

Study Guide
MBBS YEAR I
BLOCK II
MODULE IV
CARDIOVASCULAR SYSTEM
2026-2030

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VISION

National University of Medical Sciences envisions a world with a better quality of life for all by enhancing our contribution to healthcare, education, innovation, and research.



MISSION

To produce competent medical professional graduates equipped with sound knowledge & research capabilities based on scientific principles, imbued with ethics and moral values, primed to serve the community through the profession and pursue research & advanced training in any branch of medicine.

Program Learning Outcomes (PLOs)

By the end of 5-year MBBS program the WMC student should be able to:

- PLO 1. Independently manage common, non-critical clinical problems
- PLO 2. Assist in the management of critically ill patients & demonstrate competency in life saving procedures.
- PLO 3. Exhibit the attributes of an ethical professional.
- PLO 4. Conduct research which brings relevance to health care practices.
- PLO 5. Act as an efficient community health promoter.
- PLO 6. Exhibit scientific knowledge in all professional activities.
- PLO 7. Demonstrate clear and efficient written & verbal communication skills.
- PLO 8. Exhibit the habits of a lifelong learner.

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Introduction to the module:

Dear students

Welcome to the “Cardiovascular System Module” of the first year of MBBS. Building on the fundamental concepts of medical sciences covered in the 1st Block, this module will focus on teaching you specialized topics of the cardiovascular system.

This study guide is organized around themes represented by clinical cases or vignettes, which describe the different ways patients suffering from medical issues related to the cardiovascular system present to the clinics or emergency rooms. The learning objectives are mentioned to guide you to the relevant knowledge and skills. You should refer to these clinical cases during Small Group Discussions (SGDs) and Case-based learning (CBL) sessions. These themes, along with the learning objectives, are presented in the next section in a structured format for your easy understanding.

You will study, building on your previous knowledge from modules covered in the 1st Block, the anatomical details, histology and the stages of embryological development of the thoracic wall, mediastinum and the cardiovascular system as well as different anomalies and anatomical defects that may occur in addition to that you will learn about the normal functioning of the heart and blood vessels, and the interpretation of cardiac functions by interpreting ECG rhythms. You will also be taught about the biochemical role of lipids in the body, and learn about the pathophysiology, diagnosis, and management of various common cardiac diseases that patients commonly present with.

To make you a well-rounded graduate, different subjects from the humanities and various generic competencies are part of the curriculum. Thus, apart from medical subjects, you will study Medical Ethics and Professionalism, Communication Skills, Functional English, Islamiyat, Quranic studies, and photography and videography will be taught as an elective discipline.

Some of the learning strategies you will encounter may be new to you, such as Large Group Interactive Sessions (LGIS), Flipped Classrooms, Small Group Discussions (SGDs), and the most interesting of all, Case-based Learning (CBL). CBL and SGD are scored for your active participation and critical thinking, and the score is counted toward the internal assessment. You will learn the clinical skills in “Skill Lab” and will do laboratory work in Laboratory sessions (practical)

You will undergo formative and summative assessments. Formative assessment will be in the form of tests, quizzes, and scoring of CBL and SGDs, while summative assessment will be done at the end of the Block, comprising both MCQs (multiple-choice questions) and SAQs (short answer questions). The performance exam will be taken at the end of Block I in the form of OSPE (Objective Structured Performance Exam).

Cardiovascular diseases are a major cause of global mortality and morbidity. So let's learn the competencies you will require as a doctor to manage these diseases.

Please feel free to contact me for questions and comments. Let's get started!

Structured summary/overview of themes

Block Code	Y1BIIMIV
Anatomy	➤ Chest Trauma ○ Thoracic wall ▪ Bones of thorax (Sternum, ribs, vertebrae) ▪ Joints of thorax ▪ Thoracic openings ▪ Muscles of thoracic wall ▪ Neuro-vasculature of thoracic wall ➤ Hypertension ▪ Mediastinum • Division, contents and significance of mediastinum • Trachea & bronchi • Large thoracic vessels • Thoracic nerves • Esophagus • Thymus ➤ Chest pain ▪ Pericardium & heart • General anatomy of Circulatory system • Gross anatomy of pericardium & heart • Development of CVS • Histology of Circulatory System ➤ Edema ▪ Lymphoid organs. ➤ Preeclampsia ▪ Fetal period ▪ Placenta & fetal membranes ▪ Multiple pregnancy
Physiology	<u>The Heart</u> • Cardiac Muscle; The Heart as a Pump and Function of the Heart Valves • Rhythmical Excitation of the Heart • Fundamentals of Electrocardiography • Electrocardiographic Interpretation of Cardiac Muscle and Coronary Blood Flow Abnormalities: Vectorial Analysis • Cardiac Arrhythmias and Their Electrocardiographic Interpretation <u>The Circulation</u>

	• Overview of the Circulation: Pressure, Flow, and Resistance • Vascular Distensibility and Functions of the Arterial and Venous Systems • The Microcirculation and Lymphatic System: Capillary Fluid Exchange, Interstitial Fluid, and Lymph Flow • Local and Humoral Control of Tissue Blood Flow • Nervous Regulation of the Circulation and Rapid Control of Arterial Pressure • Role of the Kidneys in Long-Term Control of Arterial Pressure and in Hypertension: The Integrated System for Arterial Pressure Regulation • Cardiac Output, Venous Return, and Their Regulation • Muscle Blood Flow and Cardiac Output During Exercise; the Coronary Circulation and Ischemic Heart Disease • Cardiac Failure • Heart Valves and Heart Sounds; Valvular and Congenital Heart Defects • Circulatory Shock and Its Treatment
Biochemistry	<u>Thoracic Wall & Mediastinum</u> • Classification , chemistry & functions of Lipids • Chemistry & Classification of : • Fatty Acids, Compound Lipids, Steroids • Properties of Lipids, e.g., Rancidity • Digestion & Absorption of Lipids <u>Heart</u> • Synthesis & metabolism of fatty Acids • Metabolism of Triglycerides & Ketone Bodies • Interpretation of Cardiac Biomarkers <u>Vascular System</u> • Synthesis & Fate of Cholesterol, Bile Acids & Bile Salts • Metabolism of Lipoproteins, apolipoproteins • Metabolism of Glycoproteins, Eicosanoids • Interpretation of Lipid Profile
Clinical relevance	• Fractures of sternum, ribs & vertebrae, cervical rib, Flail chest, supernumerary ribs, sternal biopsy, thoracic outlet syndrome, dislocation of ribs, thoracotomy. Intercostal nerve block, thoracocentesis • Insertion of chest tube, Aspiration of foreign bodies • Surgical significance of transverse pericardial sinus, pericarditis, pericardial rub, pericardial effusion, cardiac tamponade, pericardiocentesis • Cardiac catheterization, coronary angiography, myocardial infarction, coronary artery disease, angina pectoris, coronary

	bypass graft, coronary angioplasty, artificial cardiac pacemaker, fibrillation of heart, cardiac referred pain • Central venous line, Congenital heart defects, Atherosclerosis • Tonsillitis. • Lymphadenopathy • Spleenomegaly • Thymic hypoplasia • Low birth weight, IUGR, Preeclampsia, placental barrier, Placental abnormalities, polyhydramnios & oligohydramnios, Abnormalities associated with twins
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Icon index

Case-based learning (CBL)	
Small group discussion (SGD)	
Learning objectives	
Large Group Interactive Session (LGIS)	
Demonstration	
Laboratory Session (Practical)	
Skill Lab sessions	
Clinical case/vignette	
Critical Questions/Guiding Questions	
Interesting facts	
Useful links	
Important	
Self-assessment	

Anatomy

Theme: Chest trauma



Chest trauma in a high-speed motor vehicle collision

A 35-year-old male was involved in a high-speed motor vehicle collision. He was the unrestrained driver, and his chest struck the steering wheel. On arrival at the scene, paramedics noted his rapid and shallow breathing (respiratory rate of 28 breaths per minute), indicating significant respiratory distress. There was tenderness on palpation over the right anterior and lateral chest wall, and crepitus was palpable over several ribs on the right side, strongly suggesting rib fractures. A chest X-ray later confirmed multiple right-sided rib fractures



- Have you ever encountered a person with blunt chest trauma in your experience? What was the outcome?
- What other chest injuries should be suspected in a high-speed collision?
- What immediate interventions are needed to stabilize this patient's breathing?



By the end of this SGD, the first-year MBBS students will be able to:

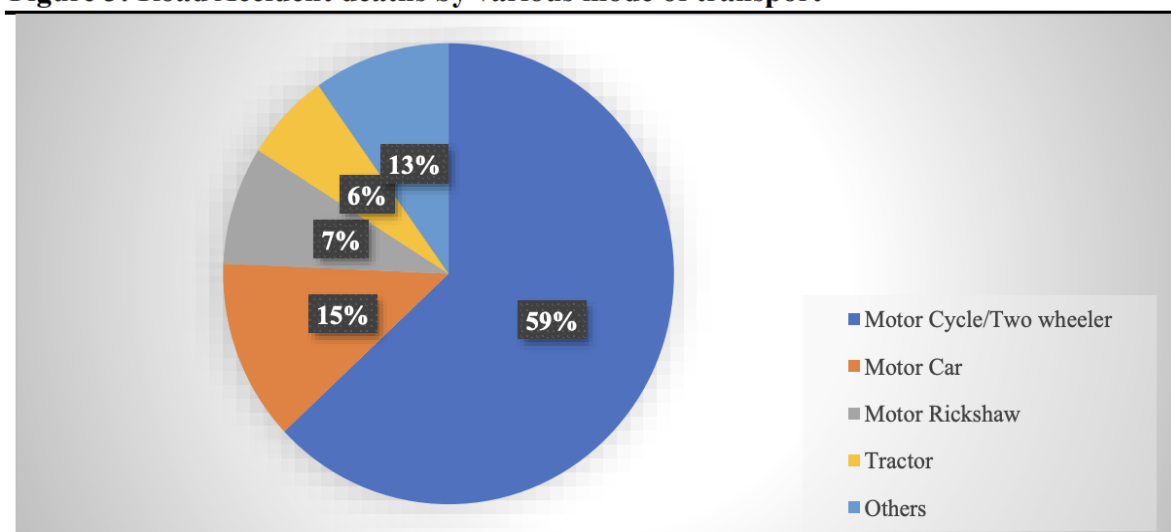


- Correlate the cartilaginous, bony and muscular framework of the thoracic cage with its functional and clinical aspects.
- Explain the gross features of thoracic wall including its blood supply, innervation & lymphatic drainage.
- Describe the joints of thorax with reference to their types and movements
- Differentiate between gross features of typical and atypical thoracic vertebrae and ribs.
- Demonstrate gross features of sternum
- Recognize gross features of thoracic wall, including its layers and contents of a typical intercostal space on prosected specimens and models.
- Identify the major structures of thoracic wall in standard medical imaging.
- Mark the sternal angle on the surface of giving subject, mentioning the importance of sternal angle with reference to great vessels and rib counting.
- Palpate the surface projections to mark major thoracic structures in a basic surface examination, exhibiting ethics, professionalism and effective communication skills.
- Interpret the anatomical basis of the following clinical conditions:

	○ Fractures of sternum, ribs and vertebrae ○ cervical rib ○ Flail chest ○ Thoracotomy ○ Sternal biopsy ○ Thoracic outlet syndrome ○ Dislocation of ribs ● Justify the selection of a site for invasive chest procedures (Intercostal nerve block, chest intubation on right and left side) giving anatomical reason ● Differentiate between gross features of typical and atypical thoracic vertebrae and ribs. ● Demonstrate gross features of sternum ● Recognize gross features of thoracic wall, including its layers and contents of a typical intercostal space on prosected specimens and models. ● Identify the major structures of thoracic wall in standard medical imaging.
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Figure 3: Road Accident deaths by various mode of transport



Reference: National Trends and Patterns in Traffic Road Accidents in Pakistan: A Statistical Analysis. (2024). *Journal of Asian Development Studies*, 13(3), 336-345. <https://doi.org/10.62345/jads.2024.13.3.27>

Theme: Vascular emergency



Hypertensive male with aneurysm

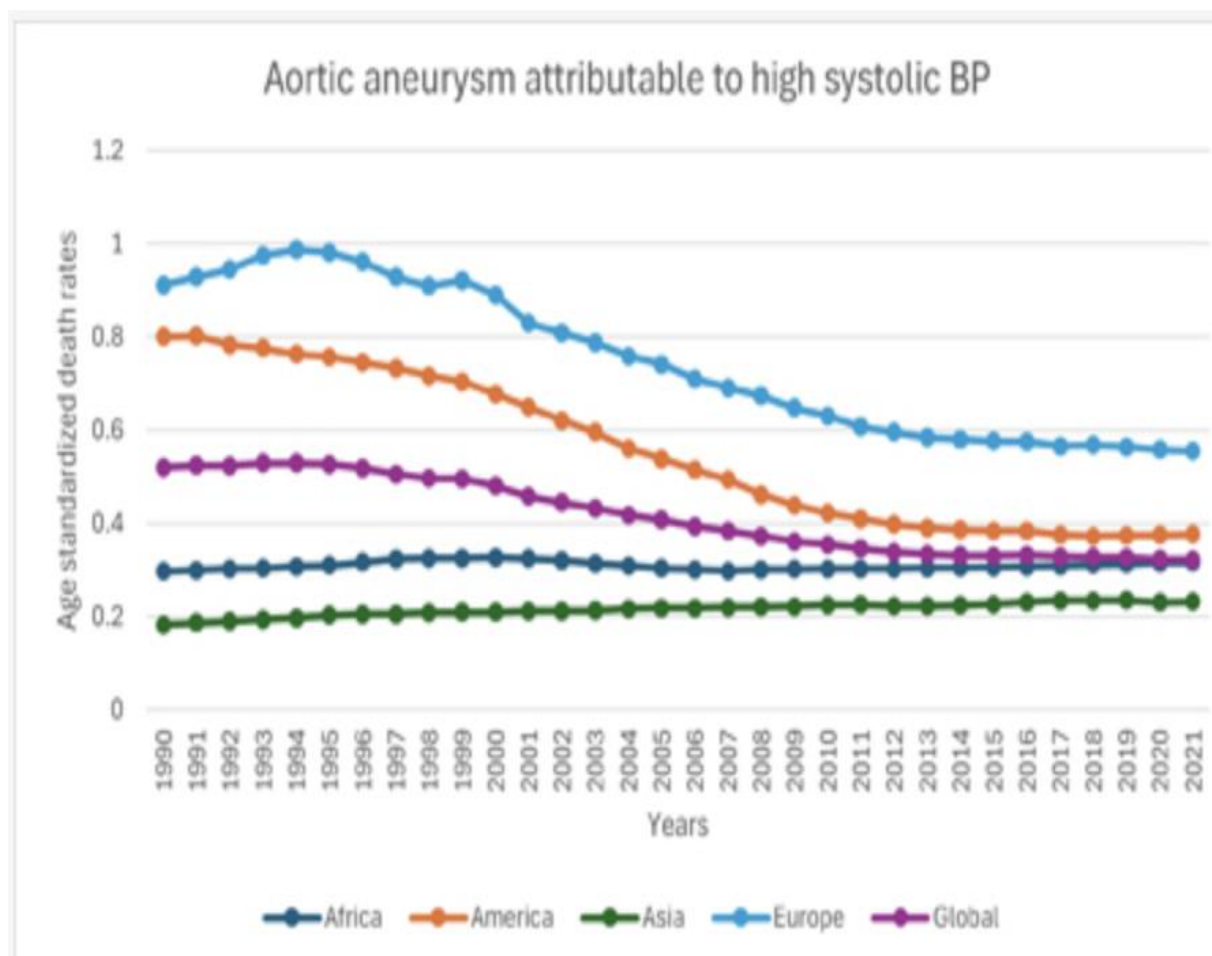
A 72-year-old female with a history of long-standing hypertension and hyperlipidemia presents to the outpatient clinic with complaints of chest discomfort, shortness of breath, and occasional hoarseness of voice. She denies any trauma or recent infection. On examination, her vital signs are stable, but auscultation reveals a soft diastolic murmur at the left sternal border. A chest X-ray shows a widened mediastinum.

A subsequent CT angiography of the chest confirms the presence of a 6.5 cm thoracic aortic aneurysm involving the ascending aorta. Cardiothoracic surgery is consulted, and elective surgical repair is planned due to the size and risk of rupture



- Have you ever heard of a person with an aortic aneurysm?
- Would you consider this a medical or surgical emergency?

	By the end of this SGD the students of first-year MBBS will be able to:
	• Explain the divisions & contents of mediastinum • Explain the topographic anatomy of major longitudinal structures (trachea, esophagus, vagus nerves, phrenic nerves, aorta, sympathetic trunk, azygous system, and thoracic duct) running through the thoracic cavity. • Trace the primary drainage routes of lymph from the organs and the wall of the thoracic cavity to the points of venous connection. • Interpret the anatomical basis of the following clinical conditions: ○ Deflection of the mediastinum ○ Mediastinitis ○ Mediastinal tumors/ cysts ○ Compression of the trachea ○ Tracheitis/ bronchitis ○ Foreign body aspiration ○ Bronchoscopy ○ Aneurysm & coarctation of the aorta ○ Patent ductus arteriosus ○ Azygos veins & caval obstruction ○ Damage/irritation to the phrenic nerve • Identify parts of the tracheobronchial tree in standard medical imaging. • Demonstrate the division and contents of the mediastinum on the models. Outline the course of the trachea and thoracic aorta on the surface of given subject exhibiting ethics, professionalism & effective communication skills.



Reference: *Circulation*

[Volume 150, Number Suppl 1
https://doi.org/10.1161/circ.150.suppl_1.4146702](https://doi.org/10.1161/circ.150.suppl_1.4146702)

Theme: Chest pain



A Patient having chest pain after a heavy meal

A-middle aged businessman, after a heavy meal at a restaurant, walks briskly to join his fellows. He develops retrosternal chest pain, of diffuse character, poorly localized, radiating to inner aspect of his left arm. The pain is slightly reduced after taking nitrates. He is taken to Casualty Department. On arrival, his pulse rate is 95/minute, blood pressure is 80/50 mmHg and he has cold sweats. The heart sounds are normal on auscultation. He informs the doctor that he has been taking medication for hypertension. The consultant directed the trainees for relevant investigations. His Electrocardiogram shows ST-elevation in leads V1-V6, 1 & AVL. Troponin-I is raised in blood. His coronary angiography shows narrowing of 3 coronary arteries



- Have you seen a person with chest pain after a heavy meal?
- Have you ever had to explain the condition like a heart attack to someone?
- How did you approach the conversation?

	By the end of this session, the students will be able to:
	• Relate the topographic anatomy of the pericardium and pericardial sinuses with their functional and clinical aspects. • Explain the gross features of borders, surfaces, apex and base of the heart. • Explain the internal features of various chambers of the heart. • Describe the arterial supply, venous drainage and nerve supply of heart. • Interpret the anatomical basis of pericarditis, cardiac tamponade, pericardial rub, pericardial effusion. • Apply your knowledge of anatomy to appraise the following procedures: Cardiac catheterization, Echocardiography, Coronary angiography, Coronary bypass graft, Coronary angioplasty, Electrocardiography, Paracentesis, Artificial cardiac pacemaker, Central venous line.
	• Interpret the anatomical basis of coronary artery disease/ coronary heart disease (angina pectoris and myocardial infarction). • Apply the anatomical knowledge to interpret a case of chest pain
	• Explain the histomorphological features of heart. • Explain the development of heart with special reference to its looping & septa formation in different parts of heart tube.

	● Explain the embryological basis of following congenital anomalies of heart: Dextrocardia, Atrial septal defects, Premature closure of oval foramen, Ventricular septal defects, Endocardial cushion defects, Tetralogy of Fallot, Persistent truncus arteriosus, Transposition of great vessels, DiGeorge sequence, Valvular stenosis, Ectopia cordis. ● Explain the surgical significance of transverse pericardial sinus.
	● Mark the sternal angle on the surface of giving subject, mentioning the importance of sternal angle with reference to great vessels and rib counting. ● Outline the borders of the heart and the auscultatory areas on the surface of the given subject while exhibiting effective communication skills, professionalism and ethics. ● Identify gross features of heart on museum models and prosected specimens. ● Identify blood vessels of heart on museum models and prosected specimens ● Recognize the developmental events of heart on the given models. ● Identify major features of heart in standard medical imaging
	● Differentiate among various slides of arteries & veins under light microscope in H&E stain ● Differentiate among various lymphoid organs under light microscope in H&E stained slides: Lymph Node, Thymus, Spleen, Palatine Tonsils ● Demonstrate the histomorphological features of circulatory system & lymphoid organs by focusing the slides at various magnifications under light microscope and illustrate them with the help of hematoxylin and eosin.

KARACHI: Every day, 40 to 45 people are brought to the National Institute of Cardiovascular Diseases (NICVD) in Karachi with heart attacks, and alarmingly, 15 percent of these patients are aged between 25 and 40. Experts attributed this rise to increasing obesity, physical inactivity, unhealthy diets, and smoking.

Theme: Heart murmur



An infant with fast breathing during feeding

A 2-month-old infant is brought to the pediatric clinic with concerns of poor weight gain and fast breathing during feeding, classic signs of cardiac strain in an infant. On examination, a continuous murmur was heard at the left upper sternal border, a characteristic finding of a patent ductus arteriosus. An echocardiography definitively showed patent ductus arteriosus, revealing the persistent connection between the aorta and pulmonary artery, which was causing the observed symptoms.

	By the end of this SGD the students will be able to:
	• Describe general plan of systemic, pulmonary and portal circulatory system. • Classify blood vessels on anatomical and functional basis with the help of examples. • Differentiate between anatomical end arteries and functional end arteries by giving examples. • Explain the anatomical basis and clinical significance of collateral circulation • Describe general plan of the lymphatic system of the body.
	• Explain the development of vascular system • Correlate the common congenital anomalies of arterial and venous system with normal developmental process. • Explain fetal circulation by comparing the circulatory changes before and after birth. • Justify the needs of sites of mixing of oxygenated and deoxygenated blood in the fetus • Recognize the developmental events of vascular system on the given models • Correlate the microscopic features of arteries, veins and capillaries with their functional & clinical aspects • Interpret the histomorphological changes in atherosclerosis, arteriosclerosis and Marfan's Syndrome.
	• Differentiate among various slides of arteries & veins under light microscope in H&E stain.

Theme: Edema



A 6-year-old with facial swelling

A 6-year-old boy develops swelling around his eyes and face, which later spreads to his neck and upper limbs. His parents notice that his neck veins appear swollen, and he has trouble lying flat. He also has a mild, dry cough.

No fever, sore throat, or rash reported. Physical examination shows prominent jugular veins, pitting edema on the face and upper limbs, and mild dullness on percussion over the upper anterior mediastinum. Chest X-ray shows a widened mediastinum, while a large anterior mediastinal mass compressing the superior vena cava (SVC) is shown on CT thorax. Biopsy (via mediastinoscopy) is suggestive of thymic hyperplasia with active germinal centers.

	By the end of this session, the students will be able to:
	• Correlate the histomorphological features of the lymph node, thymus, spleen, and palatine tonsil with their functions. • Explain the histological basis of tonsillitis.
	• Demonstrate the histomorphological features of lymphoid organs by focusing on the slides at various magnifications under a light microscope and illustrating them with the help of hematoxylin and eosin. • Differentiate among various lymphoid organs under light microscope in H&E stained slides : ○ Lymph Node ○ Thymus ○ Spleen ○ Palatine Tonsils

Theme: Edema

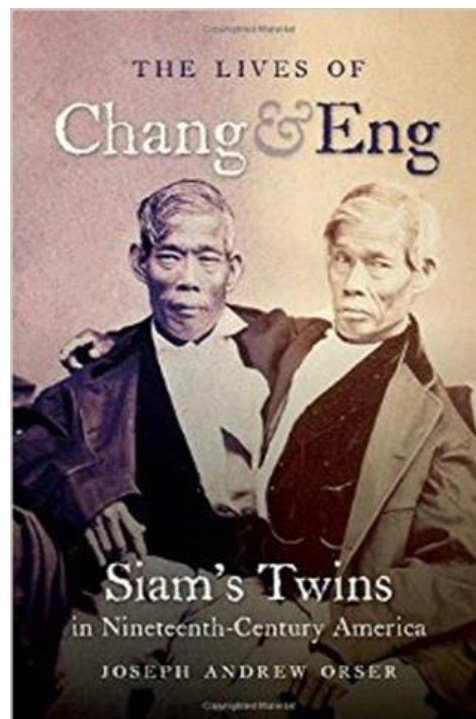


A primigravida with high blood pressure & edema

A 20-year-old primigravida consult an obstetrician at 26 weeks with complaints of severe headache for the past two weeks. Examination and investigations reveal high blood pressure (160/120 mmHg, edema and proteinuria. The obstetrician labels it a high-risk pregnancy and suspects a trophoblastic disorder. Interpret the embryological basis and complications of this disorder.

	By the end of this session, the students will be able to:
	• Summarize monthly changes in fetal period • Calculate the expected date of delivery/ time of birth • Identify the developmental events of fetal period on the given illustrations & museum models • Summarize the monthly changes in fetal period on the given model • Enumerate various methods for estimation fetal age • Differentiate between the terms of IUGR & SGA, mentioning factors affecting fetal growth • Relate the changes in trophoblast to preeclampsia & its complication • Relate the structure of placenta to its functional & clinical relevance • Trace the pathway of placental circulation (maternal & fetal) • Differentiate between composition of placental barrier at various stages of development • Elucidate the mechanism behind the occurrence of various types of multiple pregnancies. • Explain the production, circulation and absorption of amniotic fluid. • Demonstrate types of decidua & chorion, mentioning fate of each on models • Differentiate among the developmental features of various types of villi in the museum models • Differentiate between features of maternal and fetal surfaces of full- term placenta on the model. • Explain the structure of placenta on the given models • Explain the arrangement of fetal membranes in various types of multiple pregnancies on the given models

- Demonstrate the development of umbilical cord on the museum models
- Correlate the following anomalies with the development of placenta:
 - Placenta Previa
 - Placenta accreta, increta, percreta
 - Placenta Succenturiata
 - Placenta Battledore
 - Placenta Velamentosa
- Interpret the embryological basis of amniotic bands and umbilical cord defects
- Interpret the embryological basis of abnormalities related with amniotic fluid volume
- Interpret the embryological basis of abnormalities associated with multiple pregnancies
- Demonstrate types of decidua & chorion, mentioning fate of each on models
- Explain the structure of placenta on the given models



NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Physiology

Electrolyte Imbalances and Their Cardiac Manifestations



A patient with deranged potassium levels

A 35-year-old male with known end-stage renal disease (ESRD) presents to the Emergency Department with complaints of generalized weakness and palpitations for the past 2 hours. He has missed his last dialysis session.

On general physical examination, the patient appears fatigued and slightly confused.

Vitals of the patient were recorded as pulse 40/min (normal=70-80/min), Blood Pressure= 90/60 mmHg (normal=120/80 mmHg), respiratory rate=20 breaths/min(15-18bpm), and oxygen saturation=97% on room air(normal=100%)

Laboratory findings revealed a high serum potassium level of 7.2 mmol/L (Normal range 3.5–5.5 mmol/L)

ECG was conducted, which revealed sinus bradycardia, tall, peaked T waves, widened QRS complexes, and absent P waves

The clinical team suspects life-threatening hyperkalaemia and initiates emergency management.

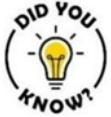


Critical Thinking Questions

1. How does missed dialysis contribute to the development of weakness and palpitations in patients with end-stage renal disease?
2. Why is it critical to differentiate weakness due to hyperkalaemia from other neuromuscular causes in ESRD patients?

	By the end of this session the first-year MBBS students will be able to:	Importance
	<u>Physiology</u> • Differentiate the physiological arrangement of right and left hearts along with the parallel arrangement of systemic circulation. • Trace the path of blood flow through the whole circulatory system with comparisons of pressures in various components of heart and circulatory tree • Explain the basic functional anatomy of the atrioventricular and semilunar valves, and how they operate. • Compare cardiac and skeletal muscle with respect to: cell size, electrical connections between cells, and arrangement of myofilaments, ion permeability, and electrical resistance.	Must Know

	● Describe role of gap junctions in creating a functional syncytium.	
	● Determination of JVP ● By adjusting position of subject's head and neck	Must Know



Your Heart Weighs Less Than a Pound

Despite being just **250–300 grams**, the heart pumps **5–6 liters of blood per minute**, or **7,000–10,000 liters per day**

Heart Sounds Can Reveal A Lot

- Auscultating the heart (S1, S2, murmurs, gallops) can reveal:
 - Valve disorders
 - Heart failure
 - Septal defects
 - And even **pericardial effusion** (muffled sounds)

A Young Girl Feeling of Fullness in the Chest and Sweats



A female student of 1st year, MBBS, suddenly developed a feeling of fullness in the chest and sweating before appearing in the VIVA exam. The college medical officer was called to examine her. On thorough evaluation, there was no history of any such previous event, cardiac disease, or any other relevant medical condition. On examination, she was afebrile, her pulse rate was 104beats /min, blood pressure was 130/85mmHg and respiratory rate was 18breaths /min. Her ECG was normal. She was reassured that her heart is working normally and she will be fine soon.



Critical Thinking Questions

1. What is the cause of feeling of fullness in the chest in this case?
2. Explain the propagation of cardiac impulse and its relationship with heart rate.
3. Describe the generation of pacemaker potential.
4. Identify the differences between the ventricular and pacemaker potential.

	By the end of session the first-year MBBS students will be able to:	Importance
 	• Explain the ionic mechanism of pacemaker automaticity and rhythmicity, and identify cardiac cells that have pacemaker potential and their spontaneous rate. • Identify neural and humoral factors that influence their rate. • Discuss the significance of “overdrive suppression” and “ectopic pacemaker”. • Trace the normal sequence of cardiac activation (depolarization) beginning in the SA node, and the role played by specialized cells of the cardiac conductive system. • Explain the functional significance of the slow conduction through the AV node (delay). Describe factors that influence conduction velocity through the AV node. • Draw a diagram and trace the path of spread of cardiac	Must Know

impulse through conductive system, atrial and ventricular myocardium and associate it with the function of heart.

- Sketch a typical action potential in a ventricular muscle labeling both the voltage and time axes accurately.
- Describe how ionic currents through various ion channels contribute to the four phases of the cardiac action potential.
- Explain what accounts for the long duration of the cardiac action potential and the resultant long refractory period and the advantage of the long plateau of the cardiac action potential and the long refractory period
- Contrast the duration of the action potential and the refractory period in a cardiac muscle and a skeletal muscle.
- Sketch the temporal relationship between AP in a cardiac muscle and the resulting contraction of that cell.
- Explain why cardiac muscle cannot remain in a state of sustained (tetanic) contraction.
- Contrast the sympathetic and parasympathetic nervous system influence on heart rate and cardiac excitation in general. Identify which arm of the autonomic nervous system is dominant at rest and during exercise.
- Discuss ionic mechanisms of these effects on both working myocardium and pacemaker cells.
- Explain how changes in sympathetic activity alter ventricular work, cardiac metabolism, oxygen consumption and cardiac output.
- Recognize the location of vasomotor center.
- Enlist the different parts of vasomotor center and their functions
- Draw, in correct temporal relationship, the pressure, volume, heart sound, and ECG changes in the cardiac cycle. Identify the intervals of iso-volumic- contraction, rapid ejection, slow ejection, iso-volumic relaxation, rapid ventricle filling, slow ventricular filling and atrial contraction.

- Compare the various phases of ventricular systole and ventricular diastole. Contrast the relationship between pressure and flow into and out of the left and right ventricles during each phase of the cardiac cycle.
- Analyze various cardiac events in relation to each other
- Define ejection fraction and calculate it from end diastolic volume, end systolic volume, and/or stroke volume.
- Predict the change in ejection fraction that would result from a change in a) preload, b) afterload, and c) contractility.
- Draw a ventricular pressure volume loop and label the phases and events of the cardiac cycle (ECG, valve movement).
- Describe the role of Starling's Law of the Heart in keeping the output of the left and right ventricles equal.
- Describe the difference in the way changes in preload and changes in contractility influence ventricular force development.
- Define preload and contractility.
- Explain why ventricular end-diastolic pressure, atrial pressure and venous pressure all provide estimates of ventricular preload.
- Explain why ventricular end-diastolic pressure provides the most reliable estimate.
- Explain how arterial pressure influences afterload.
- Describe the impact of changes in preload, afterload, and contractility in determining cardiac performance.

Clinical Relevance:

- Describe the expected auscultation sounds that define mitral stenosis, mitral insufficiency, aortic stenosis, and aortic insufficiency and their physiological basis.
- Comprehend congenital heart diseases like Patent Ductus arteriosus and Tetralogy of Fallot.
- Enlist the types of abnormal heart sounds (murmurs)
- Correlate the systolic and diastolic murmurs with valvular heart diseases like stenosis and regurgitation

	Examine the Heart Sound on Pulmonary, Aortic, Mitral, and Tricuspid areas	Must know
	<u>SKILLS</u> <u>Auscultation of heart</u> - Properly expose and position a subject and identify the different cardiac areas for auscultation of mitral, tricuspid, pulmonary and aortic valves - Demonstrate the auscultation of heart sounds by proper use of stethoscope - Differentiate between first and second heart sounds - Appraise the physiological basis of various heart sounds - Demonstrate the location and palpation of apex beat on precordium - Recognize the displacement of apex beat and its relevance to diseases of heart	



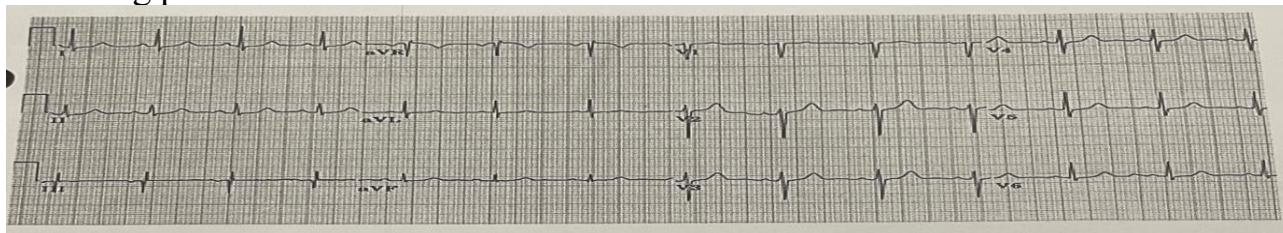
Auscultation Areas Have Nicknames

- The auscultation points are remembered with:
"All Physicians Take Money"
 - Aortic – 2nd right ICS
 - Pulmonary – 2nd left ICS
 - Tricuspid – 4th left ICS
 - Mitral – 5th ICS midclavicular line



Chest tightness and profuse sweating

A 50-year-old male presented in emergency department due to chest pain and palpitations. He is non-smoker, normotensive person who regularly exercises. He was perfectly alright in the morning but after exercise he started having profuse sweating and chest discomfort. There was slight shortness of breath. The symptoms were relieved after some rest. On examination, his blood pressure was 130/90mmHg and pulse rate was 88beats/min. ECG was recorded and showed following pattern:



Critical Thinking Questions

1. How to calculate heart rate from the given ECG.
2. Correlate the electrical events with the ECG segments, waves and intervals.
3. Describe the normal duration and voltage of all waves, segments, and intervals of ECG.
4. Explain various limb leads and their axis.
5. Determine the normal axis of heart.

	By the end of this session the first-year MBBS students will be able to:	Importance
	• Define the term dipole. Describe characteristics that define a vector. Describe how dipoles generated by the heart produce the waveforms of the ECG. • Describe the electrode conventions used by clinicians to standardize ECG measurements. Know the electrode placements and polarities for the 12 leads of a 12 lead electro-cardiogram and the standard values for pen amplitude calibration and paper speed. • Name the parts of a typical bipolar (Lead II) ECG tracing and explain the relationship between each of the waves, intervals, and segments in relation to the electrical state of the heart. • Explain why the ECG tracing looks different in each of the 12 leads. Correlate between vector and lead, type and locations of leads and principles for vector analysis. • Recognize the significance of waves, segments and	Muat Know

	intervals of ECG recording. - Describe the timing and causes of the four heart sounds. - Examine the Heart Sound on Pulmonary, Aortic, Mitral and Tricuspid areas - Record & Interpret normal ECG by placing all the chest and limb leads on an SP	
	- Record & Interpret normal ECG-I by placing all the chest and limb leads on an SP <u>SKILLS</u> <u>Recording of ECG</u> - Practice the procedure to record ECG by placing appropriate chest and limb leads on appropriate points and by adjusting the speed and calibration of the ECG machine - Properly position the patient observing the required precautions during the recording of ECG - Obtain a 12 lead ECG recording with a long lead II for measurement of heart rate and identification of irregular rhythm - Identify normal ECG waves, complexes, segments and intervals - Assess cardiac axis, rhythm, origin of cardiac impulse (pace maker) and calculate heart rate from ECG - Categorize the conditions affecting the ECG recording - Identify bradycardia, tachycardia, and MI by examining the ECG <u>ATTITUDE</u> - Practice the art of taking consent and communicating with the patient prior to conducting ECG - Explain the procedure, reassure and communicate the precautions to be taken by the patient	Must know



The Heart Makes Enough Electricity to Power a Lightbulb

- The electrical activity of the human heart, if harvested, could **power a 1–2 watt LED light**—not much, but still amazing

NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Theme: Recognition and Emergency Management of Acute Coronary syndromes



A High-Risk Patient With Crushing Chest Pain

A 65-year-old male with a history of smoking, diabetes, and hypertension presents to the Emergency Department with sudden onset of severe, crushing chest pain radiating to his left arm. He is diaphoretic and appears distressed. On examination the vitals were recorded as follows BP: 90/60 mmHg, HR: 110 bpm. An ECG revealed ST elevation in leads II, III, and aVF with reciprocal ST depression in leads I and aVL. Laboratory tests confirm elevated Troponin-I levels, consistent with an acute myocardial infarction.



Critical Thinking Questions:

1. How do comorbidities like diabetes and hypertension impact the prognosis and treatment approach?

	By the end of this session the students of first-year MBBS should be able to:	Importance
	• Outline neural and humoral factors that influence their rate and significance of “overdrive suppression” and “ectopic pacemaker”. • Discuss current of injury and describe how it alters the ST segment of the ECG. • Analyze the alteration in conduction responsible for most common arrhythmias: i.e., tachycardia, bradycardia, A V block, bundle branch block, flutter, and fibrillation • Discuss the basis of common cardiac arrhythmias and relate with ECG changes. • Explain the mechanism of myocardial injury during MI and its complications. • Explain the ECG changes in case of ischemia and differentiate them from changes in infarction. • Differentiate between anterior wall MI, lateral wall MI, inferior wall MI and Posterior wall MI based on the leads involved. • Explain the mechanism of myocardial injury during MI • Explain the ECG changes in case of ischemia and differentiate them from changes in infarction. • Correlate the ECG changes from the onset of MI to its progression and identification of changes of old MI. • Differentiate between anterior wall MI, lateral wall MI, inferior wall MI and Posterior wall MI based on the leads involved • Elucidate the significance of cardiac biomarkers in Cardiac	Must know

	Ischemia & Infarction	
	Record & Interpret normal ECG-I by placing all the chest and limb leads on an SP	Must know
	<u>SKILLS</u> <u>Recording of ECG</u> - Practice the procedure to record ECG by placing appropriate chest and limb leads on appropriate points and by adjusting the speed and calibration of the ECG machine - Properly position the patient observing the required precautions during the recording of ECG - Obtain a 12 lead ECG recording with a long lead II for measurement of heart rate and identification of irregular rhythm - Identify normal ECG waves, complexes, segments and intervals - Assess cardiac axis, rhythm, origin of cardiac impulse (pace maker) and calculate heart rate from ECG - Categorize the conditions affecting the ECG recording - Identify bradycardia, tachycardia, and MI by examining the ECG	
	<u>ATTITUDE</u> - Practice the art of taking consent and communicating with the patient prior to conducting ECG - Explain the procedure, reassure and communicate the precautions to be taken by the patient.	



Smoking Is a Powerful Trigger

- Smoking increases **platelet adhesion**, reduces oxygen delivery, and promotes **coronary vasospasm**—dramatically increasing MI risk.

Anterior MIs Are the Most Dangerous

- Anterior wall MI (typically due to **LAD occlusion**) has the **highest mortality** and is more likely to result in **heart failure** or **arrhythmias**.

Posterior MI Can Be Missed Easily

- It doesn't cause ST elevation in standard leads—instead, look for **ST depression in V1–V3** and confirm with **posterior leads (V7–V9)**.

THEME: Diagnosis and Management of Common Cardiac Arrhythmias



A patient with palpitations and fatigue

A 60-year-old female presents to the Emergency Department with complaints of palpitations, fatigue, and mild shortness of breath for the past hour. She has a known history of coronary artery disease but admits to poor medication adherence.

On examination vitals were as follows: Pulse was 130 bpm, irregularly irregular, BP 110/70 mmHg

An ECG showed an irregularly irregular rhythm, absent P waves, and narrow QRS complexes, suggestive of atrial fibrillation.



Critical Thinking Questions:

What factors determine the need for rate control versus rhythm control in this scenario?

	By the end of this session the students will be able to:	Importance
	- Discuss the basis of common cardiac arrhythmias, process that produce them and their clinical significance. - Employ the concept of sinus arrhythmia and its clinical significance. - Compare between first degree, second degree and third degree heart blocks based on pathophysiology and ECG changes. - Describe the basis of overdrive suppression and Stokes Adams attacks - Assess changes in ECG and cardiac function during common abnormalities in ionic composition of body fluids. - Differentiate between fibrillation and flutter based on ECG findings - Describe the significance of defibrillation in emergency cardiac situations	Must know
 Practical & OSPE	- Examination of Apex beat Skills - Palpate and locate apex beat on pericardium. - Explain relevance of displacement of apex beat to the diseases of heart.	Must know

THEME: Early Intervention in Sudden Cardiac Arrest



A patient with apnoea and unable to respond

A 50-year-old male suddenly collapsed while walking through a busy shopping mall. A bystander witnessed the fall and immediately approached the individual. On assessment, the patient was unresponsive and not breathing. Recognizing the emergency, the bystander promptly initiated cardiopulmonary resuscitation (CPR) following Basic Life Support (BLS) guidelines. Another bystander was instructed to call for help and activate the Emergency Medical Services (EMS). CPR was continued until professional help arrived.



Critical Thinking Questions:

- Why is it crucial to minimize the time between recognition of cardiac arrest and the initiation of high-quality CPR?

	By the end of this session the students will be able to:	Importance
	• Perform Cardiopulmonary resuscitation on a dummy according to the American Heart Association Guidelines.	Must know
Practical (OSPE) 	• Perform Cardiopulmonary resuscitation on a dummy according to the American Heart Association Guidelines. <u>SKILLS</u> • Identify factors/indications for CPR • Perform CPR according to American Heart Association guidelines • Practice the art of giving compressions on both adult and infant manikins • Demonstrate the use of Ambu bag with mask	Must Know



CPR Can Double or Triple Survival Rates

- Immediate CPR can **double or even triple** a person's chance of survival after cardiac arrest.



Every Second Counts

- For every minute without CPR, the chance of survival decreases by **7% to 10%**.
- Brain damage can begin just **4-6 minutes** after the heart stops.

THEME: Hypertension- Diagnosis and Initial Management



A Patient with headache

A 60-year-old male with a 10-year history of type 2 diabetes presents to the clinic with complaints of headache. On examination, his pulse is 80 beats per minute and blood pressure is markedly elevated at 180/120 mmHg. He reports having experienced similar episodes in the past but has never been on antihypertensive treatment.

Baseline investigations were ordered, including renal function tests and a lipid profile. The patient was started on Losartan and advised to monitor his blood pressure regularly for 8 days before a scheduled follow-up appointment.



Critical Thinking Questions:

- What lifestyle and pharmacologic strategies can help achieve long-term blood pressure control in this case?

	By the end of this session the students will be able to:	Importance
	• Interpret the Law of Laplace. Describe how it applies to ventricular function in the normal and volume overloaded (failing) ventricle. • Extrapolate the relationship between pressure, flow, and resistance in the vasculature. Apply this relationship to the arteries, arterioles, capillaries, venules, and veins. • Apply Poiseuille's law to understand the flow in distensible blood vessels. Correlate vascular resistance and conductance of blood vessels and association of flow in series vs. in parallel on total resistance. • Compare turbulent and laminar flow, the concept of pressure gradient, resistance to blood flow and its significance. • Compare the physiologic anatomy of different types of blood vessels and their importance. • Discuss the Physiology of vascular compliance, changes in compliance of blood vessels with age & comparison b/w the compliance of arteries versus veins. • Identify the origin of arterial pressure pulse and its	Must Know

propagation to the peripheral arteries.

- Describe the factors damping the arterial pulse and abnormalities of arterial pulse.
- Correlate the right atrial pressure with the factors affecting venous return to heart
- Correlate the venous resistance with Venous valves and muscle pump and gravitational forces with reference to varicose veins
- Describe how the theory of metabolic regulation of blood flow accounts for active hyperemia and reactive hyperemia.
- Identify the role of PO₂, PCO₂, pH, adenosine, and K⁺ in the metabolic control of blood flow to specific tissues.
- Diagram the synthetic pathway for nitric oxide (EDRF, endothelial derived relaxing factor), including substrate and the interplay between endothelium and vascular smooth muscle.
- Describe the role of angiogenesis in providing a long term match of tissue blood flow and metabolic need.
- Identify the cell membrane receptors and second messenger systems mediating the contraction of vascular smooth muscle by norepinephrine, angiotensin II, and vasopressin.
- Identify the cell membrane receptors and second messenger systems mediating the relaxation of vascular smooth muscle by nitric oxide, bradykinin, prostaglandins, and histamine.
- Describe the involvement of endothelial cells in the regulation of vascular diameter and inflammatory responses.
- Describe triple response
- Explain the determinants of cardiac output i.e. stroke volume output and Heart rate and factors affecting them.
- Appreciate the mechanics of low & high cardiac outputs along with their effects on heart.
- Comprehend the factors affecting stroke volume, heart

rate and total peripheral resistance.

- Understand Fick's principle for the measurement of cardiac output.
- Understand the concept of "mean systemic filling pressure," its normal value, and how various factors can alter its value.
- Define venous return. Understand the concept of "resistance to venous return" and know what factors determine its value theoretically, what factors are most important in practice.
- Construct a venous return curve. Predict how changes in right atrial pressure and mean systemic filling pressure effect the venous return
- Understand the principles underlying cardiac output measurements using the Fick, dye dilution, and thermos-dilution methods.

Contrast the local and neural control of cerebral blood flow. Discuss the relative important of O₂, CO₂, and pH in regulating cerebral blood flow.

- Describe the structural components of the blood brain barrier and how this barrier impedes the movement of gases, proteins, and lipids from the blood to neurons.
- Contrast the mechanisms of the two major types of stroke, hemorrhagic and occlusive stroke
- Describe blood pressure measurement with a catheter and transducer and explain the components of blood pressure waveform.
- Contrast the direct and indirect estimation of blood pressure with a sphygmomanometer.
- Given systolic and diastolic blood pressures, calculate the pulse pressure and the mean arterial pressure.
- Describe how arterial systolic, diastolic, mean, and pulse pressure are affected by changes in
 - a) stroke volume
 - b) heart rate
 - c) arterial compliance
 - d) total peripheral resistance
- Comprehend the determinants of arterial pressure,

factors affecting and mechanisms regulating blood pressure on short and long term basis.

- Understand mean arterial pressure and its significance.
- Contrast the sympathetic and parasympathetic nervous system control of heart rate, contractility, total peripheral resistance, and venous capacitance
- Explain the sequence of events in the following that occur after an acute increase or decrease in arterial blood pressure. Include receptor response, afferent nerve, and CNS integration, efferent to the SA node, ventricles, arterioles, venules, and hypothalamus baroreceptor reflex, CNS Ischemic response, Chemoreceptor reflex, Cushing reaction
- Explain the sequence of events mediated by cardiopulmonary volume receptors that occur after an acute increase or decrease in arterial blood pressure. Include receptor response, afferent, CNS integration, efferent to the heart, kidney, hypothalamus, and vasculature.
- Explain the role of renin-angiotensin- aldosterone mechanism with the help of a flowsheet diagram in regulation of BP at intermediate term
- Explain the significance of pressure diuresis and pressure natriuresis in long term regulation of BP
- Contrast the relative contribution of short- and long-term mechanisms in blood pressure and blood volume regulation.
- Examine the Radial Pulse and comment on rate, rhythm and character
- Record the Blood Pressure of a Subject using palpatory and Auscultatory Method
- Record the effects of posture and Exercise on Blood Pressure.

Clinical relevance:

- Tabulate WHO criteria for categorizing different types of hypertension.
- Compare primary and secondary hypertension. Enlist causes of both.

	• Record the Blood Pressure of a Subject using palpatory and Auscultatory Method • Demonstrate the use of stethoscope • Identify various parts of sphygmomanometer and stethoscope • Demonstrate the palpatory & auscultatory methods of recording blood pressure • Record the arterial blood pressure by properly placing the cuff • 2.5 cm above the cubital fossa and placing the stethoscope on the brachial artery on the medial side of biceps tendon. • Recognize the 4 types of Korotokoff sounds, their physiological basis and relevance to systolic and diastolic blood pressure <u>ATTITUDE</u> • Practice the art of taking consent from the subject/patient prior to performance of procedure. • Communicate the procedure effectively to the patient	Must Know
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Too Low Can Be Just as Bad

- While high BP is dangerous, hypotension can cause:
 - Fainting
 - Organ hypoperfusion
 - Shock in critical cases

- Especially dangerous in sepsis, trauma, or elderly patients.



Salt Isn't the Only Culprit

- High sodium contributes to hypertension, but low potassium, stress, alcohol, and poor sleep are also key triggers

	By the end of this session the students will be able to:	Importance
	• Describe the principles of capillary dynamics, structure of interstitium, Starling's forces for fluid exchange across the capillary membrane and factors affecting thereof. • Recognize the concept of starling's equilibrium, and how the interstitial space is kept dry • Explain the mechanism of formation of interstitial	Must know

	fluid, its composition and factors creating Starling's disequilibrium leading to the development of edema. - Describe how histamine alters the permeability of the post capillary venules, and how the loss of albumin into the interstitial space promotes localized edema. - Explain how edema develops in response to: - venous obstruction, - lymphatic obstruction, - increased capillary permeability, - heart failure, - tissue injury or allergic reaction, and - malnutrition. - Identify Types of edema, their pathophysiology and safety factors preventing - edema formation	
	Record the effects of posture and Exercise on Blood Pressure. <u>Measurement of arterial blood pressure</u> - Record the arterial blood pressure by properly placing the cuff 2.5 cm above the cubital fossa and placing the stethoscope on the brachial artery on the medial side of biceps tendon. - Record the effects of changing posture and performing standard exercise on blood pressure <u>ATTITUDE</u> - Practice the art of taking consent from the subject/patient prior to performance of procedure. - Communicate the procedure effectively to the patient	Must know



Pitting vs. Non-Pitting Tells You the Cause

- Pitting edema** = fluid overload or low albumin (e.g., CHF, nephrotic syndrome, liver cirrhosis)

- **Non-pitting edema** = lymphatic or myxedema (e.g., lymphedema, hypothyroidism)

Recognition and Early Management of Shock



A patient with features of Shock

A 65-year-old female presents with cold, clammy skin and rapid breathing. On examination, her blood pressure is 70/50 mmHg, heart rate is 120 bpm, respiratory rate is 26 breaths per minute, and oxygen saturation is 94%. She has a recent history of fever and purulent urine output. Clinical signs include delayed capillary refill and reduced urine output, indicating possible circulatory collapse.



Critical Thinking Questions:

1. What clinical features help differentiate septic shock from other types of shock in this patient?

	By the end of this session the students will be able to:	Importance
	Physiology: Analyze the physiological mechanisms underlying mechanisms underlying cardiac failure and various types of shock, and correlate their clinical presentations with the physiological basis for treatment and management. • Differentiate between the factors causing hyper-effective and hypo effective heart. • Differentiate the mechanisms underlying compensated and uncompensated heart failure. • Explain stages of development of shock. • Differentiate compensated and uncompensated shock.	Must know
	<u>Clinical Relevance</u> • Differentiate between right and left heart failure based on their pathophysiology and clinical manifestation. • Outline the physiology of treatment of cardiac failure • Outline the etiology, presentation and management of: • Hypovolemic shock. • Cardiogenic shock • Anaphylactic shock • Neurogenic shock • Septic shock	
	• Examine the Radial Pulse and comment on rate, rhythm and character <u>Skill</u> <u>Recording of arterial pulse</u>	Must know

- Record the Radial artery pulse by placing three fingers on radial side of semi-pronated arm and counting for one minute.
- Observe the volume, rhythm and character of the pulse
- Compare the radial pulse with the carotid and femoral pulses and note any delay
- Palpate the carotid and dorsalis pedis pulses

ATTITUDE

- Introduce yourself to the subject/patient prior to performance of procedure and take consent
- Explain the procedure of conducting arterial pulse measurement to the patient.



There Are 4 Main Types of Shock

 Easy Mnemonic: "**CHOD**"

- **C**ardiogenic (pump failure)
- **H**ypovolemic (fluid loss)
- **O**bstructive (blockage)
- **D**istributive (vasodilation e.g., sepsis, anaphylaxis, neurogenic)

- **NOTES:**

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Biochemistry

THEME: Electrolyte Imbalances and Their Cardiac Manifestations



A patient with deranged potassium levels

A 35-year-old male with known end-stage renal disease (ESRD) presents to the Emergency Department with complaints of generalized weakness and palpitations for the past 2 hours. He has missed his last dialysis session.

On general physical examination, the patient appears fatigued and slightly confused. Vitals of the patient were recorded as pulse 40/min (normal=70-80/min), Blood Pressure= 90/60 mmHg (normal=120/80 mmHg), respiratory rate=20 breaths/min(15-18bpm) and oxygen saturation=97% on room air(normal=100%) Laboratory findings revealed a high serum potassium level of 7.2 mmol/L (Normal range= 3.5–5.5 mmol/L)

ECG was conducted which revealed sinus bradycardia, tall, peaked T waves, widened QRS complexes and absent P waves

The clinical team suspects life-threatening hyperkalaemia and initiates emergency management.



Critical Thinking Questions

1. How does missed dialysis contribute to the development of weakness and palpitations in patients with end-stage renal disease?
2. Why is it critical to differentiate weakness due to hyperkalaemia from other neuromuscular causes in ESRD patients?

	By the end of this session the first-year MBBS students will be able to:	Importance
	● Define lipids and enumerate their biomedical functions ● Describe lipid classification with examples & biochemical significance including nutritional significance of lipids ● Explain the structure, chemistry, classification and biochemical functions of Fatty acids along with their nutritional role ● Describe the chemistry, functions & biochemical significance of Glycolipids, Phospholipids, Waxes and Steroids e.g. Cholesterol functions and clinical significance.	Must Know

	● Explain rancidity of fats, lipid peroxidation and its biochemical significance ● Discuss the digestion & absorption of Lipids	
	● Analyze the results of Rancidity of Fats	Must Know
	● Correlate the digestion and absorption of lipids with clinical disorders	Must Know
	● Rancidity of Fats	Good to know

Theme: Recognition and Emergency Management of Acute Coronary Syndromes



A High-Risk Patient With Crushing Chest Pain

A 65-year-old male with a history of smoking, diabetes, and hypertension presents to the Emergency Department with sudden onset of severe, crushing chest pain radiating to his left arm. He is diaphoretic and appears distressed. On examination the vitals were recorded as follows BP: 90/60 mmHg, HR: 110 bpm. An ECG revealed ST elevation in leads II, III, and aVF with reciprocal ST depression in leads I and aVL. Laboratory tests confirm elevated Troponin-I levels, consistent with an acute myocardial infarction.



- **Have you seen a person with chest pain after a heavy meal?**
- **Have you ever had to explain the condition like a heart attack to some person? *How did you approach the conversation?***
- ***How do comorbidities like diabetes and hypertension impact the prognosis and treatment approach?***

	By the end of this session the first-year MBBS students will be able to:	Importance
	• Describe the biosynthesis of fatty acids, their regulation and related disorders • Explain the mobilization and Oxidation of fatty acids along with types of oxidation (beta, alpha, omega & branched chain fatty acids), bioenergetics, regulation and related disorders • Elaborate the oxidation of fatty acids with odd number of carbon atoms and oxidation of unsaturated fatty acids • Explain Triglyceride metabolism (Lipogenesis & Lipolysis) • Explain the metabolism of ketone bodies and correlate their utilization and clinical significance in body • Estimate & interpret reports of patients with cardiovascular disease: • Serum Cholesterol, Serum Triglycerides, LDH, CK, Trop T • Elucidate the significance of cardiac biomarkers in Cardiac Ischemia & Infarction • Describe the metabolic disorders of lipid metabolism • Explain the steps of Cholesterol synthesis, regulation along with functions and fate in the body	Must Know

	• Discuss the synthesis, regulation and biochemical functions of Bile Acids and Bile Salts • Elaborate enterohepatic circulation of bile and bile salts • Discuss the metabolism of Lipoproteins (VLDL, LDL, HDL, and Chylomicrons) with respect to their transport, functions and importance in health and disease • Discuss Apolipoproteins and their role in lipoprotein metabolism • Describe the metabolism of Glycoproteins and its related metabolic disorders • Explain the classification, synthesis, biochemical functions and clinical importance of Eicosanoids • Interpret lipid profile • Explain Hypercholesterolemia in relation with pathophysiology of Atherosclerosis	
	• Describe the metabolic disorders of lipid metabolism	Must Know
	• Elucidate the significance of cardiac biomarkers in Cardiac Ischemia & Infarction • Describe the metabolic disorders of lipid metabolism • Explain Hypercholesterolemia in relation with pathophysiology of Atherosclerosis	Must Know
	• Estimation & clinical interpretation of patients with cardiovascular disease: ➤ Serum Cholesterol ➤ Serum Triglycerides ➤ LDH ➤ CK ➤ Trop T • Interpretation of Lipid Profile	Must Know

KARACHI: Every day, 40 to 45 people are brought to the National Institute of Cardiovascular Diseases (NICVD) in Karachi with heart attacks, and alarmingly, 15 percent of these patients are aged between 25 and 40. Experts attributed this rise to increasing obesity, physical inactivity, unhealthy diets, and smoking.

Theme: Recognition and Management of Nephrotic Syndromes



A 2-year-old male toddler weighing 15 kg brought to OPD with a 1-week history of swelling around the eyes and both legs, and generalized body swelling. She had a history of fever, cough and decreased urine output. Examination revealed bilateral pedal oedema (pitting type). Laboratory investigations showed protein in urine, reduced serum albumin (2.0 g/dL) with elevated lipid levels. Although kidney biopsy could not be performed due to economic problem of the family, a diagnosis of idiopathic nephrotic syndrome (NS) was made based on clinical and laboratory findings.



Critical Thinking Questions

1. What could be the cause of edema?
2. What could be the cause of appearance of protein in urine?
3. What is the significance of clinical presentation and albumin?

	By the end of this session the first-year MBBS students will be able to:	Importance
	• Plasma Proteins: • Describe the structure, classification and biochemical functions of Plasma proteins & Immunoglobulins	Must Know
	Clinical Relevance • Describe the clinical disorders associated with Plasma Proteins and Immunoglobulins: ➤ Edema ➤ Malnutrition ➤ Multiple Myeloma	Must Know
	• Describe the clinical disorders associated with Plasma Proteins and Immunoglobulins: ➤ Edema ➤ Malnutrition ➤ Multiple Myeloma	Must Know
	• Estimation and clinical interpretation of Plasma Proteins	Must Know

NOTES:

[illegible]

Important concepts:

Exam style question:

Teacher's expectation:

Assessment Policies:

During the block, you shall be continually formatively assessed in all three learning domains i.e., Cognitive, Psychomotor & Affective. The exam will be integrated with Anatomy , Physiology & Biochemistry as the main subjects with contribution from surgery and medicine.

- The weighting of internal assessment shall be 20% in 1st professional MBBS Examination.
- There shall be two integrated EBE and one integrated pre-annual examination. There will be no 3rd block exam.
- To be eligible to sit in the pre-annual exam a student must pass at least 50% of all the formal formative & summative assessments conducted during the year. The final decision of eligibility to sit in the pre-annual exam for the students failing to meet the requirements will be taken by the respective HODs & the DBOS. This decision will be on a case-to-case basis depending upon the student's performance in all 3 learning domains throughout the year.
- The scores of class tests, each integrated EBE & integrated pre-annual examination shall be used for calculation of the internal assessment.
- The Internal assessment will be calculated according to NUMS curriculum.

Internal Assessment Structure for Theory	
Weighting 20%	
Component	Weightings
1. Attendance in theory learning sessions a. >90%=10 b. 80-89% = 7 c. 75-79% = 5	10%
EBE/ ECE (Theory)	45%
Continuous formal formative assessments- Average score in all the class tests or quizzes during the academic year	20%
Pre-Annual Exam	25%
Total	100%
Internal Assessment Structure for Practical	

Weighting 20%	
Component	Weighting
1. Attendance in practical learning sessions a. >90%=10 b. 80-89% = 7 c. 75-79% = 5	10%
2. OSPE/ OSCE conducted in EBE/ ECE	45%
3. Continuous formal formative assessments- Average score in all the skill tests during the academic year	20%
Pre-Annual Exam	25%
Total	100%

Integrated End Block and Integrated Pre-Annual Examination:

- There will be two integrated end-block examinations, one at the end of each of Y1B1 and Y1B2 blocks & one pre-annual examination at the end of the academic year.
- The structure of the paper of all the end block examination and pre-annual will be the same as that for the annual examination though syllabus will be different.
- The syllabus for integrated EBE will be announced by the department at least 02 weeks prior to examination.
- Integrated Pre-annual examination will include the whole syllabus.
- The date sheet for end block and pre-annual examinations will be prepared by coordinators of 1st & 2nd year while the examinations will be conducted by the respective departments.
- The result will be utilized for calculation of internal assessment which will be submitted to NUMS examination branch at least two weeks prior to the annual exam.

Rules & regulations:

Student's code of conduct

The Student Code of Conduct sets out the standards of conduct expected of students. It holds individuals and groups responsible for the consequences of their actions. Failure to fulfill these responsibilities may result in the withdrawal of privileges or the imposition of sanctions.

Wah Medical College is a community of students, faculty and staff involved in learning, teaching, research and other activities. All members of WMC community are expected to conduct themselves in a manner that contributes positively to an environment in which respect, civility, diversity, opportunity and inclusiveness are valued, so as to assure the success of both the individual and the community. The Student Code of Conduct reflects a concern for these values and tries to ensure that members of the WMC can make use of and enjoy the activities, facilities and benefits of WMC without undue interference from others.

WMC STUDENT CODE OF CONDUCT

- Discipline
- Decent dress
- Good Manners
- Smart Turn Out
- Healthy Activities
- No smoking
- No Abusive Language
- Cooperative Attitude
- Respect for All

Feedback on the study guide

We value your feedback and will use it for improvement of this Study guide.

Kindly provide feedback for this study guide. At the email:

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dmewahmedicalcollege@gmail.com