

# Chest Pain & Acute Coronary Syndrome



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7<sup>th</sup> Abuja Cardiovascular Symposium 2023



# OUTLINE



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- CASE PRESENTATION
- CHEST PAIN
- AETIOLOGY
- CLINICAL FEATURES
- ACUTE CORONARY SYNDROME
- INVESTIGATIONS
- MANAGEMENT

# CASE 1



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- Mrs. C.I a 51year old known hypertensive presented in the emergency with chest pain x3/12. Pain was central, dull in nature with burning sensations, radiating to the back, lasting few seconds, no known aggravating or relieving factors
- No SOB, cough, palpitations
- Has been regular on tab amlodipine/lisinopril 5/10mg for 3years
- On examination: In painful distress, not pale, anicteric, acyanosed, afebrile, nil pedal oedema
- CVS PR 68bpm, BP 100/64mmhg HS S1S2
- Chest RR 20cpm, SPO2 95% RA, vesicular BS

# Q 1)What type of chest pain



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- 1) Non-cardiac pain
- 2)Cardiac chest pain
- 3)Atypical chest pain
- 4)All of the above



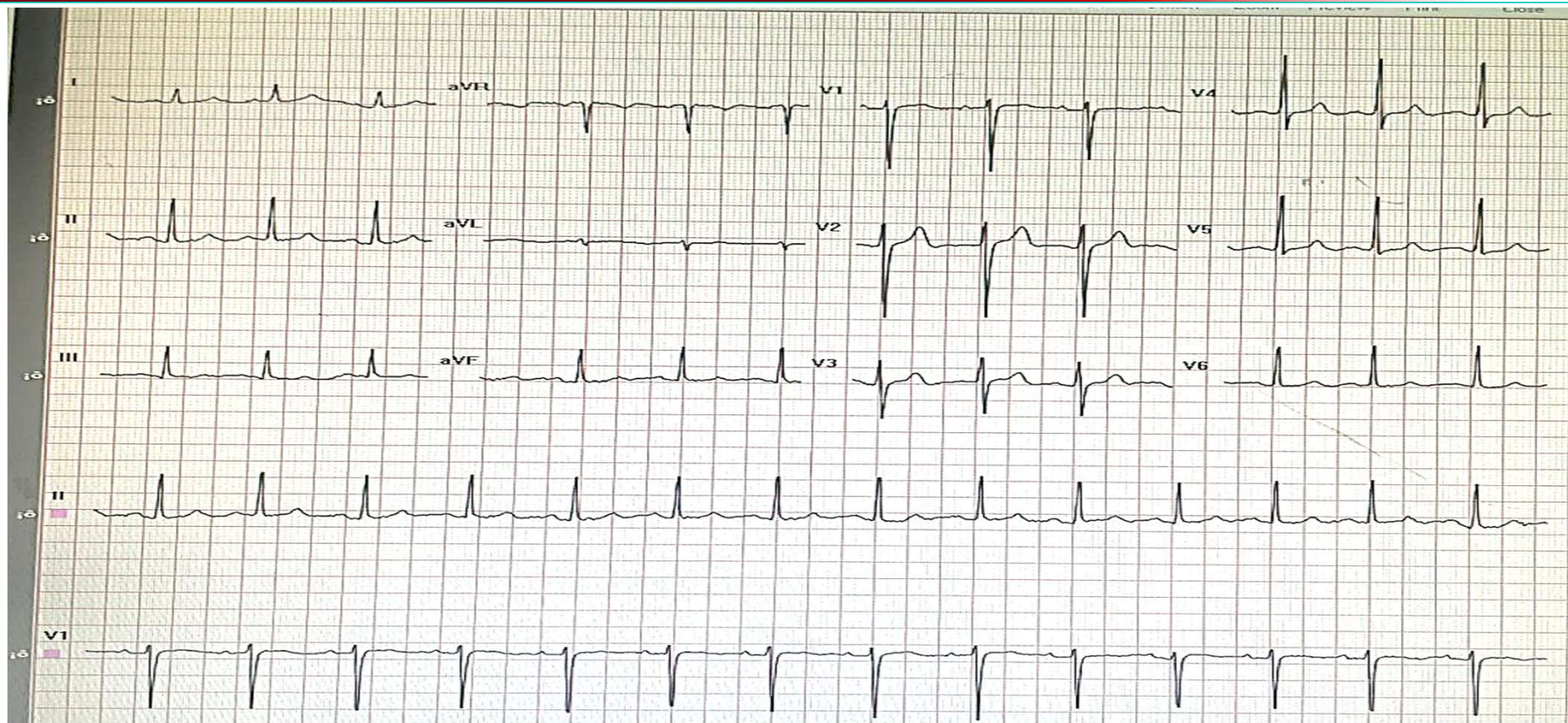
# Case 1

## ECG



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# CASE 1



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## Investigations

- FBC: Normal
- E,U,Cr: Normal
- Troponin I: Normal
- RBS 101mg/dl
- Stool for H.pylori: Positive
- ECHO: EF 55-60%, normal study

# CASE 1



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- Admitted
- IV PPI
- Analgesic
- Treated for H.pylori
  
- Pain reduced but still intermittent frequency and Endoscopy was requested
- Showed Duodenitis
  
- She was treated adequately with PPI and she responded well to therapy

# INTRODUCTION



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- Chest pain or discomfort is very common in clinical practice.
- Aetiologies range from benign conditions to life threatening conditions.
- All that is called chest pain is not necessarily of cardiac origin



# INTRODUCTION



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- **Cardiac Chest pain is evaluated by three (3) criteria**
  1. The presence of substernal/left sided chest pain/discomfort
  2. Discomfort/pain that was provoked by exertion or emotional stress
  3. Discomfort/pain relieved by rest and/or nitroglycerin.
  
- **Suspicious Chest Pain can be put into 3 different categories based on above**
  - Typical (3/3 criteria)
  - Atypical (2/3 criteria)
  - Non-cardiac (1/3 criteria)

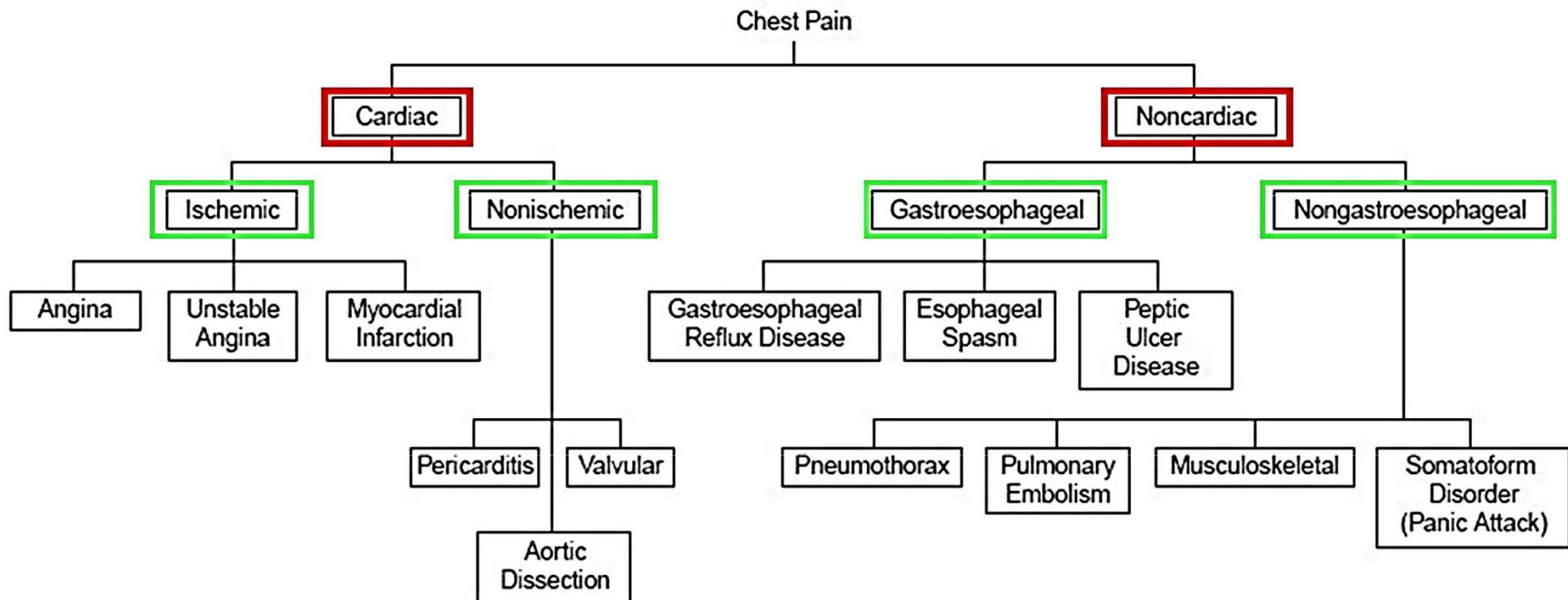
*NB. Non-cardiac chest pain doesn't mean its not from the heart, it's just much less likely*

# CAUSES OF CHEST PAIN



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## Chest Pain-History

- **Location-** Precordial, Retrosternal
- **Aggravating Factors-** Physical/Emotional Exertion
- **Relieving Factors-** Rest or Nitroglycerin
- **Duration of Pain-** <5-30mins per episode
- **Associations-** Diaphoresis, Dizziness, CV Risk Factors

## Chest Pain-History

- **Characteristics that are less likely to be Cardiac**
  - Very Sharp & Pinpoint,
  - Sub-mammary,
  - Lasting few secs or greater than 6hours/days,
  - Focal tenderness,
  - posture/food related,
  - no CV risk factors

# HISTORY



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- Pericarditis- Worse on lying down and relieved by leaning forward
- Dyspepsia- chest pain is peppery/burning in nature, worse when hungry
- Aortic dissection- Chest pain described as tearing
- Musculoskeletal- Tenderness over area of concern
- Pneumonia- Pleuritic, dyspnea, cough, fever



# TYPICAL CLINICAL FEATURES OF MAJOR CAUSES OF ACUTE CHEST DISCOMFORT

CONDITION	DURATION	QUALITY	LOCATION	ASSOCIATED FEATURES
Angina	More than 2 and less than 10 min	Pressure, tightness, squeezing, heaviness, burning	Retrosternal, often with radiation to or isolated discomfort in neck, jaw, shoulders, or arms—frequently on left	Precipitated by exertion, exposure to cold, psychologic stress S <sub>4</sub> gallop or mitral regurgitation murmur during pain
Unstable angina	10–20 min	Similar to angina but often more severe	Similar to angina	Similar to angina, but occurs with low levels of exertion or even at rest
Acute myocardial infarction	Variable; often more than 30 min	Similar to angina but often more severe	Similar to angina	Unrelieved by nitroglycerin May be associated with evidence of heart failure or arrhythmia
Aortic stenosis	Recurrent episodes as described for angina	As described for angina	As described for angina	Late-peaking systolic murmur radiating to carotid arteries
Pericarditis	Hours to days; may be episodic	Sharp	Retrosternal or toward cardiac apex; may radiate to left shoulder	May be relieved by sitting up and leaning forward Pericardial friction rub

Aortic dissection	Abrupt onset of unrelenting pain	Tearing or ripping sensation; knifelike	Anterior chest, often radiating to back, between shoulder blades	Associated with hypertension and/or underlying connective tissue disorder, e.g., Marfan syndrome Murmur of aortic insufficiency, pericardial rub, pericardial tamponade, or loss of peripheral pulses
Pulmonary embolism	Abrupt onset; several minutes to a few hours	Pleuritic	Often lateral, on the side of the embolism	Dyspnea, tachypnea, tachycardia, and hypotension
Pneumonia or pleuritis	Variable	Pleuritic	Unilateral, often localized	Dyspnea, cough, fever, rales, occasional rub
Spontaneous pneumothorax	Sudden onset; several hours	Pleuritic	Lateral to side of pneumothorax	Dyspnea, decreased breath sounds on side of pneumothorax
Esophageal reflux	10–60 min	Burning	Substernal, epigastric	Worsened by postprandial recumbency Relieved by antacids
Esophageal spasm	2–30 min	Pressure, tightness, burning	Retrosternal	Can closely mimic angina
Peptic ulcer	Prolonged	Burning	Epigastric, substernal	Relieved with food or antacids
Gallbladder disease	Prolonged	Burning, pressure	Epigastric, right upper quadrant, substernal	May follow meal
Musculoskeletal disease	Variable	Aching	Variable	Aggravated by movement May be reproduced by localized pressure on examination

# CASE 2



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- A 37year old female presenting in the emergency with
  - chest pain x4hours.
  - Sudden in onset, retrosternal, gripping in nature, non radiating, aggravated by lying down with no relieving factor
  - Associated difficulty in breathing and palpitations
  - No cough or fever
- On Examination, Young lady in respiratory distress,
  - not pale, afebrile, nil pedal oedema
  - CVS PR 94bpm, BP 134/82mmhg, S1S2
  - Chest RR 32cpm, SPO2 91% RA, vesicular BS

# CASE 2



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1. Atypical chest pain ?Acute Pericarditis
2. Typical Chest Pain ?Angina
3. Typical Chest Pain ?Myocardial Infarction
4. Non-Cardiac Chest Pain? Pneumonia



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# CASE 2



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- FBC: Normal
- E,U,Cr: Normal
- TFT: Normal
- ESR 50mm/hr
- Troponin I: Normal
- FLP: Normal
- Chest: Normal
- ECHO: EF 60-65%, good diastolic function, mild pericardial effusion

# CASE 2



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- Admitted
- Tab Ibuprofen
- Tab Colchicine
- Initially had oxygen until saturation improved
- Repeat ECG by 2<sup>nd</sup> day was normal
- Discharged by 3day

# Acute Pericarditis- clues



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- Chest pain is often retrosternal in nature, pleuritic, and positional (relieved by sitting forward, worse lying flat)
- Widespread concave ST elevation and PR depression throughout most of the limb leads (I, II, III, aVL, aVF) and precordial leads (V2-6)
- Normal or minimal cardiac Enzyme elevation
- *Remember that it could be a late complication of STEMI*

# Acute Pericarditis- ECG Stages



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- **Stage 1** – widespread STE and PR depression with reciprocal changes in aVR (occurs during the first two weeks)
  - **Stage 2** – normalisation of ST changes; generalised T wave flattening (1 to 3 weeks)
  - **Stage 3** – flattened T waves become inverted (3 to several weeks)
  - **Stage 4** – ECG returns to normal (several weeks onwards)
- *NB. Less than 50% of patients progress through all four classical stages and evolution of changes may not follow this typical pattern.*

# Differentiate Benign Early Repolarization from Pericarditis



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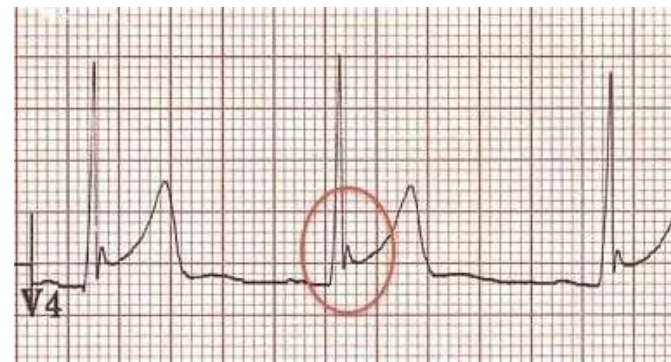
## 1. ST segment / T wave ratio

- The Height of the ST segment elevation vs Height of the T wave in V6.
- A ratio of  $> 0.25$  suggests pericarditis
- A ratio of  $< 0.25$  suggests BER

## 2. Fish Hook Pattern

- a notched or irregular J point: the so-called “***fish hook***” pattern. This is often best seen in lead V4

## 3. Stable ECG over Time in BER.





# CASE 3



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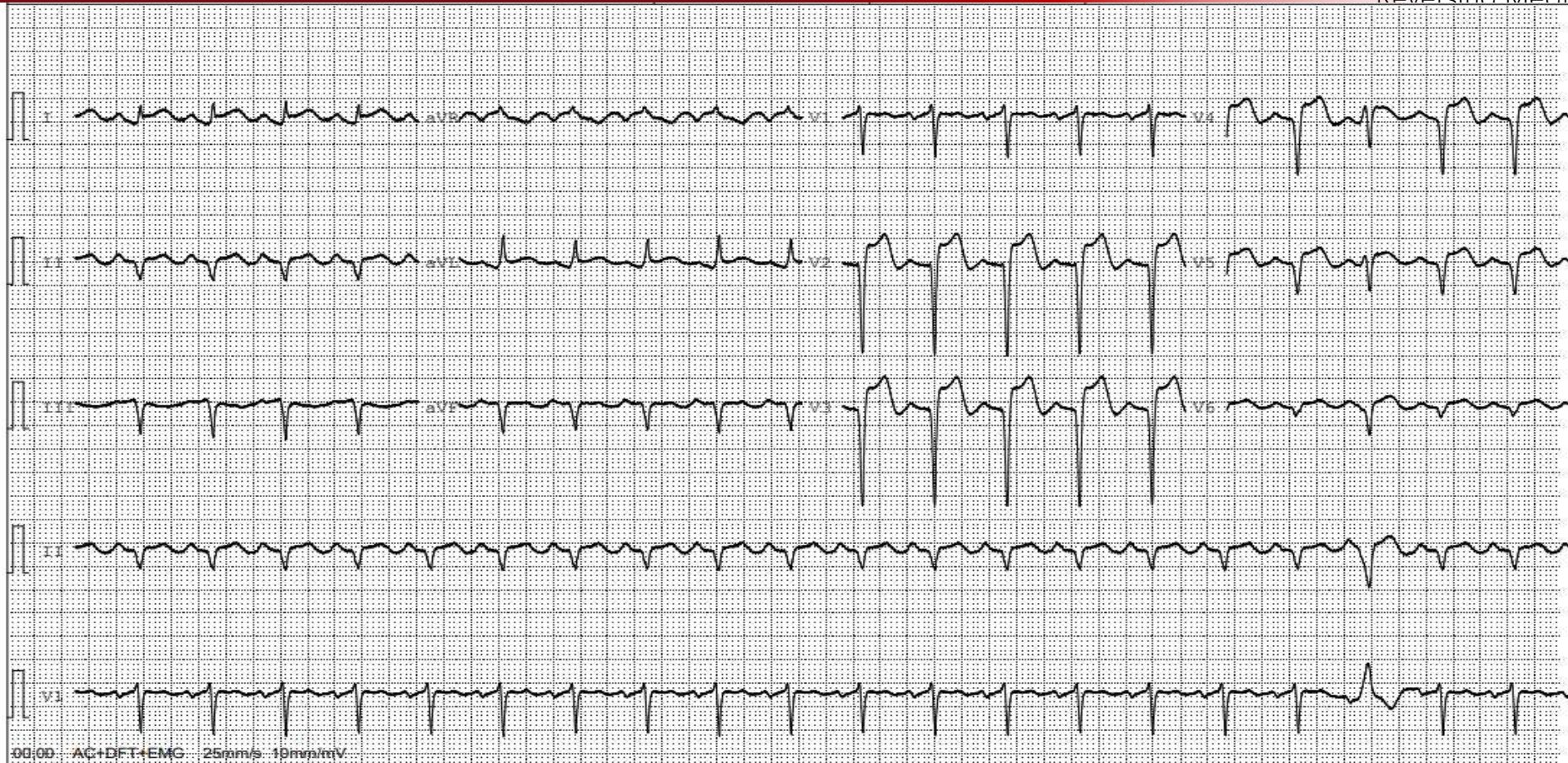
- J.A is a 61year old man who presented in the emergency with chest pain x13hours.
  - Chest pain is retrosternal, sharp, radiating to his jaw and left arm
  - Associated diaphoresis, palpitations, SOB with feeling of impending doom
  - Had an episode of vomiting, no cough or fever
  - There was dyspnea on exertion
  - No prior history of similar complains
  - Not a known hypertensive or diabetic
  - Doesn't take alcohol or smoke

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- What is the diagnosis?
  - 1) Acute pericarditis
  - 2) Non- cardiac chest pain
  - 3) Pulmonary Embolism
  - 4) Acute Myocardial infarction
  - 5) Supraventricular Tachycardia

# CASE 3



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- Was taken to a facility where he had ECG and troponin done. He had tab aspirin 300mg stat and then Cardiocare was informed via phone that they were referring
- Before arrival, Cath lab was activated and the medical team informed
- On examination at arrival, not pale, anicteric, acyanosed, afebrile, nil pedal oedema
- CVS PR 115bpm, BP 154/90mmhg JVP not elevated AB 5LICS MCL, HS S1S2
- Chest RR 20cpm, SPO2 96%, vesicular BS
- On arrival, ECG and troponin repeated
- Investigations requested
- He was connected to the cardiac monitor

# Case 3



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- Troponin 43.9ng/ml (0.0- 0.3)
- E, U,Cr: Normal
- FBC: WBC  $11 \times 10^9/L$ , PCV 43%, PLT  $233 \times 10^9/L$
- FBS: 151mg/dl
- HbA1C: 7.5%
- FLP: Normal



# Case 3



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- PCI done within 30mins of presentation at Cardiocare
- Tab Aspirin 300mg daily after initial 300mg stat
- Tab Clopidogrel 300mg stat the 75mg dly
- SC Clexane 40mg 12hrly
- Tab Isodil 5mg b.d
- Sublingual NTG spray every 5mins x3doses
- Tab Bisoprolol 1.25mg dly
- Tab atorvastatin 80mg daily

# CASE 3



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- CAG showed 95% stenosis of RCA and 100% proximal LAD and was stented
- Discharged after 5days
- Stable and on follow up visits

# ACUTE CORONARY SYNDROME



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- Acute coronary syndrome encompass a spectrum of conditions that include patients presenting with
  - Recent changes in clinical symptoms or signs,
  - with or without changes on 12-lead ECG and
  - with or without acute elevations in cardiac troponin concentrations

# ACUTE CORONARY SYNDROME



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- Acute coronary syndrome include three subclasses in the spectrum:
  1. Unstable Angina (UA)
  2. Acute Non-ST Elevation MI (NSTEMI)
  3. Acute ST Elevation MI (STEMI)

# ACUTE CORONARY SYNDROME



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- Patients presenting with suspected ACS may eventually receive a diagnosis of acute myocardial infarction (AMI) or unstable angina (UA).
  - The diagnosis of myocardial infarction (MI) is associated with cTn release and is made based on the fourth universal definition of MI.
  - UA is defined as myocardial ischaemia at rest or on minimal exertion in the absence of acute cardiomyocyte injury/necrosis.
  - It is characterized by prolonged (>20 min) angina at rest, new onset of severe angina, angina that is increasing in frequency, longer in duration, or lower in threshold or angina that occurs after a recent episode of MI



# Acute Coronary Syndrome



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## 1. Unstable angina: **NEGATIVE ECG** (but ischemic changes) + **NEGATIVE ENZYMES**

- *An unprovoked or prolonged episode of chest pain raising suspicion of acute myocardial infarction (AMI).*
- *Without definite ECG or laboratory evidence*

## 2. Non-ST Elevation Myocardial Infarction:- **NEGATIVE ECG** (but ischemic changes) + **POSITIVE ENZYMES**

- *Chest pain suggestive of AMI*
- *Non-specific ECG changes (ST depression/T inversion/normal)*
- *Laboratory tests showing release of troponins*

## 3. ST Elevation Myocardial Infarction: **POSITIVE ECG** + **POSITIVE ENZYMES**

- *Sustained chest pain suggestive of AMI*
- *Acute ST elevation or new LBBB*
- *Laboratory tests showing release of troponins*

# Acute Coronary Syndrome



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	NEGATIVE ENZYMES	POSITIVE ENZYMES
"NEGATIVE" ECG	<b>UNSTABLE ANGINA*<sup>1</sup></b>	<b>NSTEMI*<sup>2</sup></b>
POSITIVE ECG	<b>?STEMI ?Pericarditis</b> <i>(Repeat Enzymes in 6-12hrs or Exclude Ventricular Aneurysm complicating recent MI &gt;2weeks)</i>	<b>STEMI</b>

**\*1 - IN THE SETTING OF CLINICAL SUSPICION OF ACUTE MYOCARDIAL INFARCTION**

**\*2 – ECG IN NSTEMI TYPICALLY SHOWS OTHER SIGNS OF MYOCARDIAL ISCHEMIA**

# CLINICAL FEATURES



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- The typical chest pain of acute MI usually is intense and unremitting for 30-60 minutes.
- It is retrosternal and often radiates up to the neck, shoulder, and jaws and down to the left arm.
- The chest pain is usually described as a substernal pressure sensation that is also perceived as squeezing, aching, burning or even sharp.
- In some patients, the symptom is epigastric, with a feeling of indigestion or of fullness and gas.

# CLINICAL FEATURES



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- Anxiety, commonly described as a sense of impending doom
- Light-headedness, with or without syncope
- Cough
- Nausea, with or without vomiting
- Profuse sweating
- Shortness of breath
- Rapid or irregular heart rate

# Tools Required for Definition/Diagnosis



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1. History
2. ECG
3. Cardiac Enzymes
4. +/- Echocardiogram
5. +/- Coronary Angiogram (Cardiocare Hospital Abuja)



# INVESTIGATIONS



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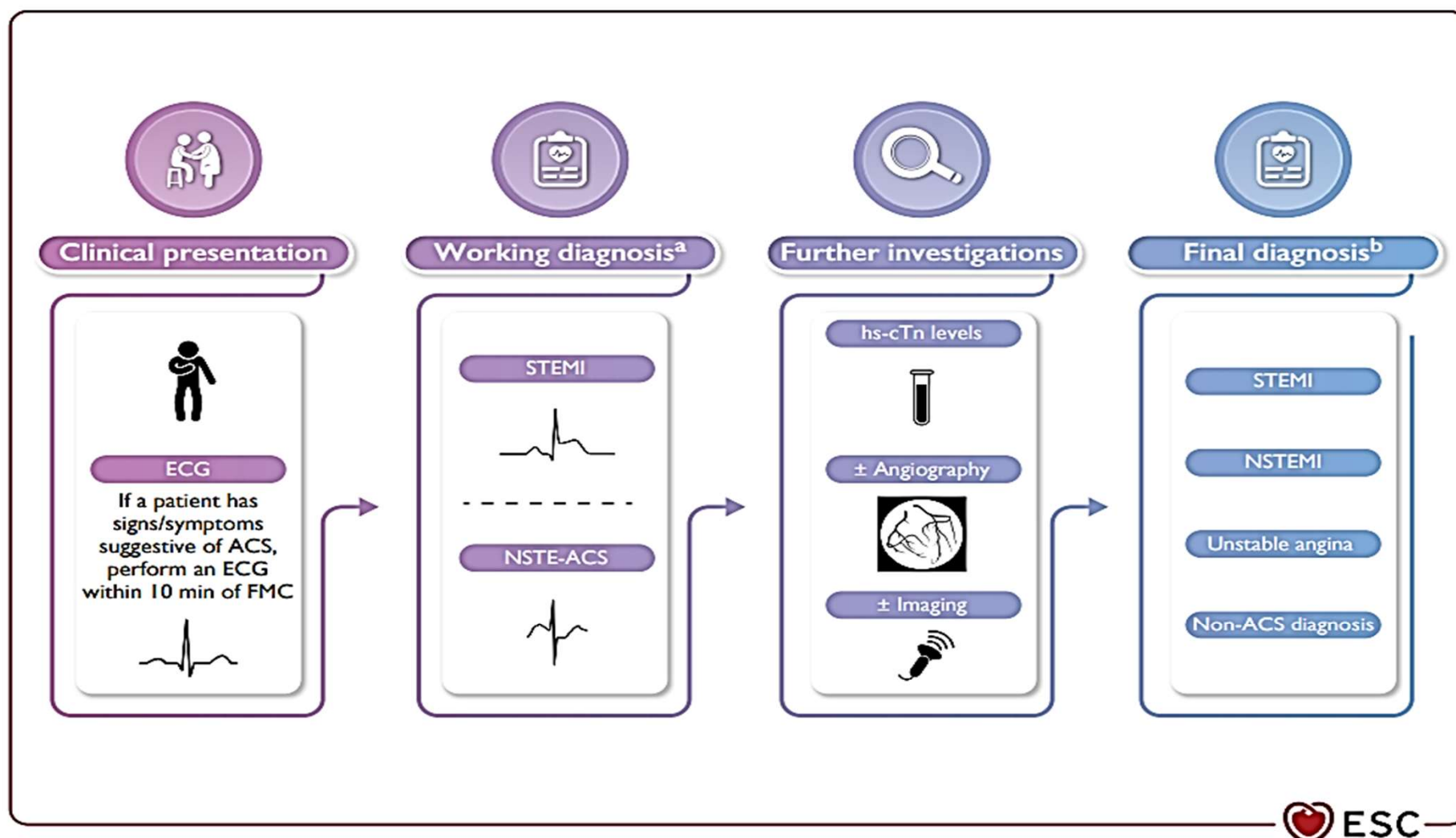
- **Troponin I or T**
- **ECG**
- Kidney Function Tests (E,U,Cr)
- Lipid Profile
- Blood Sugar and Glycemic Profile including HbA1C
- Echocardiography
- Full Blood Count and C-Reactive Protein
- Coronary Angiography

# CHEST PAIN NUGGET #1



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- “Everyone with Ongoing Acute Chest Pains **MUST** have an ECG within 5-10minutes of arrival to the emergency room.”



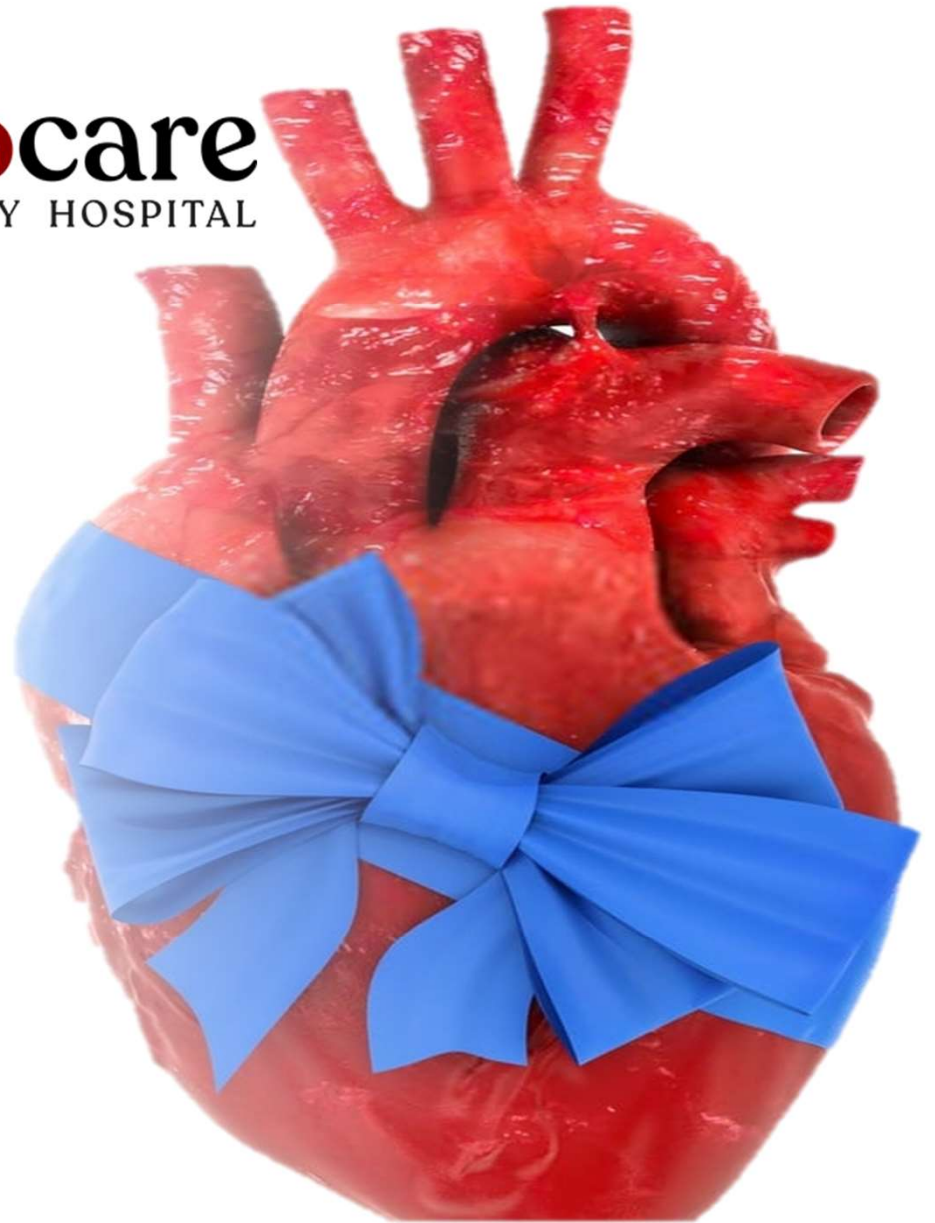


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## Pretest Risk Factors

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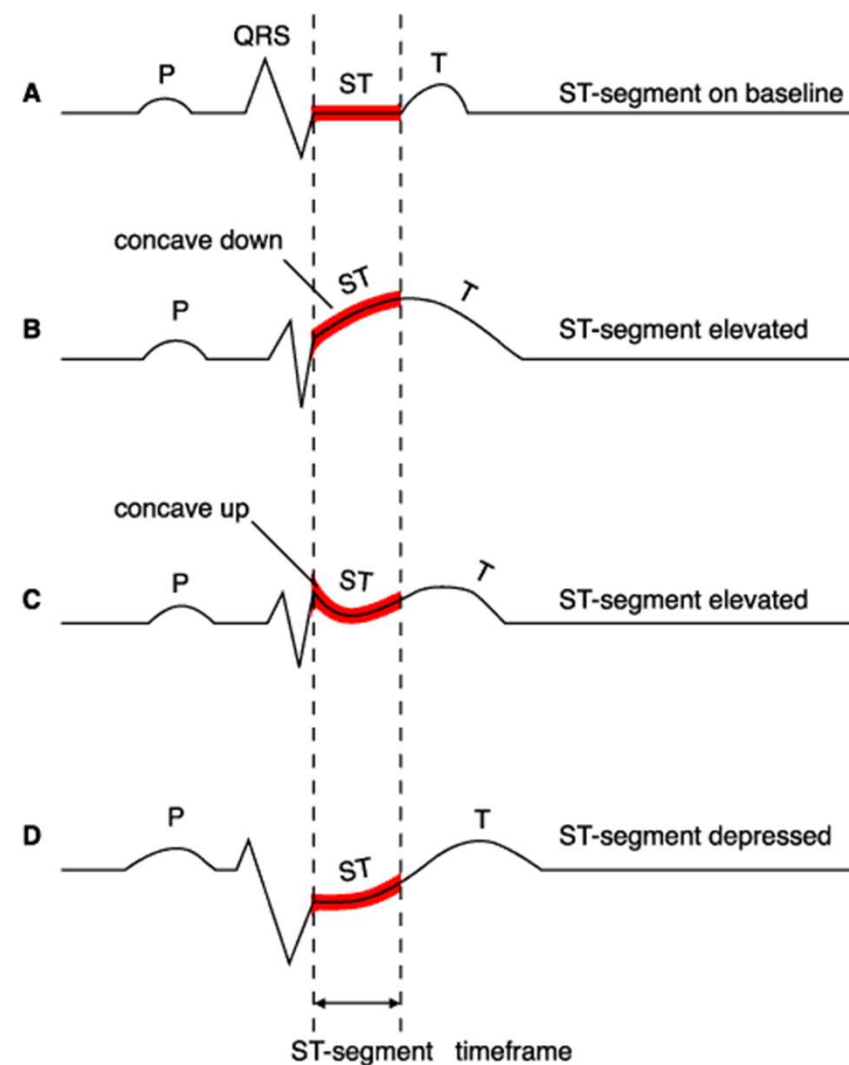
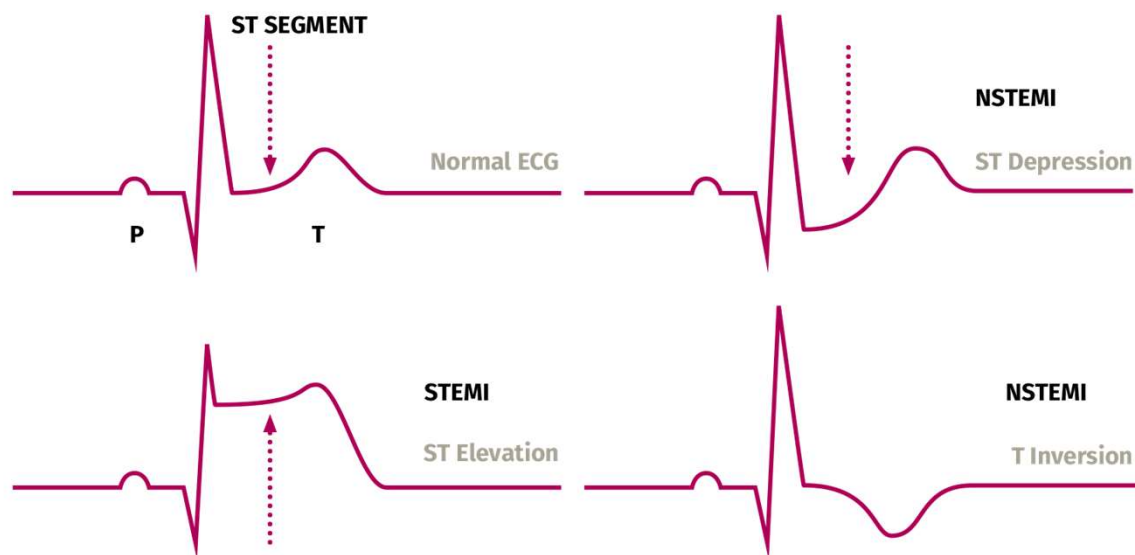
- Hypertension
  - Diabetes
  - Smoking (current or recent past)
  - Peripheral Arterial Disease
  - Previous Cardiovascular Disease
  - Dyslipidemia
  - Family History of Ischemic Heart Disease esp <40yrs
- 
- **HIGH**- 2 or more risk factors (except DM, Previous CVD or PAD)
  - **INTERMEDIATE**- 1 risk factor
  - **LOW**- No risk factor



CHEST PAIN (consider referral to CardioCare if unsure)							
12 Lead ECG (WITHIN 10MINS IF ONGOING CHEST PAIN) + CLINICAL EVALUATION + CV RISK PROFILE FOR ALL History, Exam, Previous Investigations, BP on both arms							
HIGH CV RISK (>1 RISK FACTOR)		INTERMEDIATE CV RISK (1 FACTOR)			NO CV RISK		
NORMAL ECG (REPEAT IN 3-6 HOURS FOR ACUTE ONGOING PAIN)	ABNORMAL ECG	ABNORMAL ECG	NORMAL ECG (REPEAT IN 3-6 HOURS FOR ACUTE ONGOING PAIN)		ABNORMAL ECG	NORMAL ECG	
1. ECHOCARDIOGRAM			+/- TROPONIN (Esp if ongoing or recent chest pain <10/7)		PATHWAY 2	PATHWAY 1	
2. TROPONIN (Esp if ongoing or recent chest pain <10/7)					TROPONINS (Esp if ongoing or recent chest pain <10/7) +/- ECHO		
POSITIVE TROPONIN, or SUGGESTIVE ECHO	NEGATIVE TROPONIN					NON-CARDIAC PAIN → EXCLUDE OTHER CAUSES	
ADMIT ICU/CCU, SPECIALIST CARE CORONARY ANGIO +/- PCI, ACS PROTOCOL	PRETEST PROBABILITY FOR CAD					CARDIAC PAIN OR UNSURE?	
	HIGH or SUSPICIOUS ECHO	INTERMEDIATE		LOW		TROPONINS (Esp if ongoing or recent chest pain <10/7)	
	CORONARY ANGIO	POSITIVE STRESS	NEGATIVE STRESS	PATHWAY 1	POSITIVE TROP	NEGATIVE TROP	
		CORONARY ANGIO	PATHWAY 1	CONSIDER CORONARY CT ANGIO	ECHO, ADMIT CCU, ANGIO, COVID PCR	→ EXCLUDE OTHER CAUSES	



# Significant ST Elevation



## CRITERIA FOR ST ELEVATION

1. Present in 3 Consecutive Beats
2. ST elevation 1mm (small box) above baseline in limb leads
3. ST elevation 2mm (small boxes) above baseline in chest leads
4. Must be present in at least 2 contiguous leads
  1. I, aVL, V5, V6
  2. II, III, aVF
  3. V1, V2
  4. V3, V4

# LBBB? And you're not sure?



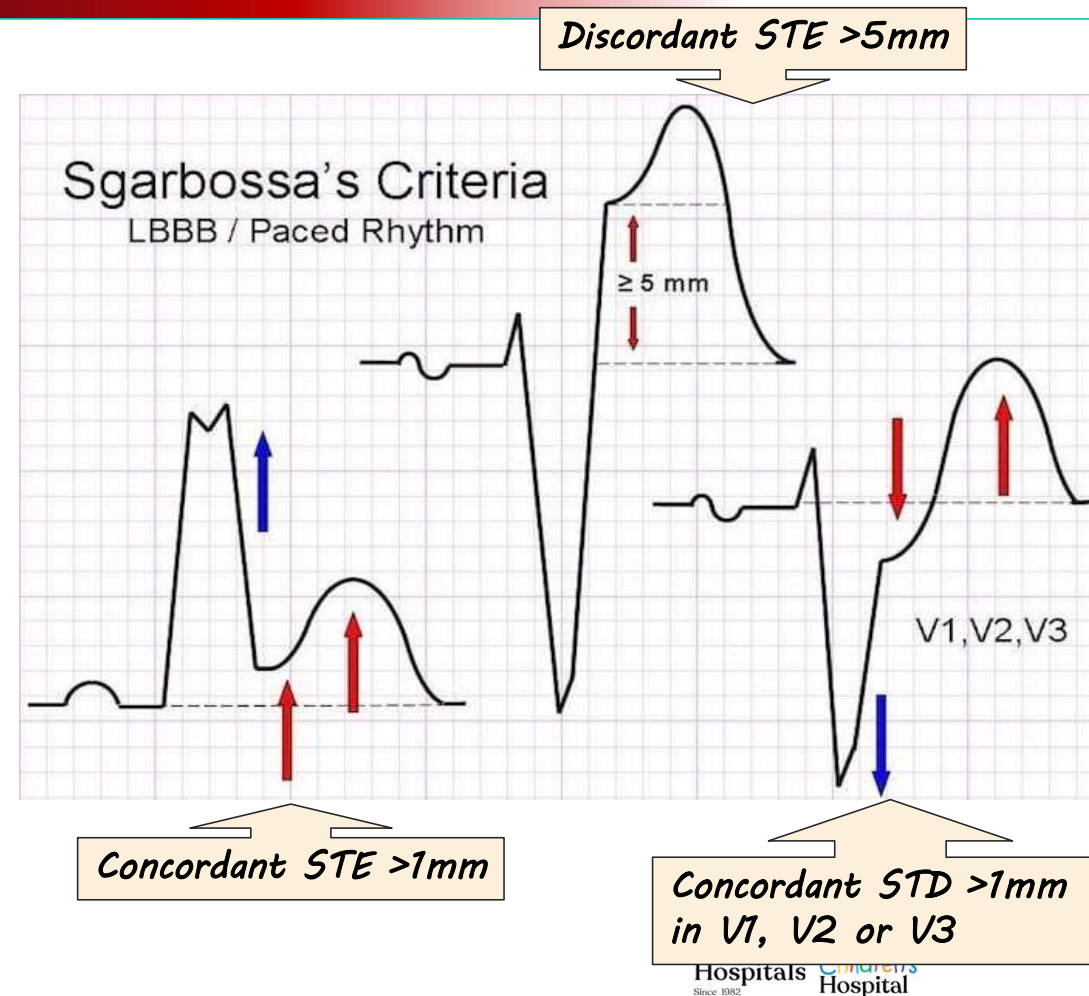
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ST elevation >1mm concordant with QRS	5pts
ST depression >1mm in V1, V2, or V3	3 pts
ST segment elevation >5mm discordant with QRS	2pts

Total point score of 3 yields > 90% specificity and an 88% positive predictive values

[www.cardiocare.ng](http://www.cardiocare.ng)



Hospitals Children's Hospital  
Since 1982

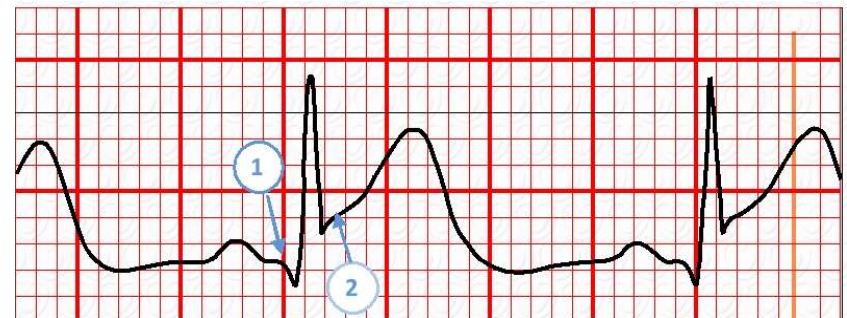
# ECG Changes suggesting Previous Myocardial Infarction



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1. Any Q wave in V2,V3  $>0.02s$  (1/2 a small box)
2. Any Q wave in and 2 contiguous leads  $>0.03s$  (1/2 a small box) or  $>1mm$  deep ( $>1$  small box)
  1. I, aVL
  2. V1-V6
  3. II, III, aVF
3. R wave  $> 0.04s$  ( $>1$  small box) and  $R/S > 1$  with concordant T wave in V1-V2 in the absence of a conduction defect



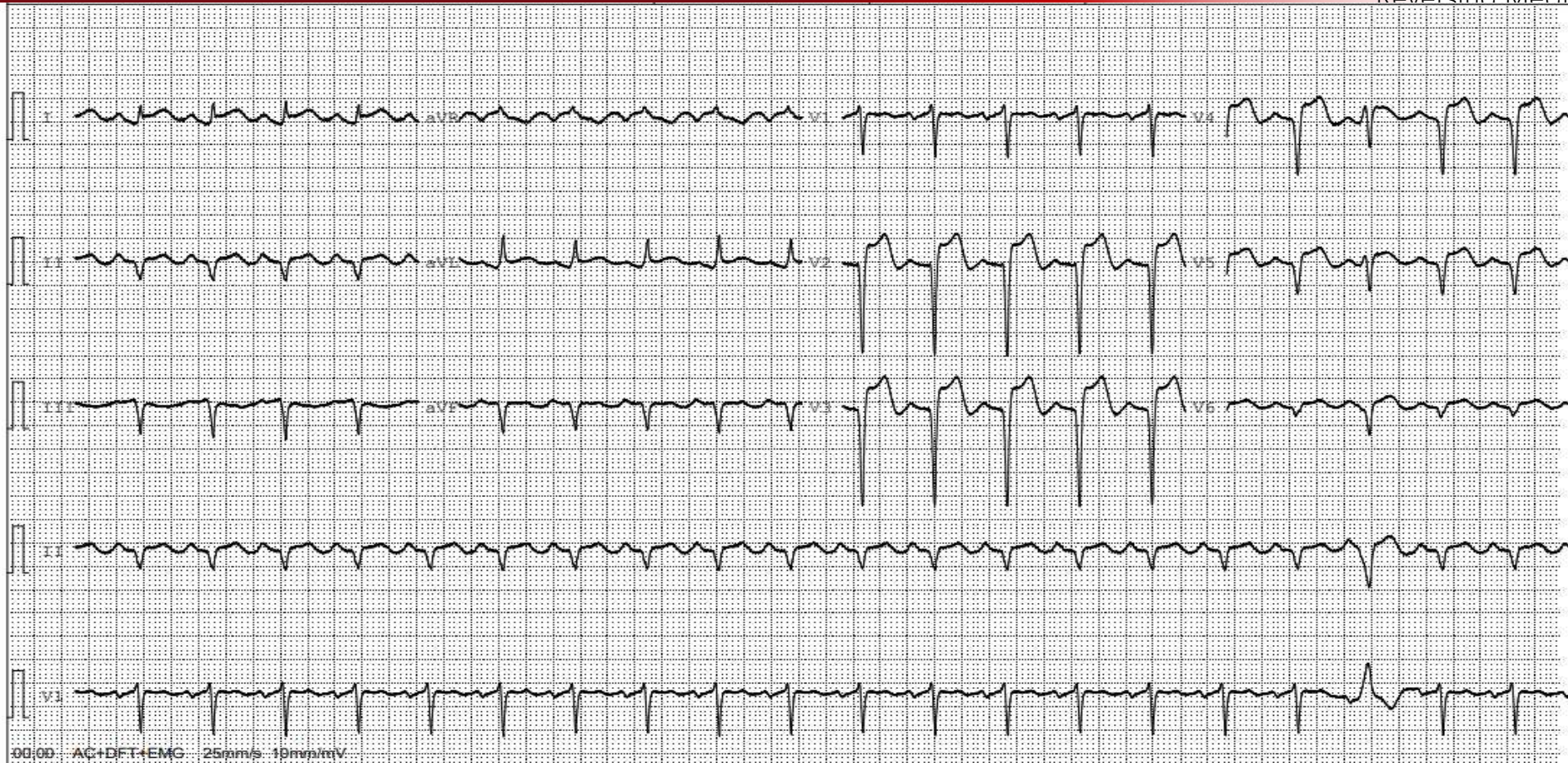


# CASE 3



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A photograph of medical professionals in a clinical setting. In the foreground, two female healthcare workers in blue scrubs and surgical masks are focused on a patient. One is wearing a hairnet. To their left, a male doctor in a white coat and stethoscope is partially visible. In the background, another person in a suit and mask is standing. The scene is brightly lit, typical of a hospital environment.

# So, How do we Treat Myocardial Infarction?

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# Goals/Targets of Treatment



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1. Restore Coronary Blood flow
2. Reduce Morbidity
3. Reduce & Treat Complications
4. Reduce Mortality
5. Reduce Risk of recurrence
6. Rehabilitate

**Our Mantra:**



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**The Limi  
Hospitals**  
Since 1982

  
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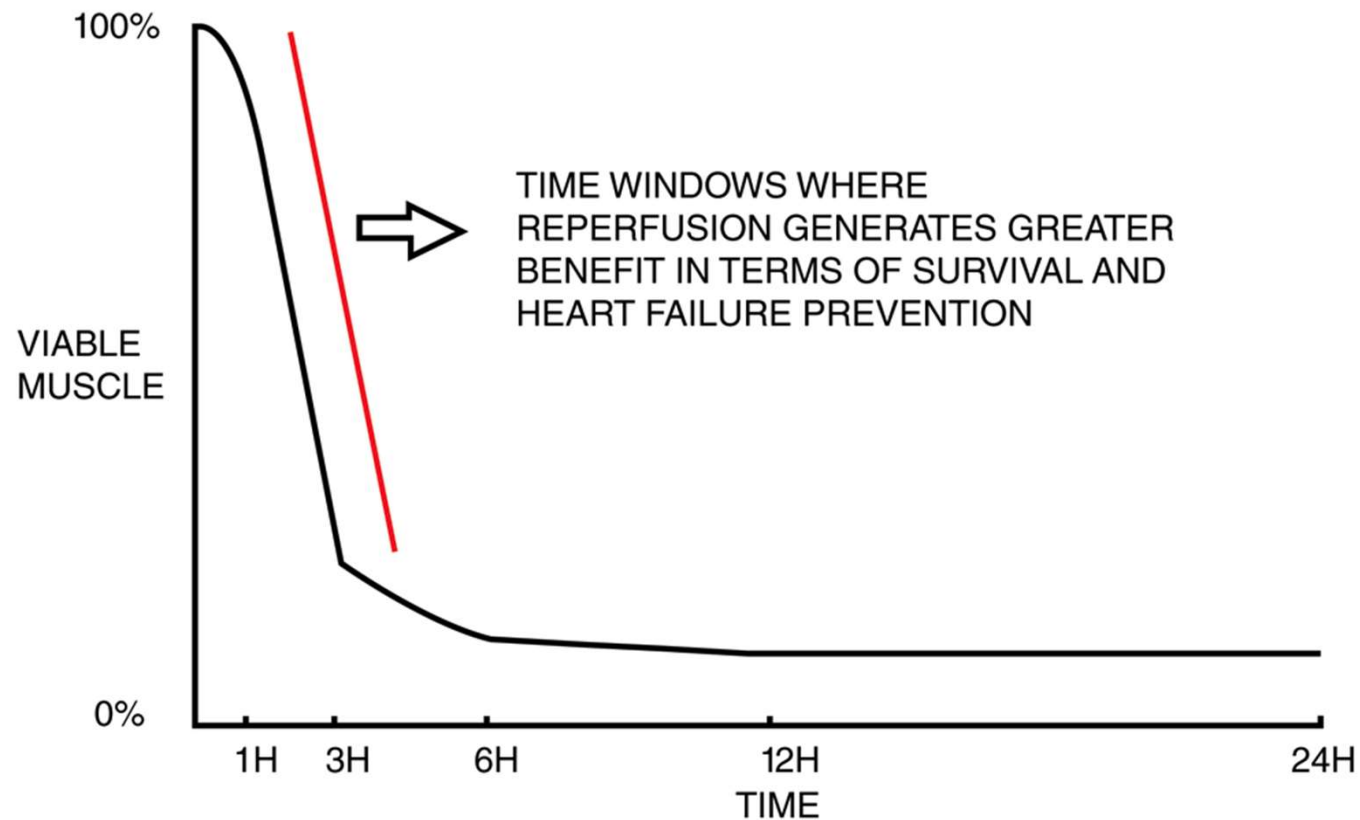


# TIME IS LIFE!



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# Management of patients with ACS



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- 1. Immediate 12 Lead ECG** –within 5 minutes of arrival and review by Doctor within 10 minutes
- 2. Diagnosis of Myocardial Infarction? Yes?**
  - Start ECG Monitoring
  - Insert Intravenous Cannula
  - Pain Relief
  - Blood Tests- Enzymes, etc
  - Give Aspirin 300mg stat chewed unless already given or contraindicated and other agents stated below
  - Get Specialist Input!!!

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# Management of patients with ACS



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## 3. Does the Patient Meet Criteria for Early Reperfusion?

- a. ST Elevation Myocardial Infarction (STEMI)
- b. 0-12 hours of onset of chest pain
- c. If >12 hours of onset of chest pain- ongoing chest pain and/or evidence of hemodynamic compromise or specialist opinion
- d. MI must not be caused by cocaine or other agents

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# Management of patients with ACS



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## 4. **A.** If Patients **MEETS** Criteria for Reperfusion Therapy (i.e. STEMI), Evaluate Time from symptom onset

### **A.** 0 – 12 hours from symptom onset and MI is not Cocaine induced

- Percutaneous Intervention (PCI) is preferred.
- If PCI is unavailable within 90 -120 minutes, Fibrinolysis could also be used except contraindicated,
- Revert to PCI
  - If Fibrinolysis is contraindicated
  - If symptoms persists after Fibrinolysis
  - If patient is unstable after Fibrinolysis

### **B.** After 12 hours reperfusion therapy is typically not recommended except in ongoing symptoms and hemodynamic instability

# Management of patients with ACS



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## 4. **B.** If Patients Does NOT MEET Criteria for Medical Reperfusion Therapy (i.e. NSTEMI/UA),

- Coronary Angiography +/- PCI
- Medical Treatment under a watchful eye
- Monitor
  - Chest Pain
  - Vitals Signs
  - ECG
  - Biomarkers
- Oxygen is recommended **only** in those with SPO2 <93% and/or evidence of shock

# Reperfusion Strategy



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- 1. Acute MI where primary PCI is available:** medical therapy and immediate transfer to the catheterization laboratory.
- 2. Acute MI where primary PCI is not available, but**
  - 1. Immediate transfer (medical contact to balloon time < 120 minutes) to a PCI facility is available:** same as above
  - 2. Transfer times will exceed the medical contact-to-PCI time of 120 minutes:** fibrinolytic therapy should be instituted in eligible patients within 30 minutes of medical contact then transfer for angiogram within 24hrs



# INTERVENTION



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Within 12 hours of symptoms onset

- Door to balloon: 90mins
- Door to needle: 30mins (12hours)
- Transfer from a non PCI capable hospital to PCI capable: 120mins
- Consider an early reperfusion strategy for patients presenting after more than 12 hours, provided there is clinical and/or ECG evidence of ongoing ischemia, with primary PCI being the preferred method

# INTERVENTION



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- NST-segment elevation (non-STE-ACS) are not candidates for immediate administration of thrombolytic agents, they should receive anti-ischemic therapy and consider PCI urgently or during admission.

# Reperfusion therapy



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- The primary goal in the management of acute MI is to institute reperfusion therapy as quickly as possible
- Time to treatment is paramount
- In STEMI, if facilities for immediate coronary angiography and PCI are available within 120 minutes of first medical contact, **this is the preferred therapy** (in the absence of contraindications).
- After 12 hours of continuous symptoms, there is little net benefit to pharmacologic reperfusion with fibrinolytics

# Reperfusion therapy- 2



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- The therapeutic window for PCI extends beyond that of fibrinolysis, but is not infinite
  - Consider delaying PCI presentation is >24hours except hemodynamically unstable
- STEMI patients usually go straight to the cath lab/CCU for thrombolysis from the ED.  
***Goal: door to balloon 90 minutes.***

# Medical Management



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- Initial medication management for MI: **MONASH-ABC**

1. **M**orphine (with anti-emetic)
2. **O**xygen
3. **N**itrates (Don't give in inferior MI or hypotension or recent use of PDEi)
4. **A**spirin + Platelet P2Y12 receptor antagonists e.g. Clopidogrel
5. **S**tatins
6. **H**eparin (UFH or LMWH)

## OTHERS

1. **A**CE-I/ARB (if no hypotension)
2. **B**eta blocker (if no hypotension; Don't give in Cocaine-induced MI)
3. **C**CU admission and care

**Get Specialist Input  
As Early As You  
Can.  
M.I. Kills**

# CABG Surgery



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## Indications

- Triple vessel disease especially in Diabetics
- One or two vessel with extensive myocardium at risk
- Left main coronary artery stenosis
- Failed percutaneous coronary angioplasty
- Occlusion of grafts from previous CABG





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