MLT 110 - Clinical Hematology Lecture

Approval Date:  
Effective Term:  

Department: MEDICAL LABORATORY TECHNICIAN  
Division: Allied Health/Public Safety  
Units: 3.00  
Grading Option: Letter Grade  
Transferability: CSU Transferable  
Course is: AA/AS Degree  

Contact Hours per Term:  
Lecture/Discussion: 4.00  

Recommended Class Size: 15  
-Rationale: Station limitations.

Discipline/Minimum Qualifications:

Catalog Description:
Presents hematology from the unclassified stem cell in the bone marrow to both normal and abnormal peripheral blood cells, including the procedures used to identify these cells.

Schedule Description:
Presents hematology from the unclassified stem cell in the bone marrow to both normal and abnormal peripheral blood cells, including the procedures used to identify these cells.

Student Learning Outcome:
1. Compare and contrast the blood disorders and correlate cell morphology and laboratory test values for each.

Course Objectives:
1. Explain the study of hematology and summarize its basic concepts and basic morphologies.  
2. Investigate hematopoiesis in the human fetus, newborn and adult.  
3. Evaluate red blood cell (RBC) metabolism as it relates to the RBC membrane, hemoglobin structure and function and RBC metabolic pathways.  
4. Compare and contrast leukocyte maturation in its various stages of normal and abnormal development.  
5. Distinguish between the various anemias and correlate cell morphology and laboratory test values for each type.  
6. Examine specific changes in leukocyte morphology, number and function in relation to diagnosis of disease.  
7. Distinguish between the various types of leukemia classifications and correlate cell morphology and
laboratory test values for each type.
8. Compare and contrast various types of lymphomas, myeloproliferative disorders and lipid storage diseases and correlate cell morphology and laboratory test values for each type.
9. Summarize quality control and quality assurance as it applies to the hematology department of the clinical laboratory.

**Course Content Outline:**

A. The study of hematology with its basic concepts and basic morphologies.
1. The role of blood as a transportation system
2. The three cell types of formed elements of the blood: Erythrocytes, Leukocytes, Thrombocytes.
3. The staining characteristics of blood cell elements.
   a. Nuclear to cytoplasm ratio
   b. Features such as size, nucleus and cytoplasm.
B. Hematopoiesis in the human fetus, newborn, and adult.
   1. Organs responsible for primary hematopoiesis
   2. Organs responsible for secondary hematopoiesis.
C. Red Blood Cell (RBC) metabolism, including membrane, hemoglobin structure and function and RBC metabolic pathways.
   1. Structure and function of the red cell including cell membrane and its components.
   2. Pathways for red cell metabolism and their relation to red cell function.
   3. Hemoglobin structure and function as it relates to hemoglobin synthesis.
      a. Categorization of hemoglobinopathies by amino acid substitution on the globin chain, their clinical impact on the patient and treatment available.
      b. Laboratory test results for each type of hemoglobinopathy
      c. Categorization of thalassemias by their defective production of the globin chains, their clinical impact on the patient and treatment available.
      d. Laboratory test results for each type of thalassemia
D. Erythrocyte maturation in its various stages of normal and abnormal development.
   1. Proper cell maturation sequence of the erythroid series.
   2. Red blood cell indices in the diagnosis of hematological disorders.
   3. Megaloblastic cell maturation of the erythroid series.
   4. Morphologic alterations in erythrocyte color, size (anisocytosis), shape (poikilocytosis), inclusions and common artifacts and abnormal distribution patterns.
   5. Abnormal cell morphologies and possible disease states.
6. Red cell dyscrasias other than anemias.
E. Various anemias, correlating RBC morphology and laboratory test values for each type.
   1. Causes, appearance of cells in the peripheral blood smear and correlated red blood cell indices in hypochromic anemias and iron deficiency anemia
   2. Causes, appearance of cells in the peripheral blood smear and correlated red blood cell indices in megaloblastic anemias.
   3. Causes, appearance of cells in the peripheral blood smear and correlated red blood cell indices in aplastic anemia.
   4. Causes, appearance of cells in the peripheral blood smear and correlated red blood cell indices in hemolytic anemias.
      a. Intracorpuscular RBC hereditary defects of the RBC membrane.
      b. Intracorpuscular RBC enzyme deficiencies.
      c. Acquired intracorpuscular RBC deficiencies.
      d. Extracorpuscular RBC defects.
5. Causes, appearance of cells in the peripheral blood smear, and correlated red blood cell indices in anemias associated with other disorders.

F. Leukocyte maturation in its various stages of normal and abnormal development.
   1. Normal mature blood leukocytes in terms of cell morphology and function.
   2. Staining characteristics of the cellular components in the major leukocytes and differentiation of cells based on these characteristics.
   3. Stages in leukocyte cell development in the three major leukocyte cell lines: Neutrophil, Lymphocyte, Monocyte.

G. Specific changes in leukocyte morphology, number and function in relation to diagnosis of disease.
   1. Changes in neutrophil count and morphology that develop in response to infections.
   2. Quantitative and qualitative disorders of neutrophils correlated with their laboratory findings.
   3. The disorders that present with lymphocytosis.
   4. Differentiate morphological features of infectious mononucleosis and other reactive lymphocytoses.

H. Leukemia classifications and correlation of cell morphology and laboratory test values for each type.
   1. Acute and chronic leukemia.
   2. Risk factors for leukemia.
   3. For the different leukemias, their predominate cell morphology and laboratory test results.

I. Types of lymphomas, myeloproliferative disorders and lipid storage diseases and correlating cell morphology and laboratory test values for each type.
   1. Diagnostic criteria used to characterize lymphoproliferative disorders.
   2. The three most common myeloproliferative disorders.
   3. Lipid storage diseases and their general characteristics.

J. Quality control and quality assurance as it applies to the hematology department of the clinical laboratory.
   1. Quality control material used in the hematology laboratory and standards.
   2. Steps involved in a hematology quality assurance program.
   3. Components involved in the pre-analytical and post-analytical phases of hematology testing.
   4. Westgard rules

**Methods of Instruction:**
Lecture:

**Methods of Evaluation:**
Exams/Tests/Quizzes

Case studies

**Typical Assignments:**

**Reading:**
Textbook chapter assignments Supplemental reference books

**Writing, Problem Solving or Performance:**
Problem solving for chapter study questions Short essay answers for some exam questions Some calculations Problem solving: Case studies to evaluate the student’s ability to apply critical thinking skills to a clinical situation.
Other:

**Required Materials**

**Examples:**

**Book 1**

**Author:** Turgeon, Mary Louise  
**Publication Date:** 2005  
**Publisher:** Lippincott, Williams & Wilkins

**Book 2**

**Author:** Carr, Jacqueline H.  
**Publication Date:** 2008  
**Publisher:** WB Saunders Co.

**Course Preparation:**

**Prerequisite(s):** None  
**Co-Requisite(s):** MLT 110L  
**Recommended:** None