# **COMPREHENSIVE STUDY GUIDE: CARDIOVASCULAR & RESPIRATORY EMERGENCIES**

## SECTION 1: CARDIOVASCULAR SYSTEM & EMERGENCIES

### 1. Cardiac Anatomy & Physiology

#### Heart Structure

* Four Chambers:
  + Right atrium (receives deoxygenated blood from body)
  + Right ventricle (pumps blood to lungs)
  + Left atrium (receives oxygenated blood from lungs)
  + Left ventricle (pumps blood to body - strongest chamber)
* Valves:
  + Tricuspid (RA→RV)
  + Pulmonary (RV→pulmonary artery)
  + Mitral (LA→LV)
  + Aortic (LV→aorta)

#### Electrical Conduction System

1. SA Node (pacemaker, 60-100 bpm)
2. AV Node (delays impulse)
3. Bundle of His/Purkinje Fibers (ventricular contraction)

#### Key Concepts

* Cardiac Output (CO) = Heart Rate × Stroke Volume
* Preload (ventricular filling)
* Afterload (resistance heart pumps against)
* Automaticity (heart's ability to self-depolarize)

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### 2. Coronary Artery Disease (CAD)

#### Atherosclerosis

* Plaque buildup in arteries → narrowed lumen → ischemia
* Vulnerable plaques can rupture → clot formation

#### Acute Coronary Syndromes (ACS)

| **Condition** | **Description** | **ECG Changes** | **Treatment** |
| --- | --- | --- | --- |
| Stable Angina | Predictable chest pain, relieved by rest/NTG | ST depression (if any) | Nitro, aspirin |
| Unstable Angina | Increasing frequency/severity, occurs at rest | ST depression/T inversion | ASA, heparin, urgent cath |
| NSTEMI | Partial occlusion, cardiac enzymes elevated | ST depression/T inversion | ASA, heparin, cath |
| STEMI | Complete occlusion, full-thickness damage | ST elevation (>1mm in 2+ leads) | ASA, nitro, PCI within 90min |

### 3. Cardiac Arrest Rhythms

#### Shockable Rhythms

* Ventricular Fibrillation (VF): Chaotic quivering, no CO
* Pulseless VT: Organized but too fast to pump effectively

#### Non-Shockable Rhythms

* PEA: Electrical activity without mechanical function
* Asystole: Flatline (confirm in 2 leads)

#### Chain of Survival

1. Early recognition & 911 call
2. Early CPR (30:2, 100-120 compressions/min)
3. Early defibrillation (within 3-5 min for VF/VT)
4. Advanced care (meds, airway)
5. Post-resuscitation care (TTM, hemodynamic support)

## SECTION 2: RESPIRATORY SYSTEM & EMERGENCIES

### 1. Respiratory Anatomy

#### Upper Airway

* Nose → Pharynx → Larynx (voice box)

#### Lower Airway

* Trachea → Bronchi → Bronchioles → Alveoli

#### Key Structures

* Diaphragm: Primary breathing muscle
* Accessory Muscles: SCM, scalenes (used in distress)

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### 2. Respiratory Physiology

#### Ventilation vs. Respiration

* Ventilation: Air movement (mechanical)
* Respiration: Gas exchange (O₂/CO₂)

#### Control of Breathing

* Central Chemoreceptors (medulla): Respond to CO₂/pH
* Peripheral Chemoreceptors (carotid/aortic): Respond to O₂

### 3. Respiratory Emergencies

#### COPD (Chronic Obstructive Pulmonary Disease)

* Types:
  + Chronic Bronchitis ("Blue Bloater"): Hypoxia, cyanosis
  + Emphysema ("Pink Puffer"): Barrel chest, pursed-lip breathing
* Management:
  + Controlled O₂ (88-92% SpO₂)
  + Bronchodilators (albuterol)
  + CPAP if severe

#### Asthma

* Patho: Bronchospasm + inflammation + mucus
* Status Asthmaticus: Life-threatening, unresponsive to treatment
* Management:
  + Nebulized bronchodilators
  + Steroids (methylprednisolone)
  + Magnesium sulfate (severe cases)

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#### Pulmonary Edema (CHF)

* Causes: LV failure → fluid backup → alveolar flooding
* Symptoms: Pink frothy sputum, crackles, orthopnea
* Management:
  + CPAP (reduces preload/afterload)
  + Nitro (venodilator)
  + Diuretics (furosemide)

#### Pneumothorax

* Types:
  + Spontaneous (tall thin males)
  + Tension (trauma, mediastinal shift)
* Symptoms: Sudden pleuritic pain, diminished breath sounds
* Treatment: Needle decompression (2nd ICS, MCL)

## SECTION 3: ADVANCED MANAGEMENT

### 1. Medications

| **Medication** | **Indication** | **Mechanism** | **Contraindications** |
| --- | --- | --- | --- |
| Aspirin | ACS | Antiplatelet | Allergy, active bleed |
| Nitroglycerin | Angina/CHF | Venodilation | SBP <90, Viagra use |
| Albuterol | Asthma/COPD | Bronchodilation | Tachycardia |
| Furosemide | Pulmonary edema | Diuresis | Hypovolemia |

### 2. Advanced Airway

* OPA/NPA: Unconscious patients
* BVM: Rescue ventilation
* ET Intubation: Gold standard (confirm with capnography)