Medical Management of Acute Coronary Syndrome: The roles of a non-cardiologist physician

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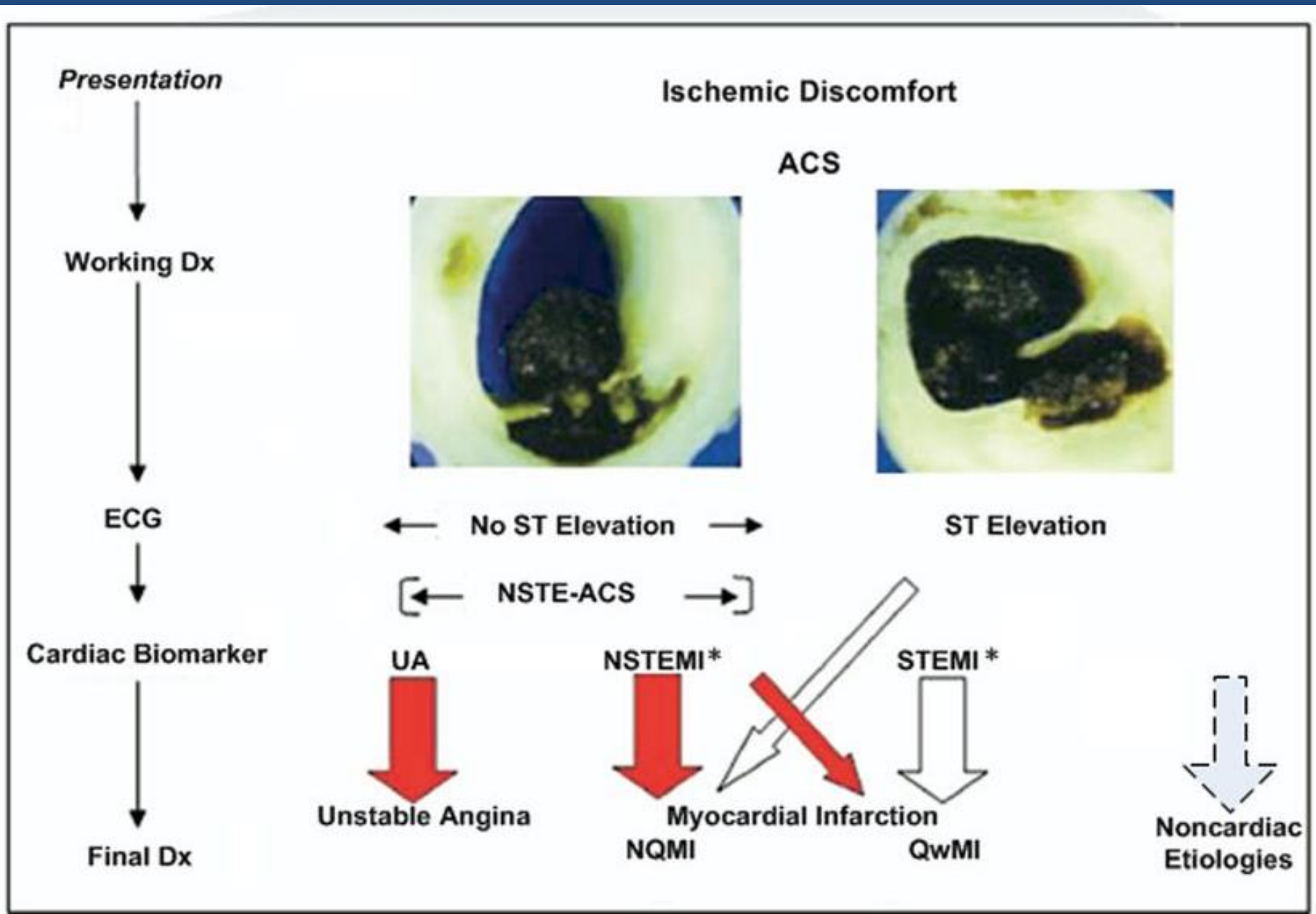
Outcome objectives of the discussion:

At the end of the discussion, the non-cardiologist participants should be able to:

1. identify patients having ACS

2. participate effectively in handling patients with ACS

3. continue the medical care of patients who have had ACS

Essential Access

- ECG
- Cardiologist/s
- Thrombolytic agents
- Ambulance
- PCI capable hospital

System of ACS Care

Presentation

Working Dx

ECG

Cardiac Biomarker

Final Dx

Ischemic Discomfort

ACS

No ST Elevation — ST Elevation

NSTE-ACS

UA — NSTEMI* — STEMI*

Unstable Angina — Myocardial Infarction — Noncardiac Etiologies

NQMI — QwMI

Management of acute coronary syndrome (ACS)

Initial assessment:

- Consider the Dx: chest discomfort, shortness of breath, or other suggestive symptoms.

- "Atypical" presentations :Women, the elderly, and diabetics

- 12 lead ECG within 10 minutes of arrival;

- Repeat every 10 to 15 minutes if initial ECG non-diagnostic but clinical suspicion remains high (initial ECG often **NOT** diagnostic).
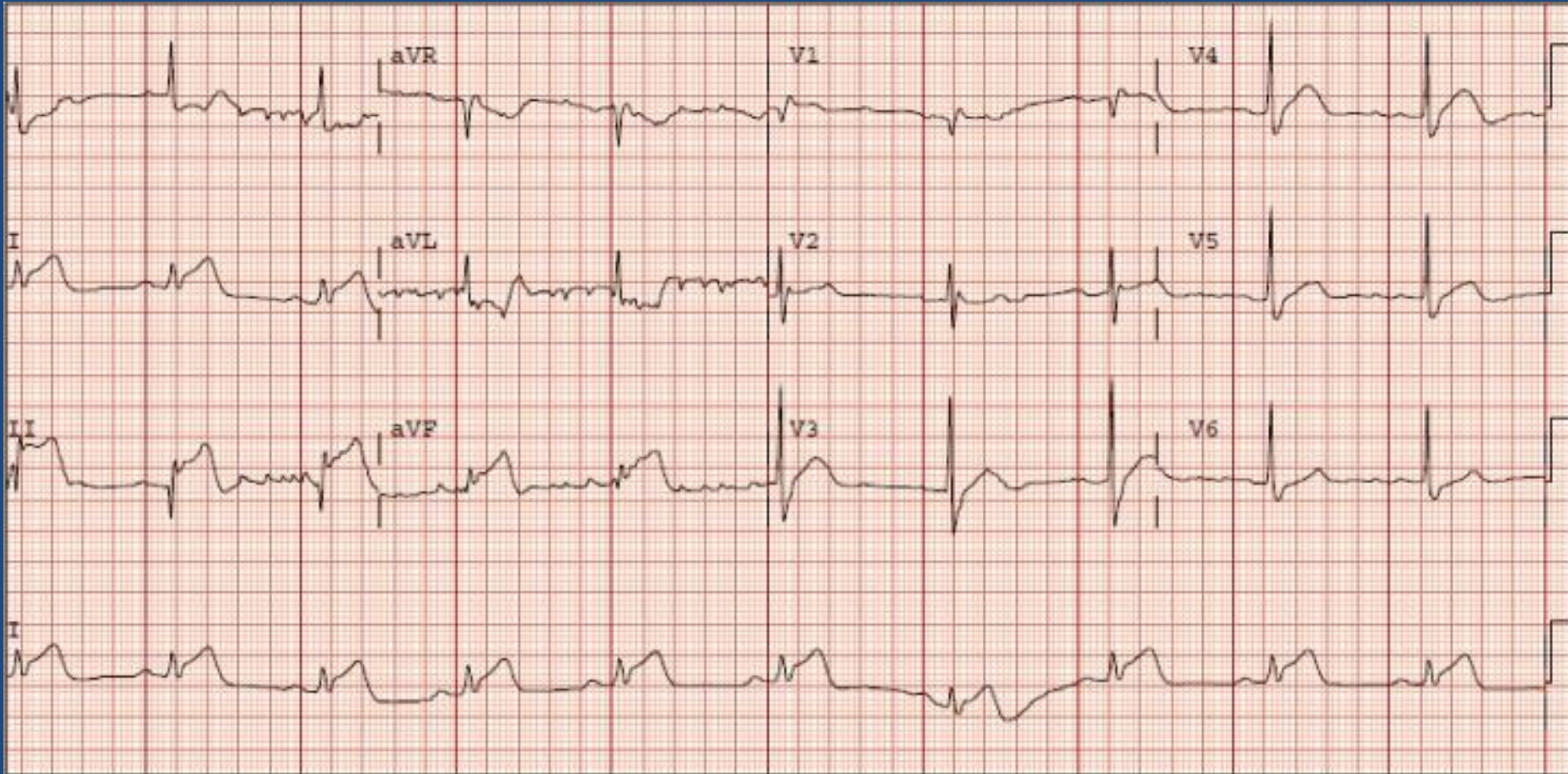
12-lead electrocardiogram from a 63-year-old man with chest discomfort after running on a treadmill, demonstrating ST elevation in lead III greater than in lead II; ST depression in leads I and aVL; and ST elevation in lead aVF greater than ST depression in lead V2. Findings are suggestive of a right ventricular myocardial infarction.
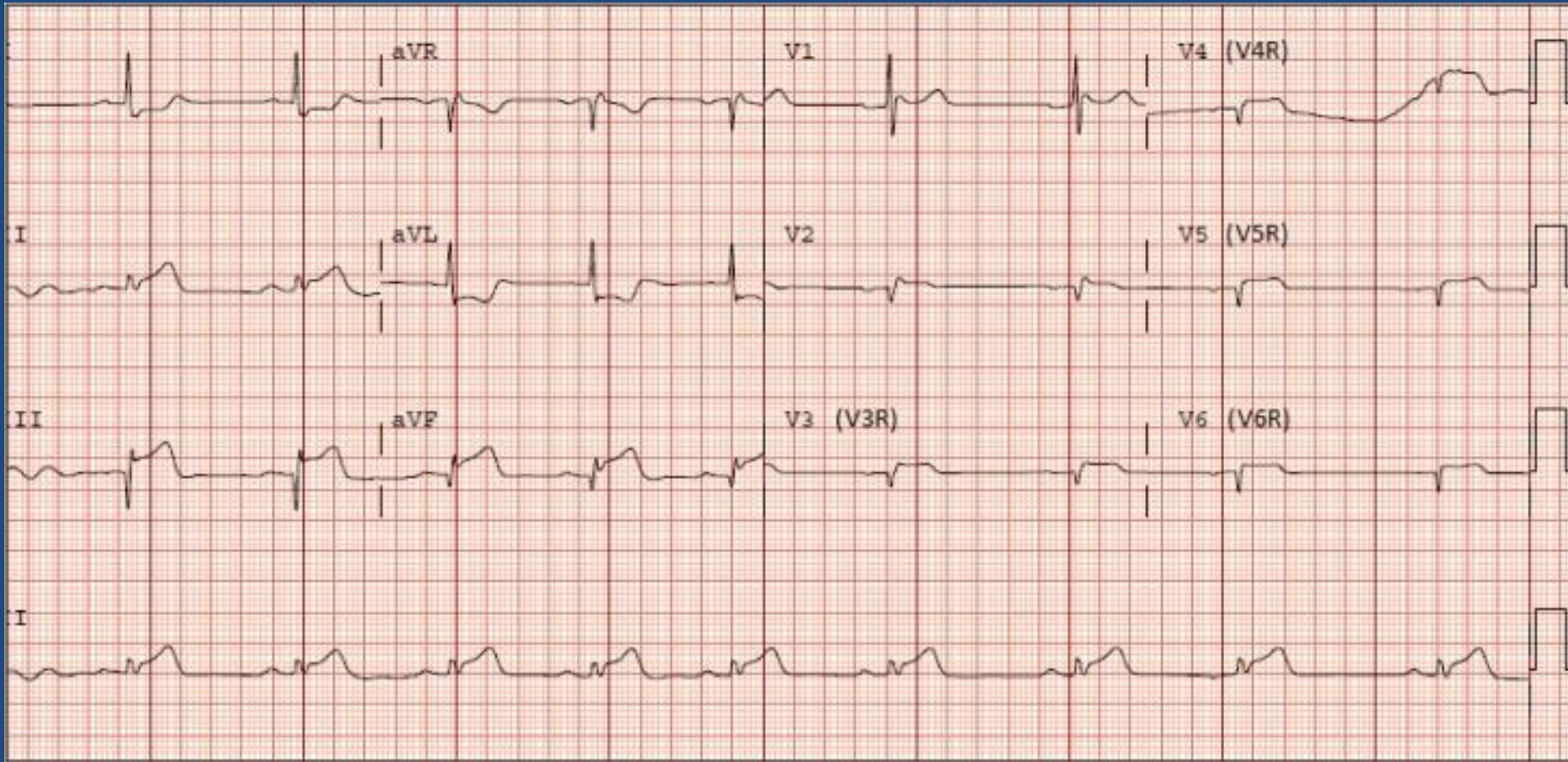
12-lead electrocardiogram from the same patient using right-sided precordial leads, demonstrating ST-segment elevation in leads V3R–V6R, consistent with a right ventricular myocardial infarction.

ECG Evolution in Acute STEMI

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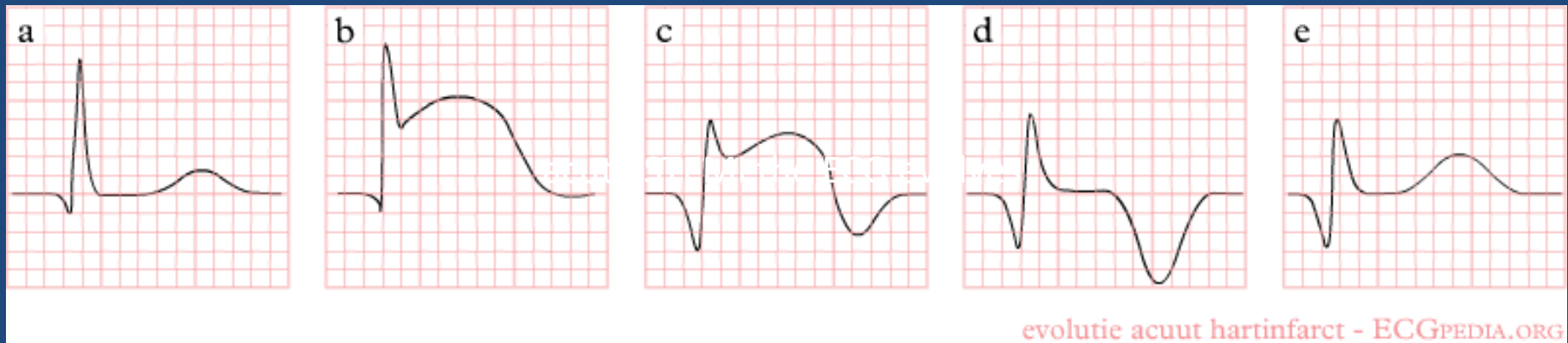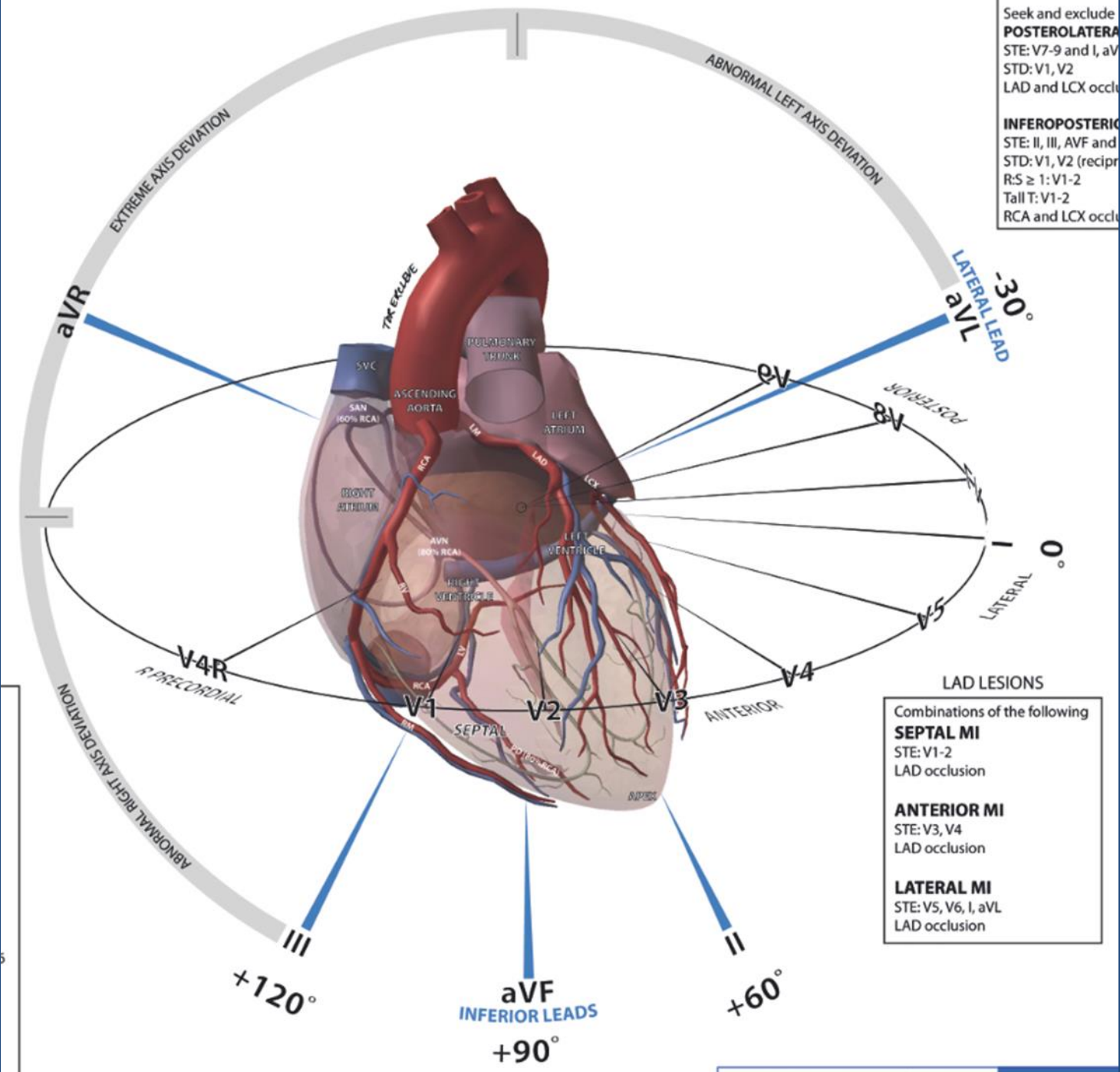
Initial assessment

STEMI:

1. ST segment elevations ≥1 mm (0.1 mV) in two anatomically contiguous leads or

2. ≥2 mm (0.2 mV) in leads V2 and V3,**OR**

3. New left bundle branch block and presentation consistent with ACS.

- If ECG suspicious but not diagnostic, consult cardiologist early.

ABNORMAL LEFT AXIS DEVIATION

EXTREME AXIS DEVIATION

ABNORMAL RIGHT AXIS LATERAL DEVIATION

aVR

aVL
-30°
LATERAL LEAD

V6

V8
POSTERIOR

I
0°
LATERAL

V5

V4

V4R
R PRECORDIAL

V1

V2

V3
ANTERIOR

SEPTAL

III
+120°
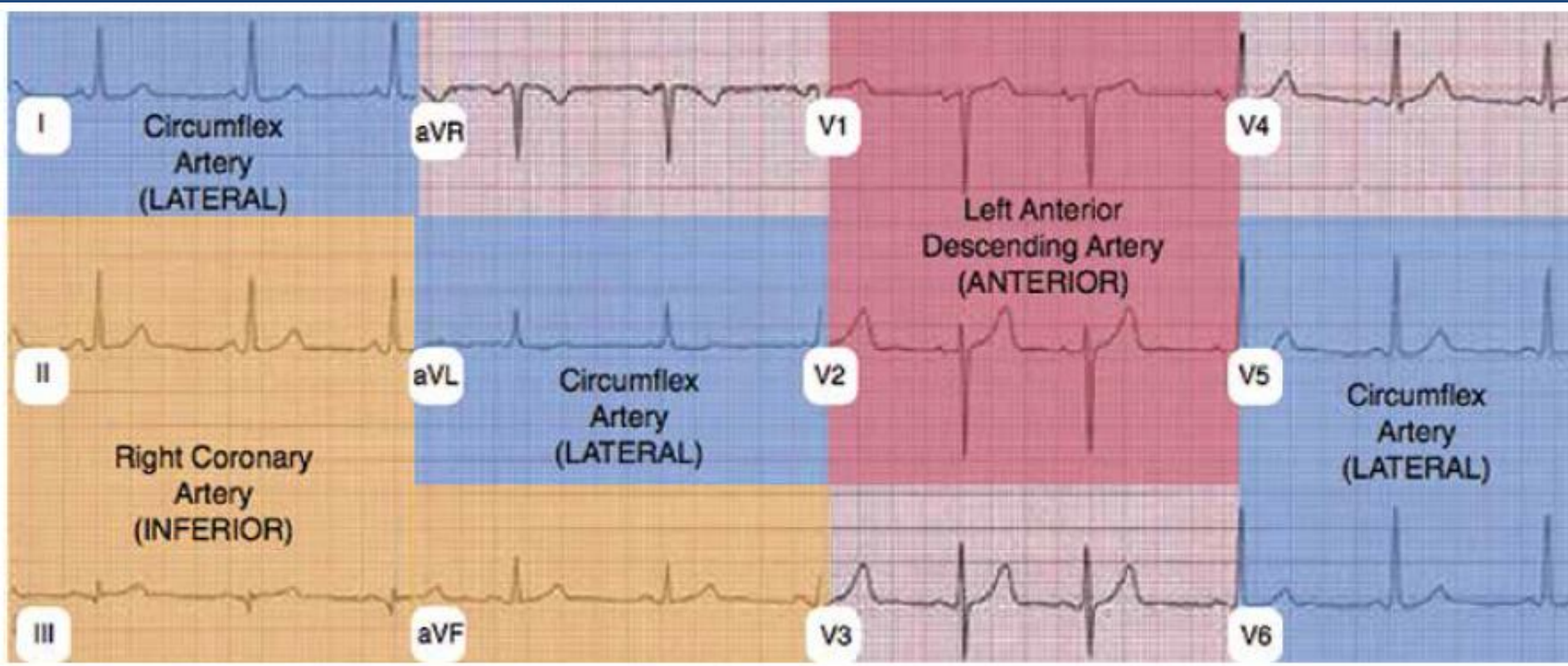
aVF
INFERIOR LEADS
+90°

II
+60°

LAD LESIONS

Combinations of the following
SEPTAL MI
STE: V1-2
LAD occlusion

ANTERIOR MI
STE: V3, V4
LAD occlusion

LATERAL MI
STE: V5, V6, I, aVL
LAD occlusion

Anatomically Contiguous Leads
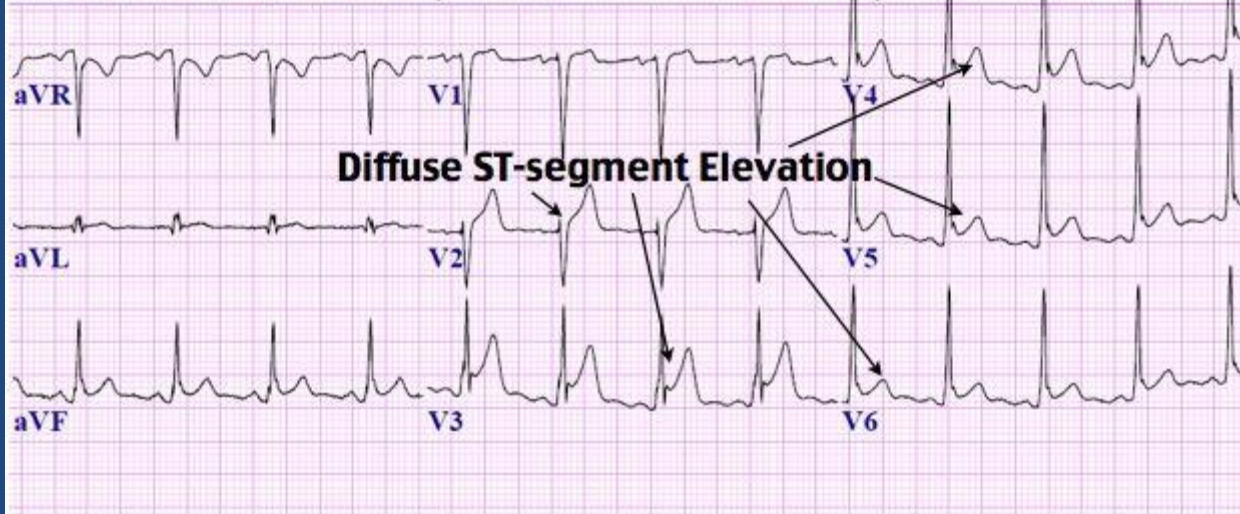
Anatomically Contiguous Leads

I Lateral	aVR	V1 Septal	V4 Anterior
II Inferior	aVL Lateral	V2 Septal	V5 Lateral
III Inferior	aVF Inferior	V3 Anterior	V6 Lateral

Acute Pericarditis

Confirmed By: ER MD

aVR V1 V4

Diffuse ST-segment Elevation

aVL V2 V5

aVF V3 V6

ST-segment Elevation MI (STEMI)

I aVR V1

Reciprocal ST-segment Depression

II aVL V2

ST-segment Elevation

III aVF V3

VI
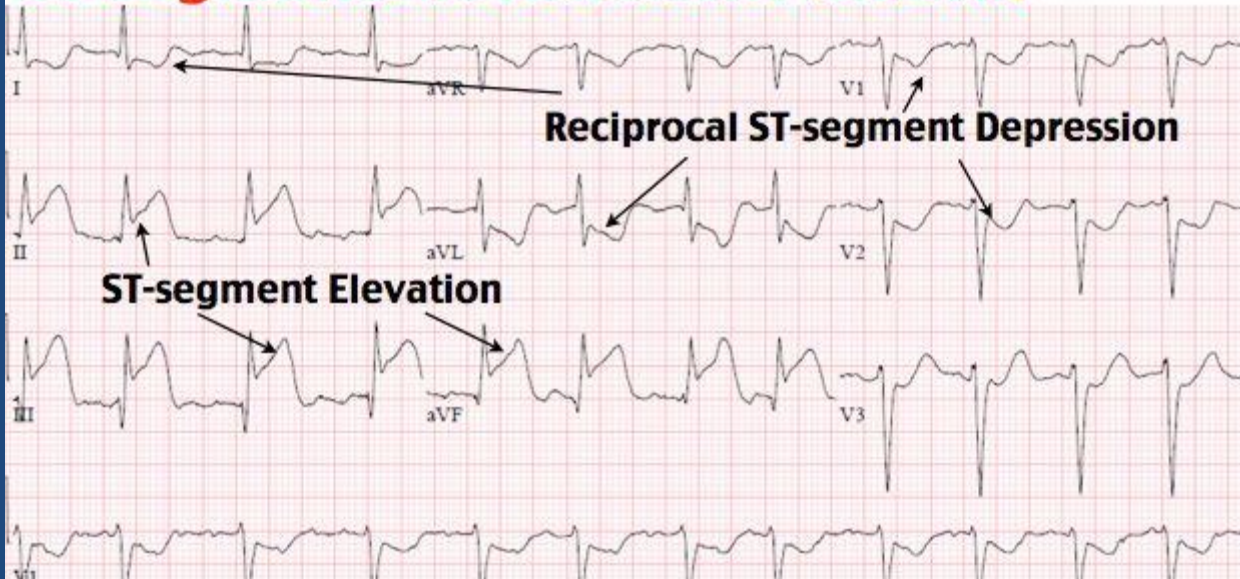
SITE	FACING	RECIPROCAL
INFERIOR	II, III, aVF	I, aVL
HIGH LATERAL	I, aVL	II, III, aVF
ANTERIOR	V1, V2, V3, V4	NONE
POSTERIOR	NONE	V1, V2, V3, V4

EMS12Lead.com

I
aVR
V1
V4

II
aVL
V2
V5

III
aVF
V3
V6
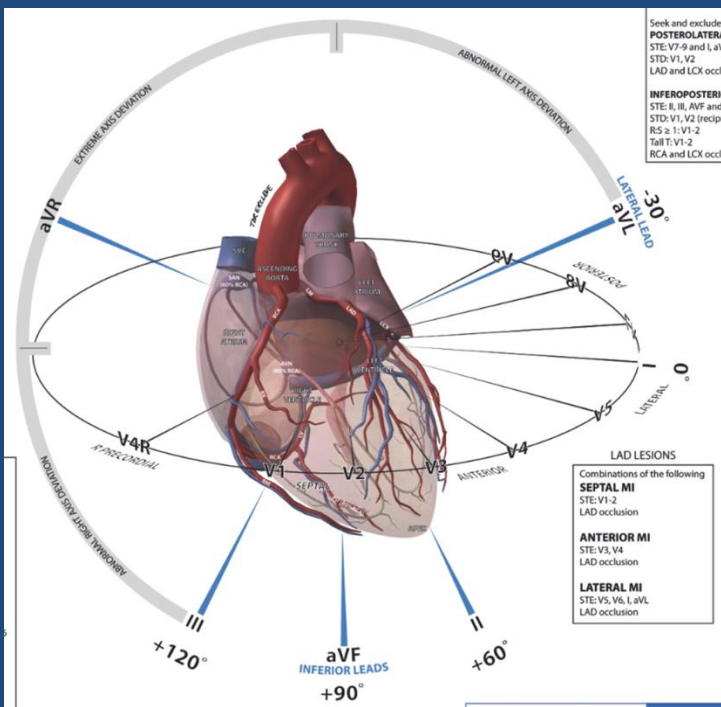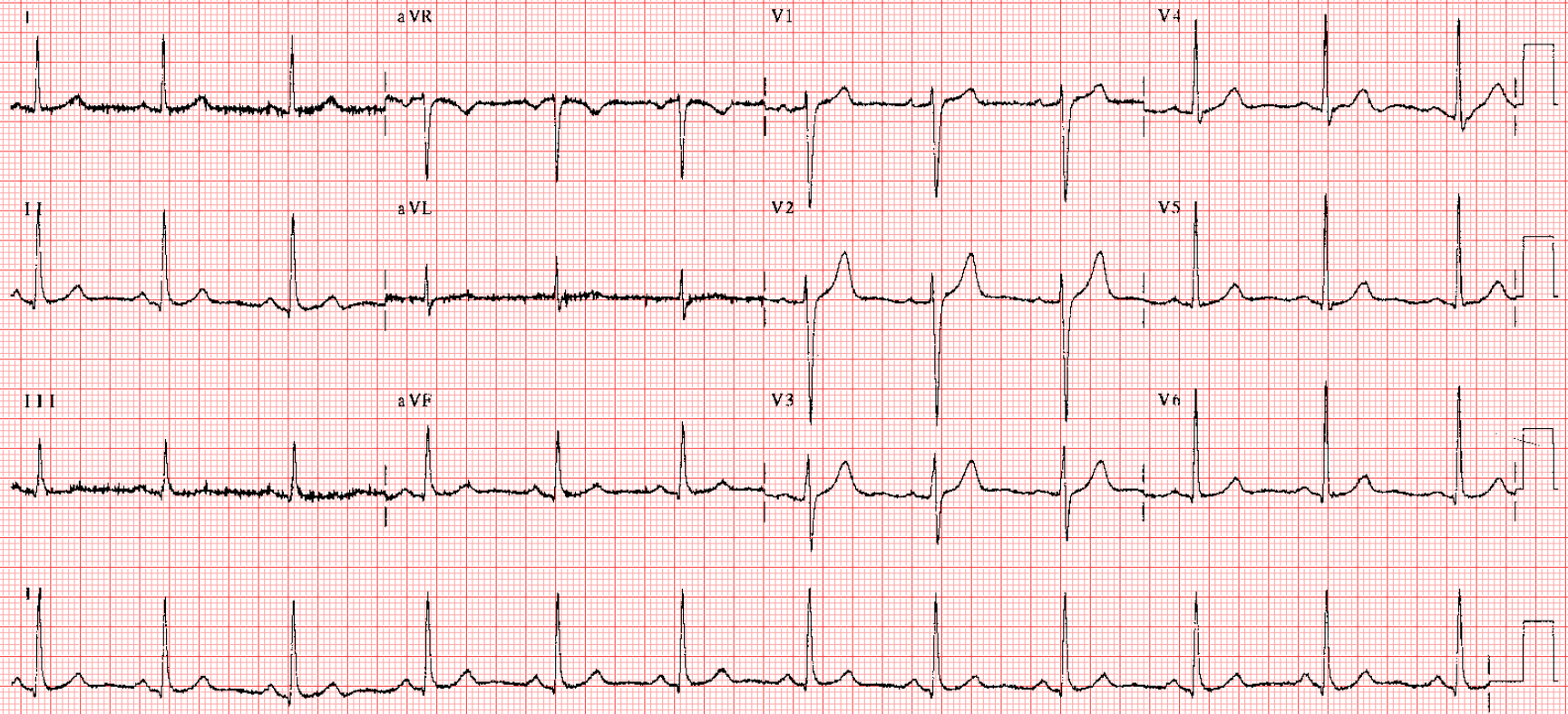
LOC 00000-0000   Speed:25 mm/sec   Limb:10 t   mV   Chest:10 mm/mV   50∿ 0.15-150 Hz   16405
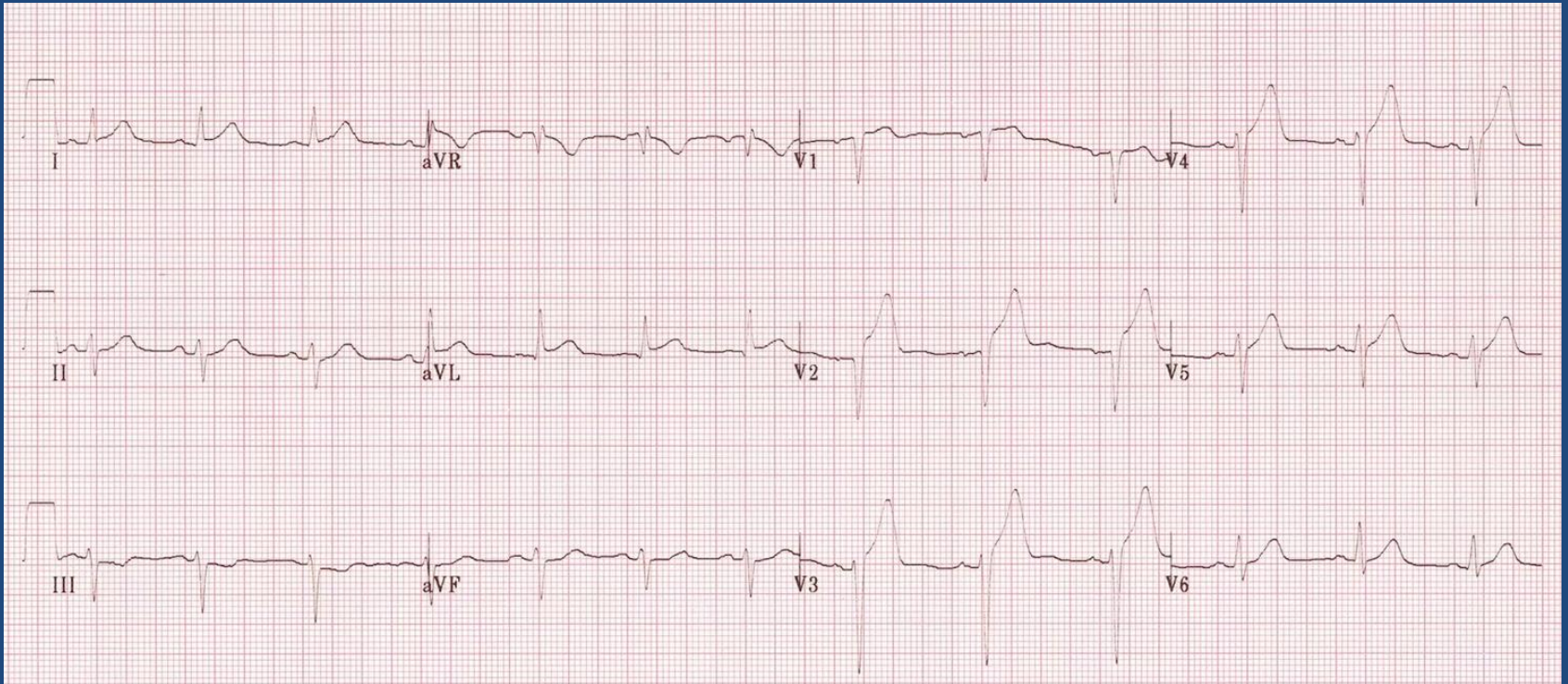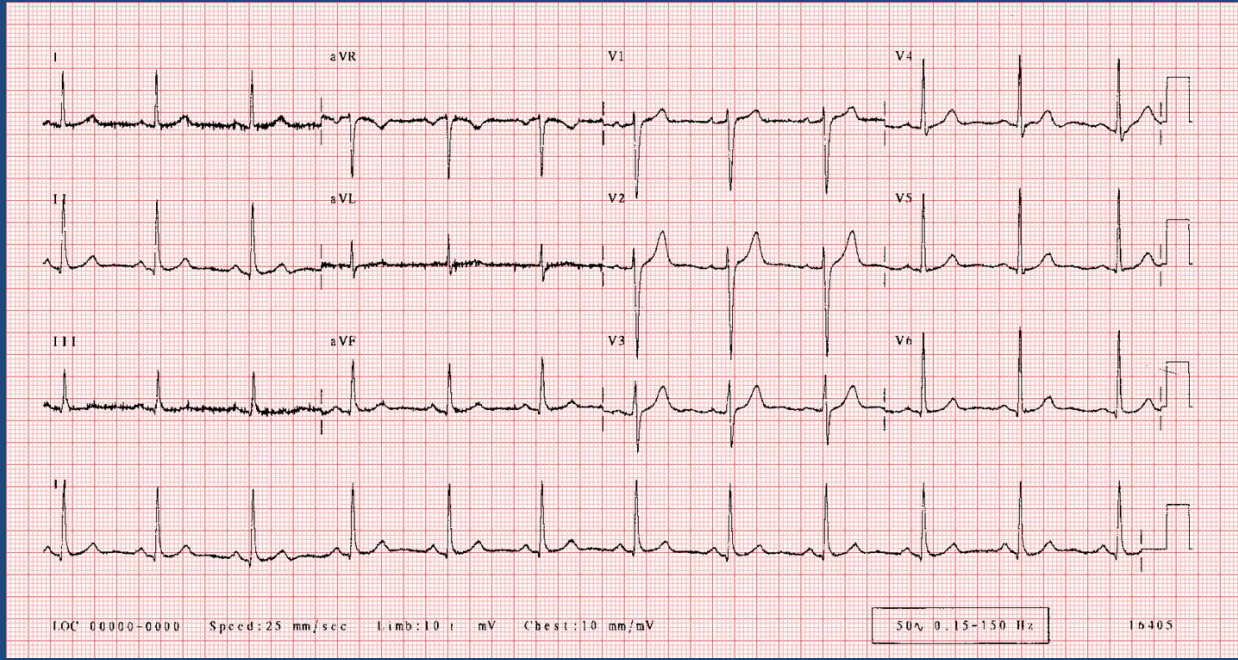
Sgarbossa criteria for diagnosis of STEMI in the setting of LBBB

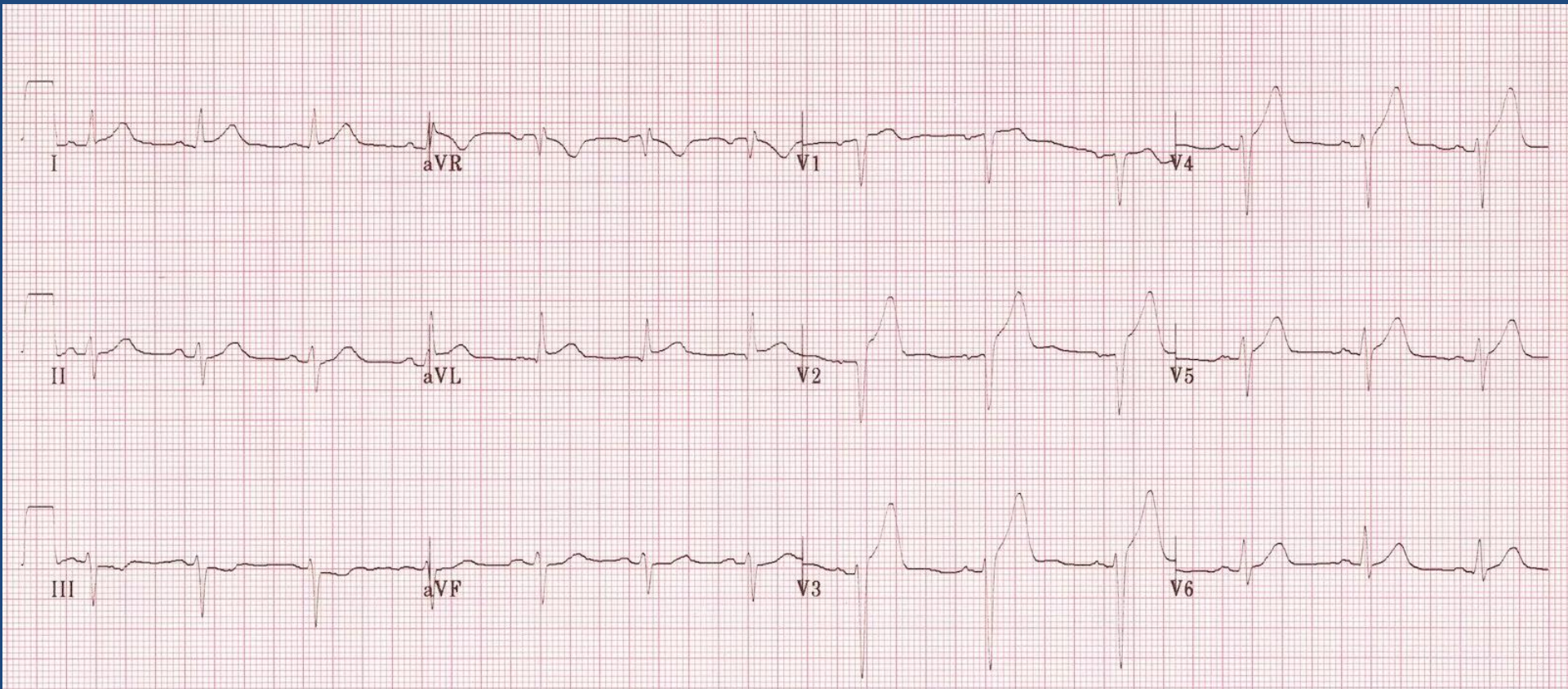| Criteria	Points		Normal LBBB	Ischemic LBBB
ST segment elevation ≥1 mm in any lead with positive QRS (V4, V5, V6, aVL, I) .	5	**V4-V6, aVL, I**		
ST segment depression ≥1 mm in V1, V2 and/or V3.	3	**V1-V3**		
ST segment elevation ≥5 mm in any lead with discordant QRS (V1, V2, V3)	2	**V1-V3**		
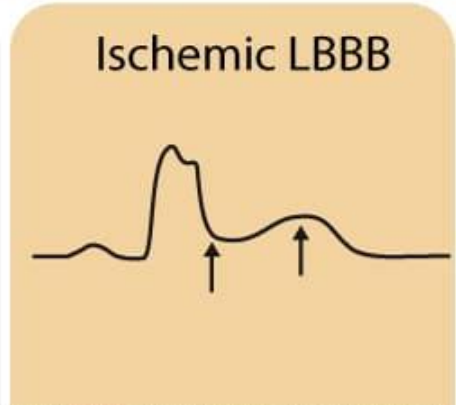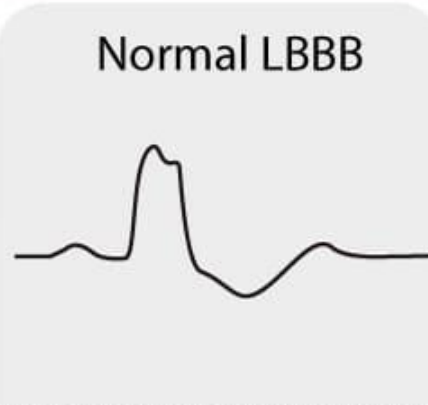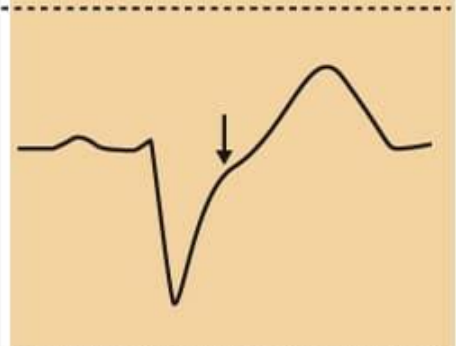
These complexes show the normal (expected) appearance of LBBB.

These complexes show ischemic manifestations in the setting of LBBB.

Relationship of Mortality Reduction and Extent of Myocardial Salvage as a Function of Total Ischemic Time

Hypothetical Construct of the Relationship Among the Duration of Symptoms of Acute MI Before Reperfusion Therapy, Mortality Reduction, and Extent of Myocardial Salvage

Shifts in Potential Outcomes With Different Treatment Strategies
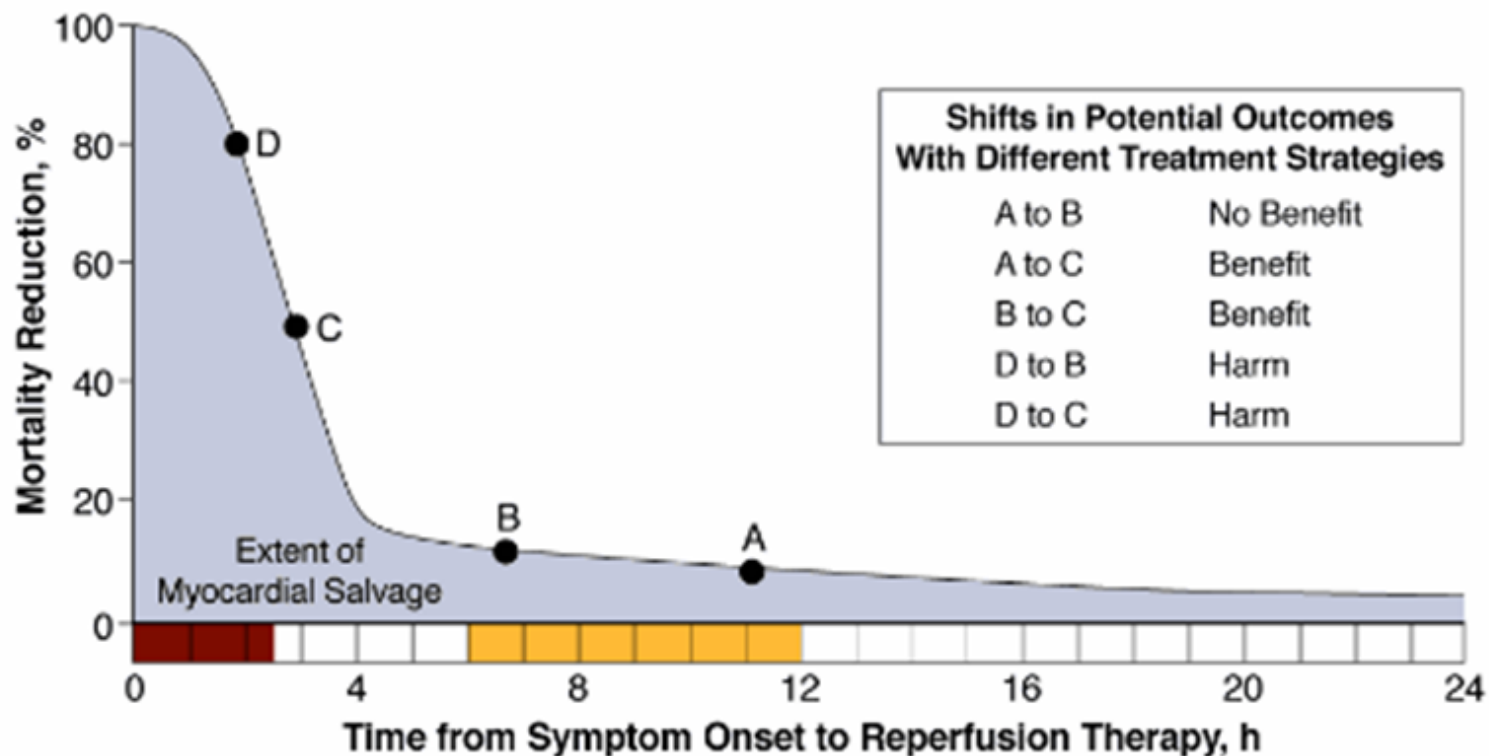
A to B	No Benefit
A to C	Benefit
B to C	Benefit
D to B	Harm
D to C	Harm

Extent of Myocardial Salvage

Mortality Reduction, % (y-axis: 0, 20, 40, 60, 80, 100)

Time from Symptom Onset to Reperfusion Therapy, h (x-axis: 0, 4, 8, 12, 16, 20, 24)

Critical Time-Dependent Period — Goal: Myocardial Salvage

Time-Independent Period — Goal: Open Infarct-Related Artery

Outcomes based on time to reperfusion
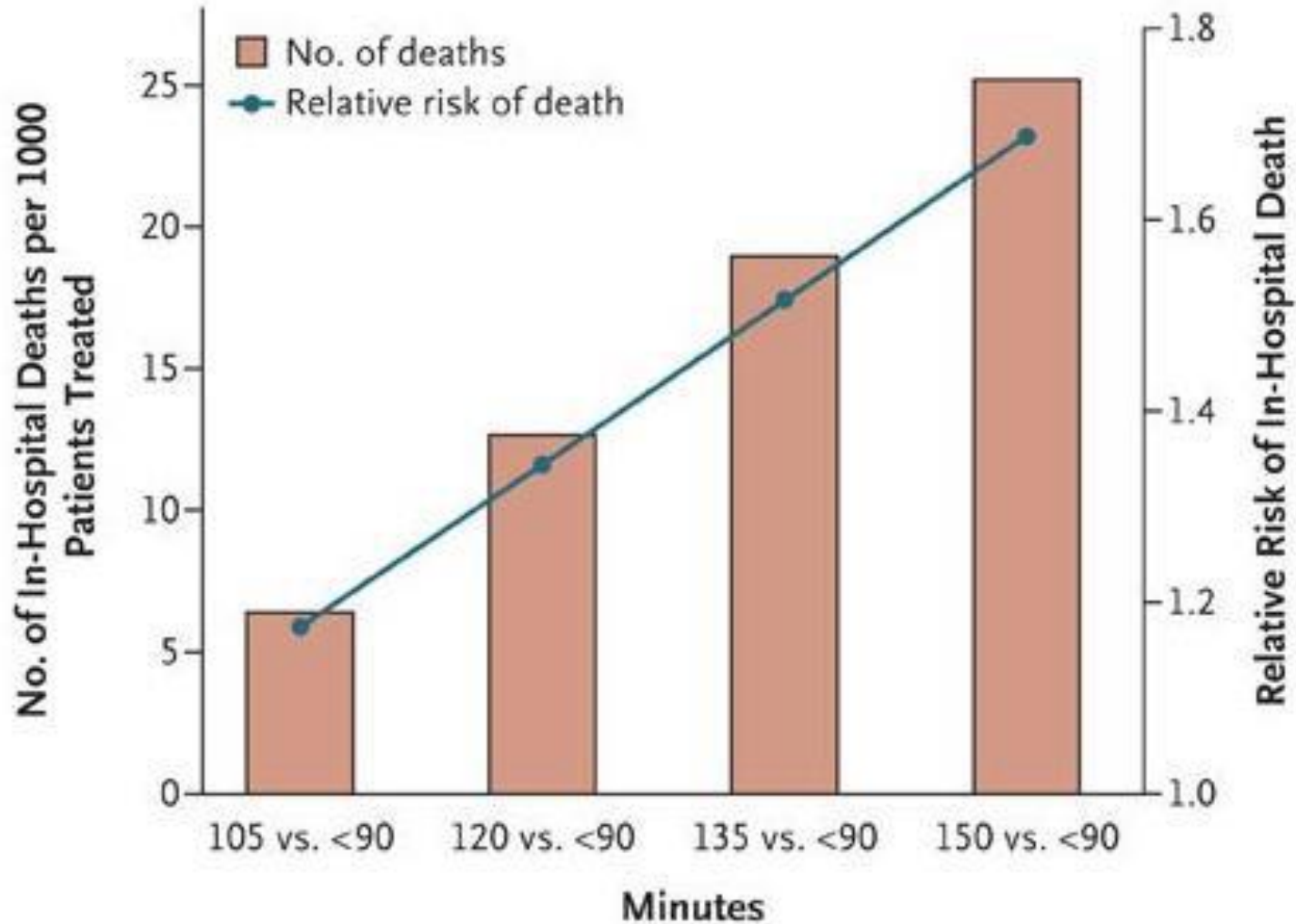
Acute STEMI

Select reperfusion strategy

1. Primary percutaneous coronary intervention
2. Fibrinolysis

Oral antiplatelet therapy

ASPIRIN + (Clopidogrel or ticagrelor or prasugrel)

Anticoagulant

UFH or bivalirudin or enoxaparin or fondaparinux
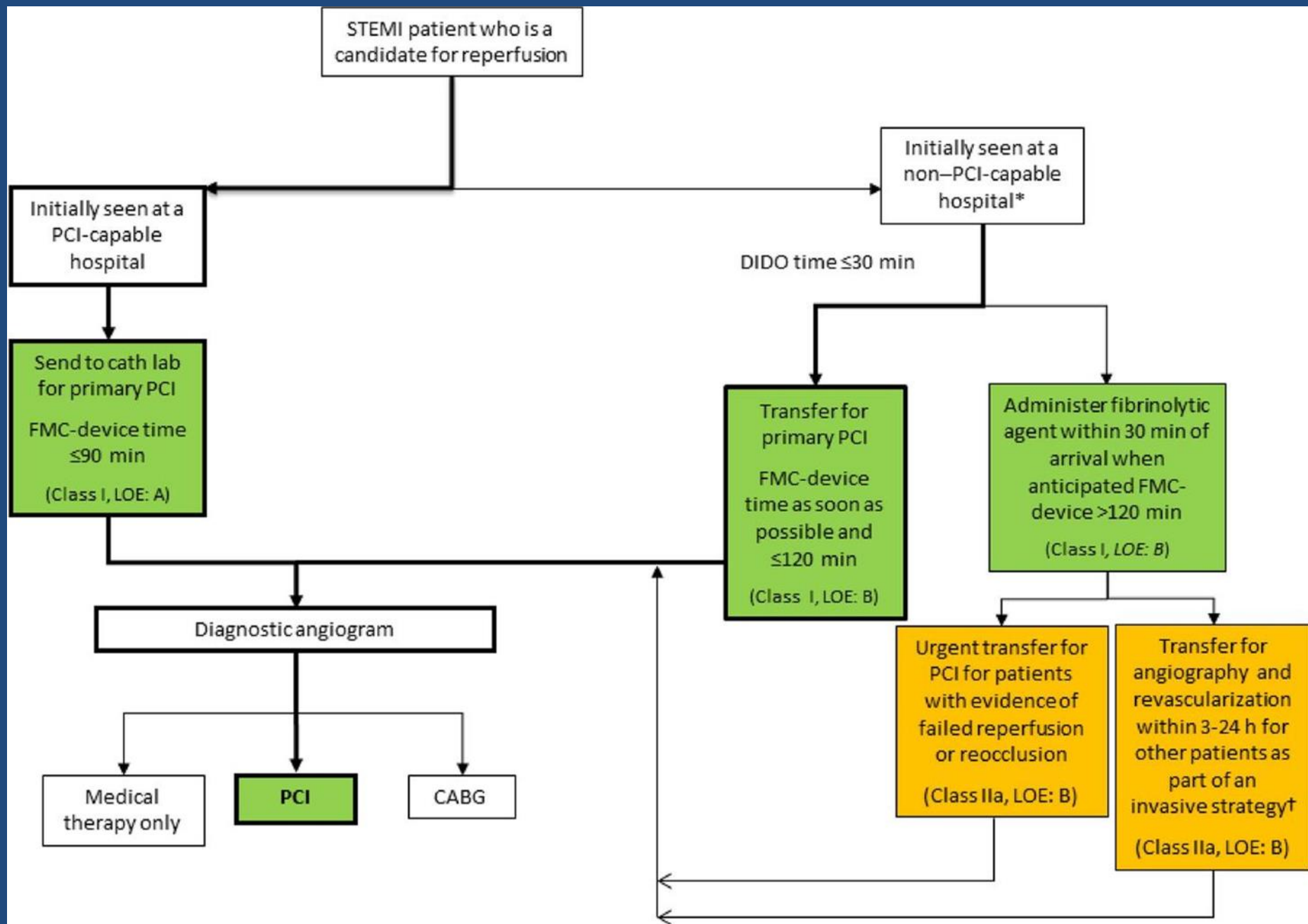
Primary PCI in STEMI

- Ischemic symptoms <12 h

- Ischemic symptoms < 12 h and contraindications to fibrinolytic therapy irrespective of time delay from FMC

- Cardiogenic shock or acute HF irrespective of time delay from MI onset

- Evidence of ongoing ischemia 12 to 24 h after symptom onset

Acute management STEMI:

Select reperfusion strategy:

- For patients with symptoms of >12 hours, fibrinolytic therapy is not indicated, but emergent PCI may be considered, particularly for patients with evidence of ongoing ischemia or those at high risk of death.

STEMI at hospitals without on-site PCI capability:

When the patient presents after two hours and PCI cannot be accomplished in less than 120 minutes. In this setting, clinical judgement needs to be exercised; fibrinolytic therapy may be appropriate in patients with up to 12 hours of symptoms.

Targets for antithrombics
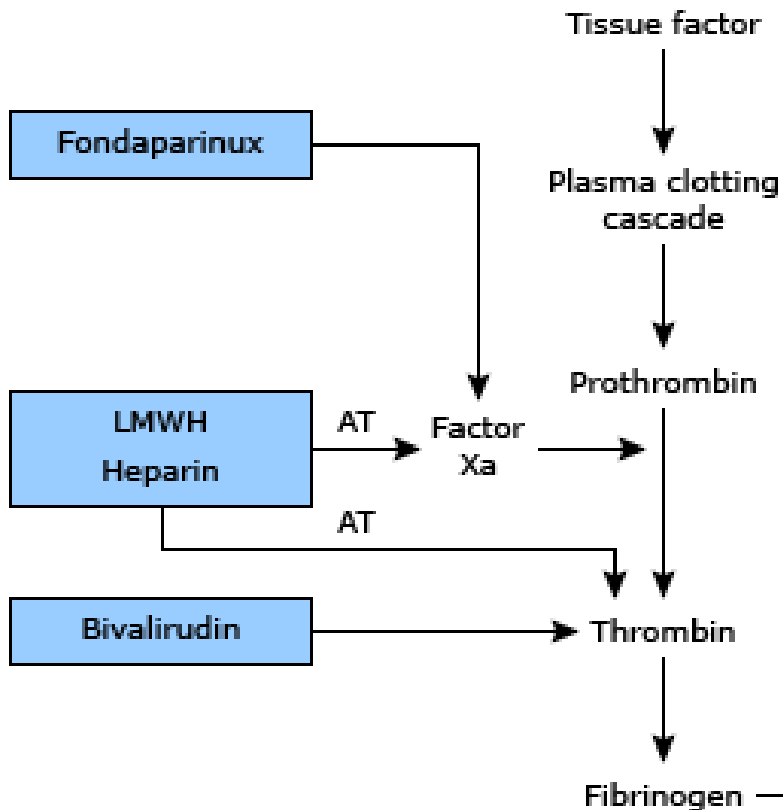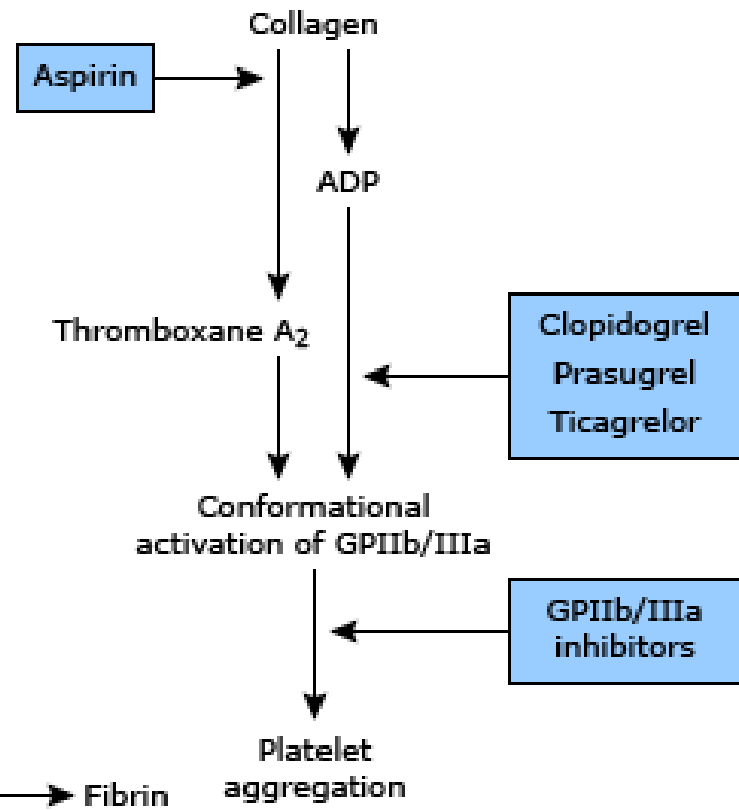
Acute STEMI

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Oral antiplatelet therapy

ASPIRIN + (Clopidogrel or ticagrelor or prasugrel)

Anticoagulant

UFH or bivalirudin or enoxaparin or fondaparinux

STEMI vs. NSTEMI
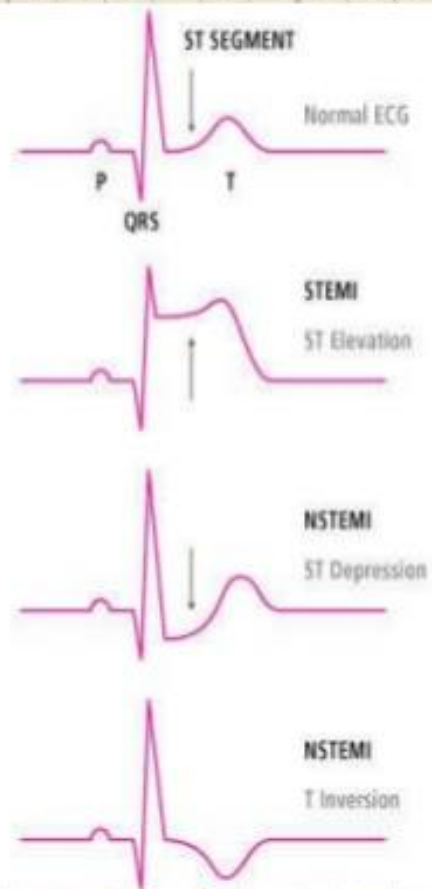
Initial assessment

Non-STEMI or unstable angina:

ST segment depressions or deep T wave inversions without Q waves or possibly no ECG changes.
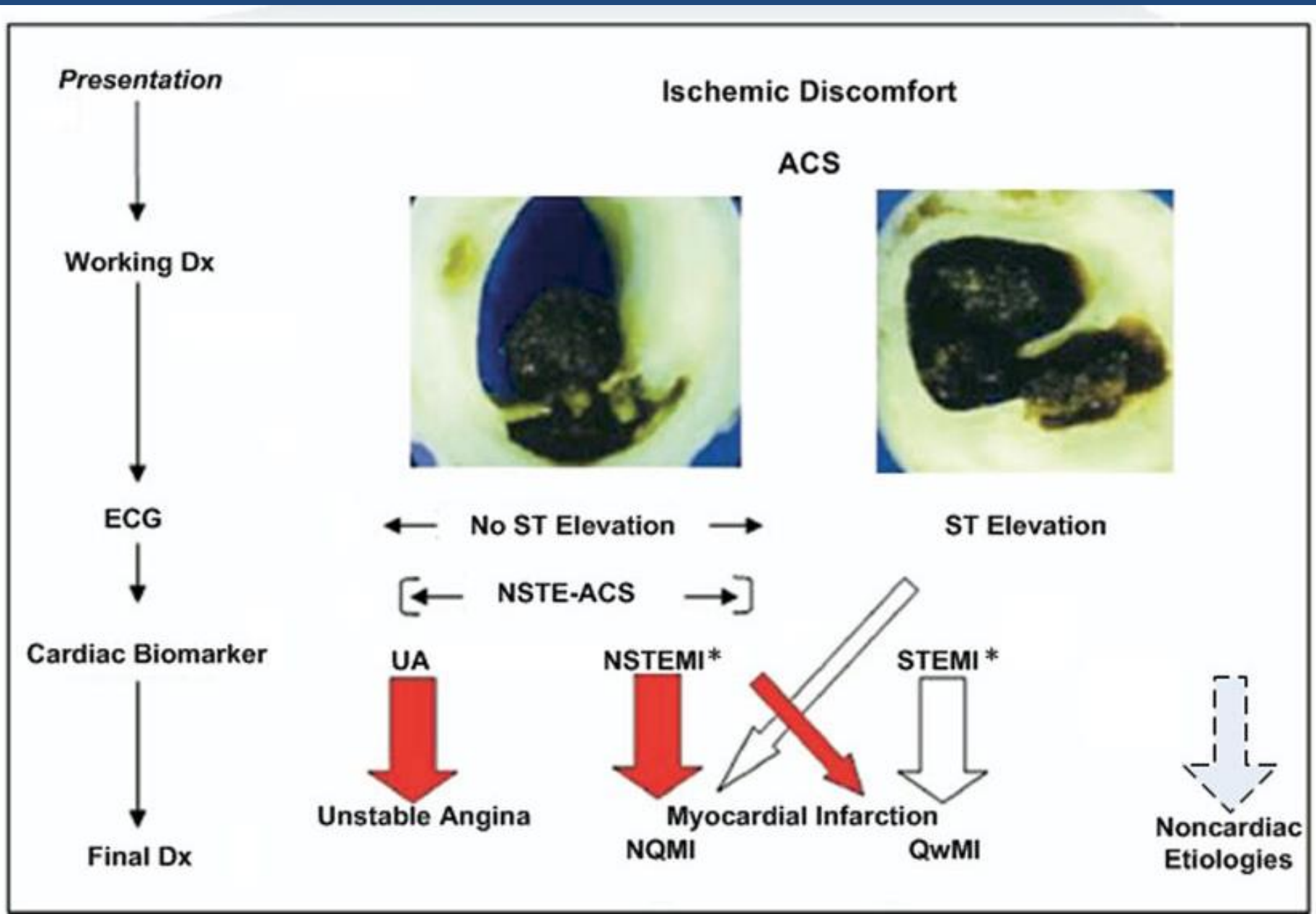
In patients with NSTE-ACS (i.e., without ST elevation, true posterior MI, or left bundle-branch block not known to be old), intravenous fibrinolytic therapy should not be used.
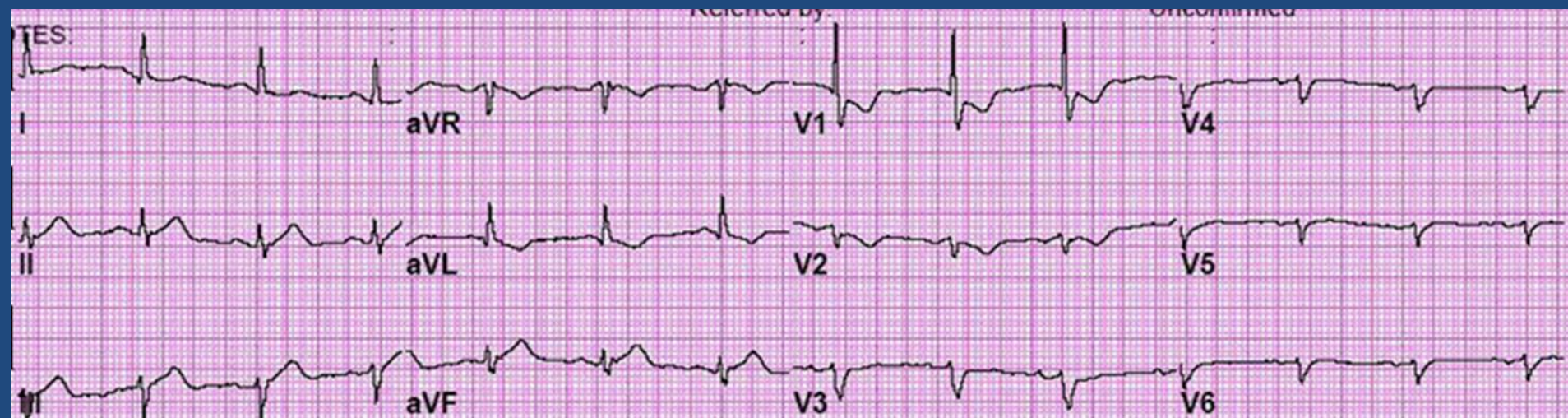
Isolated posterior MI.

There is no inferior involvement here.

ST depression in V1

Note the R/S ratio in V1 is quite high.
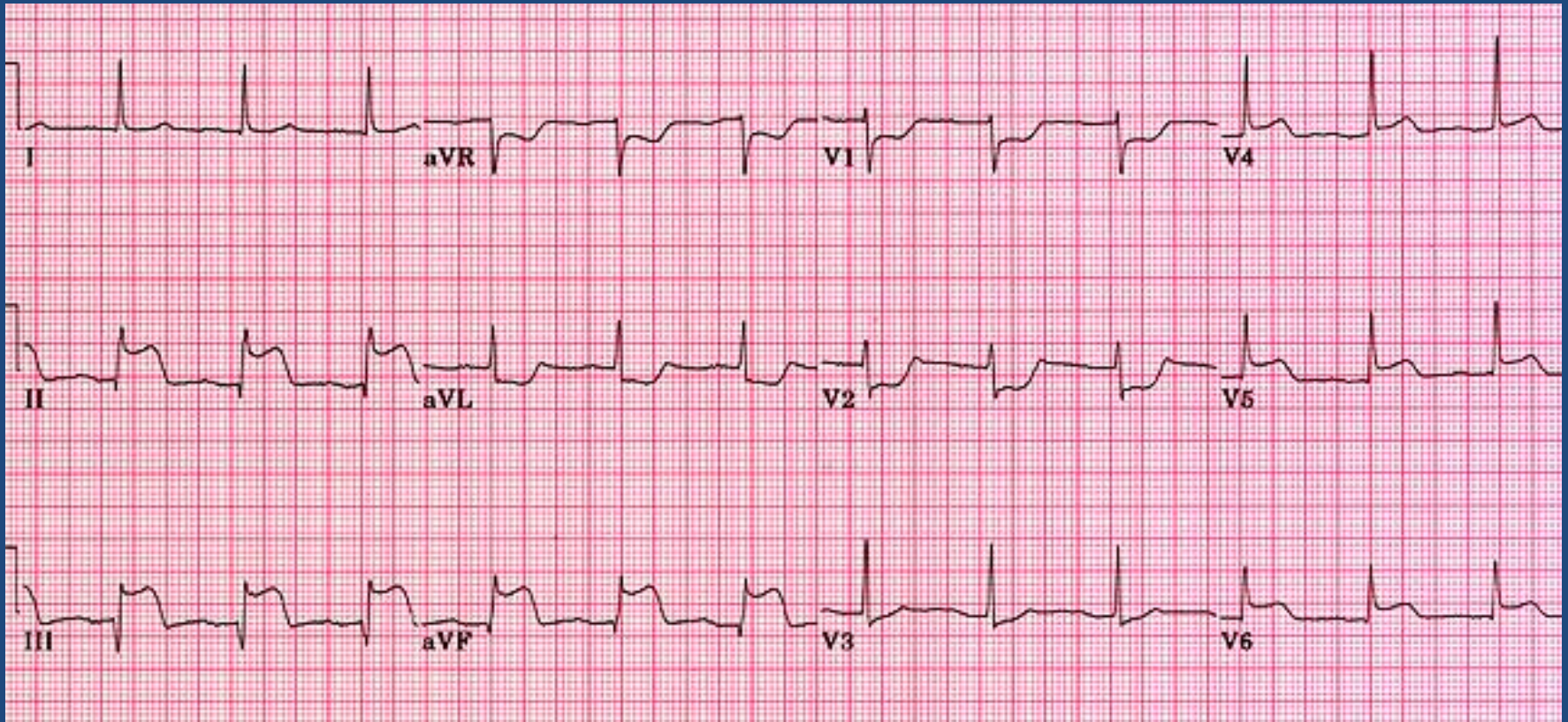
ST segments in leads overlying the posterior region of the heart (V1 and V2) are initially horizontally depressed. As the infarction evolves, lead V1 demonstrates an R wave (which in fact represents a Q wave in reverse). Note that the patient below is also suffering from an inferior wall myocardial infarction as evidenced by ST elevation in leads II, III and aVF.

Obtain emergent cardiology consultation for ACS patients with cardiogenic shock, left heart failure, or sustained ventricular tachyarrhythmia.

Prognosis: Early Risk Stratification

- 12-lead ECG within 10 minutes of the patient's arrival at an emergency facility

- Serial ECGs (e.g., 15- to 30-minute intervals during the first hour) till ischemic changes are detected

- Serial cardiac troponin I or T levels at presentation and 3 to 6 hours after symptom onset

Clinical Assessment and Initial Evaluation

• Risk stratify based on the likelihood of ACS and adverse outcome(s)

• High-risk features: Immediate referral
1. Continuing chest pain
2. Severe dyspnea
3. Syncope/presyncope
4. Palpitations

Factors Associated With Appropriate Selection of Early Invasive Strategy or Ischemia-Guided Strategy in Patients With NSTE-ACS

- Immediate invasive (within 2 h)

  - Refractory angina
  - Signs or symptoms of HF or new or worsening mitral regurgitation
  - Hemodynamic instability
  - Recurrent angina or ischemia at rest or with low-level activities despite intensive medical therapy
  - Sustained VT or VF

TIMI Risk Score* for NSTE-ACSScore	All-Cause Mortality, New or Recurrent MI, or Severe Recurrent Ischemia Requiring Urgent Revascularization Through 14 d After Randomization, %
0–1	4.7
2	8.3
3	13.2
4	19.9
5	26.2
6–7	40.9

*The TIMI risk score is determined by the sum of the presence of 7 variables at admission; 1 point is given for each of the following variables:

≥65 y of age; ≥3 risk factors for CAD; prior coronary stenosis ≥50%; ST deviation on ECG; ≥2 anginal events in prior 24 h; use of aspirin in prior 7 d; and elevated cardiac biomarkers.
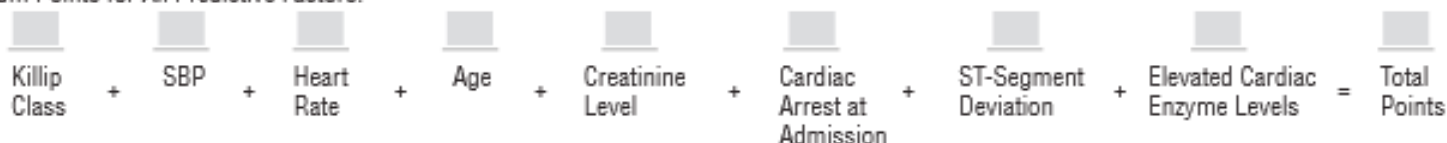
1. Find Points for Each Predictive Factor:

Killip Class	Points	SBP, mm Hg	Points	Heart Rate, Beats/min	Points	Age, y	Points	Creatinine Level, mg/dL	Points
I	0	≤80	58	≤50	0	≤30	0	0-0.39	1
II	20	80-99	53	50-69	3	30-39	8	0.40-0.79	4
III	39	100-119	43	70-89	9	40-49	25	0.80-1.19	7
IV	59	120-139	34	90-109	15	50-59	41	1.20-1.59	10
		140-159	24	110-149	24	60-69	58	1.60-1.99	13
		160-199	10	150-199	38	70-79	75	2.00-3.99	21
		≥200	0	≥200	46	80-89	91	>4.0	28
						≥90	100		

Other Risk Factors	Points
Cardiac Arrest at Admission	39
ST-Segment Deviation	28
Elevated Cardiac Enzyme Levels	14

GRACE Risk Model Nomogram

2. Sum Points for All Predictive Factors:

☐ Killip Class + ☐ SBP + ☐ Heart Rate + ☐ Age + ☐ Creatinine Level + ☐ Cardiac Arrest at Admission + ☐ ST-Segment Deviation + ☐ Elevated Cardiac Enzyme Levels = ☐ Total Points

3. Look Up Risk Corresponding to Total Points:

Total Points	≤60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	≥250
Probability of In-Hospital Death, %	≤0.2	0.3	0.4	0.6	0.8	1.1	1.6	2.1	2.9	3.9	5.4	7.3	9.8	13	18	23	29	36	44	≥52

For example, a patient has Killip class II, SBP of 100 mm Hg, heart rate of 100 beats/min, is 65 years of age, has serum creatinine level of 1 mg/dL, did not have a cardiac arrest at admission but did have ST-segment deviation and elevated enzyme levels.

His score would be: 20 + 53 + 15 + 58 + 7 + 0 + 28 + 14 = 196

This person would have about a 16% risk of having an in-hospital death.

Similarly, a patient with Killip class I, SBP of 80 mm Hg, heart rate of 60 beats/min, is 55 years of age, has serum creatinine level of 0.4, and no risk factors would have the following score:

0 + 58 + 3 + 41 + 1 = 103, which gives approximately a 0.9% risk of having an in-hospital death.

Factors Associated With Appropriate Selection of Early Invasive Strategy or Ischemia-Guided Strategy in Patients With NSTE-ACS

- Ischemia-guided strategy

- Low-risk score (e.g., TIMI [0 or 1], GRACE [<109])
- Low-risk Tn-negative female patients
- Patient or clinician preference in the absence of high-risk features

Factors Associated With Appropriate Selection of Early Invasive Strategy or Ischemia-Guided Strategy in Patients With NSTE-ACS

- Early invasive (within 24 h)

- None of the indications for immediate invasive or ischemia guided strategies, but GRACE risk score >140
- Temporal change in Tn
- New or presumably new ST depression

Factors Associated With Appropriate Selection of Early Invasive Strategy or Ischemia-Guided Strategy in Patients With NSTE-ACS

•Delayed invasive (within 25–72 h)

- None of the above but diabetes mellitus
- Renal insufficiency (GFR <60 mL/min/1.73 m²)
- Reduced LV systolic function (EF <0.40)
- Early postinfarction angina
- PCI within 6 mo
- Prior CABG
- GRACE risk score 109–140; TIMI score ≥2

Initial interventions:

- Supplemental oxygen as needed to maintain O$_2$ saturation >90 percent.

- Aspirin 325 mg (non-enteric coated), to be chewed and swallowed (unless aortic dissection is being considered).

- Sublingual nitroglycerin tablets (0.4 mg), spaced five minutes apart, or one aerosol spray under tongue every five minutes for three doses

- **IF** patient has persistent chest discomfort, hypertension, or signs of heart failure add IV nitroglycerin.

Contraindications for IV Nitroglycerin:

- Sign of hemodynamic compromise (eg, right ventricular infarction)

- Use of phosphodiesterase inhibitors (eg, for erectile dysfunction)

Initial interventions:

- **Morphine sulfate** (2 to 4 mg slow IV push every 5 to 15 minutes) for unacceptable, persistent discomfort or anxiety related to myocardial ischemia.

Initial interventions:

- Beta blocker (eg, metoprolol tartrate 25 mg orally) **IF** no signs of heart failure and not at high risk for heart failure, and no signs of hemodynamic compromise, bradycardia, or severe reactive airway disease.

Contraindications for the use of oral beta-blocker therapy within the first 24 hours of MI:

1) signs of HF,

2) evidence of low-output state,

3) increased risk for cardiogenic shock, or

4) other contraindications to beta blockade (e.g., PR interval >0.24 second, second- or third-degree heart block without a cardiac pacemaker, active asthma, or reactive airway disease).

Beta-blockers proven to reduce mortality in patients with HF

- Sustained-release metoprolol succinate
- Carvedilol
- Bisoprolol

Anti-Ischemic and Analgesic Medications: Calcium Channel Blockers

- Nondihydropyridine calcium channel blocker (CCB): verapamil or diltiazem

- Contraindications:

1. Clinically significant LV dysfunction

2. Increased risk for cardiogenic shock

3. PR interval greater than 0.24 second, or second- or third-degree atrioventricular block without a cardiac pacemaker

Anti-Ischemic and Analgesic Medications: Calcium Channel Blockers

- Long-acting CCBs and nitrates in coronary artery spasm

- Immediate-release nifedipine should not be administered in the absence of beta-blocker therapy.

Initial interventions:

- Start 80 mg of atorvastatin as early as possible, and preferably before PCI, in patients not on statin. If patient is taking a low to moderate intensity statin, switch to atorvastatin 80 mg.

Inhibitors of Renin-Angiotensin-Aldosterone System

- ACE inhibitors
- ARBs
- Aldosterone blockade

- in all patients with LVEF less than 0.40 and in those with hypertension, diabetes mellitus, or stable CKD unless contraindicated.
- ARBs for ACE inhibitor intolerant
- Aldosterone blockade (without significant renal dysfunction (creatinine >2.5 mg/dL in men or >2.0 mg/dL in women) or hyperkalemia (K >5.0 mEq/L).

Summary

STEMI/new LBBB

NSTEMI/UA

High risk features:
ST depression
Elevated biomarkers
Persistent chest pain
Hemodynamic instability
High risk score

Primary PCI with 90 min
Or
Thrombolysis within 30 min

Catheterization if high risk
Catheterization or medical in low risk

Other drugs

- Dual antiplatelet x 12 months
- Beta blockers
- Ace-inhibitor/ ARBs
- Aldosterone antagonist
- Statins: high intensity

Thank you!