



# Emergency Cardiac Care: Acute Coronary Syndrome, Heart Failure, Cardiac Arrest, Cardiac Arrhythmias For MO

































# **LEARNING OBJECTIVES**

- Identify features associated with acute coronary syndrome
- Recognize ECG changes indicating ACS
- Identify signs and symptoms associated with heart failure
- Understand the initial treatment for ACS and HF
- Understand management of a patient with cardiac arrest
- Identify and manage common cardiac arrhythmias























# **ACUTE CORONARY SYNDROME**

Imbalance between myocardial oxygen supply and demand,

which occurs due to sudden blockage of coronary arteries:

- ST-segment elevation MI (STEMI)
- Non-ST-elevation MI (NSTEMI)
- Unstable angina





**Non-ST-Elevation ACS** 





















# **ACUTE CORONARY SYNDROME -SIGNS AND SYMPTOMS**

- Central chest pressure, tightness, or pain
- Radiation of pain to arm(s), neck, or jaw
- Shortness of breath
- Diaphoresis
- Nausea
- Females/elderly/diabetic may have less typical symptoms



















# **UNSTABLE ANGINA**

- New-onset angina (>grade 2; within 2 months)
- Rest pain (> 20 minutes; within 1 week)
- Crescendo pattern:
  - Increased frequency 0
  - Increased duration
  - Decreased level of exertion



















# **SPECTRUM OF ACS**

	UA	NSTEMI	STEMI
Definition	Ischemia without necrosis	Necrosis (non-transmural)	Transmural necrosis
Diagnosis	Negative Biomarkers	Positive I biomarkers	Positive biomarkers
	No ECG ST-segment elevation; may be normal		ECG ST-segment elevation
Treatment	Invasive or conservative depending on risk		Immediate reperfusion





















# **DIFFERENTIAL DIAGNOSIS**

- Aortic dissection
- Pulmonary embolus
- Perforated ulcer
- Pericarditis
- Pneumonia
- Pneumothorax























# **PRIMARY GOALS IN ACS**

- Triage patient as 'Red'
- Identify STEMI and transfer for early reperfusion
- Relief of ischemic chest discomfort
- Reduce amount of myocardial necrosis
- Treat acute life-threatening complications



















## TRIAGE

- Chest pain/severe epigastric pain, non-traumatic:
  - Substernal compression or crushing chest pain
  - Pressure, tightness, heaviness, cramping, burning
  - Unexplained indigestion, belching, epigastric pain
  - Radiation to the neck, jaw, shoulders, back, or arms
- With or without associated dyspnea/only dyspnea
- With or without associated diaphoresis/only diaphoresis
- With or without associated nausea and/or vomiting





















# **INITIAL TREATMENT**

- Triage promptly to the red category
- Place on a trolley
- Ensure CAB, ask for immediate ECG
- IV line
- Cardiac monitor
- Oxygen (if SpO2 < 90%)
- Aspirin (325 mg)
- History, Examination























# HISTORY

## **Character and location of pain**

- Retrosternal (from the lower jaw to upper abdomen)
- Crushing, tightening, squeezing or pressure-like
- Stabbing less likely (22%)
- Pleuritic very unlikely (6%)
- Point pain unlikely to be ischemic

## Onset

Onset during sleep





















## Precipitating and relieving factors for pain

- Exertion; relief with rest
- ACS usually at rest
- Change with respiration Pleuritic
- Change with movement likely non-ischemic

Radiation of pain

**Associated symptoms** 

• Dyspnea, sweating, vomiting, fatigue





















## **Duration**

- Angina lasts for 2-10 minutes
- MI for several minutes to hours
- Benign if lasts for a few seconds or > 12-24 hours

## **Risk factors**

- Age > 40 year
- Smoking
- Male/postmenopausal
- Diabetes

- Hypercholesterolemia
- Hypertension
- Truncal obesity
- Cocaine use
- Family history





















# EXAMINATION

- Vitals; systemic examination Often normal
- Exclude pneumothorax, aortic dissection, etc.
- Bradycardia or tachycardia
- Hypotension, hypertension, or normal
- Pansystolic murmur due to MR (or VSD)
- Crepitation in lungs
- Tenderness of chest wall (8-15% of CAD!!!)
- Raised JVP in RV infarction

























- Within 10 minutes of arrival
- Serial ECGs over 3-6 hours if normal (every 15-30 minutes initially)





















# ECG IN ST ELEVATION MI (STEMI)

## **Definition of STEMI**

• New ST elevation at the J point in two contiguous leads of >0.1 mV

in all leads other than leads V2-V3

• For leads V2-V3,  $\geq 0.2$  mV in men  $\geq 40$  years;  $\geq 0.25$  mV in men < 40

years; or  $\geq 0.15$  mV in women







# **ECG IN STEMI**



Lateral Leads	I, aVL, V5 – V6	
Inferior Leads	II, III, aVF	
Anterior/Septal Leads	V1-V4	



































# **ECG CHANGES**

## A 54 year old patient presents with right-sided chest pain for 1 hour





















# **ACS – ECG CHANGES**

## A 60-year-old patient with chest pain for 2 hours

























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# A 50 year old patient with chest pain for 4 hours and a BP of 100 mmHg





## Watch out for treatment with NTG!!

















# **ACS – MANAGEMENT**

- IV access and continued monitoring
- Morphine (2-3 mg IV every 5-15 minutes)
- Oxygen (if SpO2 < 90% or CHF)
- Nitrates:
  - Sublingual for 3 doses till pain is relieved
  - $\circ$  IV (if available) for refractory pain, CHF, HT (10 µg/min; titrate) 10% reduction in MAP if normotensive; 30% if HT)
  - $\circ$  Avoid if SBP < 90 mmHg; RV infarction; use of sildenafil in 24 h





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# **ACS – ANTIPLATELETS**

- NSAIDs:
  - Aspirin 150-325 mg to be chewed (non-enteric coated)
  - No other NSAIDs except aspirin (increased mortality, re-infarction, CHF, myocardial rupture)
- ADP-receptor inhibitors (P2Y12 receptor inhibitors):  $\circ$  Clopidogrel – 300 mg stat and then 75 mg od (no loading if age > 75 years)























## **REPERFUSION THERAPY**

30 min





















# ACS – SUMMARY

- Suspect on the basis of symptoms
- ECG is confirmatory for STEMI; may not be available
- PHC treatment is aimed at relieving symptoms of ischemia
- Rapidly shift the patient























# HEART FAILURE-INTRODUCTION

**Definition: The heart's** inability to pump sufficient blood to meet the body's metabolic demands-

- Left heart failure: pulmonary edema
- Right heart failure: Liver congestion, peripheral edema, JVD
- Bi-ventricular failure with signs of both





















# HEART FAILURE – FEATURES

- Fatigue
- Dyspnea on exertion
- Cough
- Orthopnea
- Paroxysmal nocturnal dyspnea
- Leg/ankle/feet swelling
- Weight gain

























# ACUTE HEART FAILURE – FEATURES

- Severe dyspnea (even at rest)
- Hypoxemia (restless, low oxygen saturation)
- Crepitations on lung exam: pulmonary edema
- Maybe hypertensive or hypotensive





















# **ACUTE HEART FAILURE –** TREATMENT

- Airway: ensure patency
- Breathing:
  - Propped up position, oxygen
  - Positive pressure ventilation (CPAP or BiPAP), if available
  - Consider endotracheal intubation / positive pressure ventilation if:
    - Increasing respiratory fatigue
    - Increasing somnolence (hypercarbia)
    - Low oxygen saturation despite maximal oxygen support

























- Circulation:
  - Diuresis: furosemide 40 mg IV
  - Hypertensive: gentle lowering of pressure (unless acute onset)
    - Goal: 20% lowering over 15-60 minutes
    - Isosorbide 5 mg sublingual (may repeat every 5 minutes)
    - Enalapril 5 mg IV or po, if needed
- Hypotensive:
  - Seriously ill, pre-terminal
  - No IV fluids; Dopamine 10 mcg/kg/min IV infusion 0



















# **ACUTE HEART FAILURE –** TRANSFER

- Allow patient to sit up during treatment and in ambulance
- Contact receiving physician prior to transfer to discuss care























# **ACUTE HEART FAILURE –** SUMMARY

- Suspected by symptoms and signs
- Chest X-ray confirmatory, but not be available
- PHC treatment aimed at relieving shortness of breath and hypoxia and stabilizing the blood pressure
- Rapidly shift the patient























# CARDIAC ARREST CARDIAC ARRHYTHMIAS



















# **LEARNING OBJECTIVES**

To understand:

- The sequence of priorities in treatment of a cardiac arrest patient
- Importance of continuous perfusion of the brain and heart during resuscitation
- Principle of high-quality CPR
- Importance of early defibrillation
- Common arrhythmias and their initial treatments























# **YOUR PATIENT**

- 65 year old male walks into PHC complaining of chest pressure and shortness of breath
- He collapses onto the floor while waiting
- He is unconscious and unresponsive
- No pulse/breathing
- This is a Cardiac Arrest!
- Immediate action required!!
- **Blood pressure or pupillary check? Absolute No**
- Each minute delay in CPR ® survival declines by 10%























# **CAB FOR CARDIAC ARREST**

## Circulation

- Continuous, nearly uninterrupted chest compressions
- Defibrillation (unsynchronized; for VF or pulseless VT)

## Airway

- Ensure open airway
- Head tilt / jaw thrust
- Nasopharyngeal or oropharyngeal airway
- Delay intubation; bag-valve-mask ventilation

## **Breathing**

100% high-flow oxygen; 10 ventilations/minute (30:2)









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# CEREBRAL AND CARDIAC PERFUSION IS THE KEY

## **Blood Flow to Vital Organs During Chest Compressions**





















# **SCENE SAFETY AND PRIMARY** ASSESSMENT

- Scene safety: Cardiac arrest can happen anywhere • Middle of traffic, on the highway, near water, due to electric shock
- Primary Assessment
  - Confirm unresponsiveness
  - Cover (with mask- COVID precaution)
  - Feel for a pulse and look for chest rise
- Simultaneously get help





















# **HIGH QUALITY CPR**

Immediately start chest compressions:

- 100-120 compressions/min for 2 minute cycles
- Compress at least 2" (not exceeding 2.4")
- Allow full chest recoil equally important
- Effective only if performed on a hard surface floor
- Requires a dedicated 2-person "compression team"
  - To give compressions alternatively every 2 minutes 0





















# DEFIBRILLATION

- Connect Defibrillator as soon as available
- "STOP compression" for rhythm analysis
  - If Automated External Defibrillator (AED): On prompting by machine "analyzing"
  - If manual defibrillator: team leader decides when to stop
  - Rhythm analysis after every 2 minutes of compressions
  - Quick rhythm analysis (<5 seconds)</li>























- If ventricular fibrillation or ventricular tachycardia present
  - Recognize and charge; alert the team
  - AED will say 'shock advised'
  - If there is no VF or VT, will say "Shock Not advised"
- If VT/VF, press the 'Shock' button
- Aftershock or if the shock is not advised, START compression to perfuse "stunned" myocardium
- Pulse check (<5 seconds) and rhythm check every 2 minutes
- If a pulse is present, the resuscitation is successful.
- If absent, resume compressions and repeat the cycle























## Lead placement

Four positions are equally effective:

- Anterolateral
- Anterior-posterior
- Anterior-left infrascapular
- Anterior-Right infrascapular





















## AED

- Power on
- Attach leads
- Analyze rhythm
- Clear the patient if the shock is advised
- Charge and shock
- Resume CPR





















# **HIGH PERFORMANCE CPR**

- Stop compressions only in 4 instances
- Assessing for pulse every 2 mins
- Assessing rhythm every 2 minutes
- Before the team leader presses the 'Shock' button to deliver a shock
  - Must restart compression immediately after shocking
- When patient regains cardiac output (ROSC)























# **HIGH-PERFORMANCE CPR – AIRWAY**

- Initially: oral airway or nasal airway in place
- Intubation / LMA airway only after 3 or more full cycles of compressions (>6 minutes)
- No break-in compressions for >10 seconds



















# **HIGH-PERFORMANCE CPR –** BREATHING

- If a second person available:
  - Ventilate with BVM at 30:2 compression :ventilation
  - Stop compressions during ventilation if not intubated
  - If intubated, do not stop compressions while 0 ventilating (one breath every 6 seconds)
- If alone, chest compressions for initial 2-3 cycles





















# **HIGH-PERFORMANCE CPR-CIRCULATION**

- Attach a cardiac monitor/defibrillator for monitoring rhythm
- Obtain IV access for medication administration:
  - Epinephrine after second shock if VT/VF
  - Epinephrine as soon as possible if the nonshockable rhythm
  - 1 mg every 3-5 minutes (best after every 2 cycles)
  - Amiodarone/Lidocaine if VT/VF continues
    - Amiodarone: 300 mg IV bolus; repeat 150 mg IV OR
    - Lidocaine: 1 1.5 mg/kg IV bolus; 0.5 0.75 mg/kg IV later





































## CPR Quality

- Push hard (at least 2"; not more than 2.4") and fast (100-120/min)
- Minimize interruptions
- Avoid excessive ventilations
- Change compressor every 2 min
- If no advanced airway, 30:2 ratio

## Shock Energy for Defibrillation

- Biphasic: as per manufacturer recommendations (e.g. initially 120-200 J; if unknown, use maximum available
- Second and subsequent shocks: maximum energy
- Monophasic: 360 J

## Drug therapy

- Epinephrine: 1 mg x 3-5 minutes
- Amiodarone: first dose 300 mg bolus; Second dose: 150 mg bolus OR
- Lidocaine: First dose 1-1.5 mg/kg; Second dose: 0.5 – 0.75 mg/kg

## Advanced airway

## Return of pulse

## **Reversible causes** • Hypovolemia

- Hypoxia

- Hypothermia

- Toxins

• ET or supraglottic airway Confirm by 5-point auscultation • Once advanced airway in place, give one breath every 6 seconds (10 breaths/minute) with continuous chest compressions

Return of spontaneous circulation

• Hydrogen ion (acidosis) • Hypo-/Hyperkalemia Tension pneumothorax • Tamponade, cardiac

• Thrombosis, pulmonary • Thrombosis, coronary



















## **TEAM MEMBERS**

## Doctor:

- Team leader and timekeeper
- Can assist with compressions
- Airway management

**Primary Nurses:** 

- Airway control
- Connect cardiac monitor, begin IV line, administer medications

Ward Boys / Secondary Nurses:

• Alternate chest compressions (if trained)























# **POST-ROSC CARE**

- If the return of spontaneous circulation (ROSC, BP/pulse return):
  - ECG
  - Prevent the patient from becoming warm (avoid excess blankets)
  - Transport to a higher level of care
  - Preferably transport to center with cardiac catherization capability
- If no ROSC after 20-30 minutes, terminate (if no shockable rhythm)





















# **COMMON ARRHYTHMIAS**

## **Tachycardias:**

- Sinus tachycardia
- Supraventricular tachycardia (SVT)
- Atrial fibrillation
- Atrial flutter
- Ventricular tachycardia

## **Bradycardias:**

- Sinus bradycardia
- Junctional bradycardia
- 2nd or 3rd degree heart block





















# **APPROACH TO ARRHYTHMIAS**

- Priorities: C A B
- Determine if rhythm stable or unstable
  - Stable = adequate BP, no signs of shock or ischemia
  - Unstable = hypotensive, signs of shock or ischemia
    - Diaphoresis
    - Confusion / decreased mental status
    - Hypotension
    - Pulmonary edema
    - Myocardial ischemia























# **MANAGEMENT OF TACHYCARDIA**

## Stable Tachycardia:

- No specific treatment required (adenosine/diltiazem if available)
- Apply oxygen
- Transfer to hospital/cardiologist for further treatment

## **Unstable Tachycardia:**

- Circulation: Rhythm must be cardioverted, if available
- If cardioversion is not available, stabilize "CABs" and transfer
- Treatment for a shock: IV fluids (unless in CHF)
- Airway/Breathing: Apply oxygen























## Amiodarone IV Dose:

First dose: 150 mg over 10 minutes.

Repeat as needed if VT recurs. Follow by maintenance infusion of 1 mg/min

## Sotalol IV Dose:

100 mg (1.5 mg/kg) over 5 minutes.

















# **MANAGEMENT OF BRADYCARDIA**

## **Stable:**

- No treatment is required if BP and perfusion adequate
- IV access important
- Frequent monitoring for signs of worsening

## **Unstable**:

- Atropine 1 mg IV and repeat if necessary (total of 3 mg maximum)
- Dopamine or adrenaline IV infusion to increase the rate and BP



























# **SUMMARY – CARDIAC ARREST**

- CAB is the priority sequence
- High-performance CPR
- Early defibrillation is vital, if available

















# SUMMARY – CARDIAC ARRHYTHMIAS

- Determine if the patient is stable or unstable
- Stable patients do not need treatment at the PHC level but should be shifted promptly to a cardiologist for further care
- Unstable patients must be treated and stabilized, then shifted





















- 24 year old male with no co-morbidity, no family history of cardiac ailments
- Experienced chest discomfort and sweating lasting for one hour as he was working out at a gym
- Presented to PHC 90 minutes after the episode
- ECG machine is not available
- What will you do?





















A 51 year male presents to ER in an unresponsive state with carotids not palpable. Identify the **shockable** rhythms:





















A 56 year old female with a history of pelvic fracture is brought in an unresponsive state. Carotids are not palpable. Cardiac monitor shows the following rhythm





















A 56-year-old male is brought with complaints of epigastric pain and vomiting. The patient is in shock.



- Your diagnosis?
- ECG technician wants to go for a cup of tea?









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# Thank You















