Chapter 11: Special Collections and Point-of-Care Testing

Objectives

1. Define the key terms and abbreviations at the beginning of this chapter.
2. Explain the principle behind each special collection procedure, identify the steps involved, and list any special supplies or equipment required.
3. Describe patient identification and specimen labeling procedures required for blood bank tests and identify the types of specimens typically required.
4. Describe sterile technique in blood culture collection, explain why it is important, and list the reasons why a physician might order blood cultures.
5. List examples of coagulation specimens and describe how to properly collect and handle them.
6. Describe chain-of-custody procedures and identify the tests that may require them.
7. Explain the importance of timing; identify the role of drug half-life, providing names of drugs as examples; and describe peak, trough, and therapeutic levels in therapeutic drug monitoring.
8. Define point-of-care testing (POCT), explain the principle behind the POCT examples listed in this chapter, and identify any special equipment required.

Objectives (cont’d)

7. Explain the importance of timing; identify the role of drug half-life, providing names of drugs as examples; and describe peak, trough, and therapeutic levels in therapeutic drug monitoring.

Special Procedures

- Blood Bank Specimens
  - Specimen requirements
    - Lavender- or pink-top EDTA tubes
    - Non additive glass red-top maybe used
  - Identification & labeling requirements
    - Patient’s full name
    - Patient’s hospital ID# or SS#
    - Patient’s date of birth
    - Date & time of collection
    - Phlebotomist’s initials
Special Procedures (cont’d)

• Blood Bank Specimens
  – Special identification systems
    • ID bracelet w. self-carbon adhesive label for specimen
    • Blood ID-band with linear bar-coded BBID 
  – Siemens Patient Identification Check-Blood Administration

• Type, Screen, and Cross-Match
  – Blood type (ABO) & Rh factor (+ or -) & screen
  – Cross-match to determine compatibility between patient & donor

Special Procedures (cont’d)

• Blood Donor Collection
  – General
    • Collected for transfusions, not diagnostic testing
    • Collected in “units” from volunteers
    • Requires special training & skills
  – Donor eligibility
    • Between ages 17 & 66 years
    • Weight at least 110 lbs
    • Physical exam & medical history required
    • Written permission from donor required

• A phlebotomist compares a labeled blood bank tube with a blood bank ID bracelet

• Blood Donor Collection
  – Lookback program
    • All blood components of unit must be traceable to donor
    • Requires notification to all blood recipients when a donor is shown to be positive for a transmissible disease
  – Autologous donation
    • Person donates blood for his/her own use (e.g., for elective surgeries)
  – Cell salvaging
    • Patient’s blood can be salvaged, washed, & reinfused
    • Salvaged blood must be tested for residual free hemoglobin
Special Procedures (cont’d)

- Blood Cultures
  
  General
  - Determine presence & extent of infection
  - Identify type of organism responsible & best antibiotic to use
  - Should be ordered on basis of patient having a condition in which bloodstream invasion is possible & presence of fever

  Specimen requirements
  - 2 blood culture sets
  - Drawn 30 to 60 min. apart (unless patient in critical condition)
  - Collected in special bottles, one aerobic & one anaerobic

Special Procedures (cont’d)

- Blood Cultures: Video (Blood Cultures)
  
  Skin antisepsis: Most important part of collecting
  
  Purpose
  - Destroy skin microorganisms
  - Prevent misinterpretation of microorganism as pathogenic
  - Acceptable antiseptics
    - chlorhexidine gluconate
    - Tincture of iodine or povidine
  - Requires 30- to 60-second friction scrub

Special Procedures (cont’d)

- Blood Cultures
  
  Collection procedure
  1. Follow normal ID protocol; explain collection procedure
  2. Identify venipuncture site & release tourniquet
  3. Aseptically select & assemble equipment
  4. Perform friction scrub
  5. Allow site to dry
  6. Remove flip-off cap & inspect bottle for visible defects
  7. Cleanse culture bottle stoppers while site is drying

Special Procedures (cont’d)

- Performing friction scrub, removing flip-off cap, & cleansing culture bottle stopper
**Special Procedures (cont’d)**

- **Blood Cultures**
  - **Collection procedure**
    8. Mark min. & max. fill on culture bottles
    9. Reapply tourniquet & perform venipuncture
    10. Inoculate medium as required
    11. Invert bottle several times
    12. Clean patient’s skin if applicable
    13. Label specimen containers with required ID info which includes name, DOB, time collected, indicate where it was drawn from (RH, RA, LH, LA)
    14. Dispose of used & contaminated materials

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**Special Procedures (cont’d)**

- **Performing venipuncture & inoculating medium**

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**Special Procedures (cont’d)**

- **Blood Cultures**
  - **Collection procedure**
    15. Thank the patient, remove gloves, & sanitize hands
    16. Transport specimens to lab ASAP

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**Special Procedures (cont’d)**

- **Media inoculation methods**
  - **Direct inoculation**
    - Collect specimen directly into blood culture medium
  - **Use butterfly & specially designed holder**
  - **Syringe inoculation**
    - Transfer blood to bottles after draw is completed
    - Safety transfer device is required
Special Procedures (cont’d)

- Blood Cultures
  - Intermediate collection tube
    - Sometimes used in place of blood culture bottle
    - Yellow-top SPS tube is acceptable
    - Use is discouraged, however, because:
      - Final concentration of SPS is increased
      - Presents another opportunity for contamination
      - Increased exposure risk to lab staff

Special Procedures (cont’d)

- Antimicrobial Neutralization Products
  - Purpose
    - Removes or neutralizes antimicrobials/antibiotics from blood
    - Prevents antimicrobials from inhibiting growth of microorganisms.

Special Procedures (cont’d)

- Coagulation Specimens
  - A “clear” or discard tube is required for coagulation tubes (PT/PTT) drawn with butterfly because of the tubing. Some places require a discard tube each time a blue top is drawn. Top of pg 372
  - Sodium citrate tubes must be filled until vacuum is exhausted. If not filled completely they will be rejected. Must be 9:1 ratio of blood to anticoagulant.
  - Never pour 2 partially filled tubes together
  - Cooling on ice during transport may be required
  - When drawing from an indwelling catheter: A draw & discard 10 mL must be drawn by the RN.

Special Procedures (cont’d)

- 2-Hour Postprandial Glucose
  - Glucose in diabetics is significantly increased 2 hrs after meal
  - Excellent screening test for diabetes
- Hyperglycemia: increased blood glucose level
- Hypoglycemia: decreased blood glucose level
Special Procedures (cont’d)

- Glucose Tolerance Test (GTT)
  - GTT preparation
    - Patient must:
      - Fast at least 12 hrs but not more than 16 hrs before test
      - Drink water during fast & test
      - Do not smoke or chew gum
  - GTT procedure
    1. Follow normal ID protocol & explain collection procedure; advise of fasting requirements
    2. Draw fasting specimen & check for glucose
    3. Ask patient to collect fasting urine specimen (if needed)
    4. Give patient determined dose of glucose beverage
    5. Remind patient to finish beverage within 5 min.
    6. Note time patient finishes, start timing, calculate collection times
    7. Give a copy of collection times to patient (not necessary, pt does not leave area)
    8. Collect blood & urine specimens at computed times
    9. Label all specimens with collection times, intervals, patient ID
    10. Deliver or send specimens to lab ASAP

Special Procedures (cont’d)

- Lactose Tolerance Test
  - Determines lack of enzyme that converts lactose into glucose/galactose
  - Performed in same manner as 2-hr GTT, only w. lactose

- Paternity/Parentage Testing
  - Excludes possibility of paternity rather than proves it
  - Requires a chain-of-custody protocol & specific ID procedures
  - Mother, child, & alleged father are all tested
  - Blood samples are preferred, but cheek swabs are increasing
  - Blood sample testing includes ABO & Rh typing
Special Procedures (cont’d)

• Therapeutic Drug Monitoring
  – Establishes & maintains drug dosage at therapeutic level
  – Such as blood thinners, seizure meds etc
  – Avoids drug toxicity
  – Typically used for drugs with therapeutic ranges

• Therapeutic Phlebotomy: Video (Hemochromatosis)
  – Withdrawal of large volume of blood to treat (500ml)

• Polycythemia: Body’s over production of RBCs
• Hemochromatosis: Excess iron deposits in tissues

Special Procedures (cont’d)

• Toxicology Specimens
  – Clinical blood alcohol (ethanol) specimens
    • Normally ordered by physician for treatment purposes
    • Chain of custody not required, but follow standard protocol
    • Required in connection to on-the-job injury, employee insurance programs, & employee drug screening
    • Skin preparation: don’t use alcohol-based disinfectant
    • Specimen requirements: gray-top sodium fluoride tube; fill tube until vacuum is exhausted & don’t remove stopper
  – Forensic blood alcohol (ethanol) specimens
    • Often requested by law enforcement officials
    • Used to determine levels in breath, urine, or blood
    • Specimen collection must follow chain of custody
    • Forensic toxicology is concerned with legal consequences of toxin exposure.

• Drug screening
  • Required by many healthcare organizations, sports associations, & major companies
  • May be random, pre employment, post accident
  • May detect a specific drug or screen for up to 30 drugs
  • Typically performed on urine rather than blood
  • Chain of custody is required
Special Procedures (cont'd)

- Drug screening
  - Patient preparation requirements
  - Explain test purpose & procedure
  - Advise patient of his or her legal rights
  - Obtain a witnessed, signed consent form
- Specimen collection requirements
  - Special area for urine collection
  - Proctor present at time of collection
  - Split sample may be required
  - Specimen must be labeled, sealed, & placed in a clocked container

Trace Elements
- Tests for aluminum, arsenic, copper, lead, iron, & zinc
- Measured in small amounts
- Traces of them in glass, plastic, or stopper material can leach into specimen
- Special trace element–free tubes must be used (royal blue & contain EDTA, heparin, or no additive)

Point-of-Care Testing

- General
  - Brings lab testing to location of patient
  - Made possible by development of small, portable testing devices
  - Offers convenience to patient & short turnaround time
  - Requires carrying out quality-control & maintenance procedures necessary to ensure that results are accurate

Point-of-Care Testing (cont’d)

- Quality and Safety in POCT
  - Waived vs. non-waived quality control checks
  - Electronic quality control (EQC) built into POC instruments
  - Specimen collection & handling not checked by EQC
  - Daily external liquid QC for noninstrumented POCT
  - POC instruments become possible fomites for disease
    - Disinfect with 10% bleach
    - Reduce cross-contamination between patients
Point-of-Care Testing (cont’d)

- Coagulation Monitoring by POCT
  - **Coagulation tests that are monitored**: Done in physician office, to monitor pt blood thinner (warfarin)
    - Prothrombin time (PT) & international normalized ratio (INR)
    - Activated partial thromboplastin time (APTT or PTT)
    - Activated clotting time (ACT)
    - Platelet function

Point-of-Care Testing (cont’d)

- Coagulation Monitoring by POCT
  - **POCT instruments**
    - Cascade POC — ACT, APTT, PT/INR
    - CoaguChek XS Plus — PT/INR
    - GEM Premier 4000 — ACT, APTT, PT/INR
    - i-STAT — ACT, PT/INR
    - Verify Now — platelet function

Point-of-Care Testing (cont’d)

- **Bleeding-Time Test Procedure**
  1. ID patient & sanitize hands
  2. Determine patient use of aspirin in past 2 weeks & describe risks
  3. Support patient’s arm on steady surface
  4. Select area on inner lateral surface of forearm
  5. Place blood pressure cuff around arm
  6. Clean selected area with alcohol & allow to air-dry
  7. Put on gloves & prepare equipment
  8. Remove puncture device from package, keeping blade sterile

Point-of-Care Testing (cont’d)

- **Bleeding-Time Test Procedure**
  9. Inflate blood pressure cuff to 40 mm Hg
  10. Remove safety clip & place puncture device on forearm
  11. Depress trigger & start timer; discard in sharps container
  12. Blot blood flow at 30 seconds w. filter paper
  13. Stop timer when blood no longer stains filter paper
  14. Remove blood pressure cuff, clean & bandage arm
  15. Record time to nearest 30 seconds
  16. Dispose of used & contaminated supplies; thank patient
Point-of-Care Testing (cont’d)

- Place puncture device firmly on lateral aspect of forearm

Point-of-Care Testing (cont’d)

- Arterial Blood Gases and Chemistry Panels
  - Arterial blood gases measured
    - pH
    - Partial pressure of carbon dioxide
    - Oxygen saturation
    - Partial pressure of oxygen

Point-of-Care Testing (cont’d)

- Arterial Blood Gases and Chemistry Panels
  - Electrolytes measured
    - Sodium
    - Potassium
    - Chloride
    - Bicarbonate ion
    - Ionized calcium

Point-of-Care Testing (cont’d)

- Multiple-Test-Panel Monitoring by POCT
  - Commonly ordered stat tests such as blood gases, electrolytes, & hemoglobin
  - Instruments with a menu of several different tests:
    - GEM Premier
    - i-STAT
    - NOVA Stat Profile Analyzer
    - ABL 80 Flex
**Point-of-Care Testing (cont’d)**

- Other Tests Performed by POCT
  - Cardiac troponin T & I
  - Lipid testing
  - B-type natriuretic peptide
  - C-reactive protein
  - **Glucose**: Most common
  - Glycosylated hemoglobin

- Hematocrit:
- Hemoglobin A1C: Done in some physician’s office
- Lactate
- **Occult blood**: Microscopic blood in stool
- Pregnancy testing
- Skin tests
- Strep testing
- Urinalysis

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**Chapter 10/11 test info:**

- Know what disqualifies a site for capillary puncture
- What are the skin puncture supplies
- Osteomyelitis, Osteochondritis
- Hemoconcentration
- Maximum depth of capillary puncture
- Additional fluids found in capillary specimens
- What angle used in routine blood smear
- Most common POCT
- What is collected 1st when doing capillary puncture?

- Spiral patterns on finger tips
- Small tubes used to collect capillary specimens
- When are capillary specimens normally done on adults
- Hypoglycemia
- Measures packed cell volume
- Newborn/neonatal screening
- GTT
- Therapeutic drug monitoring
- Skin asepsis
- Cold agglutinins
- Type & screen

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**Cont.**

- Feathered
- Capillary blood more resembles what
- 43 multiple choice
- Know study questions