

**Clinical Medicine I
Cardiovascular Objectives**

EKG Labs I, II, III, IV

A. Anatomy and Physiology of the Heart

1. Name and identify the parts of the electrical conduction system of the heart.
2. Name and define various properties of the cardiac cells.
3. Define the following:
 - Depolarization process
 - Repolarization process
4. Define inherent firing rate and give the inherent firing rates of the following:
 - SA node
 - AV junction
 - Ventricles
5. List and define the three basic mechanisms that are responsible for ectopic beats and rhythms.

B. The Electrocardiogram: Basic Concepts and Lead Monitoring

1. Explain what the electrocardiogram (ECG) represents.
2. Articulate the function of the Lead II rhythm strip.
3. Give the characteristics of the following waves and complexes:
 - Normal P wave
 - Abnormal P wave
 - Normal QRS complex
 - Abnormal QRS complex
 - Normal T wave
 - Abnormal T wave
4. Give the characteristics and significance of the following intervals and segments:
 - PR interval
 - QT interval
 - R-R interval
 - ST segment
5. Describe at least one method of determining the heart rate from the ECG or rhythm strip.
6. List and describe the steps in determining the PR interval and the AV conduction ratio.

C. The 12-Lead Electrocardiogram

1. Describe how the six limb leads and six precordial leads of a 12-lead ECG are obtained.
2. List the facing leads that view the following surfaces of the heart:
 - Anterior
 - Lateral
 - Inferior (or diaphragmatic)
 - Right ventricle
3. Define the following terms:
 - Vector
 - Biphasic deflection
4. Define the following terms:
 - Normal QRS axis
 - Left axis deviation (LAD)
 - Right axis deviation (RAD)
 - Indeterminate axis (IND)
5. List the cardiac and pulmonary causes of left and right axis deviation.

1. Define the diagnostic characteristics, cause, and clinical significance of each of the following sinus node rhythms:
 - Normal sinus rhythm (NSR)
 - Sinus arrhythmia
 - Sinus bradycardia
 - Sinus tachycardia
2. Define the diagnostic characteristics, cause, and clinical significance of the following atrial arrhythmias:
 - Premature atrial contractions (PACs)
 - Atrial tachycardia
 - Atrial flutter
 - Atrial fibrillation
 - Paroxysmal supraventricular tachycardia (PSVT)
3. Define the diagnostic characteristics, cause, and clinical significance of the following ventricular arrhythmias:
 - Premature ventricular contractions (PVCs)
 - Ventricular tachycardia (VT)
 - Ventricular fibrillation (VF)/flutter
 - Ventricular escape rhythm
 - Ventricular asystole
4. Define the diagnostic characteristics, cause, and clinical significance of atrioventricular blocks.
 - First-degree AV block
 - Second-degree, type I AV block (Mobitz type I)
 - Second-degree, type II AV block (Mobitz type II)
 - Third-degree (complete AV block)
 - Pacemaker rhythm
5. Name and identify the atrioventricular (AV) node and the parts of the electrical conduction system within the ventricles on an anatomical drawing.
6. Discuss the pathophysiology, causes, and ECG characteristics of the following bundle branch blocks:
 - Right bundle branch block
 - Left bundle branch block
7. List the five major causes of bundle branch.
8. Discuss the pathophysiology of enlargement or hypertrophy of the following heart chambers and list the electrocardiogram (ECG) abnormalities characteristic of each:
 - Right atrial enlargement
 - Left atrial enlargement
 - Right ventricular hypertrophy
 - Left ventricular hypertrophy
9. Identify a rhythm that is stimulated by a pacemaker.

Ischemic Heart Disease

1. List the causes of myocardial ischemia, injury, and infarction.

2. Define myocardial ischemia, myocardial injury, and myocardial infarction and indicate which are reversible and which are not.
3. Identify the three main anatomic locations in the heart where acute myocardial infarctions occur and list the coronary arteries that supply these areas.
4. Describe the changes in the Q, R, and T waves and ST segments in facing and opposite ECG leads in myocardial ischemia, injury, and necrosis and when they appear following the onset of an acute myocardial infarction.
5. Give the measurements characteristic of an abnormally elevated or depressed ST segment.
6. List the diagnostic changes in the Q waves, R waves, ST segments, and T waves in the facing and opposite ECG leads (where applicable) during the early and late phases of the following acute MI:
 - Anterior MI
 - Lateral MI
 - Inferior MI
 - Posterior MI
7. Discuss the characteristics of the pain encountered in an acute MI according to:
 - Frequency of occurrence
 - Location and radiation
 - Quality, intensity, and duration
 - Relation to body movement
 - Associated emotional and psychological manifestations
 - Responsiveness to rest and/or nitroglycerin
8. Discuss the importance of the following in making a diagnosis of acute myocardial infarction (MI) in this early phase:
 - Clinical evaluation
 - ECG changes
 - Serum cardiac markers
9. Describe the sequence of changes in the myocardium that occurs during the four phases of evolution of an acute anterior wall transmural myocardial infarction, including the timing and duration of each phase and sequence.
10. Name the potential complications of acute myocardial infarctions.
11. List the specific symptoms commonly experienced by the patient during an acute MI and their causes under the following categories:
 - General and neurological symptoms
 - Cardiovascular symptoms
 - Respiratory symptoms
 - Gastrointestinal symptoms
12. Discuss diagnostic modalities that may confirm an MI, identify the evolution of the MI over time and the diagnostic modalities' limitations.
13. Describe the medical history one would obtain for a patient with each of the following diagnoses:
 - Stable (classic, exertional) angina
 - Unstable (crescendo, preinfarction) angina
 - Variant (Prinzmetal's) angina and
 - Anginal equivalent.
14. Identify appropriate first line diagnostic tools in the evaluation of angina.
15. List three reasons that a patient with diabetes mellitus (DM) should be considered in a special category with regard to angina and MI.
16. Recognize the diagnostic challenges for heart disease in women and why these differences exist between men and women.

Hyperlipidemia

1. Discuss the incidence of coronary heart disease in men vs women.
2. Summarize in general the pathophysiological sequence of events that underlies the development of atherosclerotic disease.
3. Describe the effect of family history, sex, age, DM, HTN, diet, sedentary life-style, and smoking on hyperlipidemia.
4. Identify the risk factors for cardiovascular disease (modifiable and non-modifiable).
5. List the current "normal" values of total cholesterol, LDL, HDL, and triglycerides for a patient with and without cardiovascular risk factors.
6. Identify the use of C-reactive protein(CRP) as a diagnostic tool in ischemic heart disease.
7. Discuss primary, secondary and tertiary prevention as they relate to hyperlipidemia.
8. Identify the risk factors for cardiovascular disease per NCEP III.
9. Discuss the current NCEP III recommendations for the non-pharmacological management treatment of hyperlipidemia.
10. Recognize the specific populations at greater risk for hyperlipidemia and discuss the ramifications to those people at increased risk.

Hypertension and Hypotension

1. Define systole and diastole in terms of the cardiac cycle.
2. Identify the diagnostic criteria by which a definition of systolic and/or diastolic hypertension is made.
3. Define and describe the etiology of essential, secondary, and malignant hypertension.
4. Recognize non-reversible and reversible risks for elevated blood pressure.
5. Identify the most common clinical presentation of a patient with uncomplicated HTN.
6. Describe the initial work up on a patient with HTN with regard to findings sought on history, physical exam, laboratory, x-ray and EKG.
7. Describe the significance of non-pharmacologic management for reducing hypertension by using diet, exercise, weight loss, and smoking cessation.
8. Discuss end organ damage secondary to HTN found at the eyes, renal, cardiac, and vascular systems.
9. Recognize the secondary causes of HTN associated with the renal system, vascular system, endocrine system, pregnancy, and drug or medication.
10. Describe the etiology, pathology, management, and patient education for orthostatic/postural hypotension.

Introduction to Murmurs and Valvular Heart Disease

1. Define systole and diastole in terms of
 - atrial filling or contraction
 - ventricular filling or contraction

- aortic/pulmonic valve opening or closure
 - mitral/tricuspid valve opening or closure
2. Describe in relationship to systole and diastole the murmurs associated with:
 - aortic stenosis
 - aortic insufficiency/regurgitation
 - mitral stenosis
 - mitral insufficiency/regurgitation
 - mitral valve prolapse
 3. Differentiate between the grades of murmurs.
 4. Describe the physical maneuvers that can be used to accentuate a murmur.
 5. Identify possible etiologies, recognize signs and symptoms, and describe the management of each of the murmurs listed above.
 6. Discuss when referral for surgery is indicated for mitral and aortic valvular disease.
 7. Recognize complications associated with valvular disease.
 8. Discuss the diagnostic tests available to diagnose valvular disease.

Carditis

1. Describe the etiology, pathophysiology, and clinical presentation of endocarditis, myocarditis, and pericarditis.
2. Name the major precipitating cause of endocarditis.
3. Determine the appropriate indication for endocarditis prophylaxis.
4. Discuss the acute treatment of rheumatic heart disease (RHD) as it relates to carditis and current recommendations for prophylaxis in a person with a history of RHD.
5. Discuss EKG, radiologic and/or cardiac echocardiography, and clinical laboratory useful in the differential diagnosis of endocarditis, myocarditis, and pericarditis.
6. Describe the first line treatment of each condition.

Vascular Disease

1. Describe the epidemiology, etiology, and pathophysiology of venous and arterial peripheral vascular disease.
2. Describe the diagnostic assessment (invasive and non-invasive methods) of investigating peripheral artery disease (PAD) and PVD.
4. Differentiate signs and symptoms of arterial and venous vascular disease, their clinical presentation, and the first line management of each of the following conditions:
 - superficial venous thrombosis (SVT)
 - deep venous thrombosis (DVT)
 - chronic and acute arterial occlusive disease
 - phlebitis/thrombophlebitis
 - chronic venous insufficiency
 - varicose veins
 - venous ulceration
5. Describe the etiology and pathophysiology of Raynaud's disease.
6. Identify the vascular manifestations of giant cell arthritis.
6. Describe the etiology and clinical presentation of temporal arteritis, the population at risk, and the potential consequence of unrecognized/untreated disease.
7. Identify the clinical presentation of aortic aneurysm and the criteria for surgical intervention.
8. Outline the general principles of surgical and medical management for vascular disease.
9. Identify emergent situations and those requiring referral.
(Stroke will be covered in CM II in the Neurology Unit.)

Heart Failure

1. Define heart failure (HF).
2. Discuss the clinical presentation of HF.
3. Discuss the etiology of right ventricular, left ventricular, and biventricular failure.

4. Describe the symptoms and physical exam findings of HF and list additional asymptomatic clues on physical exam associated with left and right sided heart failure.
5. Describe the etiology of cor pulmonale, its role in the development of HF, and prognosis.
6. Differentiate between the etiology, pathophysiology, diagnosis, and management of systolic and diastolic failure.
7. List and discuss the merits and limitations of adjunctive aids (imaging, EKG, and laboratory studies) in the diagnosis of suspected HF.
8. Identify the pathologic mechanisms that must be addressed to alleviate the symptoms of CHF, including pulmonary edema, and non-pharmacologic methods that are used to control HF.

Cardiomyopathy

1. Identify the various causes of dilated, hypertrophic, and restrictive cardiomyopathy.
2. Differentiate between the pathophysiology, signs and symptoms, physical exam findings, and first line management of dilated, hypertrophic, and restrictive cardiomyopathy.
3. Describe EKG findings for each of the above cardiomyopathies.
4. Describe the ECG findings for dilated and hypertrophic.
5. Discuss the merits and limitations of EKGs, radiological imaging, and laboratory studies in the differential diagnosis of cardiomyopathy.

Cardiac Laboratory and Diagnostic Procedures

1. Describe each of the following diagnostic tests and indications for use:
 - Cardiac Enzymes/Acute Myocardial Infarction Panel
 - Hypertension Panel
 - Total Cholesterol
 - Lipoprotein Profile
 - Cardiac Risk Assessment
 - EKG
 - Chest X-Ray – Imaging of the heart and great vessels/conventional radiology
 - Nuclear Cardiology
 - PET
 - Thallium vs. SESTAMIBI
 - Multiple-gated blood pool imaging
 - MRI and CT
 - Cardiac Catheterization/Angiography
 - Echocardiogram
 - Two-Dimensional
 - Stress
 - Doppler
 - Trans-esophageal
 - Holter Monitor
 - Rhythm monitor
 - Event monitor
 - 12 lead EKG
 - Brain Natriuretic Peptide (BNP)
2. Discuss the cost of the above diagnostic tests/procedures, risks to the patient, indications for initial and follow-up diagnostic assessment, and patient education regarding these laboratory tests and diagnostic procedures.