Overview

Welcome to the "Gateway" for University of Maryland/Upper Chesapeake Health (UM/UCH). This edition was produced in conjunction with ARUP Laboratory, which is the reference laboratory utilized for testing that is not performed in-house. Our intention is to provide you, our customers, with a detailed service guide to assist with the pre-analytical, analytical, and post-analytical aspects of laboratory medicine.

This directory is designed to provide easy access to pertinent information for each section of the laboratory. It is divided into three major sections. The first section is a general information section which defines the laboratory's procedures and protocols for the pre-analytical and post-analytical analysis. The second section is an alphabetical test listing, which defines the test options performed within each laboratory section or at ARUP laboratories. The third section is a special instructional section, which includes information regarding specific tests listed in the alphabetical test listing.

Once again, this site was designed for you. We encourage your feedback and suggestions for subsequent editions. We are committed to providing you with accurate, reliable, patient-focused laboratory services.

Sincerely,

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Specialized Laboratory Services

Upper Chesapeake Health is equipped and staffed to perform routine clinical and anatomical laboratory tests as well as some specialized tests. For procedures requiring means beyond capabilities of the laboratory, properly collected specimens are referred to an outside reference laboratory accredited by the College of American Pathologist and approved by the Chairman of the Department of Pathology and Medical Staff.

Clinical Laboratories

Clinical Laboratories are in operation 7 days per week, 24 hours per day. Full coverage exists Monday through Friday, 7 a.m. to 3 p.m., and limited coverage between the hours of 3 p.m. and 7 a.m. Staffing levels and availability of certain tests are diminished during limited coverage periods.

Licensure and Accreditation

The laboratory is certified by the Center for Medicare Services (CMS) under the Clinical Laboratory Improvement Amendment (CLIA), licensed by the State of Maryland, and accredited by the Joint Commission (TJC) and the College of American Pathologists (CAP). In addition, the Blood Bank is accredited by the Association for the Advancement of Blood and Biotherapies (AABB).

Cytology/Histopathology and Pathology

Laboratory hours are as follows:

- Cytology/Histology (UM/UCMC): Monday through Friday, 7 a.m. to 4:30 p.m.
- Pathology Office: Monday through Friday, 8 a.m. to 4:30 p.m.

There is a pathologist on-call at all times to cover Surgical and Clinical Pathology, as well as operating room consultation, such as frozen sections. The pathologist on-call can be reached by contacting the laboratory.

Outpatient Services – UM/UCMC

Phlebotomy services are provided on the Garden level of the Ambulatory Care Center. Hours of operation are Monday through Friday, 7:00 a.m. to 3:30p.m. Requests for outpatient services must be in writing/electronically from the attending physician. A verbal order by telephone or otherwise must be followed with a written/electronic order. ICD-10 codes must also be included with written order. Glucose tolerance testing, bone marrow biopsies, and therapeutic phlebotomies must be scheduled through Centralized Scheduling (443-843-7000). Renal and muscle biopsies for special studies must be scheduled 24 hours in advance.

Specimen Collection and Preparation

Laboratory test results are dependent on the quality of the specimen submitted. It is important that all specimens and requisitions be properly labeled with patient's first and last name, date and time of collection, collector's initials, date of birth and specimen source, when applicable.

If there is any doubt or question regarding type of specimen that should be collected, it is imperative that the laboratory is called to clarify order and specimen requirements.

Blood Collection

Venous or capillary blood for laboratory analysis is drawn by authorized personnel. Laboratory personnel are not authorized to perform arterial punctures on patients or draw blood from patients with a Port-A-Cath® or other type of indwelling catheter.

Most laboratory tests are performed on anticoagulated whole blood, plasma, or serum. Please refer to individual test listings for specific requirements.

- *Plasma:* Draw a sufficient amount of blood with indicated anticoagulant to yield necessary plasma volume. Gently mix blood collection tube by inverting 6 to 10 times immediately after draw. If required, separate plasma from cells by centrifugation within 20 to 30 minutes.
- *Serum:* Draw a sufficient amount of blood to yield necessary serum volume. Allow blood to clot at ambient temperature, and then, separate serum from clot by centrifugation within 20 to 30 minutes. Caution: avoid hemolysis.
- *Whole Blood*: Draw a sufficient amount of blood with the indicated anticoagulant. Gently mix blood collection tube by inverting 6 to 10 times immediately after draw.

Blood Collection Techniques

Blood Culture Collection Technique

Equipment: Disposable gloves, sterile needle, needle holder, BACTEC™ culture vials (aerobic and anaerobic), tourniquet, 3.15% Chlorhexidine gluconate swab, gauze, and adhesive bandage or tape.

Procedure:

1. Inpatient: Identify patient by asking them to state full name and date of birth. If patient is unable to verbalize, identify patient by comparing patient date of birth and spelling of first and last name on requisition and/or labels with patient's armband. Armband must be physically attached to the patient when making this comparison. Patient information on patient's armband must match patient information on requisitions and/or labels.

Note: All discrepancies between the patient's armband and requisition and/or labels must be resolved before specimen is drawn from patient.

Outpatient: Outpatients will be asked to verbalize first and last name and date of birth which will be compared with registration paperwork.

2. Check above bed for any "special instructions" signs.
3. Assemble all necessary equipment in a convenient location close to the patient.
4. Prepare venipuncture site as follows:
   A. Locate vein to be used.
   B. For patients > 2 months, using 3.15% chlorhexidine gluconate swab, scrub skin with friction in a horizontal and vertical fashion for 30 seconds.
      Note: Betadine® Method and Patients Under 2 Months of Age: Scrub site using an alcohol pad working outward from venipuncture site in a circular motion. After alcohol prep, scrub site using a Betadine® pad working outward from venipuncture site in a circular motion. For patients with iodine sensitivity, cleanse skin with alcohol for 60 seconds. Do a second Betadine® scrub with a fresh pad scrubbing outward from venipuncture site in a circular motion. **The Betadine® should be allowed to dry.** Do not palpate vein after second scrub. Do not wipe or blow Betadine® dry, as this will contaminate site.
   C. Allow to dry for 30 seconds.
   D. Do not touch or palpate area after cleansing.
5. Prepare BACTEC™ culture vials.
   A. Remove flip-off caps from BACTEC™ culture vials.
   B. Wipe top of vials with a single isopropyl alcohol wipe and allow to dry for 60 seconds. **Do not use iodine on tip of BACTEC™ vial.** (Iodine will cause rubber septum to disintegrate, and sterile integrity of vial will be compromised.)
6. Draw blood
   A. Apply tourniquet to patient's arm above desired venipuncture site.
      Note: Do not use regular VACUTAINER® blood collection set – liquid media from vial may back flow into patient's vein. Butterfly with VACUTAINER® is acceptable.
   B. Insert needle into prepared vein and draw 8mL to 10mL of blood into each blood culture vial. The aerobic vial (blue-top) should be used first. **Note:** Avoid drawing blood through an indwelling intravenous or intra-arterial catheter.
   C. Loosen tourniquet from patient's arm.
   D. Withdraw needle and discard into puncture resistant biohazard container.
   E. Cover puncture site with gauze and apply pressure until all bleeding has stopped.

F. Apply bandage to puncture site after bleeding stops. Use paper tape for elderly patients.
G. Invert each vial 1 to 3 times.
H. Post-phlebotomy care is important. Extreme care should be used with patients on anticoagulant therapy or that are platelet deficient. These patients are prone to extended bleeding times.
I. Write collector's initials, date and time and, site of collection (ie, right arm) on the LIS specimen label. Place label on vial but do not cover bar code on blood culture bottles with patient's specimen label.
Note: All labeling must be performed at bedside for inpatients. For outpatients, specimens must be labeled before patient leaves collection area.
J. Deliver BACTEC™ culture vials promptly to laboratory.

7. Sources of possible error are as follows:
   A. Improper cleansing and disinfection of venipuncture site and rubber septum on blood culture vials may be sources of contamination leading to false-positive blood cultures.
   B. Touching a previously disinfected site with anything non-sterile may be a source of contamination.
   C. Overfilling bottle beyond recommended fill will result in false growth index readings on instrument resulting in a false-positive culture.
   D. Reduced volume of blood will delay detection of positive blood cultures.
   E. Prior to use, each vial should be examined for evidence of contamination, such as cloudiness, bulging or depressed rubber septum, or leakage. Do not use if contamination is present.

Skin Puncture Technique

Equipment: Disposable gloves, disposable auto-disabling single-use fingerstick device, microcollection tubes, 70% isopropyl alcohol wipes, gauze, and adhesive bandage or tape.

Procedure:

1. Inpatient: Identify patient by asking them to state full name and date of birth. If patient is unable to verbalize, identify patient by comparing patient date of birth and spelling of first and last name on requisition and/or labels with patient's armband. Armband must be physically attached to the patient when making this comparison. Patient information on patient's armband must match patient information on requisitions and/or labels.
Note: All discrepancies between the patient's armband and requisition and/or labels must be resolved before specimen is drawn from patient.

   Outpatient: Outpatients will be asked to verbalize first and last name and date of birth which will be compared with registration paperwork.
2. Check above bed for any "special instructions: signs.
3. Select appropriate microcollection tube type for test(s) ordered.
4. Assemble all necessary equipment in a convenient location close to patient.
5. Skin puncture blood can be obtained from lateral or medial plantar surface of heel, plantar surface of a big toe, or palmar surface of distal phalanx of a finger.
6. If an infant's heel is punctured, site should be on plantar surface medial to a line drawn posteriorly from middle of great toe in heel or lateral to a line drawn posteriorly from between fourth and fifth toes to heel. In almost all infants, heel bone is not under these areas. Puncture should not be through a previous puncture site which may be infected, nor should it be at curvature of heel.
7. Skin punctures should not be performed on central area of an infant's foot (area of arch). This may result in injury to nerves, tendons, and cartilage and offers no advantage over puncturing heel. Skin punctures should not be performed on fingers of infants.
8. When skin punctures are performed on adult fingers, the following guidelines should be observed:
   A. Puncture should be on palmar surface of distal phalanx and not at side of tip of finger, because tissue on side and tip of finger is about half as thick as tissue in center of finger.
   B. Fifth finger should not be punctured because tissue is considerably thinner than tissue of thumb, index, middle, and ring fingers.
9. Warming skin puncture site can increase blood flow through site sevenfold. A hot pack or warm, moist towel at a temperature of no higher than 42°C may be used to cover site for at least 3 minutes.
10. The site should be cleaned with a 70% isopropyl alcohol wipe. Rubbing area vigorously with alcohol pad will increase circulation. Site must be thoroughly dried with a sterile gauze pad before being punctured because residual alcohol causes rapid hemolysis. Betadine® should not be used to clean and disinfect skin puncture sites; blood contaminated with Betadine® may have falsely elevated levels of potassium, phosphorus, or uric acid.

11. The heel or finger must be held firmly to prevent sudden movement. Wearing gloves, perform by applying slight pressure to finger to release lancet.
12. The first drop of blood should be wiped away with a gauze pad; it is most likely to contain excess tissue fluid. Exception to this protocol may be point of care testing. Refer to specific point of care procedures for instructions.
13. If puncture is adequate, 0.5 mL of blood can be collected from a single puncture site.
14. Blood flow from puncture is enhanced by holding puncture site downward and gently applying continuous pressure to surround tissue (or proximal to puncture site when blood is obtained from a finger). Strong repetitive pressure (milking) should not be applied; it may cause hemolysis or contamination of specimen with tissue fluid.
15. Release pressure occasionally to allow blood to flow back into puncture site.
16. Hold microcollection tube at an angle below, horizontal with vent hole in collection cap in an upward position. Let blood flow into top of collection cap. Do not scoop blood into container or hemolysis may occur. Occasional tapping will assist flow to bottom of container.
17. Remove collection cap and replace with stopper.
18. When blood is collected in microcollection devices containing anticoagulant (ie, EDTA or heparin), devices should be immediately stoppered and blood mixed well to prevent coagulation. These tubes must be filled with proper quantity of blood; overfilling will result in clot formation whereas under filling can cause morphologic changes in cells due to excess anticoagulant.
19. After blood has been collected from an infant's heel, press a gauze pad against puncture site until bleeding stops.
20. Apply a BAND-AID® dot to puncture site.
21. Post-puncture care is important. Extreme care should be used with patients on anticoagulant therapy or who are platelet deficient. These patients are prone to extended bleeding times.
22. Label all vials with patient's first and last name, DOB, medical record number, location, date and time of collection and collector's initials.
    Note: All labeling must be performed at bedside for inpatients. For outpatients, specimens must be labeled before patient leaves collection area.
23. Dispose of skin puncture device, collection equipment etc., into appropriate puncture resistant biohazard containers.

Venipuncture Technique

Equipment: Disposable gloves, sterile needle, needle holder, evacuated blood collection tubes, tourniquet, 70% isopropyl alcohol wipes, gauze, and adhesive bandage or tape.

Procedure:

1. Inpatient: Identify patient by asking them to state full name and date of birth. If patient is unable to verbalize, identify patient by comparing patient date of birth and spelling of first and last name on requisition and/or labels with patient's armband. Armband must be physically attached to patient when making this comparison. Patient information on patient's armband must match patient information on requisitions and/or labels.
   Note: All discrepancies between patient's armband and requisition and/or labels must be resolved before specimen is drawn from patient.

   Outpatient: Outpatients will be asked to verbalize first and last name and date of birth which will be compared with registration paperwork.
2. Check above bed for any "special instructions" signs.
3. Select appropriate tube type for test ordered.
4. Assemble all necessary equipment in a convenient location close to patient.
5. Thread appropriate needle into holder until it is secure.
6. Close patient's hand and select a vein site. Large median cubital and cephalic veins are used most frequently. Wrist and hand veins are also acceptable for venipuncture. Never draw a specimen from a location above an intravenous site, specimen will be contaminated and over diluted.
7. Apply tourniquet 3 to 4 inches above venipuncture site. Never leave tourniquet on for longer than 60 seconds. Localized stasis may occur with a tourniquet, together with the formation of a partial filtrate of blood and hemoconcentration. This may result in erroneously high values for all protein-based analytes, packed cell volume, and other cellular elements.
8. Cleanse venipuncture site with 70% isopropyl alcohol wipes, allowing area to dry to prevent hemolysis.
9. Anchor vein with your thumb 1 inch to 2 inches below venipuncture site.
10. Wearing gloves, remove needle cap. With bevel up, line up needle with vein. Insert needle into vein. Grasp flange of needle holder and push tube forward until butt-end of needle punctures stopper. Maintain tube below site when needle is in vein.
11. Fill tube until vacuum is exhausted and blood flow ceases.

12. Remove tube from holder and insert next tube into holder
13. If more than 1 blood collection tube is required, tubes should be drawn in following order:
    A. Blood culture
    B. Light blue
    C. Yellow
    D. Plain red/gold SST
    E. Light/dark green
    F. Purple (EDTA)
    G. Pink
    H. Gray
    I. Royal blue
14. If blood collection tube contains an additive, invert gently 10 to 15 times to ensure thorough mixing.
15. After all specimens have been drawn, remove tourniquet and remove needle slowly, and place a gauze pad over site. Apply pressure to site until bleeding stops.
16. Apply a bandage to venipuncture site after bleeding stops. Use paper tape for elderly patients.
17. Label all vials with patient's first and last name, DOB, medical record number, location, date and time of collection and collector's initials. Do not cover bar code on blood culture bottles with patient's bar code label.
    Note: All labeling must be performed at bedside for inpatients. For outpatients, specimens must be labeled before patient leaves collection area.
18. Post-phlebotomy care is important. Extreme care should be used with patients on anticoagulant therapy or who are platelet deficient. These patients are prone to extended bleeding times.
19. If first phlebotomy attempt is unsuccessful, it is imperative that a fresh, sterile needle (and blood collection tubes if vacuum is lost) be used before performing a second puncture.
20. Only a physician or nurse is permitted to manipulate indwelling lines for specimen procurement. To provide specimens that are satisfactory for laboratory testing, draw first 10 mL of blood; but do not send this blood to lab (it is drawn to cleanse line of medication or intravenous fluid). The next specimen can be used for chemistry, hematology, etc. The last specimen is used for coagulation studies.
21. Dispose of all needles, collection equipment etc., into puncture resistant biohazard containers as per protocol. Do not cut or break needles before discarding into containers.

Histopathology Specimen Collection

Specimens removed surgically from a patient should be submitted to laboratory for examination by a pathologist. Certain specimens that are specifically excluded from this requirement are approved by the Medical Executive Committee.

INSTRUCTIONS FOR RANDOM URINE COLLECTION

Please read these instructions before collecting a random urine specimen:

1. Your physician has requested a test that requires a random urine specimen.
2. Please void into this clean container that has been labeled with your full name and date of birth. Remove the screw top cap before you start voiding.
3. A clean catch or midstream urine collection is preferred. You should first void a small amount of urine into the toilet, then collect some urine into the clean container before you are finished voiding.
4. Place the screw top cap back on the container and tighten securely. Use toilet paper or a paper towel to wipe off any urine that may have gotten on the outside of the container.
5. The urine specimen should be refrigerated with 10 minutes of collection or taken immediately to the laboratory. If collected onsite, place specimen in pink container (UCMC) or basket (HMH) for phlebotomist to bag and send to the laboratory.

INSTRUCTIONS FOR 24 HOUR URINE COLLECTION

Please read these instructions before starting a 24 hour urine collection:

1. Your physician has requested a urine test that requires a 24 hour collection.
2. You have been provided with the following items:
   a) Instruction sheet that you should read before starting this collection.
   b) A 24 hour urine collection jug that has been properly labeled with your full name and date of birth as well as adding any needed preservative that is required for the test. The preservative that has been added is:

   _____

   (Enter preservative added or NONE if none is needed)

   IMPORTANT: Appropriate "warning" labels for any potentially hazardous preservatives are attached to the urine collection jug. **Do not** dump out any preservative that is present.
   If several urine tests are requested, then separate collections may have to be done if different

preservatives are needed.

c) Special handling during collection (the needed condition is circled):
Ambient (Room temp)Keep on ice or refrigerated

d) A clean white "nun's cap" container to catch and transfer all the urine you pass for a complete 24 hour period.

3. Your very first urination of the morning (ex. 6 am) will be the starting time for the 24 hour period. Record the date and time of the start on the urine collection jug label where it says, "Start:" This very first urination should be discarded and not saved in the preservative container because this urine was formed before your collection period began.
4. After the first urination, you will collect all the urine you pass during the next 24 hours into the "nun's cap" and then pour it over into the 24 hour urine collection jug. Do not urinate directly into the collection bottle because the preservative could splash on you causing harm.
5. If instructed to do so, you should keep the collection jug refrigerated or in a cool place during the 24 hour collection.
6. At the end of the collection period, you should urinate at the stop time (24 hours after the start time) and transfer this final urine into the collection jug.
7. Tightly seal the 24 hour collection jug and return it to the Laboratory Department for proper testing. If you have any questions, please contact the Lab at 443-843-5460 AMC or 443-643-1400 UCMC.

INSTRUCTIONS FOR A CLEAN CATCH URINE COLLECTION

Directions for male clean catch urine specimen:

1.Open package.
2. Wash hands thoroughly with soap and water. Rinse well and dry with paper towel.
3. Tear open the towelette packages so that the towels can be easily removed with one hand as they are needed.
4. Open the urine container.
5. Do not touch any of the inside surfaces of the container or the lid.
6. Pull back the foreskin to completely expose the head of the penis. Wash the head of the penis thoroughly using first one towelette then the other. Discard the used towelettes into the toilet bowel.
7. Pass a small amount of urine into the toilet bowel, and then pass a sample into the container. Do not allow the container to touch the legs or the penis. Keep your fingers away from the rim and inner surface of the container. Fill the container half full. Replace the lid on the container.
8. The urine specimen should be refrigerated with 10 minutes of collection or taken immediately to the laboratory. If collected onsite, place specimen in pink container (UCMC) or basket (HMH) for phlebotomist to bag and send to the laboratory.
9. Attach label and /or print name on label.

Directions for female clean catch urine specimen:

1.Open package
2.Wash hands thoroughly with soap and water. Rinse well and dry with a paper towel.
3. Tear open the towelette packages so that the towels can be easily removed with one hand as they are needed.
4. Open the urine container.
5. Do not touch the inside surfaces of the container or the lid.
6. Remove undergarments and sit on the toilet seat with legs spread widely apart. With one hand, spread labia apart to expose the vulva. Keep this hand in place during the washing and urinating procedure. Use one towelette to wash the vulva well passing the towelette only from front to back, not back and forth. Repeat this procedure using the second towelette.
7. Begin urinating into the toilet bowel. Without stopping the stream, insert the container to collect the specimen.
8. Do not allow the container to touch the legs, vulva or clothing. Fill the container about half full. Replace the lid on the container.
9. The urine specimen should be refrigerated with 10 minutes of collection or taken immediately to the laboratory. If collected onsite, place specimen in pink container (UCMC) for phlebotomist to bag and send to the laboratory.
10. Attach the label and /or print name on label.

Specimen Collection and Preparation

Labeling of Specimens

Blood Bank Specimens

Blood Bank specimens for “Crossmatch” or "Type and Screen” must be labeled with a Blood Bank typenex wristband. (**Unlabeled specimens are not acceptable.)** The following information must be handwritten on label:

- Patient’s first and last name
- Medical record number
- Date and time of draw
- Phlebotomist’s initials
- Patient’s date of birth

Blood Bank typenex wristband is compared to patient’s hospital identification bracelet for accuracy, and peel-off label must then be attached to specimen. Wristband is then immediately secured to patient’s wrist or ankle.

Specimens for Areas Other than Blood Bank

Specimens collected by nursing or medical personnel, for tests other than compatibility testing, must be labeled with the following:

- Patient’s first and last name
- Date and time of collection
- Collector’s initials
- Specimen source (Cytology, Histology, and Microbiology specimens)
- Physician’s name (Cytology and Histology specimens)
- Patient’s date of birth

Minimally acceptable labeling (except for Blood Bank specimens) includes first and last name, date of birth, date and time of collection, and collector’s initials. Collector’s initials may be communicated verbally to laboratory team members.

Microbiology Specimen Collection

Laboratory personnel are not authorized to collect culture specimens from sites other than throat or nose on outpatients.

Specimen Collection Tubes Available

The following is a list of tubes referred to in specimen requirements:

- *Green-Top Tube (Heparin) [light green or dark green]:* This tube contains lithium or sodium heparin – used for drawing heparinized plasma or whole blood for special tests.
  Note: After tube has been filled with blood, immediately invert tube several times in order to prevent coagulation.
- *Grey-Top Tube (Potassium Oxalate/Sodium Fluoride):* This tube contains potassium oxalate as an anticoagulant and sodium fluoride as a preservative – used to preserve glucose in whole blood and for some special chemistry tests.
  Note: After tube has been filled with blood, immediately invert tube several times in order to prevent coagulation.
- *Lavender-Top Tube (EDTA):* This tube contains EDTA K_2as an anticoagulant – used for most hematological procedures.
  Note: After tube has been filled with blood, immediately invert tube several times in order to prevent coagulation.
- *Light Blue-Top Tube (Sodium Citrate):* This tube contains sodium citrate as an anticoagulant – used for drawing blood for coagulation studies.
  Note: It is imperative that tube be completely filled. The ratio of blood to anticoagulant is critical for valid prothrombin time results. Immediately after draw, invert tube 6 to 10 times in order to activate anticoagulant.
- *Pink-Top Tube (K_2EDTA):* This plastic tube contains K_2EDTA as an anticoagulant – used for most Blood Bank procedures.
  Note: After tube has been filled with blood, immediately invert tube several times in order to prevent coagulation.
- *Red-Top Tube*: This tube is a plain VACUTAINER® containing no anticoagulant – used for drawing serum for selected chemistry tests and immunohematology.
- *Royal Blue-Top Tube*: There are 2 types of royal blue-top Monoject® tubes – 1 with the anticoagulant EDTA and the other plain. These are used in drawing whole blood or serum for trace element analysis. Refer to individual metals in individual test listings to determine tube type necessary.
- *Serum Gel Tube (Gold SST)*: This tube contains a clot activator and serum gel separator – used for various laboratory tests.
- *Yellow-Top Tube (ACD)*: This tube contains ACD – used for drawing whole blood for special tests.
- *Special Collection Tubes:* Some tests require specific tubes for proper analysis. Please contact the laboratory at Aberdeen Medical Center or Upper Chesapeake Medical Center prior to patient draw to obtain correct tubes for metal analysis or other tests as identified in individual test listings

Specimen Rejection

Unacceptable Specimens

Proper specimen collection, handling, and requisition completion, when appropriate, are an essential part of obtaining valid, timely laboratory test results. All test requisitions and specimens delivered to laboratory must meet defined criteria for identification, collection, quality, volume, and testing in order to be processed. Specimens are submitted in appropriately labeled and well-constructed containers with secure lids to prevent leakage during transport. Unit is notified of rejected or problem specimens upon receipt.

Inadequately Labeled Specimens

Criteria for rejection are as follows:

- *Improperly/Incompletely Labeled*: Patient's first and last name, date of birth, date and time of collection, and collector's initials are minimum acceptable patient identification data required on specimens. At some point, a medical record number must be obtained before results may be reported. Surgical specimens must also be labeled with specimen source and surgeon's name. Microbiology specimens must include specimen source on label. Blood Bank specimens with labels having nicknames or abbreviations are unacceptable.
- *Mislabeled Specimens*: A specimen is mislabeled if patient identification differs from patient identification on requisition associated with it. Blood Bank specimens labeled with incorrect medical record number, patient name misspelled, or nicknames or abbreviations are unacceptable.
- *Unlabeled Specimens*: Any specimen is unlabeled if container holding specimen does not have patient's first and last name directly affixed to it. Container itself must be labeled, not merely lid or bag in which specimen is placed. Blood Bank specimens must have Typenex® label affixed.

Optimal labeling includes:

- Patient's first and last name
- Hospital location
- Medical record number
- Date and time of collection
- Collector's initials
- Specimen source
- Physician's/surgeon's name
- Patient's date of birth

Inadequate Requisitions

Manual or computer generated requisitions are used when submitting the following specimens:

- Anatomic Pathology specimen
- Cytology specimens

Requisitions should include the following information:

- Patient's first and last name
- Date of birth
- Sex
- Race (for Anatomic Pathology only)
- Hospital location
- Medical record number (if applicable)
- Account number
- Date and time of collection
- Time of excision, time in fixative
- Collector's initials
- Specimen source
- Ordering physician's/surgeon's name (if other than attending physician/surgeon)
- Requesting physician's/surgeon's signature (for Anatomic Pathology and Cytology specimens only)
- Test(s) requested
- Diagnosis/clinical history
- ICD-10 code (numeric)(for outpatients)
- Last menstrual period (for Anatomic Pathology and Cytology GYN specimens only)

Specimens Which Pose Hazardous Handling Conditions

Any specimen submitted in a manner which could create a health or safety hazard to laboratory personnel is considered unacceptable. These include:

- Specimens submitted in syringes with needles intact
- Cracked or leaking containers with external contamination
- Specimens submitted in tissue paper, diapers, foil, plastic wrap, etc
- Specimens in formalin without formalin warning sticker affixed to specimen container

Unsatisfactory or Suboptimal Specimens

A specimen is unsatisfactory if it is collected, handled, or transported in such a way that substances or constituents of interest cannot be accurately measured or counted in the clinical laboratory. These include:

- Specimens collected in incorrect tube, container, or preservative
- Specimens drawn above an intravenous line
- Specimens inappropriately handled with respect to temperature, timing, or storage requirements
- Quantity not sufficient
- Specimens hemolyzed or showing evidence of contamination which would interfere with testing or cause invalid test results
- Blood Bank specimens with moderate or gross hemolysis or in serum separator tubes
- Anatomical pathology or Cytology specimen not placed in proper fixative
- Microbiology specimens collected in non-sterile containers.

Specimen Rejection

The presence of hemolysis, microscopic evidence of contamination, etc., make some specimens less than optimal for testing. In this case, specimen will need to be recollected or certain tests will not be performed. This will be indicated in report at completion.

Unacceptable Specimens – Corrective Action

Improperly/Incompletely Labeled Specimens

The adequacy of specimen labeling for Blood Bank will be determined by that section since it adheres to more stringent labeling rules than other laboratory sections. Guidelines for sections other than Blood Bank are that a specimen labeled only with patient's name may be accessed in laboratory systems, and collector will be contacted to provide needed information.

Mislabeled or Unlabeled Specimens

The laboratory will cancel order and will notify location where specimen originated and request a new specimen. Irreplaceable specimens may include spinal fluid, fluid aspirate, timed specimens, surgical tissue, etc. Irreplaceable specimens lacking labeling may not be accessed into laboratory system. Specimens are maintained at proper temperature (i.e., ambient temperature, refrigerated temperature) until collector provides positive identification. Documentation of identification process, including identification of personnel who provided positive identification of specimen, is entered in computer systems and recorded on the Correction of Specimen Labeling Error Form.

Inadequate Requisitions

When patient's identification or other essential information is not on requisition or a requisition was not received, a new or completed requisition from collection site is requested.

If requisition is lacking nonessential information, specimen may be temporarily accessed and tested. The collection site will be contacted to provide needed information.

Specimens Which Pose Hazardous Handling Conditions

Specimens submitted in syringes with needles attached are unacceptable. If such a specimen is received, laboratory will notify collection site and offer opportunity to come to laboratory and transfer specimen into an acceptable, labeled container.

Specimens submitted in cracked or leaking containers with external contamination or specimens submitted in tissue paper, foil, etc., that are able to be re-obtained will be cancelled, and collection site will be notified. A new specimen and new order will be requested. Specimens that cannot be re-obtained will be assessed, and collection site will be notified if corrective active is necessary. This action may include offering personnel from collection site opportunity to transfer specimen into an acceptable, labeled container.

Unsatisfactory or Suboptimal Specimens

If collection, transport, or storage conditions are deemed unacceptable by laboratory personnel, ordered tests are cancelled, collection site is notified, and a new specimen and new order is requested.

Requests/Reporting

Critical Results
Some results of procedures performed in the laboratory are so indicative of poor patient condition that they could be life-threatening and are deemed "critical." Critical results are determined by the Upper Chesapeake Health Medical Executive Committee. These results are communicated to responsible individuals immediately. The charge nurse or the patient's nurse (in the case of an inpatient) or the physician's office (in case of an outpatient) is to be notified immediately of the critical results(s).

Critical Values
In accordance with the CAP requirement, ARUP and UM/UCH have a mutual agreement that when ARUP has verified a critical result from a sample referred to them by UM/UCH, they will call the UM/UCH laboratory with these results. Notification to the ordering physician, is the responsibility of the UCH laboratory.

Distribution of Reports
Results of testing are available immediately upon test completion and verification via computer terminals located throughout the hospital. Critical values are verbally reported to the patient's caregiver in accordance with laboratory protocol.

All outpatient results are faxed Monday through Friday to physician offices unless otherwise directed by physician.

Medical Records
The Medical Records Department maintains all requests for laboratory services as part of the patient's chart. Laboratory results, for both inpatients and outpatients, are made part of the medical record. Surgical Pathology results are retained for ten years.

<u>Release of Medical Records</u>
Test results may only be released to the patient after the patient completes a "Release of Medical Information Form."

Reference Values
All reference values listed on the report are for adult normals unless otherwise indicated.

Reportable Disease
The laboratory endeavors to comply with reporting requirements for each state health department regarding reportable disease. These results are reported by fax, form, or phone depending upon individual state health department regulations. The laboratory reports to the appropriate state health department based upon the state listed on the client address. The lab strives to cooperate with clients so that both comply with state regulations. If further information is needed, please do not hesitate to contact the laboratory.

Requisitions
The laboratory will only perform tests at the request of a physician or authorized individuals defined by the State of Maryland. Specific test request forms are provided free of charge by the laboratory. Essential order elements on requisition include:

- Adequate patient identification, which is the patient's name and date of birth
- Name and address of ordering physician so that test results will be forwarded to that physician correctly.
- Tests or assays requested must be listed.
- Date and time of specimen collection, where the physician has deemed it as necessary.
- ICD-10 code(s) for Medicare patients. Non-Medicare patient requisitions must include a narrative diagnosis or signs/symptoms for the patient.

Additional clinical information is required on some of these forms for diagnostic reasons. Please complete all information requested for help in interpreting results. Fill in the test that is requested.

UCH LAB CRITICAL VALUE NOTIFICATION LIST

CHEMISTRY

STANDARD CRITICAL VALUES		
TEST	**LOW**	**HIGH**
Bilirubin, Neonatal	Call All	Call All
Calcium	**<**7 mg/dL	**>**12 mg/dL
Carbon Dioxide	**<**15 mmol/L	>40 mmol/L
Chloride	<80 mmol/L	>115 mmol/L
Creatinine	-	>10 mg/dL
CSF	Call All Inpatient and ED patients	Call All Abnormal Outpatient
Glucose	<54 mg/dL	>400 mg/dL
Glucose (neonate)	<40 mg/dL	>250 mg/dL
Lactate	-	≥2.0mmol/L
Potassium	**<**3.0 mmol/L	**>**6.5 mmol/L
Sodium	**<**125 mmol/L	>150 mmol/L
Therapeutic Drug Levels	Call All Toxic Levels	Call All Toxic Levels
Troponin	-	TNT 5th gen ≥52 ng/L All patients (inpatient and ED) initial result only
Urea Nitrogen Blood	-	>100 mg/dL
Acetaminophen	-	>150 mg/mL
Magnesium	<1.0 mg/dL	>4.5mg/dL
OB Magnesium	-	>9.0 mg/dL
Ionized Calcium	<0.75 mmol/L	>1.6 mmol/L
WB Ionized Calcium	<0.75 mmol/L	>1.6 mmol/L
Salicylate		>30.0 mg/dL
Ethanol		>300 mg/dL

HEMATOLOGY

STANDARD CRITICAL VALUES		
TEST	**LOW**	**HIGH**
CSF	Call All	Call All
CSF Cell Count (>9 WBC's)	Call Infection Control	Call Infection Control
Gross Abnormal Diffs	Immature Cells-Issue Preliminary, Pathologist Review to Follow	Immature Cells – Issue Preliminary, Pathologist Review to Follow
Hematocrit	<25 %	-
Hemoglobin	<8.0 g/dL	-
Platelet Count	<20,000 k/mm3	>1,000,000 k/mm3
WBC	<2,000 k/mm3	>25,000 k/mm3

COAGULATION

STANDARD CRITICAL VALUES		
TEST	**NOT on Anti-Coag Therapy**	**IS on Anti-Coag Therapy**
PT/INR	INR of 5.0 or greater	INR of 5.0 or greater
PTT	>50 seconds	>120 seconds

UCH LAB CRITICAL VALUE NOTIFICATION LIST (continued)

BLOOD BANK

STANDARD CRITICAL VALUES		
TEST	**NOTIFICATION REQUIRED**	
Antibody work up delays	Yes	
Hemolytic Transfusion Reactions	Yes	
No Compatible Blood Available	Yes	
Positive Coombs-infants	Yes	

MICROBIOLOGY

STANDARD CRITICAL VALUES		
TEST		
Blood Culture	All Positive Cultures	
Gram Stains on Sterile Body Fluids	Presence of Bacteria	
Biofire	All Positives for Respiratory Panel and Meningitis panel for inpatients only	
SARS Co V2	All Positives for inpatients only	

IMMUNOLOGY

STANDARD CRITICAL VALUES		
TEST		
Influenza A and B	All Positives for inpatients only	
RSV	All Positives for inpatients only	

POINT OF CARE

STANDARD CRITICAL VALUES		
TEST	**LOW**	**HIGH**
Glucose (Whole blood)	< 54 mg/dl	> 400 mg/dl
Glucose (Neonate)	< 40mg/dl	>250 mg/dl

Required Reportable Diseases and Conditions

Amebiasis (Entamoeba histolytica)
Anaplasmosis (Anaplasma phagocytophilum)
Anthrax (Bacillus anthracis)
Arbovirus infections * (see box below)
Babesiosis
Botulism
Brucellosis
Burkholderia mallei
Burkholderia pseudomallei
Campylobacter
CD4 count
Chancroid (Haemophilus ducreyi)
Chlamydia trachomatis including LGV
Cholera (Vibrio cholerae)
Clostridium difficile
Clostridium perfringens, epsilon toxin
Coccidioidomycosis (Coccidioides immitis)
Congenital Coccidioidomycosis
Creutzfeldt-Jakob
Cryptosporidiosis (Cryptosporidium sp.)
Cyclosporiasis (Cyclospora cayetanensis
Diphtheria (Corynebacterium diphtheriae)
E. coli 0157:H7 infection
Ehrlichiosis
Encephalitis, infectious
Giardiasis
Gonorrhea (Neisseria gonorrhoeae)
Haemophilus influenzae (invasive disease) isolated from a normally sterile site
Hantavirus
Hepatitis A IgM
Hepatitis, viral (types B, C, D, E and G)
Human Immunodeficiency Virus infection (HIV)
Influenza novel A or pandemic strain
Influenza-associated pediatric mortality
Isosporiasis (Cystoisospora belli)
Legionellosis
Leprosy (Mycobacterium leprae)
Leptospirosis (Leptospira interrogans)
Listeriosis (Listeria monocytogenes)
Lyme disease (Borrelia burgdorferi)
Malaria (Plasmodium species)
Measles (Rubeola)
Meningitis (bacterial, viral, fungal)
Meningococcal invasive disease (Neisseria meningitidis)
Microsporidiosis
Mumps
Mycobacteriosis other than MTB complex or M. leprae
Pertussis (Bordetella pertussis)
Pesticide related illness (cholinesterase below normal range)
Plague (Yersinia pestis)
Pneumonia in a healthcare worker resulting in hospitalization
Poliomyelitis (Poliovirus)
Psittacosis (Chlamydophila psittaci)
Q Fever (Coxiella burnetti)
Rabies
Ricin toxin poisoning
Rocky Mountain Spotted Fever (Rickettsia rickettsii)
Rubella & Congenital Rubella Syndrome
Salmonellosis (non-typhoid fever types)
Severe Acute Respiratory Syndrome (SARS)—SARS associated Coronavirus (SARS-CoV)
Shiga-like toxin production
Shigellosis
Smallpox (other orthopoxviruses)
Staphylococcal Enterotoxin B
Streptococcal invasive disease (types A&B) isolated from a normally sterile site
Streptococcus pneumoniae (invasive)
Syphilis (Treponema pallidum)
Tetanus (Clostridium tetani)
Trichinosis (Trichinella spiralis)
Tuberculosis
Tularemia (Francisella tularensis)
Typhoid fever (Salmonella typhi)
Vancomycin intermediate S. aureus
Vancomycin resistant S. aureus
Varicella (chickenpox, fatal cases only)
Vibriosis, noncholera
Viral hemorrhagic fevers (all types including but not limited to Crimean-Congo, Ebola, Marburg, Lassa, Machupo viruses)
Yersiniosis

Arbovirus infections including but not limited to:	
Chikungunya virus	St. Louis encephalitis
Dengue fever	Western equine encephalitis
Eastern equine encephalitis	West Nile Virus
	Yellow fever

LaCrosse virus	Zika virus

Test Ordering and Requests for Laboratory Services

Test Ordering
Refer to the following methods:

- Routine Requests: Physicians and nurses are urged to order the majority of testing for the 5 a.m. collection on the night before service is desired. Phlebotomy uses a handheld device which allows for real-time collection of specimens. When testing is ordered, the patient and testing information appear on the handheld device screen for the phlebotomist to see. All STATS and Timed tests will show as a priority and are collected before routine testing.
- STAT Requests: STAT requests should be used only if absolutely necessary. They are collected and processed immediately. Please note that abuse of STAT classification results in delay of routine and true STAT requests.
  Note: The use of "Now" is not recognized terminology. Please use routine, STAT, or Timed. If "Now" is used, it will be considered a timed test.
- Timed Requests – should be used for:
  -Requests for laboratory specimens to be collected at a specific time are to be ordered as "Timed".

Requests for Laboratory Services
The laboratory will only perform tests at the request of a physician or authorized individual as defined by the State of Maryland. Technologists are not authorized to accept or reject requests for extraordinary services. Such requests must be directed to the pathologist. Please refer to the following for instructions on requesting laboratory services:

- Inpatient Requests: Requests for laboratory services (except for Anatomic Pathology) are entered into HIS by physician or nurse.
- Outpatient Requests: Requests for services on outpatients must be in writing or electronically from attending physician. A verbal request must be followed by a written order. All requests must include the essential order elements previously identified.

PRIORITY TESTING

Testing from the ED, ICU, Labor and Delivery, OR, and the Nursery have highest priority. The following tests take priority over all other tests requested whenever unusual circumstances dictate.

HEMATOLOGY

WBC & Hematocrit
(Differential if WBC is <2,000 or < 50,000)
PT, PTT and Fibrinogen
Cell Count – CSF & Body fluids

CHEMISTRY

Glucose
BUN
Creatinine
Electrolytes (Na, K, Cl, CO_2)

URINALYSIS

Urinalysis without microscopic

MICROBIOLOGY

Gram Stain

BLOOD BANK

Crossmatch
Transfusion Reaction Workup

STAT TESTING

BLOOD BANK

Type and crossmatch (STAT and ER patients)
Transfusion reaction workups
Delivery/preparation of:
- Red Blood Cells Leukocyte Reduced
- Apheresis Platelets Leukocyte Reduced (when available)
- Pooled Cryoprecipitate AH
- Plasma, frozen within 24 hours after phlebotomy

NOTE: Antibody problems will be evaluated on a case-by-case basis to determine availability of products.

HEMATOLOGY

CBC
Manual differential
Reticulocyte count
Fibrinogen
FDP
PT
PTT
ESR
Sickle cell testing
D-Dimer
Cell count – CSF, pleural fluid, ascitic fluid, joint fluid
Monospot
Kleinhauer/Betke testing
Rapid Malaria Screen

STAT TESTING – *(continued)*

CHEMISTRY

Acetaminophen
Albumin
Alkaline phosphatase
ALT
Ammonia
Amphetamines
Amylase
AST
Barbiturates
Benzodiazepines
BNP (Pro)
BUN
Buprenorphine
Calcium
Chloride
CK
CO_2
Cocaine
Creatinine
CSF protein
CSF glucose
Digoxin
Dilantin (phenytoin)
Direct bilirubin
Ethanol
Gentamicin
Glucose
hsCRP
Ionized Calcium
Iron
Ketones
Lactic Acid
LDH
Lipase
Lithium
Magnesium
Methadone
Opiate
Osmolality
Oxycodone
PCP
Phenobarbital
Phosphorous
Potassium
Pregnancy test (urine & serum)
Salicylate
Sodium
Tegretol (carbamazepine)
THC
Theophylline
Total bilirubin
Total protein
Troponin
Valproic acid
Vancomycin

URINALYSIS

Urinalysis

MICROBIOLOGY

Gram Stain
Rapid Strep Screen Group A
RSV testing
Influenza testing
Rotavirus (UCMC dayshift only)
SARS Co-V2

HISTOLOGY

Frozen sections – frozen sections occurring after 5pm Monday through Friday or on weekends must be scheduled in advance with the Pathologist. Other procedures available on a case-by-case basis upon consultation with Pathologist.