

Anatomy and Physiology

- **Normal anatomy of the heart and major vessels, valves, coronary circulation, cardiac conduction system, innervation, microcirculation (capillary transport, osmotic pressure, viscosity)**
- **Cardiac cycle:**
  - Control of heart rate
  - Impulse propagation
  - Electrophysiology (ion channels and currents)
- **Blood pressure:**
  - Systolic
  - Diastolic
  - Mean pressure
  - Pulse pressure
  - Systemic and pulmonary vascular resistance
- **Intracardiac pressures:**
  - Preload and afterload
  - Venous return (vascular compliance, intrathoracic pressure, body position)
  - LVEDP
  - Coronary perfusion pressure
  - CVP
  - PAP
  - Pulmonary artery occlusion pressure
- **Ventricular function:**
  - Frank-Starling law
  - CO determinants and measurements
  - Myocardial oxygen utilization
  - Systolic and diastolic function

- **Regulation of CO, BP, and blood volume:**
  - Baroreceptors
  - Baroreceptor reflex
  - Bainbridge reflex
  - Hormonal control
- **Shunts:**
  - Right-to-left
  - Left-to-right
  - Physiologic
- **Valsalva maneuver:**
  - Techniques
  - Indications
  - Physiology

Pathophysiology and Anesthetic Management

- **CAD and valvular heart disease, cardiac stenting (bare metal stents vs. drug eluting stents)**
- **Heart failure, cardiomyopathy, idiopathic hypertrophic subaortic stenosis (IHSS), pulmonary hypertension, physiology of patients with heart transplants**
- **Pericardial effusion, cardiac tamponade, and constrictive pericarditis**
- **PE and air embolism:**
  - Causes
  - Recognition and management
- **Hypertension and hypotension:**
  - Causes and management
  - Intraoperative controlled hypotension
- **Vascular diseases:**
  - AAA
  - Arterial occlusive disease
  - Thoracic aneurysms (ruptures and dissections)

- **Mediastinal mass and superior vena cava syndrome**
- **Intracorporeal and extracorporeal ventricular assist devices, ECMO, intra-aortic balloon pump, total artificial heart, anesthetic implications for patients with ventricular assist devices**
- **Shock states:**
  - Compensated/normotensive shock
  - Decompensated/hypotensive shock
  - Warm shock
  - Cold shock
  - Hypovolemic shock
  - Cardiogenic shock
  - Distributive shock
  - Obstructive shock
  - Dissociative shock
- **Implantable cardioverter defibrillators (ICDs) and cardiac resynchronization therapy (CRT) devices**
- **Temporary, transvenous, permanent, transcutaneous, and subcutaneous CIEDs**
- **Fixed rate, (asynchronous), atrial, ventricular, dual chamber, and biventricular CIEDs**
- **Standard nomenclature for CIEDs**
- **Anesthetic management of patients with pacemakers/ICDs**

#### ACLS and BLS

- **Pharmacology and routes of drug administration (IV/IO/ETT)**
- **Resuscitation guidelines, post resuscitation guidelines, and team responsibilities**
- **Primary, secondary, and diagnostic assessments (H's and T's)**
- **Synchronized cardioversion and defibrillation, pharmacologic cardioversion, AED vs. manual defibrillator**
- **Bradycardia, tachycardia, respiratory arrest, and pulseless arrest algorithms**
- **Management of acute coronary syndrome and stroke**

#### Cardiovascular Implantable Cardiac Devices (CIEDs):

- **Pacemakers**

#### Cardiovascular Monitoring

- **Arterial lines, central lines, and pulmonary artery catheters**
  - Indications, contraindications, and potential complications
  - Equipment, insertion techniques, sites of insertion
  - Monitoring:
    - Arterial blood pressure
    - Central venous pressure (CVP)
    - Pulmonary artery pressure (PAP)
    - Pulmonary artery occlusion pressure (PAOP)
- **Pressure transducers:**
  - Monitoring accuracy
  - Zeroing
  - Effects of gravity
  - Resonance and damping
- **Cardiac output:**
  - Fick principle
  - Thermodilution
  - Mixed and central venous oxygen saturation
  - Calculation of SVR and PVR

- **ECG:**
  - Normal and abnormal rhythm interpretation and management
- **Noninvasive blood pressure (NIBP) monitoring:**
  - Oscillometry and continuous non-occlusive
- **Stroke volume variation monitoring:**
  - Effects of mechanical and spontaneous ventilation
  - Pulsus paradoxus
  - Stroke volume index
  - Monitoring requirements
  - Fluid management
- **Principles of Doppler ultrasonography and echocardiography (use with IVs, arterial lines, central lines, and peripheral nerve blocks)**
  - Antegrade and retrograde cardioplegia
  - Hemodilution
  - Anticoagulation and antifibrinolytic therapy
  - Deep hypothermic circulatory arrest and cerebral protection techniques
  - Normothermic antegrade cerebral perfusion
  - Open vs. closed bypass systems
  - Miniature cardiopulmonary bypass systems
  - Partial cardiopulmonary bypass
  - Left heart bypass
  - Right heart bypass
  - Myocardial preservation
  - Advantages
  - Disadvantages
  - Complications of bypass

### Cardiothoracic And Vascular Surgery

- *Coronary artery bypass graft (CABG), on pump and off pump techniques, open valve replacement, endovascular valve replacement, hybrid coronary revascularization, surgery on the ascending and descending aorta, cardiac transplantation, ventricular assist device placement, pericardiocentesis, pericardial window, left atrial appendage closure, transmyocardial laser revascularization, laser lead extraction, mediastinoscopy, excision of mediastinal mass, aortogram, surgery on the abdominal aorta, lower extremity occlusion surgery, etc.*
- **Cardiopulmonary bypass:**
  - Components of the bypass machine
  - Venous and aortic cannulation techniques
  - Aortic cross clamping
  - Priming solutions

- **Anesthetic steps to on-pump cardiothoracic surgery**
- **Thoracic Surgery:**
  - Anesthetic considerations and management
  - Lung isolation techniques
  - Management of one lung ventilation

### Cardiovascular Drugs

- **Neurotransmitters, types of receptors, target organs, agonists, antagonists, tocolytic uses**
- **Inotropes, vasodilators, vasoconstrictors, antianginal, and antiarrhythmics**
- **Cholinergic Agents, Anticholinergic Agents, and Cholinesterase Agents:**
  - Neurotransmitters
  - Muscarinic and nicotinic effects
  - Cholinergic Crisis

- Anticholinergic Syndrome