BARTON COMMUNITY COLLEGE
COURSE SYLLABUS

I. GENERAL COURSE INFORMATION

Course Number: MLTC 1502
Course Title: MLT Hematology/Coagulation
Credit Hours: 6
Prerequisite: Phlebotomy national certification eligibility and Anatomy & Physiology and General Microbiology and Fundamentals of Chemistry passed with the minimum of a C or instructor permission.
Division/Discipline: Workforce Training and Community Education Division, Medical Laboratory Technology Program
Course Description: This course presents the theory behind hematologic principles including the formation of blood cells, identification of normal and abnormal blood cells as they correlate to disease. Also included is the study of coagulation, the clotting and fibrinolytic mechanisms of the blood. Students will learn the theory and skills required to perform medical laboratory testing in Hematology and Coagulation. Hands-on laboratory time is required.

II. INSTRUCTOR INFORMATION

III. COLLEGE POLICIES

Students and faculty of Barton Community College constitute a special community engaged in the process of education. The College assumes that its students and faculty will demonstrate a code of personal honor that is based upon courtesy, integrity, common sense, and respect for others both within and outside the classroom.

Plagiarism on any academic endeavors at Barton Community College will not be tolerated. The student is responsible for learning the rules of, and avoiding instances of, intentional or unintentional plagiarism. Information about academic integrity is located in the Student Handbook.

The College reserves the right to suspend a student for conduct that is determined to be detrimental to the College educational endeavors as outlined in the College Catalog, Student Handbook, and College Policy & Procedure Manual. (Most up-to-date documents are available on the College webpage.)

Any student seeking an accommodation under the provisions of the Americans with Disability Act (ADA) is to notify Student Support Services via email at disabilityservices@bartonccc.edu

IV. COURSE AS VIEWED IN THE TOTAL CURRICULUM

This is one of a series of technical courses for the Medical Laboratory Technician Program.

This course is designed to develop the knowledge, competencies and critical thinking related to Hematology and Coagulation and to develop useful job-oriented skills and safety practices for medical laboratory testing. This course includes information, at a minimum, from the current Body of Knowledge for Medical Laboratory Technicians.

Students planning to transfer credit for a baccalaureate degree will be granted transfer credit only as determined by the four year institution.

The transferability of all college courses will vary among institutions, and perhaps even among departments, colleges, or programs within an institution. Institutional requirements may also change without prior notification. Students are responsible to obtain relevant information from intended transfer institutions to ensure that the courses the student enrolls in are the most appropriate set of courses for the transfer program.

V. ASSESSMENT OF STUDENT LEARNING

Barton Community College is committed to the assessment of student learning and to quality education. Assessment activities provide a means to develop an understanding of how students learn, what they know, and what they can do with their knowledge. Results from these various activities guide Barton, as a learning college, in finding ways to improve student learning.

<u>Course Outcomes, Competencies, and Supplemental Competencies</u>

A. Relate the proper specimen collection and handling, type of quality control used, reference ranges, principle of analysis currently available, and sources of analytical errors for each of the analytes discussed or approached in the course.
   1. Demonstrate an understanding of Quality Control, Quality Assurance and HIPAA (Health Insurance Portability and Accountability Act of 1996) Programs.
   2. Identify and explain all aspects of proper specimen management.
   3. Demonstrate proper use and care of associated laboratory equipment.

B. Perform all procedures with regard to prescribed safety protocol and confidentiality.
   1. Exhibit safe laboratory practices according to established laboratory protocol.
   2. Demonstrate proper affective behavior
   3. Exhibit professional conduct and positive interpersonal communication skills with patients, laboratory personnel, and other health care professionals.

C. Correlate abnormal results with the most likely disease process by determining the clinical significance of the findings.
   1. List the most common RBC, WBC and coagulation abnormalities as they relate to clinical findings.

D. Discuss the hematopoiesis and hemostasis process.

1. Define hematopoiesis and differentiate the process as it applies to the fetus, child and adult.
2. Illustrate the major components of a typical cell.
    a. List the functions of the blood cells.
    b. Explain the basic chemical structural composition of hemoglobin and indicate the relationship of heme to globin molecules.
    c. Explain the function of platelets in hemostasis.
    d. Define categories of leukocytes based on site of origin, specific function, interrelationships and morphology.
3. Compare and contrast the major morphological changes during normal hematologic cell maturation in terms of cytoplasmic and nuclear maturation and changes in cell size.
    a. Prepare a chart illustrating the maturation sequence for the white blood cells, red blood cells, megakaryocytes and platelets.
    . b. Paraphrase the general morphologic changes that occur during cell maturation.
4. Define hemostasis and illustrate the hemostatic process.
    a. Develop a list of the blood coagulation factors using standard nomenclature.
    b. Prepare a chart illustrating the interaction of the coagulation factors from activation to formation of a stable fibrin clot.
    c. Explain the function of fibrinolysis.

E. Perform routine (automated or manual) hematological procedures, including the manual differential and morphology and paraphrase the principles for each, as well as selected "special" hematology analyses.

1. Define hematology and define or identify suffixes, prefixes and terms as covered in the material presented.
2. Recommend proper hematology specimen collections.
    a. differentiate the anticoagulants of commonly used venipuncture vacuum tubes used in hematology and explain the mechanism of action within each tube.
    b. Predict the likelihood of encountering active bone marrow from biopsy sites when given the patient's age.
3. List the component analyses of a complete blood count (CBC) and summarize the principles of the automated hematology analyses.
    a. Compute the absolute cell count from a given set of data.
        i. Compute a corrected white blood cell count from a given set of data.
        ii. Identify sources of error in automated cell counting and determine appropriate corrective action.
    b. Distinguish the major red blood cells (RBC) indices and compute each from a given set of data.
    c. List the basic components and general principles of the operation of selected hematology instruments, noting sources of error.
        i. Explain the different principles of automated cell counting.
        ii. Explain the principles of common instruments used for point of care

testing for hemoglobin (HGB), hematocrit (HCT), white blood cell (WBC) counts and platelet (Plt) counts, including advantages and disadvantages associated with the instruments.

iii. Compute the mean, standard deviation and coefficient of variation for a given set of test results, as well as the RCF of a centrifuge at a given RPM.

4. Prepare and stain peripheral blood smears with polychromatic stains and examine under light microscopy.
   a. Demonstrate the proper use of the light microscope.
   b. Perform a differential count with platelet estimation.
   c. Perform and evaluate peripheral blood smear cell morphology.
   d. Evaluate the morphologic abnormalities of white and red blood cells.
   e. Recommend two types of blood smears needed to diagnose malaria.

5. Utilize the manual methods of testing as discussed in class and interpret sources of errors for each.
   a. Outline the principles and procedures of manual methods of white blood cell counting, platelet counting and compute cell counts for each from a given set of data.
   b. Apply the principles and procedures for microhematocrit determinations.
   c. Implement the cyanmethemoglobin method of HGB analysis and compute hemoglobin compounds and variants as covered in this course.
   d. Illustrate a reticulocyte and utilize the principles and procedures for determination of the retic count and compute a count from a given set of data.
   e. Implement the principles and procedures for the determination of the erythrocyte sedimentation rate (ESR).
6. Explain the principles and procedures of hemoglobin electrophoresis and sickle-cell screening.
7. State reference ranges for all parameters as presented in class.

F. Perform and evaluate routine coagulation analyses by automated or semi-automated methods, with competency (as judged with the use of control materials).
   1. Recommend proper hemostasis specimen collection, management and centrifugation.
      a. Explain the criteria for acceptability of hemostasis specimens.
      b. Identify the anticoagulant of commonly used venipuncture vacuum tubes used in hemostasis analyses and explain the mechanism of action.
      c. Predict the effect on hemostasis tests of unacceptable specimens, and the corrective action.
   2. Employ the principles and procedures of each laboratory test used to monitor anticoagulant therapies.
      a. Monitor warfarin using the prothrombin time and international normalized ration (PT/INR).
      b. Monitor standard unfractionated heparin therapy using the activated clotting time (ACT) and the partial thromboplastin time (PTT).
   3. Interpret screening test results collectively to narrow the diagnosis for a patient and recommend additional tests to confirm diagnoses.

a. Explain the principles and procedures for the bleeding time test.
b. Select the appropriate tests for fibrinolysis and accurately interpret results.
ii. Explain the principles and procedures for fibrin degradation products, D-dimer, plasminogen and plasminogen activators.
c. Select the appropriate mix studies to detect factor deficiencies, lupus anticoagulants and specific factor inhibitors.
d. State reference ranges for all parameters as discussed and presented.

G. Interpret and evaluate results for each analysis presented, applying theory to predict possible disease states.
1. Assess the major hematological characteristics and causes of erythrocytic disorders.
2. Define anemia.
a. Differentiate iron deficiency anemia and pernicious anemia.
b. Compare and contrast the major hemoglobinopathies and thalassemias.
c. Summarize the structural anomalies of hemoglobins S and C.
d. Differentiate a hemolytic disorder from hemolytic anemia.
e. Differentiate intravascular and extravascular hemolysis when given clinical and laboratory findings.

H. Explain the major hemostatic characteristics and causes of the following coagulation disorders.
1. Fibrinogen deficiency
2. Hemophilia A and B
3. Von Willebrand's Disease
4. Disseminated Intravascular Coagulation (DIC)
5. Fibrinolysis
6. Hypercoagulable states

I. Assess the major hematological characteristics and causes of erythrocytic disorders, myeloproliferative disorders, leukemias and platelet disorders.
1. Define myeloproliferative disorders.
a. Define Polycythemia Vera and identify clinical symptoms commonly observed in patients with P. Vera.
b. Define essential thrombocythemia.
c. Define and explain chronic myelogenous leukemia (CML) and the clinical phases.
2. Define leukemia.
a. Distinguish between acute lymphoblastic and acute myeloid leukemias.
b. Interpret the results of diagnostic tests for the acute leukemias.
c. Compare the frequency of acute lymphocytic leukemias to chronic lymphoblastic leukemia in children and the elderly.

VI. INSTRUCTOR'S EXPECTATIONS OF STUDENTS IN CLASS

VII. TEXTBOOKS AND OTHER REQUIRED MATERIALS

VIII. REFERENCES

IX. METHODS OF INSTRUCTION AND EVALUATION

X. ATTENDANCE REQUIREMENTS

XI. COURSE OUTLINE

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