**The Practice of Phlebotomy**

1. General Practice of Phlebotomy
2. Due to the wide variety and volume of laboratory tests ordered, blood collection has become an essential skill for health care workers.
3. Individuals are specially trained to collect the correct specimen using a variety of collection techniques.
4. Allows medical laboratory technicians and medical laboratory scientists to devote their time to the actual performance of specimen analysis.
5. A wide variety of health care workers may be trained to draw blood.
6. Phlebotomists may be involved in Point of Care Testing (POCT) which involves bedside collection and testing of patient’s blood.
7. History
8. Blood collection training was much simpler, individuals were trained “on the job” (OJT).
9. Complexity of equipment used and increase in types of tests ordered has increased the demand for individuals to go through a structured training program.
10. Definition of phlebotomy from Greek words, *phlebo*, relates to veins, *tomy*, relates to cutting.
11. The primary duty of the phlebotomist is to collect blood specimens for laboratory analysis.
12. The most common method is by venipuncture, accessing a vein with a needle to obtain blood samples without destroying the integrity of the vein.
13. This is an invasive procedure which must be performed with skill to prevent harming the patient.
14. *Three* purposes for collection and analysis of laboratory samples:
    1. Diagnostic testing
    2. Therapeutic assessment
    3. Monitoring patient’s condition
15. Professionalism
16. Professionalism is the skill, competence or character expected of an individual in a trained profession.
17. Healthcare workers base this on four categories: Respect, service, support and growth.
18. Professional competencies
19. Competency statements describe entry-level skills and tasks.
20. ASCP has competency statements to describe entry-level knowledge and skills of various laboratory professions, including phlebotomy.
21. Professional Ethics
22. ***Principles of right and wrong conduct for the profession.***
23. Doctors have the Hippocratic Oath (400 BC)
24. Do no harm intentionally.
25. Perform according to sound ability and judgment.
26. Do what you’re trained to do, no more.
27. Deal with patients assigned, not those you’re curious about.
28. Keep all patient information confidential.
29. Implied code of ethics for *all* health care professions, most common are:
30. Do no harm to anyone intentionally.
31. Perform according to sound technical ability and good judgment.
32. Respect the patient’s rights.
33. The National Phlebotomy Association has designated the responsibilities of the phlebotomist as follows:
34. Represents the laboratory.
35. Gain and apply knowledge.
36. Maintain accuracy, reliability and reproducibility of results.
37. Respect patient’s bill of rights.
38. Perform specified skills as defined by the hospital or laboratory standards.
39. Professional Behavior
40. Health care professionals have personal responsibility to provide best care possible.
41. Character attributes for phlebotomists include:
42. Sincere interest in health care.
43. Emotional stability and maturity.
44. Accountability for doing things right.
45. Respect for the patient’s rights.
46. Dedication to high standards of performance.
47. Propensity for cleanliness.
48. Pride, satisfaction, and self-fulfillment in the job.
49. Working as member of a team.
50. Enjoy interacting with patients.
51. Professional behavior involves doing the right thing when no one is watching.
52. Appearance, Grooming and Physical Fitness
53. Posture
54. Phlebotomy is done standing up, good posture essential to protect back and neck.
55. Stand erect, avoid slouching.
56. Appear relaxed.
57. Grooming
58. Physical appearance communicates impression.
59. Neat, clean hair.
60. Clean, well groomed fingernails and hands.
61. Scrubs or business casual clothing.
62. Clean lab coat required for specimen processing.
63. Good health habits (nutrition, exercise) improves attitude, appearance and helps reduce stress.
64. Dealing with stress
65. Prevalent in workplace
66. Non-physician lab personnel ranked third in terms of workplace stress.
67. Rapid changes in technology force individuals to adjust to faster paced, pressured life.
68. Physiological changes
69. Increased blood pressure, heart rate, respiration, body metabolism and blood flow.
70. Constant stress can result in chronic high blood pressure, predisposing one to heart attack or stroke.
71. Causes
72. Constant change with little escape from it.
73. The trauma associated with change is overlooked.
74. Phlebotomists change may be: different shift or location, people you work with, supervisor, new techniques or policies, or some or of all of these.
75. Rules for low stress living.
76. Make time your ally, not your master.
77. Associate as much as possible with gentle people.
78. Learn and practice the skill of deep relaxation.
79. Use aerobic exercise
80. Engage in satisfying, meaningful work.
81. Do not let work dominate your entire life.
82. Find some time in every day for complete privacy.
83. Open yourself up to new experiences and self renewing opportunities.
84. Read interesting books and articles.
85. Don’t bite off more than you can chew.
86. Seek rewarding experiences in all dimensions of your life.
87. Surround yourself with cues that affirm positive thoughts and positive approaches to life and that remind you to relax and unwind occasionally.
88. Protective Equipment and Clothing – proper use reduces stress due to safety concerns.
89. Employers are legally required to provide Personal Protective Equipment (PPE).
90. PPE includes: gowns, gloves, masks, laboratory coats and face shields.
91. Safety equipment for processing and disposing of samples is provided.
92. Due to latex sensitivity, a variety of non-latex gloves in appropriate sizes must be provided.
93. Working with Health Care Team Members
    1. Shifts in job roles and responsibilities have changed practice of phlebotomy in some facilities.

b. Downsizing, reorganization and point of care testing (POCT) have resulted in other health care professionals being trained in phlebotomy.

c. Skills for working as a successful team include:

1) Improving technical skills.

2) Effective communication skills

3) Participation in decision making

4) Problem solving

1. Communication Skills in the Patient Care Environment
2. Phlebotomist is a critical link in healthcare.

a. Quality of sample directly impacts the quality of laboratory results.

b. Two components: collection technique and patient (client) interaction.

1. Bedside Manner – this can refer to both in- and out-patient settings.

a. Knock on the patient’s door prior to entering.

b. You never get a second chance to make a good first impression; patients will form an opinion about you in the first 30 seconds of contact.

c. Critical to have all supplies available and approach patient with pleasant facial expression, neat appearance, and professional manner.

d. Blood collection is procedure dreaded most by patients.

e. Introduce yourself and state your mission, informed consent critical.

f. Remain calm, compassionate and professional.

g. Thank patient for cooperation when leaving.

1. Communication issues in the home and ambulatory settings.
   1. Terms used for laboratory testing outside the laboratory setting include: on-site testing, alternate-site testing, near-patient testing, patient-focused testing, point of care testing, and bedside testing.

b. Communications in these environments may take more time due to:

1) More lengthy introduction and explanation.

2) Location of sample collection area.

3) In a home setting must know location of restroom and bed.

4) In a home setting may need a phone to clarify orders.

5) Procedure must be fully explained, especially first time.

6) Meticulous patient identification.

7) Must ensure care of puncture site.

1. Patient Interview

a. Guidelines differ depending on site.

b. Hospitals require the use of two patient identifiers: patient armband name and number compared to requisition and asking patient to state their name which is compared to requisition. **Never ask a patient,** “Are you Mr. Jones?” always ask them to sate their name.

c. Outpatient settings require additional information: driver’s license, date of birth (DOB), address, etc.

d. Verbal and non-verbal cues and listening skills are critical in patient communication; these will be discussed in detail later.

e. If patient is a child, give instructions to parent.

1. Teaching Patients

a. Patient must cooperate for successful procedure.

b. Phlebotomist must provide basic information in a way patient will understand.

c. Define “fasting” or “NPO” if necessary and reasons.

d. Timed testing must be clearly explained to the patient, e.g., glucose tolerance testing, drug testing.

e. Phlebotomists may need to give instructions for urine collection, 24 hour urine collection, stool, or sputum collections.

f. Best to give oral and written instructions in the patient’s language.

6. Communication Strategies

a. Communication techniques involved:

1) Verbal communication

2) Nonverbal communication

3) Active listening

4) Written communication

* 1. Effective communication is critical involving communication loop: sender, receiver and filters, filters are damaging to effective communication.

7. Verbal Communication

a. Language barriers.

1) Must translate medical terminology; bring conversation down to patient’s level of understanding.

2) Use simple, honest terms, look for facial expression indicating understanding.

3) After explaining procedure if patient extends their arm this indicates understanding and agreement to have the procedure done.

4) Never state the “This won’t hurt.”

b. Hearing disabilities or impairments

1) Section 504 of the Rehabilitation Act of 1973, affirms the right of sensory impaired persons, including hearing impaired persons whose primary or exclusive language is sign language, to receive health and related services in inpatient, outpatient, and emergency settings which are equal to, or as effective as, those provided to persons without disabilities.

2) Lip reading (or speech reading)

3) Writing notes and finger spelling

4) Family members and friends

5) Qualified sign language interpreters.

c. Visual impairments

1) Terms used are visually impaired, low vision or sightless.

2) Use Braille

3) When addressing speak directly to patient without raising voice.

4) May need to assist getting them to the draw station. Allow blind person to take your arm. Describe the path you will take as you go to avoid hazards.

5) In an inpatient setting if you move items you must return them to their original place or inform patient of the changes you have made.

6) Let the patient know who is in the room.

7) Respect the blind person and do not ask inappropriate questions about their condition.

8) Think of the patient as a regular person who happens to be blind not as a blind patient.

d. English as a second language

1) Use non-verbal cues like sign language.

2) Find an interpreter.

3) Telephone language lines.

4) Internet translations sites.

5) Learn Spanish, it will increase your employment opportunities (English to Spanish list in your textbook)

6) Speak respectfully and articulate clearly.

e. Cultural diversity

1) There is enormous diversity in populations of all cultures.

2) Respect the integrity of cultural beliefs.

3) Individuals’ explanations for their ill-health and their expectations of health care can affect their acceptance of treatments and the eventual outcome of treatment.

4) All of us are capable of identifying with our own culture and forming prejudiced views about other cultures and other belief systems – the skill is in being aware of this possibility and recognizing when it is occurring.

5) Some cultures may respond to treatment if it is emphasized as “important” rather than “helpful”.

6) Value diversity. In other words, do not merely tolerate people of differing backgrounds and viewpoints, but consider differences as strengths.

7) Conduct a cultural self-assessment.

f. Age

1) Vocabulary used when communicating with a teen is different than for elderly.

2) Be sensitive to word usage, and use appropriately.

3) View presentation Age Specific Care at Internet Resources of Phlebotomy page

g. Tone of voice and inflection can change positive statement into a negative one.

1) Be sure pitch or tone matches words you are trying to communicate.

2) Sarcasm is easily communicated and picked up on by tone.

3) Practice using calm, soothing and confident tone of voice.

4) KEY: calm compassionate, friendly and say it with a smile.

5) AVOID: degrading, whiney, sarcastic, angry, frustrated, patronizing tones.

h. Emergency situations

1) Surgical suite, recovery room or emergency room (ER) are locations which require extra speed and accuracy without losing the “personal touch”.

2) Consider each patient in terms of their dignity, not the “burn case down the hall”, “head injury in 807”.

8. Nonverbal Communication

a. Positive body language.

1) Smiling

2) Good grooming

3) Erect posture

4) Eye contact and eye level – beware of cultural differences

5) Zone of comfort

b. Negative body language or distracting behaviors.

1) Rolling eyes

2) Nervous behaviors

3) Deep sighs

4) Crossed arms, wrinkled forehead

5) Throwing things around

6) Chewing gum

7) Yawning

c. Be aware of recognize non-verbal messages when patients use them.

9. Active Listening Skills

a. Is a key component of effective communication.

* + 1. Lets patient know that you are truly interested.
    2. Good listening skills do not depend on intellect or intelligence, can be learned.
  1. Tips for active listening.
     1. Concentrate on speaker
     2. Use the silent pause so you can mentally summarize
     3. Use phrases such as “I see”, or “Oh”, periodically
     4. Keep personal judgments to yourself.
     5. Verify with feedback, paraphrase.
     6. Sense and address body language you may observe, i.e., sadness
     7. Maintain eye contact
     8. Encourage patient to expand
     9. Paraphrase to ensure understanding
     10. PRACTICE

10. Written Communication

a. Varies with job responsibilities.

b. Required by phlebotomist, especially in writing up reports of adverse situations which may occur as a result of a blood collection procedure.

c. Concise and correct word usage crucial.

E. Patient rights

1. A Patient’s Bill of Rights form
   1. It is the responsibility of all members of the health care team to recognize that your responsibility is to the patient’s health, safety and personal dignity.
   2. Many hospitals and health care facilities have adopted and incorporated “A Patient’s Bill of Rights”, developed by the American Hospital Association into their policy manual.
2. Patient’s Bill of Rights should include/address the following:

a. Respectful and considerate care

b. Accurate information

c. Informed consent.

d. Patient refusal of blood test

e. Privacy

f. Strict confidentiality

g. Advance directives

h. Information about the identity and role of personnel involved in his or her care.

i. Information about research involved in his or her care.

j. Billing

3. Issues in Specimen Collection

a. Deliver quality of care regardless of the demeanor of the patient.

b. Laboratory tests and results are strictly confidential.

c. All records must be secured and accessed only by those individuals who need them.

d. Patient has the right to know your name, position (especially if you are a student), description of procedure, and ultimately has the right to refuse.

e. Document in writing any unusual occurrences, especially confrontations.

F. Family, visitors and significant others

1. Family and visitors may be more difficult to deal with than the patient.

a. Make requests or demands that are not part of your job duties.

b. Refuse requests to get food or water, as patient may have status of “nothing by mouth” (NPO), have them contact the nurse.

c. Ask their cooperation in reassuring the patient.

1. You can ask family or visitors to step outside during blood collection if necessary.
2. Physicians, priests, chaplains have right to privacy with patient.

a. Leave and come back later.

b. If timed or STAT request ask permission to collect specimen.

G. Health Care Organizations

1. Health care organizations are located in a variety of settings which offer different ***levels of care.***

a. ***Primary care*** facilities maintain and monitor normal health and prevent diseases through immunization.

b. ***Secondary care*** have doctors who are specialists in a particular group of diseases, organ systems or one organ.

c. ***Tertiary care*** provides highly specialized care, geared to treating unusual or complex problems and utilize sophisticated diagnostic instruments.

d. ***Acute care*** hospital, hospital say of *30 days or less*.

e. **Long term care**, stays *longer than 30 days*.

f. Ambulatory care.

g. Home health services.

h. In patient defined as hospitalized patient.

2. Ancillary services provide services to help maintain the functioning of the institution or provision of specialized services.

H. Department of Clinical Laboratory Medicine – Personnel

1. Composed of ***two major areas:***

a. **Clinical pathology** analyzes blood, body fluids, and biopsy materials.

b. **Anatomic pathology** involved in autopsies, cytology and surgical pathology.

2. Clinical Laboratory Improvement Act of 1988 (CLIA 1988) established regulations concerning qualifications of personnel performing laboratory testing, periodic inspections, proficiency testing, and investigation of complaints. Laboratory tests classified as:

a. Waived

b. Moderate complexity tests - requires degree

c. High complexity tests – requires degree

3. Laboratory Director - **Medical Director**

a. A pathologist with extensive education in pathology.

b. Aid the patient’s physician in the correlation of laboratory results with disease states.

c. Aid the doctor in setting up lab protocols such as when to order what type of laboratory tests and determining the “menu” of laboratory testing to offer.

d. Involved with interpretation of tissues such as those obtained during biopsy, surgery, autopsy and bone marrow.

e. All problems or abnormal results obtained by the techs are referred to the pathologist.

1. Laboratory Director – **Administrative Technologist**

a. Title held will be dependent on facility – Lab Manager, Chief Technologist, Technical Director.

b. May have on the job training (OJT) or have additional education in management and administration.

c. Oversees administrative and technical services such as establishing lab policies and procedures, hiring lab workers, maintaining the budget, providing orientation and training of new employees, providing continuing education (CE) for staff and assigning duties based on qualifications of the staff.

1. Technical supervisors

a. Larger hospitals have large laboratory sections requiring a supervisor with extensive experience and education in a lab specialty.

b. They aid the lab directory by preparing work schedules for their department, ordering departmental supplies, providing training, maintaining Standard Operating Procedure (SOP) manuals, assist in budget preparation, perform employee evaluations, discipline, hiring and firing of personnel.

1. Medical Laboratory Scientists (MLS), Old Names - Clinical Laboratory Scientist (CLS), Medical Technologist (MT)

a. B.S. in laboratory science or biologic science which must include didactic and clinical training in laboratory medicine.

b. B.S. plus one additional year in a hospital based program.

c. B.S. which includes clinical laboratory science education, either a 3+1 or 2+2.

d. These individuals perform all bench work using basic to advanced techniques.

e. Performs preventative maintenance (PM) on equipment, troubleshooting, performs and evaluates quality control (QC), participates in continuing education, and teaches MLS and MLT students.

7. Medical Laboratory Technician (MLT), old name Clinical Laboratory Technician (CLT)

a. Has obtained education through a hospital based 2 year certificate program or associate degree at the college level.

b. Under the direct supervision of a MLS performs routine tests and procedures.

c. MLTs free up the MLS to trouble shoot equipment or perform advanced or complex procedures on patient samples.

8. Phlebotomist

a. Phlebotomist has high school diploma or GED to enter training program.

b. Programs vary in location and length of time of training, depending upon their purpose.

c. Several professional and certifying agencies are available for phlebotomists.

d. Training varies – OJT or structured program.

e. Collects blood specimens from adults, children and babies using appropriate technique and equipment.

f. Identification of the patient is the most critical step.

g. Must understand and follow to the letter all precautions related to the collection of blood specimens, whether others follow or not.

h. May also be responsible for starting and collecting specimens for glucose tolerance tests (GTT), bleeding times, blood cultures, instructing patients on these procedures as well as the proper collection of urine and semen samples, and processing specimens in the lab.

i. Must be able to deliver specimens in a timely fashion, maintain accurate records and logs, and exhibit professional conduct and attitude at all times.

I. Department of Clinical Laboratory Medicine – Laboratory Departments

1. Phlebotomists collect blood samples for a variety of tests

a. Samples are delivered to the laboratory.

b. Phlebotomist may be responsible for accessioning, matching blood samples to request and delivering to appropriate department.

* 1. Knowledge of tests performed in each department essential for proper delivery.
  2. Knowledge of clinical significance of commonly performed test enhances knowledge of blood collection protocols, especially special testing requirements such as fasting, additional safety requirements and special handling.

2. ***Clinical Chemistry*** is the largest laboratory department. Through chemical analysis of serum or plasma many diseases of the major organs systems can be diagnosed such as heart attacks, hepatitis, renal failure, diabetes, etc. ***(Drawn in red, gold or green stoppered tube unless noted otherwise)***

a. Perform chemical analyses on serum or plasma.

b. Blood lipids (fat) such as cholesterol and triglycerides used to diagnose risk of heart disease.

c. Iron and total iron binding capacity to diagnose anemia.

d. Electrolytes – sodium, potassium, CO2 and chloride may be abnormal in dehydrated patients.

e. Uric acid – indication of impaired renal function or gout.

f. Creatinine and Blood Urea Nitrogen (BUN) used to monitor kidney function.

g. Liver function tests include AST, ALT, alkaline phosphatase, LDH, and bilirubin.

h. Cardiac enzymes – CK, AST, LDH along with electrolytes aid in the diagnosis of heart attack.

1. Amylase and lipase levels aid in the diagnosis of acute pancreatitis.
2. Glucose to diagnose and monitor diabetes. ***(May use gray stoppered tube).***
3. Hormones such as thyroxine (T4), parathyroid hormone, insulin, testosterone, renin activity luteinizing hormone, prolactin, and cortisol.
4. Drug analysis is of two types:
   * 1. Therapeutic drug monitoring (TDM) to ensure patient is maintaining therapeutic blood levels of drugs such as gentamicin, dilantin, tobramycin, digoxin, etc.
     2. Drugs of abuse testing to detect blood alcohol, barbiturates, salicylates, etc.
5. Special chemistry deals with analysis of rare or uncommon substances.
6. Immunoassay which includes the techniques of radioimmunoassay (RIA) and enzyme immunoassay (EIA) to detect antigens or antibodies associated with infectious diseases.
7. Chemistry profiles are very popular and include a menu of commonly ordered chemistry tests selected to evaluate each major organ system. Visit <http://www.bbpl.com> .

3. ***Hematology*** is the study of the formed elements of the blood to identify diseases associated with blood and blood forming tissues.

a. Hematology tests aid the physician in diagnosing infections, leukemia, polycythemia, anemia and other blood dyscrasias (abnormalities).

b. The most commonly ordered hematology test is the complete blood count (CBC) which is routinely performed on automated instruments that electronically count the cells and calculate results.

* 1. **CBC is actually a multi-part assay** which includes the following tests ***(purple stoppered tube)***:

1) hematocrit (HCT)

2) hemoglobin (HGB)

3) red blood cell (RBC) count

4) white blood cell (WBC) count

5) platelet count

6) mean corpuscular hemoglobin (MCH)

7) mean corpuscular hemoglobin concentration (MCHC)

8) mean corpuscular volume (MCV)

9) differential (DIFF) – done on a blood smear.

* 1. Other tests performed in the hematology department include:

1) reticulocyte count ***(purple)***

2) erythrocyte sedimentation rate (ESR or Sed Rate) ***(purple or black)***

3) sickle cell preparation ***(purple)***

4) Eosinophil count ***(purple)***

5) Cell counts and differential on body fluids such as: CSF, pleural, Synovial, and pericardial.

4. Coagulation department is often housed in the hematology area.

* 1. Coagulation deals with the study of defects in the blood clotting mechanism and monitoring of medication such as “blood thinners” or anticoagulant therapy.

b. Blood for the following tests is always collected in ***light blue stoppered*** tubes.

1) Prothrombin time (PT)

2) Partial thromboplastin time (PTT)

3) Fibrinogen

4) Fibrin split products or fibrin degradation products (FDP)

5. Urinalysis department is often housed in the hematology are also.

a. Urinalysis (UA) is a routine test performed on urine that involves chemical tests to screen for substances which may indicate disease or damage.

b. UA dipstick will detect the presence of the following substances which, when abnormal, may indicate disease or illness – pH, specific gravity, protein, glucose, bilirubin, urobilinogen, nitrites, leukocytes, occult blood, and ketones.

c. The urine is **centrifuged**, decanted and the small portion that is left is microscopically examined for the presence and number of the following – yeast, bacteria, WBCs, RBCs, mucous, epithelial cells, crystals and parasites.

d. Pregnancy tests using urine may be performed in this department.

e. It is important to remember that cultures (UA C&S) are commonly ordered on urine. *The urine must be taken to the microbiology department first for processing*.

6***. Microbiology*** is the department that analyzes body fluids and tissues for the presence of pathogenic microorganisms primarily by means of **culture and sensitivity (C&S).**

a. Results of the C&S tell the physician the type of organisms present as well as the particular antibiotic that would be most effective for treatment.

* 1. Collecting and transporting microbiology specimens is very important in the identification of microorganisms and must be handled with great care.
  2. Subsections of microbiology include **bacteriology** (study of bacteria), **parasitology** (study of parasites), **mycology** (study of fungi), and **virology** (study of viruses).
  3. Test frequently ordered includes the following:
     + 1. Acid-fast bacilli (AFB) smear
       2. AFB culture
       3. Fungus direct smear
       4. Culture and sensitivity
       5. Gram stain
       6. GC (gonococcal) culture
       7. Pinworm prep
       8. Ova and parasite (O&P)
       9. Occult blood
       10. Strep screen
       11. Fungus culture
       12. Throat culture
       13. Urine culture
       14. Blood culture
       15. Fecal culture

1. **Immunohematology (Blood Bank or transfusion service)** performs tests to provide compatible blood and blood products to patients for transfusion purposes.
   1. The blood bank technologist relies on the phlebotomist to perform identification of the patient **without error**, since patients will die if given the wrong blood type.
   2. Stopper color

1) **Plain red** NO GEL for labs using tube testing.

2) **Pink stopper** for labs using the gel blood bank testing system.

3) The only exception is the Direct Antiglobulin test which is drawn into a **purple or pink stopper tube**.

c. Tests include the following:

1) ABO/D (Rh) testing

2) Antibody screen AKA indirect antiglobulin test (IAT).

3) Type and Screen (T&S)

4) Crossmatch

5) Direct Antiglobulin Test (DAT or DC)

6) Rh Immune Globulin (RHIG) or Rhogam workup

7) Antibody titer

8) Antigen typing

9) Antibody Identification

10) Requests for components such as RBCs, platelets, cryoprecipitate (CRYO) and fresh frozen plasma (FFP) will be delivered to the blood bank.

1. Anatomic and surgical pathology include the following departments:
   1. *Cytology* processes body fluids and other tissue specimens for detection and diagnostic interpretation of cell changes that might indicate cancer, i.e., PAP smears.
   2. *Histology* prepares and process tissue samples removed during surgery, autopsy or other medical procedures for microscopic examination and evaluation by a pathologist.
   3. *Cytogenetics* provides detailed study of individual chromosomes that can detect genetic or acquired diseases or disorders.
   4. *Molecular diagnostics* testing to detect genetic disorders, malignant disorders, infections, pathogens, paternity and DNA fingerprinting in forensic medicine.
      * 1. Education and research develops new procedures as well as basic research contributing to clinical laboratory sciences.
2. Performed by pathologists, PhDs and Medical Laboratory Scientists.
3. Generally done in large teaching hospitals with affiliations with a large university.

J. Interdepartmental Relationships

1. The process of the correct test results getting to the patient’s chart involves a number of individuals.

a. **Only physicians, nurse practioners or physicians assistants can order lab tests**, they write or enter it on the chart.

b. Nurse or ward clerk sends request to the lab.

c. Phlebotomist draws the correct specimens and returns them to the lab.

d. Specimens are delivered, processed and tested in the appropriate lab departments

e. The results generated and delivered to the patient’s chart, usually electronically.

f. The doctor reviews the results to diagnose and treat the patient.

2. These steps must be performed in a timely manner in order to provide quality care to the patient.