NCHSE
National Consortium for Health Science Education

Departmental Rotations
Clinical Laboratory Services

Using the objectives listed below as a **guide** will help you to have a successful rotation in this department. Please remember that you are a visitor in an actual work environment and that patient safety and comfort are the priority of your preceptors. Your visit may be interrupted if they become very busy, please wait patiently until they are free to resume working with you.

The Clinical Laboratory plays an important role in health care delivery through the detection, diagnosis, and treatment of disease. The laboratory is under the direction of specialized physicians called pathologists. Medical Technologists work in the laboratory examining and analyzing tissues, cells, and body fluids (blood, urine, saliva, etc.). They perform many different tests simultaneously using the latest technology. Computers capture the data from cell counters, microscopes, centrifuges, and other laboratory equipment. After data is collected, the pathologists and technologists interpret the results.

OBJECTIVES

At the end of this rotation each student should be able to:

- Identify the main laboratory divisions.
- List the names of the tests commonly performed in the laboratory section they visited and explain the purpose of each.
- Explain the disease or conditions that the laboratory tests help detect or diagnose.
- Name the specimen source (blood, urine, tissue, etc.) for each test observed.
- Identify the equipment used for each test observed.
- Identify the units for measurement used to conduct the test and report the test results.
- State the typical number of tests performed in the laboratory per day.
- Explain how the laboratory communicates with other departments within the hospital. This includes how the laboratory receives requests for tests and how test results are communicated.

During this rotation the students will observe:

- The computers, refrigerated sample storage devices, chemistry, hematology, bacteriology, and virology equipment used in a clinical laboratory.
- Each step (from work order to test results report) in the laboratory process.
- A technologist performing laboratory tests.
- Safety measures and precautions used in the laboratory.

During this rotation the students will have an opportunity to ask questions about:

- The specific tests they see being performed.
- The equipment used in the lab.
- Job responsibilities, educational requirements, and career paths of clinical laboratory staff.

Clinical Laboratory Services
Sample Student Questionnaire Answer Key

Student Name	Career Exploration Supervisor(s)	Date

1. What is studied in clinical laboratory services?

   The analysis of blood and body fluids for the diagnosis of disease or the determination of effectiveness of treatment.

2. Give the job responsibilities and educational requirements for each of the following workers within clinical laboratory services:

   Medical Technologist/Clinical Laboratory Scientist: *The job responsibilities include the analysis of clinician-requested laboratory tests on blood and body fluids using sophisticated instrumentation to provide physicians with critical data necessary for appropriate patient care. Inherent in this job function is the ability to evaluate results and test systems to ensure accuracy. The educational requirements include a Bachelor of Science Degree with a one-year internship in Medical Technology/Clinical Laboratory Scientist. Licensing and/or certification is also required.*

3. Name three tests performed in the laboratory.

   Answers may vary depending on visitation site.

   A. Give the purpose of each of the tests named.

      Answers may vary.

   B. How does each of the tests detect, diagnose, or monitor treatment?

      Answers may vary.

   C. What is the specimen source (tissue, fluid, etc.) for each of the tests?

      Answers may vary.

   D. What units of measurement are used to report the results of each test?

      Answers may vary.

4. Why are Standard Precautions important for laboratory personnel?

   The use of Standard Precautions significantly decreases the risk associated with handling infectious and/or dangerous materials. It is required by laboratory regulatory agencies. Further, proper utilization of Universal Precaution techniques will help assure specimen integrity and prevent cross contamination of samples.

5. What high school courses should you take if you want to work in the Clinical Laboratory Services Department?

   The high school courses a person should take if they want to work in the Clinical Laboratory Services are Math, Biology, Chemistry, Physics, and Microbiology. Answers may vary.

6. If you have taken one of the courses listed above, give one example of how something you learned in the class was used in the laboratory.

   Answers may vary.

MICROBIOLOGY

A. What is a urine culture?

Urine culture is a test to detect harmful bacteria in the urine.

B. What is a blood culture?

Blood culture is a test to detect bacteria or other organisms in the blood.

C. What is the throat culture?

Throat culture is a test to detect harmful bacteria in the throat.

D. What are bacteria?

Bacteria are microorganisms that invade living systems and cause an infection. They are usually treatable with antibiotics.

E. What is a virus?

A virus is a microorganism that invades living systems and causes an infection. They are not usually treated with antibiotics.

F. How do Medical Technologists/Clinical Laboratory Scientists interpret culture results?

Medical Technologists/Clinical Laboratory Scientists interpret culture results by naming the organism and how many are in the culture, such as 1+ to 4+. Expect to see "Identification of an organism that shouldn't be in the specimen"

G. What is an antibiotic? How are antibiotics used to determine the susceptibility of microbial agents?

An antibiotic is a substance capable of killing or weakening bacteria. Different types of antibiotics are mixed with bacteria in test tubes or petri dishes to find out if the bacteria are affected by the antibiotic.

CLIENT SERVICES AND SPECIMEN PROCESSING

A. How is an order for a specimen placed with the laboratory? Is there a Laboratory Information System (LIS) used for the lab orders? What LIS computer system is involved with this operation?

The Laboratory Computer System is used to enter orders for specimens. Orders are entered under the Clinical Lab Order Entry section. Medical record numbers, billing codes, test mnemonics, specimen priority, collection code, date and time are entered into the system for each specimen.

B. How are specimens labeled and tracked to specific patients?

Specimens are labeled with a specific sticker with the patient's name, medical record number, date, time and the phlebotomist's initials.

C. Explain how and why blood specimens are spun in a centrifuge? What are two critical actions needed to be performed on the "daughter" tubes? (Appropriate patient identification and specimen tube.)

Blood specimens in tubes are placed in the centrifuge and spun at a prescribed an appropriate period to separate cells from the serum.

D. Explain the term "pour off" or "aliquot off", referring to a manipulation of a blood specimen after centrifugation.

After the blood specimen has spun in the centrifuge, the serum is poured off or pipetted into aliquot tubes. The tubes go to several/many different laboratory departments to have tests run.

E. Why is a high degree of accuracy critical to the work of this Laboratory area?

A patient' care and treatment are determined by the accurate results of the tests. Inaccuracy could lead to death in extreme cases. Make the point that - 85% of lab errors are analytical.

TRANSFUSION SERVICES

A. What do the terms "blood type", or "type", and "Rh" refer to?

Blood type, or type, and Rh refer to one of the classes (A, B, O and Rh positive or negative) which human blood is separated on the basis of the presence or absence of antigens in the red blood cells.

B. What is an antibody screen?

An antibody screen is a test to look for an immunoglobulin in the patient's blood sample that would react with a foreign, transfused donor cell and cause harm to the patient.

C. What is donor blood?

Donor blood is a unit of blood donated by an individual and processed and tested by a licensed facility. The donor blood is to be given to a patient with a need for oxygen-carrying red blood cells.

D. What is recipient blood?

Recipient blood is a patient's blood sample which is tested for type, Rh and antibodies, so donor units can be selected and matched for the patient.

E. How do the terms "autologous", "volunteer", and "designated" relate to donor blood?

There are three types of donor blood:
- *Autologous - blood donated by a patient and processed to be transfused back to the patient.*
- *Volunteer - blood donated by a volunteer donor.*
- *Designated - blood donated by a person who knows a patient in need of a transfusion and has gone in to donate for that patient.*

F. What is meant by "compatibility testing", or "cross-matching" donor blood with recipient blood?

Donor and recipient blood are cross matched to assure that the patient's (recipient) blood is compatible with the donor. This is done to assure the patient will not have an adverse reaction to the donor blood during a transfusion.

CHEMISTRY

A. Name three instruments used in this area of the Laboratory. Give the function of each:

- *Dimension Chemistry Analyzer - used for serum analysis, (i.e. Glucose, Sodium, and Potassium etc.).*
- *ACA Analyzer - used for therapeutic drug monitoring (i.e. Tegretol, Dilantin, and Lithium levels etc.).*
- *Centrifuge - used to separate serum from cells.*

B. Under what circumstances is a specimen labeled STAT?

A specimen is labeled stat when a patient is in critical condition and the results of the lab values are essential for immediate treatment.

C. Under what circumstances is a specimen labeled “stat” or “timed”?

A specimen is labeled stat or timed when lab results are needed as soon as possible to determine treatment.

D. Under what circumstances is a specimen labeled ROUTINE?

A specimen is labeled routine when lab results are not needed immediately to determine treatment. Routine labs are done daily.

E. Name six specific tests performed in this area of the Laboratory. Give the detection, diagnosis, or therapeutic monitoring associated with each of the tests listed.

- *Glucose - a test to identify diabetes. This test is based on the concentration of glucose in the blood. Most often, blood glucose concentration is determined when the patient is "fasting", or prior to ingestion of food. Fasting blood glucose is a more reproducible and comparative result.*
- *Bilirubin - a test to identify liver disease. This test is based on blood bilirubin levels. The test is useful in premature infants and in patients with liver disease. Both classes of patients have a liver which is not functioning at peak efficiency.*
- *Potassium - a test to identify elevated or decreased levels of potassium. Potassium is an electrolyte (charged ion) that is used by cells to establish a charge across their plasma membrane (maintenance of heart contraction).*
- *Cholesterol - a test to identify if cholesterol is elevated. If elevated, there is risk for heart disease. Cholesterol is a member of the lipid/fat family. Therefore, cholesterol may be used as a "marker" of fat metabolism.*
- *Digoxin - a test to identify level of the therapeutic drug. Used for heart rhythm anomalies.*
- *Theophylline - a test to identify level of a therapeutic drug. Used for asthmatic patients.*

HEMATOLOGY

A. Identify each of the following blood tests: CBC, Diff, PT, and PTT.

- *CBC - Complete Blood Count*
- *Diff - Differential - to report a percentage of different WBC's present*
- *PT - Prothrombin Time - evaluates clotting factors*
- *PTT - Partial Thromboplastin Time - evaluates clotting factors*

B. What is the function of:

1. Red Blood Cells (RBC's, Erythrocytes): *RBC's carry oxygen from the tissues and CO2 from the tissues to the lungs.*
2. White Blood Cells (WBC's, Leukocytes): WBC's are cells that fight infection.
3. Platelets (Plate's, Thrombocytes): *Platelets initiate blood clotting at an open wound to prevent continuous bleeding.*

C. Name the types of WBC's that would be found in the blood of a normal, healthy person.

The types of WBC's that are found in the blood of a normal, healthy person are lymphocytes, monocytes, neutrophils, basophils, and eosinophils.

D. Define hemophilia.

Hemophilia is a disease caused by a lack of clotting factors that result in abnormal bleeding

E. What is "Sickle Cell Anemia"

Sickle Cell Anemia is a disease of the red blood cells where there is an abnormality in the hemoglobin molecule that results in critical periods of anemia.

F. What happens if a person does not have enough platelets?

If an individual does not have enough platelets, their blood will not clot properly and have problems with bleeding. In extreme cases it can lead to death.

G. Name two items (foods or drugs) that will affect the action of platelets.

Aspirin and Tegretol are two drugs that will affect the clotting action of platelets.

Clinical Laboratory Services
Sample Student Questionnaire

Student Name	Career Exploration Supervisor(s)	Date

1. What is studied in clinical laboratory services?

2. Give the job responsibilities and educational requirements for each of the following workers within clinical laboratory services:

   Medical Technologist:

   Medical Technician:

3. Name three tests performed in the Laboratory.

   A. Give the purpose of each of the tests named.

   B. How does each of the tests detect, diagnose, or monitor treatment?

   C. What is the specimen source (tissue, fluid, etc.) for each of the tests?

   D. What units of measurement are used to report the results of each test?

4. Why are standard precautions important for laboratory personnel?

5. What high school courses should you take if you want to work in the Clinical Laboratory Services Department?

6. If you have taken one of the courses listed above, give one example of how something you learned in the class was used in the laboratory.

MICROBIOLOGY

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B. What is a blood culture?

C. What is the throat culture?

D. What are bacteria?

E. What is a virus?

F. How do medical technologists interpret culture results?

G. What is an antibiotic? How are antibiotics used to determine the susceptibility of microbial agents?

CLIENT SERVICES AND SPECIMEN PROCESSING

A. How is an order for a specimen entered into the computer system? What computer system is involved with this operation?

B. How are specimens labeled and tracked to specific patients?

C. Explain how and why blood specimens are spun in a centrifuge?

D. Explain the term "pour off" or "aliquot off", referring to a manipulation of a blood specimen after centrifugation.

E. Why is a high degree of accuracy critical to the work of this laboratory area?

TRANSFUSION SERVICES

A. What do the terms "blood type", or "type", and "Rh" refer to?

B. What is an antibody screen?

C. What is donor blood?

D. What is recipient blood?

E. How do the terms "autologous", "volunteer", and "designated" relate to donor blood?

F. What is meant by "compatibility testing", or "cross-matching" donor blood with recipient blood?

G. What is the significance of the disease AIDS and Hepatitis to donated blood and the handling of blood samples?

CHEMISTRY

A. Name three instruments used in this area of the Laboratory. Give the function of each.

B. Under what circumstances is a specimen labeled STAT?

C. Under what circumstances is a specimen labeled ASAP?

D. Under what circumstances is a specimen labeled ROUTINE?

E. Name six specific tests performed in this area of the Laboratory. Give the detection, diagnosis, or therapeutic monitoring associated with each of the tests listed.

HEMATOLOGY

A. Define each of the following terms: CBC, Diff, PT, and PTT.

B. What is the function of:

1. Red Blood Cells (RBC's, Erythrocytes):
2. White Blood Cells (WBC's, Leukocytes):
3. Platelets (Plate's, Thrombocytes):

C. Name the types of WBC's that would be found in the blood of a normal, healthy person.

D. Define hemophilia.

E. Define sickle cell anemia.

F. What happens if a person does not have enough platelets?

G. Name two items (foods or drugs) that will affect the action of platelets.

Clinical Laboratory Services
Student Evaluation of Rotation

Student Name	School	Date

Facility	Department

1. How would you rate your overall visit to this department? (Circle the number that most closely represents your opinion.)

1	2	3	4	5	6	7	8
Poor							Excellent

2. To what degree did your career exploration supervisor/mentor make you feel welcome? (Circle the number that most closely represents your opinion.)

1	2	3	4	5	6	7	8
Poor							Excellent

3. To what degree was your career exploration supervisor/mentor prepared to answer your questions? (Circle the number that most closely represents your opinion.)

1	2	3	4	5	6	7	8
Poor							Excellent

4. What part of the rotation was most interesting?

_____

_____

5. Write down one interesting lesson, or new fact you learned, while at this visitation site.

_____

_____

6. Write down the name of the class at school in which you might learn more about the interesting lesson in question 5, above.

_____

7. Comments:

_____

_____

Clinical Laboratory Services
Staff Evaluation of Rotation

Student Name	Supervisor/Mentor	Date

Facility	Department

1. Would you want this student back at your site? (circle one) Yes No
   Briefly describe.

   _____

2. How would you rate the students' overall visit to this site? (Circle the number that most closely represents your opinion.)

   1 2 3 4 5 6 7 8
   Poor Excellent

3. The students' attitude during this visit was: (Circle the number that most closely represents your opinion.)

   1 2 3 4 5 6 7 8
   Poor Excellent

4. How would you rate the students' interest in your presentation? (Circle the number that most closely represents your opinion.)

   1 2 3 4 5 6 7 8
   Poor Excellent

5. Did the student ask questions that showed they were engaged with your presentation? (circle one) Yes No

6. Was the student cooperative? (circle one) Yes No Briefly describe.

   _____

   _____

7. Would you like to continue to have students rotate through in your site? (circle one) Yes No
   Briefly describe.

   _____

   _____

8. Comments: _____