CARDIOLOGY UNIT

UNIT DESCRIPTION

The Cardiology unit is approximately 35 hours in length. In this unit, students learn about the structure, function, evaluation and treatment of the heart and vascular system. Evaluation of this important regulatory system includes the ability to perform the relevant history and physical exam, and to recognize symptoms of cardiac abnormality or malfunction.

LEARNING GOALS

Upon completion of this unit, students should be able to:

1. Describe the anatomy and physiology of the heart and peripheral vascular bed.
2. Know the components of the medical history that are pertinent to the evaluation of the cardiovascular system.
3. Describe the techniques in the physical that are directed to the examination of the cardiovascular system.
4. Distinguish specific historical information and physical examination techniques involved in evaluating patients with specific cardiovascular disorders.
5. Explore the risk factors (modifiable and non-modifiable) associated with cardiovascular disease.
6. Identify conduction disturbances and compare and contrast normal and abnormal cardiac rhythms on an EKG tracing.
7. Describe the etiology, pathophysiology, physical and clinical findings associated with specified cardiovascular disorders.
8. Compare the treatments both pharmacological and non-pharmacological and prevention modalities of specified cardiovascular disorders.
9. Recognize and describe radiologic findings associated with cardiac manifestations.
10. Formulate a management plan utilized to evaluate patients with known or suspected cardiovascular disease.
11. Recommend proper utilization of referrals for the cardiac patient.

TOPIC OUTLINE

1. Cardiac Physiology
2. Evaluation of the cardiac patient
3. Valvular Heart Disease
4. Congestive Heart Failure
5. Hypertension
6. Atherosclerosis and Stable Angina Pectoris
7. Syncope
8. Cardiac Testing
9. Cardiomyopathies
10. Acute Coronary Syndrome
11. Rhythm Disturbances
12. Cardiac Pharmacology
13. Cardiac Rehabilitation

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INSTRUCTIONAL OBJECTIVES

**Cardiac Physiology**

1. Differentiate the contributions of sodium, potassium, and calcium in the development and maintenance of the resting membrane potential.
2. Diagram the phases of the action potential and ionic shifts contributing to each phase.
3. Identify the pathway of the cardiac conduction system from the sinoatrial node to the ventricular tissue and describe the electrical activity of each part.
4. Discuss the mechanical actions of actin and myosin within the cardiac contractile myofibrils.
5. Outline the pressure and volume changes that occur through the human heart during a cardiac cycle.
6. Explore the relationship and dependent factors that exist between coronary blood flow and myocardial oxygenation.
7. Compare the simultaneous events occurring during the electrical and mechanical aspects of the cardiac cycle.
8. Define cardiac cell excitability and discuss the effects of excitability on electrical cardiac conduction performance.
9. Discuss metabolic, physical and chemical effects on the resting membrane potential and action potential in relationship to excitability.
10. Define cardiac output and discuss each of its factors including stroke volume, preload, after load, contractility, and heart rate.
11. Review the Frank-Starling curve in association with the factors affecting cardiac mechanical performance as noted in #10.
12. Discuss the reflexes and neural and humoral factors that influence the regulation of blood pressure and cardiac output.

**Evaluation of the Cardiac Patient**

1. Identify the cardinal symptoms for cardiovascular disease.
2. Diagram the location at which the mitral, tricuspid, pulmonic, and aortic murmurs can best be heard.
3. Know the components and proper techniques of the cardiovascular and peripheral vascular examination.
4. Discriminate normal versus abnormal physical exam findings and the clinical significance of these findings.
5. Describe in detail the six qualities of murmurs.
6. Discuss arterial pressure pulse and be familiar with clinical scenarios that the arterial pulses may vary.
7. Describe the technique for measuring jugular venous distension and discuss its physiologic significance.
8. Understand the utility of chest x-ray, electrocardiogram and blood tests in the initial evaluation of the cardiac patient.
Valvular Diseases

1. Review the cardiac anatomy with special attention to the valves.
2. Describe the cardiac physical exam including timing, quality, and location of murmurs and techniques for bedside diagnosis of the most common forms of valvular heart disease.
3. Compare and contrast stenosis versus regurgitation when describing valvular disease.
4. Summarize the hemodynamic effects of valvular heart disease and understand the concepts of pressure versus volume overload.
5. Devise a list of presenting signs and symptoms for left-sided valvular lesions and right-sided valvular lesions.
6. Describe diagnostic tests and procedures used to evaluate valvular disease. Be familiar with the specificity, sensitivity, contraindications, risk and means of interpretation of each.
7. Critique medical versus surgical treatment options for the most common forms of valvular heart disease (MR, MI, AS, AI, MVP).
8. Specify the indications for consultation, referral, and emergency therapy.
9. Know the indications and pharmacologic regimens for endocarditis.

Atherosclerosis and Stable Angina

1. Identify the steps in the pathogenesis of atherosclerosis.
2. Know the modifiable and non-modifiable risk factors for the development of atherosclerosis.
3. Create a list of primary and secondary causes of hyperlipidemia.
4. Know the desired lipid levels and ratio goals for the prevention of atherosclerotic heart disease in adults.
5. Explore the indications for ordering diagnostic tests and procedures used to evaluate a patient with known or suspected atherosclerotic heart disease and unstable angina.
6. Describe the multidisciplinary team approach to risk factor assessment and modification.
7. Explore the therapeutic life styles (TLC) diet and be able to calculate the daily caloric requirement as well as total and saturated fat grams.
8. Describe the indications, mechanism of action, side effects and contraindications for the most commonly prescribed medication available to treat hyperlipidemia.
9. Identify invasive and/or surgical procedures used to treat atherosclerosis and stable angina and their complications.
10. Understand the role of hyperlipidemia in the development of metabolic syndrome.
11. Describe the pathogenesis of angina pectoris and understand the factors which affect myocardial oxygen supply and demand.
12. Differentiate stable, unstable and variant angina based on pathogenesis and clinical presentation.
13. Compare the treatment options available for patients with stable, unstable and variant angina.
14. Explore the prognostic factors associated with angina.
15. Understand the genetics of obesity, cardiovascular disease and hypertension.
16. Review clinical cardiovascular genetics of familial hypercholesterolemia including HDL abnormalities, and metabolic syndrome.
Congestive Heart Failure (CHF)

1. Summarize the causes and precipitating factors of CHF.
2. Explain the pathophysiology of right and left-sided heart failure and know the clinical presentation of each.
3. Describe diagnostic tests and procedures used to evaluate congestive heart failure. Be familiar with the specificity, sensitivity, contraindications, risks and means of interpretation of each.
4. Formulate the management goals in the patient with CHF.
5. Identify the nonpharmacologic management modalities in treating CHF.
6. Know the pharmacologic classes available to treat CHF including angiotensin converting enzyme inhibitors, diuretics, cardiac glycosides, and vasodilators. Understand the advantages and disadvantages and mechanism of action of each class.
7. Differentiate the classes of the New York Heart Association Classification and its implications for prognosis.

Cardiac Testing

1. Describe the procedures used in performing the following noninvasive tests: exercise stress test (with and without a nuclear tracer), pharmacologic stress test, trans-thoracic echocardiogram, transesophageal echocardiogram, Holter monitoring, an event recorder and coronary angiography.
2. Describe the indications, potential complications and contraindications for the noninvasive tests listed in the previous objective.
3. Recognize the limitations of exercise stress testing.
4. Compare and contrast the Bruce protocol and modified Bruce protocols in exercise stress testing.
5. Differentiate between the nuclear tracers Thallium and Sestamibi.
6. Distinguish between Persantine and Dobutamine when used in pharmacologic stress testing.
7. Recommend the specific patient population in whom it is difficult to obtain adequate echocardiograms and accurate nuclear images.
9. Outline the indications and contraindications for coronary angiography, percutaneous transluminal coronary angioplasty, coronary stents and coronary artery bypass grafts.
10. Summarize the patient characteristics that are associated with increased mortality from coronary angiography.
11. Describe the techniques used for angiography, percutaneous transluminal coronary angioplasty, coronary stents and coronary artery bypass grafting and understand the clinical information yielded in each of these procedures.
12. Evaluate the role of adjuvant therapy utilized with stenting.
13. Compare the restenosis rates for angiography, percutaneous transluminal coronary angioplasty, coronary stents and coronary artery bypass grafting.
Cardiomyopathies

1. Review the cardiac anatomy and physiology specifically relating to: cardiac output, stroke volume, preload and afterload.
2. Compare and contrast the three major cardiomyopathies: dilated cardiomyopathy, hypertrophic cardiomyopathy and restrictive cardiomyopathy.
3. Compare the signs and symptoms of each of the three major cardiomyopathies.
4. Explore the diagnostic tests and procedures used to evaluate cardiomyopathies. Be familiar with the specificity, sensitivity, contraindications, risk and means of interpretation of each.
5. Summarize the pharmacologic and surgical treatment options for each of the cardiomyopathies.

Syncope

1. Describe the physiology of syncope.
2. Summarize the incidence of and the mechanisms for the following causes of syncope: neurologic, cardiac, peripheral vascular, respiratory, autonomic, drug-induced and psychiatric.
3. Review the importance of an accurate history in assessing a patient who has had a syncopal episode.
4. Describe diagnostic tests and procedures used to evaluate a patient with syncope. Be familiar with the specificity, sensitivity, contraindications, risk and means of interpretation of each.
5. Formulate an appropriate treatment plan for the patient the patient with syncope.

Cardiac Rehabilitation

1. Define the role that the physical therapist plays in the care of the patient during cardiac rehabilitation.
2. Summarize the goals of cardiac rehabilitation services.
3. Restate the New York Heart Association Classification.
4. Summarize the phases of cardiac rehabilitation and recognize the indications and contraindications to each of them.
5. Know the monitoring parameters used to assess the patient during cardiac rehabilitation.

Cardiac Pharmacology

1. Know the clinical indications for the following classes of cardiac medications: diuretics, beta-blockers, anti-arrhythmic agents, alpha adrenergic receptor blockers, digoxin/inotropes, angiotensin 2 receptor blockers, calcium channel blockers, lipid lowering agents, nitrates, alpha 2-agonists, and angiotensin converting enzyme inhibitors.
2. Understand the mechanism of action, common side effects, contraindications/precautions, routes of administration and dosages of the cardiac medications noted in #1.
3. Recognize the clinical presentation associated with medication overdose in each of the above classes of cardiac medications. Know the appropriate treatment for these drug overdoses.
4. Develop team building and presentation skills via small group activities.

**Hypertension**

1. Evaluate the magnitude of risk for cardiovascular and cerebrovascular diseases associated with hypertension.
2. Define the stages of hypertension.
3. Explore the clinical management outlined by the Joint National Committee on hypertension for each level of blood pressure described in #2.
4. Know the etiologies, signs and symptoms of secondary hypertension.
5. Recommend healthy behavior changes in patients and know the non-pharmacologic approaches to lowering blood pressure.
6. Distinguish the different classes of anti-hypertensive medications; know their mechanisms of action, indications, contraindications and adverse effects.
7. Differentiate hypertensive emergency and hypertensive urgency and know the clinical management of each.

**Rhythm Disturbances**

1. Describe the physiologic causes for common cardiac rhythm disturbances.
2. Summarize the clinical approach to the patient with dysrhythmias.
3. Discuss the treatment methods available for rhythm disturbances including mechanical, electrical, surgical and pharmacologic managements.
4. Know the treatment options used for the following dysrhythmias: symptomatic and asymptomatic bradycardias, sinus tachycardia, atrial tachycardias, atrial fibrillation and flutter, paroxysmal supraventricular tachycardias, wide complex tachycardias, ventricular tachycardia, pulseless ventricular tachycardia, pulseless electrical activity and asystole.
5. Review clinical cardiovascular genetics of Long QT syndrome.

**Acute Coronary Syndrome (ACS)**

1. Know the modifiable and non-modifiable risk factors for ACS.
2. Describe the relationship between oxygen supply and demand in the heart and the pathophysiology of a myocardial infarction (M.I) and unstable angina (UA); including atherosclerosis, thrombosis, and vasospasm.
3. Explore the diagnostic indicators of ACSI, including history, physical examination, EKG, and laboratory tests.
4. Describe the clinical management of acute M.I., including thrombolytic therapy.
5. Understand the potential complications of acute M.I., and know the clinical management of those complications.
6. Formulate a management plan for a patient in the post-M.I. period and understand the long-term management issues.
TEACHING STRATEGIES

Lectures

METHODS OF EVALUATION

Examination 100%

REQUIRED READINGS

Selected Handouts distributed for the Cardiology Unit