

Certified Hemodialysis Technologist/Technician

Examination Content

The BONENT Certified Hemodialysis Technologist/Technician examination measures technical proficiency in certain skills, areas and general areas of knowledge. The examination tests the following five major domains of practice and tasks performed in the scope of hemodialysis technology:

I. Patient Care	65%
II. Machine Technology	10%
III. Water Treatment	5%
IV. Dialyzer Reprocessing	5%
V. Education/Personal Development	15%

I. PATIENT CARE (65%)

A. Assessment

1. Assess fluid management:
 - a. replacement therapy
 - b. sequential ultrafiltration
 - c. TMP calculation
 - d. ultrafiltration concepts
2. Collect and evaluate patient data:
 - a. access patency
 - b. apical pulse
 - c. blood pressure
 - d. breath sound
 - e. heart sounds
 - f. jugular vein distension
 - g. peripheral edema
 - h. pulse
 - i. respiration
 - j. signs of infection
 - k. temperature
 - l. weight
3. Observe changes in appearance of dialyzer
4. Recognize symptoms and/or complications occurring during dialysis:
 - a. chills
 - b. cramps
 - c. fever
 - d. shock
5. Recognize symptoms and/or complications due to operator or equipment error:
 - a. air embolism
 - b. bleach or formaldehyde reaction
 - c. chemical pyrogen reaction
 - d. hemolysis and water quality
6. Recognize symptoms and/or complications associated with the administration of medications and dialysis treatments (e.g., antihypertensives, erythropoietin, iron dextran)
7. Recognize problems regarding heparinization in hemodialysis (e.g., coagulation, hemorrhage, hemostasis)
8. Recognize access complications in patient (e.g., clotting, infection, recirculation)
9. Recognize blood leaks during dialysis

B. Management of Treatment

1. Adjust blood pump settings and pressure monitors to maintain safe and efficient dialysis per order of physician
2. Adjust fluid removal (TMP) according to established protocols
3. Administer local anesthetics according to established protocols
4. Administer anticoagulants to patient
5. Administer medication for initiation of treatment:
 - a. Heparin
 - b. local anesthetic
6. Alter dialyzing fluid
7. Apply pressure to cannulation sites after removal of cannulation needle
8. Apply dressings to cannulation sites
9. Cannulate:
 - a. AV grafts

- b. AV fistulas
- 10. Clean and dress access site using appropriate techniques
- 11. Collect blood samples for:
 - a. aluminum levels
 - b. blood chemistry
 - c. clotting time studies
 - d. cultures
 - e. hematocrits
 - f. hepatitis studies
 - g. iron studies
 - h. Kt/V
 - i. recirculation time studies
- 12. Communicate orally or in writing with other health care professionals regarding patient treatment plan (pre and post dialysis)
- 13. Initiate dialysis treatment using established access routes
- 14. Maintain appropriate documentation (data) regarding incident reporting
- 15. Monitor and record treatment data:
 - a. apical pulse
 - b. arterial and venous pressures
 - c. blood flows
 - d. blood pressure
 - e. clotting times
 - f. dialysate flow rates
 - g. fluid removal parameters
 - h. hemoglobin/hematocrit levels
 - i. Kt/V
 - j. pulse
 - k. temperature of dialysate
 - l. TMP
 - m. recirculation bloods
 - n. respiration
 - o. UFR
 - p. weight
- 16. Monitor fluid management:
 - a. replacement therapy
 - b. sequential ultrafiltration
 - c. TMP calculation
 - d. ultrafiltration concepts
- 17. Monitor the dialyzer delivery system continuously during treatment
- 18. Obtain (spin) serum specimens
- 19. Perform coagulation studies to determine heparinization
- 20. Perform procedure(s) to terminate dialysis treatment
- 21. Perform hematocrit test and quality assurance
- 22. Prepare medication for initiation of treatment:
 - a. Heparin
 - b. local anesthetic
 - c. normal saline
- 23. Prepare specimens for transportation to laboratory for analysis
- 24. Recommend patient care needs to nurse
- 25. Remove needles after termination of treatment
- 26. Verify patient identification at initiation of dialysis

C. Intervention

- 1. Administer oxygen to patient by cannula or mask
- 2. Initiate CPR to ensure patient survival
- 3. Initiate appropriate action regarding symptoms and/or complications occurring during dialysis:
 - a. chills
 - b. cramps
 - c. fever
 - d. shock
- 4. Initiate appropriate action regarding symptoms and/or complications due to operator or equipment error:
 - a. air embolism
 - b. bleach or formaldehyde reaction
 - c. chemical pyrogen reaction
 - d. hemolysis
- 5. Initiate appropriate action regarding symptoms and/or complications occurring with the administration of medications and dialysis treatments (e.g., antihypertensives, erythropoietin, iron dextran)

6. Initiate appropriate action regarding problems of heparinization in hemodialysis (e.g., coagulation, hemorrhage, hemostasis)
7. Initiate appropriate action regarding access complications in patient (e.g., clotting, infection, recirculation)
8. Initiate appropriate action regarding blood leaks during dialysis
9. Perform hemastix safety test
10. Provide emotional support to:
 - a. patient
 - b. family
11. Respond to patient needs (e.g., comfort items)
12. Respond to alarms and make dialysis adjustments

D. Evaluation

1. Evaluate symptoms and/or complications occurring during dialysis:
 - a. chills
 - b. cramps
 - c. fever
 - d. shock
2. Evaluate symptoms and/or complications due to operator or equipment error:
 - a. air embolism
 - b. bleach or formaldehyde reaction
 - c. chemical pyrogen reaction
 - d. hemolysis
3. Evaluate symptoms and/or complications associated with the administration of medications and dialysis treatments (e.g., antihypertensives, erythropoietin, iron dextran)
4. Evaluate problems regarding heparinization in hemodialysis (e.g., coagulation, hemorrhage, hemostasis)
5. Evaluate access complications in patient (e.g., clotting, infection, recirculation)
6. Evaluate blood leaks during dialysis
7. Review patient laboratory data for abnormal values
8. Review dialysis orders

II. MACHINE TECHNOLOGY (10%)

A. Maintenance of Systems

1. Clean and disinfect dialysis equipment per unit policy (protocol)
2. Develop preventative maintenance schedules for all dialysis equipment
3. Document all dialysis equipment repair work performed
4. Maintain record of all machine maintenance performed
5. Maintain emergency equipment in proper working order for immediate use
6. Maintain/verify the calibration of ancillary equipment used to maintain medical devices
7. Maintain/calibrate dialysis machine
8. Order supplies and equipment for dialysis unit
9. Perform troubleshooting and repair of unit or home equipment according to manufacturer's recommendations, and OSHA, HCFA, requirements
10. Perform preventative maintenance to dialysis and ancillary equipment following manufacturer's recommendations, and OSHA, HCFA and AMMI requirements
11. Perform repairs to dialysis and ancillary equipment following manufacturer's recommendations and OSHA, HCFA, and AMMI requirements
12. Perform electrical leakage tests on all dialysis equipment
13. Verify blood and dialysate flow rates

B. Machine Set-up

1. Assemble dialysis equipment for operation
2. Assemble auxiliary equipment (e.g., oxygen therapy)
3. Install dialysis equipment in dialysis unit
4. Perform residual chemical checks
5. Perform required safety checks on dialysis equipment:
 - a. conductivity
 - b. pH
 - c. pressure holding test
 - d. temperature
6. Perform safety checks:
 - a. air bubble detector/alarm
 - b. arterial pressure gauge
 - c. blood leak detector/alarm
 - d. blood pump
 - e. dialysis fluid
 - f. heparin pump

- g. venous pressure gauge
- 7. Prepare bicarbonate solution
- 8. Prepare dialysis machine for operation:
 - a. rinse
 - b. prime
 - c. calibrate alarm(s)
 - d. set monitor(s)
 - e. fluid delivery system
 - f. connections
- 9. Prime dialysis machines
- 10. Rinse dialyzer of disinfectant/germicide

C. Machine Operation/Evaluation

- 1. Evaluate quality control of dialysis equipment per AAMI standards
- 2. Monitor usage of equipment and supplies
- 3. Perform rinse procedures for dialysis delivery systems
- 4. Perform disinfect procedures for dialysis delivery systems
- 5. Maintain equipment maintenance records for compliance with regulatory and standard setting organizations (e.g., OSHA, HCFA, JCAHO, CDC, AMMI, FDA)
- 6. Participate in the development of equipment maintenance procedures and schedules

III. WATER TREATMENT (5%)

A. Components/Design of Systems

- 1. Recognize the action of:
 - a. micron filtration
 - b. multimedia filtration (e.g., sand filter)
 - c. submicron filtration
 - d. ultrafiltration
- 2. Recognize the action of carbon absorption
- 3. Recognize the action of water softening
- 4. Recognize the action of reverse osmosis (RO)
- 5. Recognize the action of deionization
- 6. Recognize the process of ultraviolet light exposure

B. Maintenance of Systems

- 1. Clean and disinfect water treatment equipment
- 2. Maintain in proper working order, all treatment components
- 3. Perform water treatment system checks:
 - a. bacterial culturing
 - b. conductivity
 - c. residual disinfectants
 - d. resistivity
 - e. soft test
 - f. total dissolved solids (TDS)

C. Monitoring/Evaluating Systems

- 1. Analyze/examine water for use in dialysis to determine:
 - a. water contamination
 - b. water purity
 - c. water treatment component efficiency
- 2. Collect water and dialysate specimens for cultures and chemical analysis per AMMI standards
- 3. Evaluate quality control of reprocessing equipment per AAMI standards
- 4. Monitor safety tests:
 - a. chloramine
 - b. chlorides
 - c. hardness
 - d. LAL
 - e. percent rejection
- 5. Maintain water treatment systems records for compliance with regulatory and standard setting organizations (e.g., OSHA, HCFA, JCAHO, CDC, AMMI, FDA)
- 6. Review (annually) AAMI recommended practices for water treatment

IV. DIALYZER REPROCESSING (5%)

A. Procedures

- 1. Document dialyzer reprocessing in accordance with regulatory agencies, AAMI standards and manufacturer's recommendations

2. Ensure proper labeling according to facility protocol
3. Maintain reprocessing records
4. Prepare dialyzer for reprocessing
5. Reprocess dialyzer per facility protocol

B. Testing/Validation/Evaluation

1. Perform dialyzer reuse tests:
 - a. bacterial culturing
 - b. presence of disinfectant/germicide
 - c. pressure testing
 - d. residual disinfectant
 - e. visual inspection

V. EDUCATION/PERSONAL DEVELOPMENT (15%)

A. Patient Education

1. Advise patient of discharge instructions (e.g., care of infiltration site)
2. Advise patient and family members based on physician's orders regarding:
 - a. personal hygiene
 - b. self-care
 - c. various treatment modalities
3. Explain dialysis concepts to patients:
 - a. access care
 - b. artificial kidney function
 - c. dialyzer reprocessing
 - d. diffusion, osmosis, ultrafiltration
 - e. fluid, electrolyte, acid-base balance/composition
 - f. physiology of kidney
 - g. physiology of urinary system

B. Personal/Professional Development

1. Attend staff meetings for procedural updates
2. Attend continuing education programs to maintain current knowledge of dialysis
3. Demonstrate an understanding of the purpose of multi-disciplinary care plans
4. Explain the uses of medications and treatments to patient:
 - a. antihypertensives
 - b. Calcijex
 - c. EPO
 - d. Heparin
 - e. Hypertonic saline
 - f. IDPN
 - g. Infed
 - h. Saline
 - i. Xylocaine
5. Maintain proper body mechanics for patient and self
6. Maintain current CPR certification from the American Heart Association
7. Maintain a clean and safe patient environment (e.g., infection control)
8. Maintain patient confidentiality on medical and personal matters
9. Maintain (handle) patient's personal property (e.g., prosthetic devices, dentures)
10. Maintain universal precautions for infection control and blood borne pathogens
11. Maintain current knowledge of AAMI Standards for Dialysate Supply Systems
12. Participate in case presentations at patient care conferences
13. Participate in dialysis unit safety procedures (e.g., fire drills)
14. Perform on-site:
 - a. clinical instrumentation in-service
 - b. technical instrumentation in-service
15. Recognize complications in dialysis treatments regarding infectious diseases (e.g., AIDS, hepatitis-B, influenza)
16. Recognize clinical manifestations of electrolyte imbalances
17. Recognize problems with decreased efficiency of dialyzer
18. Review relevant current professional literature
19. Train (precept) new technologists

C. Quality Related Issues

1. Document incidents appropriately:
 - a. emergency-related issues
 - b. equipment/devices related issues

- c. patient care issues
- 2. Maintain appropriate documentation (data) regarding:
 - a. quality monitoring
 - b. treatment
- 3. Maintain an inventory of all chemical and equipment supplies
- 4. Maintain proper storage of medications to ensure quality
- 5. Maintain proper storage of equipment and materials
- 6. Participate in continuous quality improvement (CQI) activities
- 7. Participate in the development of Quality Assurance programs for dialysis unit
- 8. Participate in the development of dialysis unit objectives