UNIT 9 LABORATORY PROCEDURES

CHAPTER 42

URINALYSIS

Overview

Urinalysis is an important tool in patient diagnosis and in following the course of a disease. It is vital that medical assisting students understand both the importance of urinalysis and what it entails, including proper collection techniques for urine specimens, safety guidelines involved in collecting and handling specimens, and a knowledge of the measures that need to be taken to ensure a consistent quality control program. In addition, students must understand how to properly perform urinalysis and must be cognizant of factors that may interfere with urinalysis accuracy. Standard Precautions must be observed when handling and analyzing urine specimens.

Lesson Plan

I. LEARNING OUTCOMES	ABHES	CAAHEP
A. Define, spell, and pronounce the key terms as presented in the glossary.		
B. Use language/verbal skills that enable the patient's understanding.	MA.A.1.8.cc	I.A.2
C. Display sensitivity to the patient's rights and feelings in collecting specimens.	MA.A.1.8.bb	III.A.1
D. Explain the rationale for performing a proper clean catch collection to a patient.	MA.A.1. 10.b(1)	III.A.2, IV.P.6
E. Explain the process of urine formation.	MA.A.1.2.c	I.C.5
F. Discuss the importance of safety procedures and quality control when working with urine.	MA.A.1.10.a	III.C.9
G. Describe the importance of proper collection and preservation of 24-hour urine specimens.	MA.A.1.10. b(1)	I.P.14
H. Identify the proper technique for examining the physical characteristics of a urine specimen.	MA.A.1.10. b(1)	I.P.14
I. Perform urinalysis (excluding microscopy).	MA.A.1.10. b.(1)	I.P.14
J. Identify the proper method of preparing urine sediment for microscopic examination.	MA.A.1.10. b.(1)	I.P.14
K. Identify normal and abnormal structures found during the microscopic examination of urine sediment.	MA.A.1.10. b(1)	I.P.14
L. Analyze the professionalism questions and apply them to this chapter's content.		

II. PROFESSIONALISM QUESTIONS
  A. Communication
    1. Did you introduce yourself? Did you identify the patient through name and birth date or other identifying feature?
    2. Did you listen to and acknowledge the patient?
    3. Did you speak at the patient's level of understanding?
    4. Did you provide appropriate responses/feedback?
    5. Did you explain procedures and expectations to the patient?
    6. Did you allay patients' fears regarding the procedure being performed and help them feel safe and comfortable?
    7. Did you respond honestly and diplomatically to the patient's concerns?

- B. Presentation
  1. Were you dressed and groomed appropriately?
  2. Were you courteous, patient, and respectful to the patient?
  3. Did you display a positive attitude?
  4. Did you display a calm, professional, and caring manner?
- C. Competency
  1. Did you pay attention to detail?
  2. Did you ask questions if you were out of your comfort zone or did not have the experience to carry out tasks?
  3. Were you knowledgeable and accountable?
- D. Integrity
  1. Did you work within your scope of practice?
  2. Did you immediately report any error you had made?

III. REFERENCES
- A. Lindh, Wilburta Q., Pooler, Marilyn S., Tamparo, Carol D., Dahl, Barbara M., & Morris, Julie A., *Delmar's Comprehensive Medical Assisting: Administrative and Clinical Competencies,* 5e
- B. See text Chapter 42, References/Bibliography
- C. Any other teacher-preferred reference material such as your program MSDS manual, Web sites of OSHA, CLIA, and so forth

IV. VISUAL AIDS
- A. Computer access to identified Internet resources
- B. Any other teacher-preferred visual aids (PowerPoints, etc.)
- C. Copies of available OSHA regulations, Material Safety Data Sheets (MSDSs), Standard Precautions, and CLIA '88

V. EQUIPMENT AND MATERIALS
- A. Computer, TV monitor, and Internet access
- B. Pamphlets and articles on laboratory safety and bloodborne pathogens
- C. See IV: Visual Aids

VI. SAFETY
- A. Basic classroom procedures
- B. Follow Standard Precautions
- C. Maintain confidentiality of laboratory reports and other patient information
- D. Review CLIA and OSHA regulations and pamphlets on laboratory procedures

VII. PREPARATION
- A. Arrange for visual aids equipment.
- B. Collect materials.
- C. Review Chapter 42 in the text, the Study Guide, the Competency Manual, and the Instructor's Manual.
- D. Review CLIA and OSHA regulations and laboratory safety.

VIII. INTRODUCTORY REMARKS/ACTIONS
- A. Read Learning Outcomes in the text with students to introduce the chapter.
- B. Ask, "What would happen to your health if you were unable to produce urine?"
- C. Ask, "Why do some people urinate more than others and what factors contribute to urinary output?"

IX. PRESENTATION
- A. Urine Formation
  1. How body excretes water and gets rid of waste, which can become toxic if not removed
  2. Two kidneys eliminate soluble waste products of metabolism
  3. Urine forms in kidneys and leaves body through urethra
  4. Filtration
     - a. One million nephrons in each kidney
     - b. Nephron—combination of glomerulus and tubule
     - c. Glomerulus filters waste products, salts, and excess fluid from blood
     - d. Tubule concentrates filtered material

    e. Substances filtered out from body
        (1) Water
        (2) Ammonia
        (3) Electrolytes
        (4) Glucose
        (5) Amino acids
        (6) Creatinine
        (7) Urea
    f. Excess sugar can alert to possible diabetes
    g. Routine urinalysis testing
5. Reabsorption
    a. About 180 liters of filtrate produced daily
    b. Only 1–2 liters of urine eliminated
    c. Much filtrate reabsorbed into body
    d. Blood cells and most proteins stay in blood
    e. Concentration of glucose in blood below 180 mg/dL will be reabsorbed
    f. Glucose is a threshold substance
6. Secretion
    a. Substances not already filtered are secreted into urine through distal convoluted tubule
    b. Hydrogen and ammonium ions may be secreted into urine exchanged for sodium

B. Urine Composition
    1. After passing through kidney, urine is 96% water and 4% dissolved substances (urea, salt, sulfates, phosphates)
    2. Abnormal constituents of urine
        a. WBCs
        b. Fat
        c. Glucose
        d. Casts
        e. Bile
        f. Hemoglobin and RBCs
    3. Changes in urine production
        a. Amount of urine excreted can rise or fall
        b. Urine color can change
        c. Urine appearance can vary
        d. Urine odor can change
        e. Cells can be present in urine
        f. Chemical constituents in urine can change
        g. Urine concentration (specific gravity) may vary

C. Safety
    1. Standard Precautions
    2. Transmission-based precautions
    3. Biohazard precautions
    4. Proper disposal of urine

D. Quality Control
    1. Regulatory agencies
    2. Written testing protocols
    3. Maintaining testing records
    4. Recalibration of instruments
    5. Documentation of daily control testing kept at least 3 years
    6. Commercially available urine control samples
    7. Run positive and negative controls each day on all tests

E. Precautions to Use When Handling Urine
    1. Treat as infectious, use gloves
    2. Avoid splashes, use face shield
    3. Process sample as soon as possible
    4. Store urine only in designated refrigerator
    5. Dispose of properly

F. CLIA 1988
  1. Appropriate training in methodology of test being performed
  2. Understanding of urine-testing quality control procedures
  3. Proficiency in the use of instrumentation; being able to troubleshoot problems
  4. Knowledge of stability and proper storage of reagents
  5. Awareness of factors that influence test results
  6. Knowledge of how to verify test results
  7. CLIA categorizes microscopic exam as a PPM

G. Urine Containers
  1. Types
    a. Nonsterile containers for routine urinalysis
    b. Sterile containers for urine cultures
    c. Twenty-four-hour collection containers with added preservatives
  2. Label container immediately after specimen collection
    a. Patient's name, age, gender, identifying number
    b. Date and time of collection
    c. Provider's name
    d. Label the cup, not the lid
  3. Request fresh urine sample if patient brings sample in a generic container

H. Urine Collection
  1. Urine specimen types
    a. Random (spot) specimen
      (1) Obtained at any time
      (2) Most common
    b. First morning void specimen
      (1) If concentrated specimen preferred, first specimen of day is most concentrated
    c. Fasting/timed specimens
      (1) Used when provider wants to measure substance without interference from food intake
      (2) Length of fast varies
      (3) Give patient written directions
      (4) Use regular urinalysis container
    d. Twenty-four-hour specimen
      (1) Circadian rhythm and intake of food and water determine concentration of substances at different times during day/night
      (2) Requested when quantitative tests for different substances are desired
      (3) Expressed in units per 24 hours
      (4) Use of preservatives and refrigeration
      (5) Sometimes use 2-hour or 12-hour collection instead
  2. Collection methods
    a. Clean-catch method; midstream collection
      (1) Patient instructed in cleansing technique
    b. Catheterized
      (1) Insert sterile catheter directly into bladder through urethra
      (2) Not contaminated, sterile
      (3) Can cause infection if not done correctly
      (4) Use only when other methods are contraindicated or show repeated positive testing for bacteria or contaminants
      (5) Patient education in 24 hour urine and in clean-catch, midstream urine collection

I. Examination of Urine
  1. Best when fresh, even still warm
  2. Must test within 30 minutes, or refrigerate
  3. Routine urinalysis procedure consists of physical, chemical and microscopic examination
    a. Physical examination of urine
      (1) Assess volume of urine specimen, making sure specimen is sufficient for testing. If less than 10mL, amount should be recorded. If volume is very small, priority is given to which tests to perform and Quantity Not Sufficient (QNS) is written on the report
      (2) Observe and record color and transparency of specimen

- (3) Note any unusual urine odor
- (4) Measure specific gravity of specimen
    - (a) Urinometer
        - i. Measures specific gravity
        - ii. Reading the meniscus
        - iii. Urine should be at room temperature
        - iv. Human error is a concern, may be less accurate
    - (b) Refractometer
        - i. Most common tool for measuring specific gravity of liquids
        - ii. Measures refractive index of urine
        - iii. Reads about 0.002 below that of true specific gravity
        - iv. Needs one drop of urine
        - v. Easy to use

b. Chemical examination of urine
- (1) Use of Multistix reagent strips with color-coded chart
- (2) Chemical testing available on urine reagent test strips
    - (a) Bilirubin
    - (b) Blood
    - (c) Glucose
    - (d) Ketones
    - (e) Leukocyte esterase
    - (f) Nitrites
    - (g) pH
    - (h) Protein
    - (i) Specific gravity
    - (j) Urobilinogen
- (3) Reagent test strip quality control

c. Microscopic examination of urine sediment
- (1) Sediment is forced to the bottom of centrifuged tube
- (2) Helps determine kidney disease, disorders of urinary tract, and systemic disease
- (3) Need fresh urine
- (4) Use of urine color atlas
- (5) Use of urine stains
- (6) Sediment components
    - (a) Centrifuge 10–15 mL of urine
    - (b) Pour off supernatant urine
    - (c) Resuspend sediment by tapping
    - (d) Stain (optional)
    - (e) Put drop of sediment on slide and properly cover with cover slip, avoiding trapped air
- (7) Urine sediment cells and microorganisms (using atlas of urine sediment)
  NOTE: This is a PPMP
    - (a) RBC
    - (b) WBC
    - (c) Renal or vaginal epithelial cells
    - (d) Bacteria
    - (e) Yeast
    - (f) Parasites
    - (g) Sperm
    - (h) Artifacts
    - (i) Squamous epithelial cells
- (8) Crystals in urinary sediment
    - (a) Require little attention
    - (b) Form as urine specimens stand
    - (c) Uric acid, cystine, and sulfa drug crystals can indicate disease states
- (9) Casts in urinary sediment
    - (a) Important to note
    - (b) Formed when protein accumulates and precipitates in kidney tubules

            (c) Tamm-Horsfall mucoprotein and serum proteins can form waxy casts
            (d) May indicate kidney disease
            (e) Appearance of casts
            (f) Hyaline cast most common kind seen
            (g) Granular casts and cellular casts also seen
            (h) Takes an experienced eye to identify
        d. Urinalysis report
            (1) Chain of custody
    J. Drug screening

X. APPLICATION
    A. Use the Learning Outcomes at the beginning of Chapter 42 in the text as the basis for questions to assess comprehension.
    B. See the Classroom Activities section below for numerous application activities.
    C. Assign students to complete Chapter 42 in the Study Guide.
    D. Complete the Procedures in Chapter 42, using the Competency Manual to evaluate.

XI. EVALUATION
    A. Evaluate any assigned application activities.
    B. Evaluate student participation during presentation.
    C. Grade responses to Chapter 42 in the Study Guide.
    D. Evaluate student performance on Chapter 42 Procedures.

Classroom Activities

1. Have each student keep a record of the amount of fluid taken in and the amount excreted for 1 day. Compare the intake to the output.
2. Have a guest speaker discuss dialysis. If possible, visit a dialysis center.
3. Obtain brochures and pamphlets from the Kidney Foundation.
4. Show an appropriate video. (Ask the Kidney Foundation, because it usually has videos to loan.)
5. Ask a urologist or medical assistant working in urology to visit the class as a guest speaker. A slide presentation may be used to help students learn about disorders and diseases of the urinary system.

Answers to Critical Thinking Boxes

1. What are the three actions that take place in the formation of urine?

Filtration, secretion, and reabsorption.

2. Why do you suppose we test for sugar in urine but not salt/sodium?

Sugar is a substance that can spill into urine if the blood sugar level is too high, which indicates that the body cells are not using all the sugar in the blood properly. Salt/sodium are both variables that do not indicate a disease condition and can vary according to our diets.

1. What criteria does CLIA use to determine which tests are in each category?

CLIA determines categories according to the difficulty of each test, specialized training needed, and the level of medical decision-making required.

2. In a urinalysis, which part is not in CLIA's waived category?

The microscopic examination of urine is not in the CLIA waived category.

1. Is there any test that can be performed on urine that is not in a sterile container?

Yes, a pregnancy test can be performed on a sample in a non-sterile container, first morning void preferred.

2. If a patient brings in a urine specimen from home in a clean baby food jar, can it be used for any testing or any part of a urinalysis?

If the patient is being tested for pregnancy, the urine sample can be used. For a urinalysis for diagnosis of a urinary tract infection, though, the medical assistant should respectfully ask for a fresh sample in a sterile container.

3. If a medical assistant is color blind, does that mean she/he cannot perform the chemical testing of urine?

Since the determination of the color of the urine sample is a visual judgment and the reagent test strips used in the chemical analysis of urine depend on a judgment of color and shades of color, a medical assistant who is color blind should not perform those portions of the urinalysis.

4. What (if any) accommodations can be made for her/him?

The medical assistant may perform the other portions of the urinalysis or may use an automated analyzer.

Answers to Case Studies

Case Study 42-1

Refer to the scenario at the beginning of the chapter. Wanda is careful to prepare her patient properly so she gets a good sample, she pays attention to the details so that the test is run properly, and she cares about the quality of the results.

1. What is the worst that can happen if the patient does not give a good clean-catch midstream urine sample?

The specimen can be misread microscopically due to the overabundance of epithelial cells, and the urine may be contaminated with blood or bacteria from the vaginal area or the skin.

2. What might happen if the reagents Wanda uses are outdated or have not been stored properly?

The reagents would not be reliable if they haven't been stored properly or if they are expired. They should be disposed or donated to a teaching program for practice.

3. If Wanda does not care about the quality of the urine tests, how does that reflect on the rest of Wanda's work?

A variety of answers will be presented by the students, usually related to the poor quality of Wanda's work ethic.

Case Study 42-2

Linda Sterns came to Inner City Health Care today because she is experiencing frequent urination, itching, and burning when urinating. Dr. Rice ordered a urinalysis, which clinical medical assistant Wanda Slawson is performing. Wanda notes that the urine has a cloudy appearance and the chemical reagent test strip tests positive for nitrites. Wanda confers with Dr. Rice, who instructs her to prepare a slide for a microscopic examination of the specimen.

1. Why might Dr. Rice want to examine this specimen microscopically?

To aid in the diagnosis of a urinary tract disorder. The presence of abnormal urine sediment cells and microorganisms can be determined when the specimen is examined microscopically.

2. How would the findings be reported?

Dr. Rice will look for the presence of WBCs, bacteria, yeast cells, or parasites.

Answers to Certification Review

1. d. Treat all specimens as if they were infectious
2. c. Physical, chemical, and microscopic
3. b. Clean-catch
4. b. Glucose
5. a. Reagent test strip
6. c. Blood
7. c. Abdominal pain, dysuria, and frequency
8. a. Hyaline
9. d. All of the above
10. c. Quantity not sufficient

This project was funded at $3,000,000 (100% of its total cost) from a grant awarded under the Trade Adjustment Assistance Community College and Career Training Grants, as implemented by the U.S. Department of Labor's Employment and Training Administration. Rogue Community College is an equal opportunity employer/program. Auxiliary aids and services, alternate form and language services are available to individuals with disabilities and limited English proficiency free of cost upon request.