structures:

- _____
- _____
- _____
- **Approximately _____%of the Left Ventricle**
  - **INFERIOR Wall**
  - **½ POSTERIOR WALL**



"Classic" cardiac chest pain:

- **Location: _____**
- **___ or _____ in nature**
- **Does not change with _____**

All patients with ACS symptoms . . .

STAT 12 Lead ECG; obtain and have read within _____!!!

ACC/AHA Guideline!

Unstable Angina Findings:

The 12 Lead ECG may exhibit:

- **_____in leads that view the ischemic region**
  - **ST Depression**
  - **T Wave Inversion**
  - **Other "non-specific" ST-T changes**
- **The ECG may be _____.**
- **Troponin is _____.**

NSTEMI Findings:

The 12 Lead ECG may exhibit:

- **_____in leads that view the ischemic region**
  - **ST Depression**
  - **T Wave Inversion**
  - **Other "non-specific" ST-T changes**
- **The ECG may be _____.**
- **Troponin is _____.**

Q: To evaluate the patient for ischemia or infarction, what part of the ECG do we look at?

Q: Why is QRS width an issue when we look at J Points, ST Segments and T Waves??

PATTERNS of ACS & ISCHEMIA

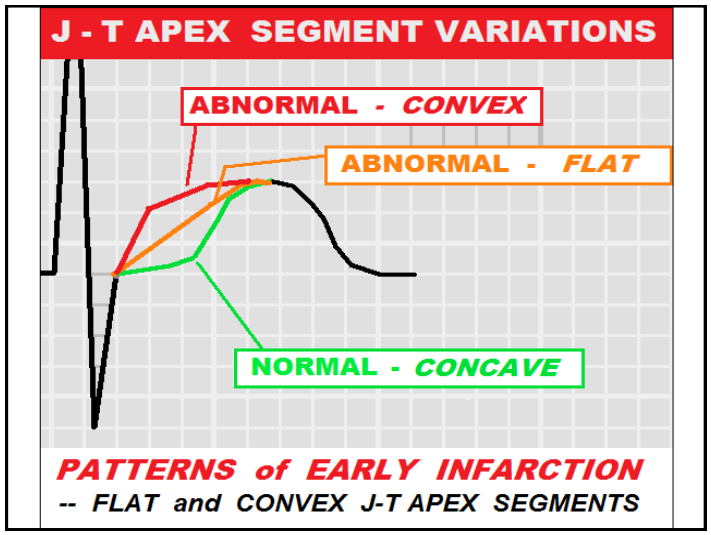
-- J POINT, ST SEGMENT, and T WAVE ABNORMALITIES --

!	FLAT or CONVEX J-T APEX SEGMENT	**ACUTE MI** *EARLY PHASE*
!	HYPER-ACUTE T WAVE	**ACUTE MI** *EARLY PHASE*
!	S-T SEGMENT ELEVATION at J POINT	**ACUTE MI**
!	DEPRESSED J pt. DOWNSLOPING ST and INVERTED T	- **ACUTE (NON-Q WAVE) MI** - **ACUTE MI** - (RECIPROCAL CHANGES) - ISCHEMIA

INVERTED T WAVE	- **MYOCARDITIS** - **ELECTROLYTE IMBAL.** - ISCHEMIA
SHARP S-T T ANGLE	- **ACUTE MI** (NOT COMMON) - ISCHEMIA
BI-PHASIC T WAVE (WELLEN'S)	- **SUB-TOTAL LAD LESION** - **VASOSPASM** - **HYPERTROPHY**
DEPRESSED J POINT with UPSLOPING ST	- ISCHEMIA
DOWNSLOPING S-T SEGMENT	- ISCHEMIA

Some less common, less reliable possible indicators of ACS:

?	FLAT S-T SEGMENT > 120 ms	- ISCHEMIA
?	LOW VOLTAGE T WAVE WITH NORMAL QRS	- ISCHEMIA
?	U WAVE POLARITY OPPOSITE THAT OF T WAVE	- ISCHEMIA



ECG Patterns associated with "EARLY PHASE MI:"

- ***J-T Apex abnormalities***
- ***Dynamic ST-T Wave Changes on Serial ECGs***

Dynamic ST-T Wave Changes:

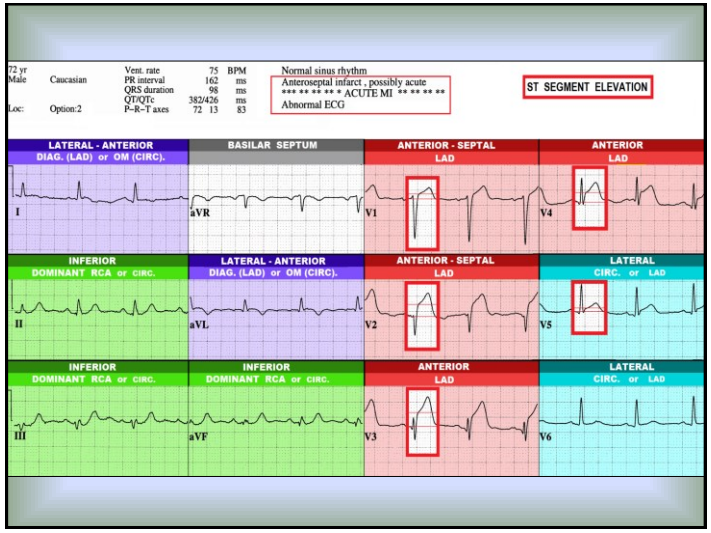
- Other than HEART RATE related variations (which affect intervals), ***J Points, ST-Segments and T Waves SHOULD NOT CHANGE.***
- **When changes to J Points, ST-Segments and/or T waves are NOTED, consider EVOLVING MYOCARDIAL ISCHEMIA and/or EARLY PHASE MI, until proven otherwise.**

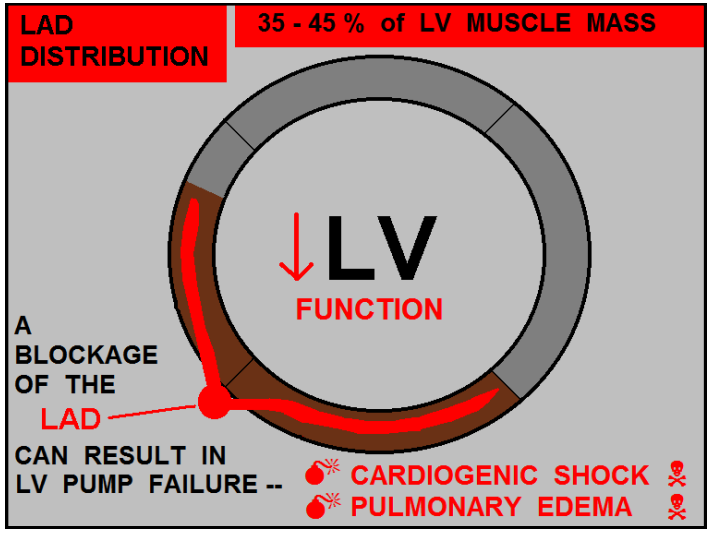
STEMI Criteria for 18 Lead ECGs:

Right-Sided Chest Leads (V3R – V6R): ___ mm

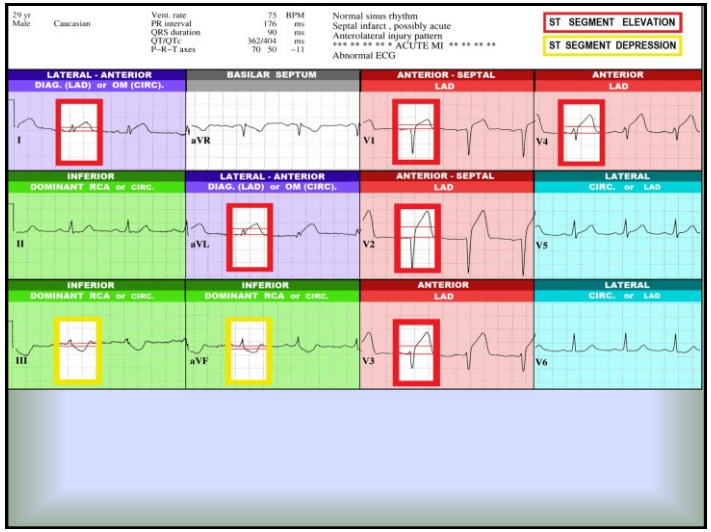
Posterior Chest Leads (V7 – V9): ___ mm

* P. Rautaharju et al, "Standardization and Interpretation of the ECG," JACC 2009;(53)No.11:982-991

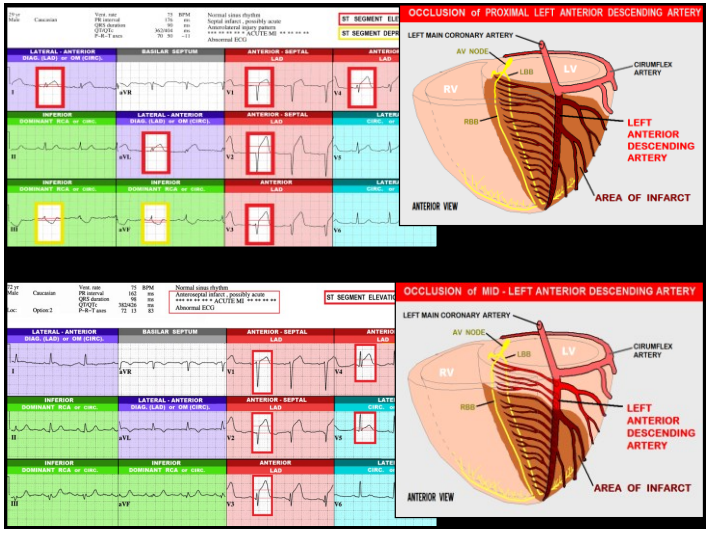


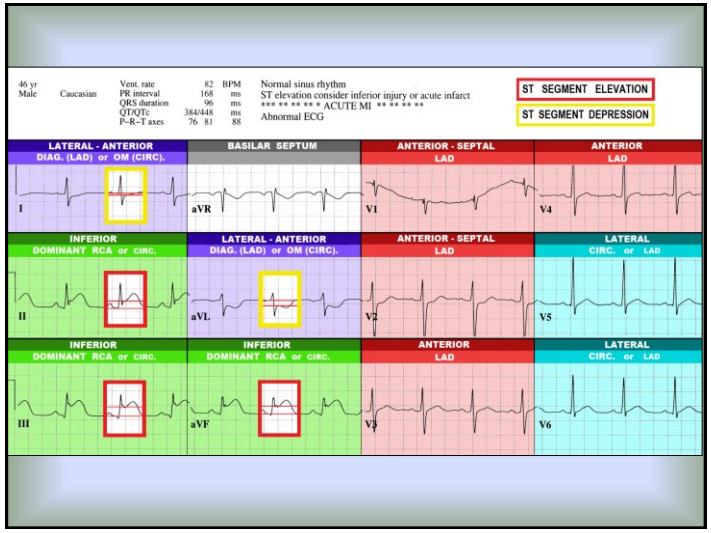


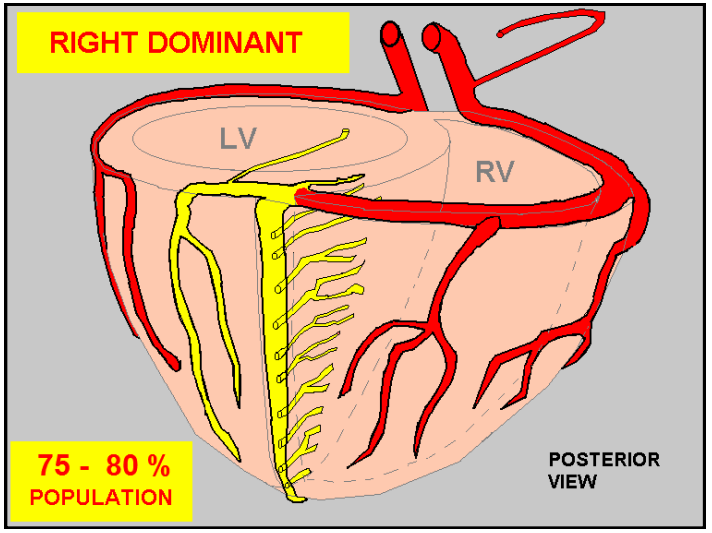
ANTICIPATED COMPLICATIONS of ANTERIOR-SEPTAL WALL STEMI & POSSIBLE INDICATED INTERVENTIONS:	
- CARDIAC ARREST	BCLS / ACLS
- CARDIAC DYSRHYTHMIAS (VT / VF)	ACLS (antiarrhythmics)
- PUMP FAILURE with CARDIOGENIC SHOCK	INOTROPE THERAPY: -DOPAMINE / DOBUTAMINE / LEVOPHED - INTRA-AORTIC BALLOON PUMP (use caution with fluid challenges due to PULMONARY EDEMA)
- PULMONARY EDEMA	- CPAP - ET INTUBATION (use caution with dieuretics due to pump failure and hypotension)
- 3rd DEGREE HEART BLOCK - NOT RESPONSIVE TO ATROPINE	TRANSCUTANEOUS or TRANSVENOUS PACING




ST SEGMENT ELEVATION
ST SEGMENT DEPRESSION
LATERAL - ANTERIOR
DIAG. (LAD) or OM (CIRC).
BASILAR SEPTUM
ANTERIOR - SEPTAL
LAD
ANTERIOR
LAD
INFERIOR
DOMINANT RCA or CIRC.
LATERAL
CIRC. or LAD
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6


OCCLUSION of PROXIMAL LEFT ANTERIOR DESCENDING ARTERY
LEFT MAIN CORONARY ARTERY
AV NODE
LBB
LV
RV
RBB
CIRUMFLEX ARTERY
LEFT ANTERIOR DESCENDING ARTERY
AREA OF INFARCT
ANTERIOR VIEW
OCCLUSION of MID - LEFT ANTERIOR DESCENDING ARTERY


ST SEGMENT ELEVATION
ST SEGMENT DEPRESSION
LATERAL - ANTERIOR
DIAG. (LAD) or OM (CIRC).
BASILAR SEPTUM
ANTERIOR - SEPTAL
LAD
ANTERIOR
LAD
INFERIOR
DOMINANT RCA or CIRC.
LATERAL
CIRC. or LAD
I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6


RIGHT DOMINANT
LV
RV
75 - 80 %
POPULATION
POSTERIOR
VIEW

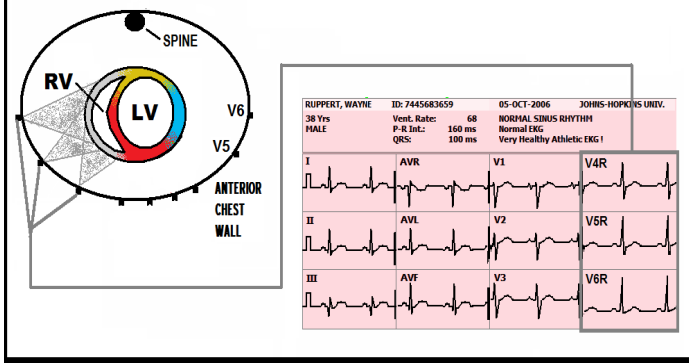
ANTICIPATED COMPLICATIONS of INFERIOR WALL STEMI secondary to RCA Occlusion & POSSIBLE INDICATED INTERVENTIONS:	
- CARDIAC ARREST	BCLS / ACLS
- CARDIAC DYSRHYTHMIAS (VT / VF)	ACLS (antiarrhythmics)
- SINUS BRADYCARDIA	ATROPINE 0.5mg, REPEAT as needed UP TO 3mg. (follow ACLS and/or UNIT protocols)
- HEART BLOCKS (1st, 2nd & 3rd Degree HB)	ATROPINE 0.5mg, REPEAT as needed UP TO 3mg, Transcutaneous Pacing, (follow ACLS and/or UNIT protocols)
- RIGHT VENTRICULAR MYOCARDIAL INFARCTION	- The standard 12 Lead ECG does NOT view the Right Ventricle. - You must do a RIGHT-SIDED ECG to see if RV MI is present. - Do NOT give any Inferior Wall STEMI patient NITRATES or DIURETICS until RV MI has been RULED OUT.
- POSTERIOR WALL INFARCTION	- POSTERIOR WALL MI presents on the 12 Lead ECG as ST DEPRESSION in Leads V1 - V3. - POSTERIOR WALL MI is NOT PRESENT ON THIS ECG

To see the
RIGHT VENTRICLE . . .

. . . such as in cases of
INFERIOR WALL M.I.

☞ You must do a
RIGHT - SIDED EKG ! !

V4R - V6R VIEW THE RIGHT VENTRICLE



RV MI STEMI Criteria:

- ST Elevation of ___mm (0.5mv) or more in Leads V3R, V4R, V5R or V6R

IN ***EVERY*** CASE of

INFERIOR WALL STEMI

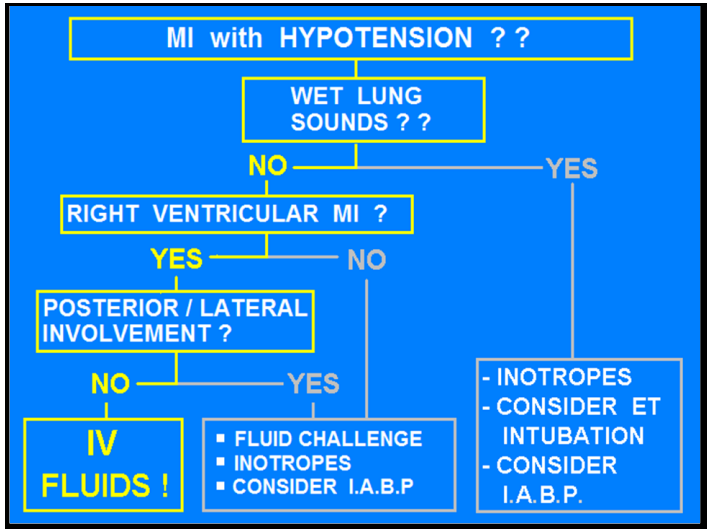
You must first *RULE OUT*
RIGHT VENTRICULAR MI
BEFORE giving any:

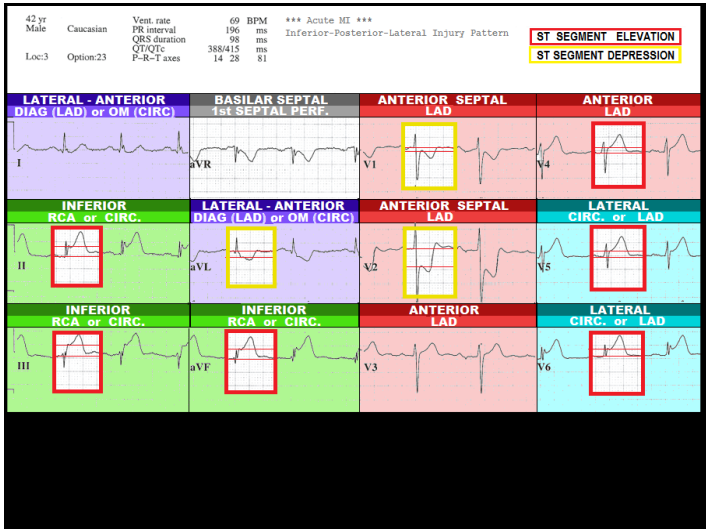
- NITROGLYCERIN
- Diuretics

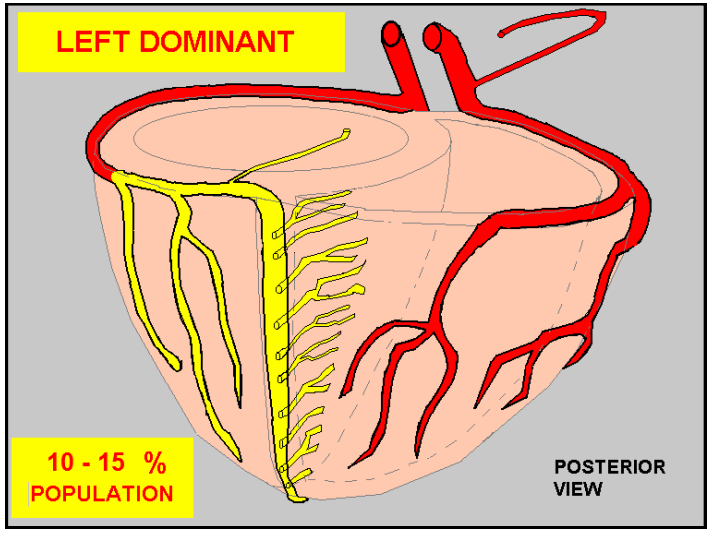
Nitroglycerin & Diuretics
are
CLASS III CONTRINDICATED
in
RIGHT VENTRICULAR MI ! !*

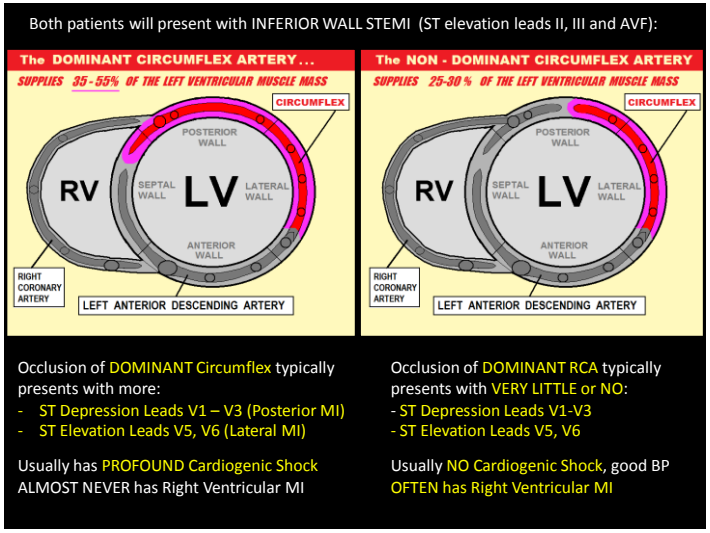
They precipitate SEVERE HYPOTENSION

*** A.H.A. ACLS 2010 / 2015**



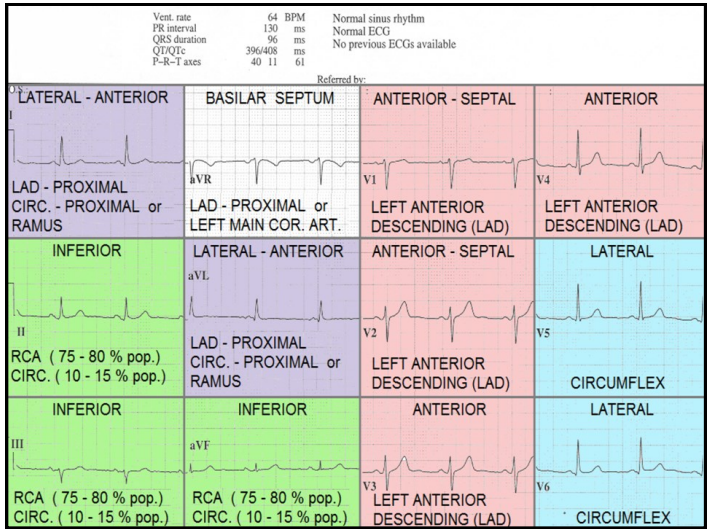




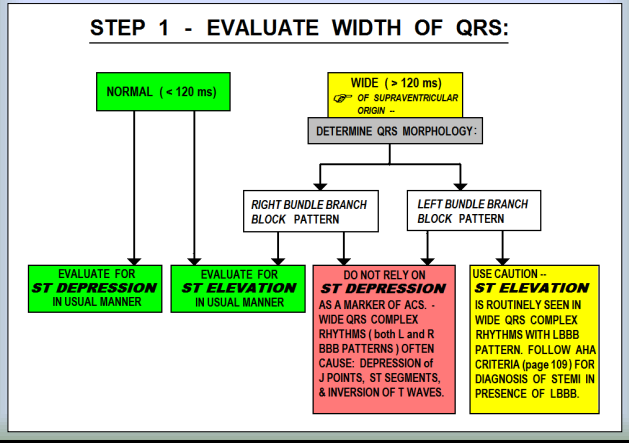


Posterior STEMI Criteria:

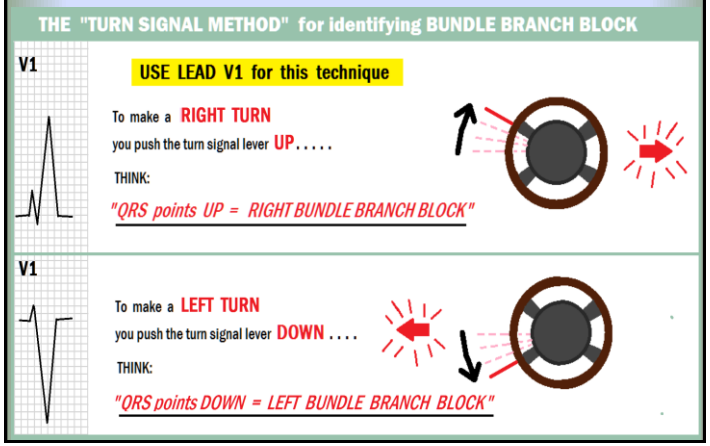
- **ST Elevation of ___mm (0.5mv) or more in Leads V7, V8 and/or V9**



Evaluating the ECG for ACS:



Simple "Turn Signal Method" . . .



Wide QRS present:
(QRSd > 120ms)

- **When RIGHT Bundle Branch Block pattern is present:**
  - Precordial Leads typically demonstrate ST Depression and T wave Inversion
  - **DOES NOT MASK STEMI; *when ST Elevation is noted, CONSIDER STEMI ! !***

Wide QRS present:
(QRSd > 120ms)

- **When LBBB QRS pattern is present:**
  - ST-Segment Elevation is typically noted in Precordial Leads
  - ***Can cause up to 5mm of J Point Elevation in normally calibrated ECG (1mm=10mv)***
  - ***Does NOT typically cause ST elevation in INFERIOR Leads (II, III and AVF).***

Diagnosis of STEMI with LBBB pattern:

2013 ACC/AHA Guideline for Management of STEMI

- ***ST Elevation of 0.1mv (1mm) or more in leads with Positive Deflection QRS complexes***
- ***ST Elevation of 0.5mv (5mm) or more in leads with Negative Deflection QRS complexes***
- ***ST Segment Changes as compared with those of older ECGs with LBBB***
- ***Convex ST Segment***
- ***New Onset LBBB with ACS symptoms . . .***