

● NGN NCLEX 2026 · VISUAL REFERENCE ● RENAL · GENITOURINARY SYSTEM ●

HIGH-YIELD PROCEDURE

Hemodialysis

Extracorporeal renal replacement therapy — vascular access, complications, intra-dialytic monitoring, and patient teaching for the client with ESKD.

SYSTEM: RENAL / GENITOURINARY FOCUS: PROCEDURE · COMPLICATIONS · TEACHING

NCJMM: RECOGNIZE CUES → TAKE ACTION

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DEFINITION & OVERVIEW

What is Hemodialysis?

Hemodialysis (HD) is the **mechanical removal of fluid, electrolytes, urea, and uremic toxins** from the blood when the kidneys can no longer perform these functions. Blood is pumped from the client into an external dialyzer (artificial kidney), filtered across a semipermeable membrane against dialysate, and returned to the body.

INDICATION · ACUTE

AKI with crisis

Fluid overload, hyperkalemia, acidosis, uremic symptoms, or drug toxicity (A-E-I-O-U).

INDICATION · CHRONIC

ESKD (Stage 5 CKD)

GFR < 15 mL/min/1.73m². Typical schedule: **3× weekly, 3–5 hours/session.**

A-E-I-O-U MNEMONIC

When to dialyze

Acid–base · Electrolytes (↑K⁺) · Intoxications · Overload · Uremia

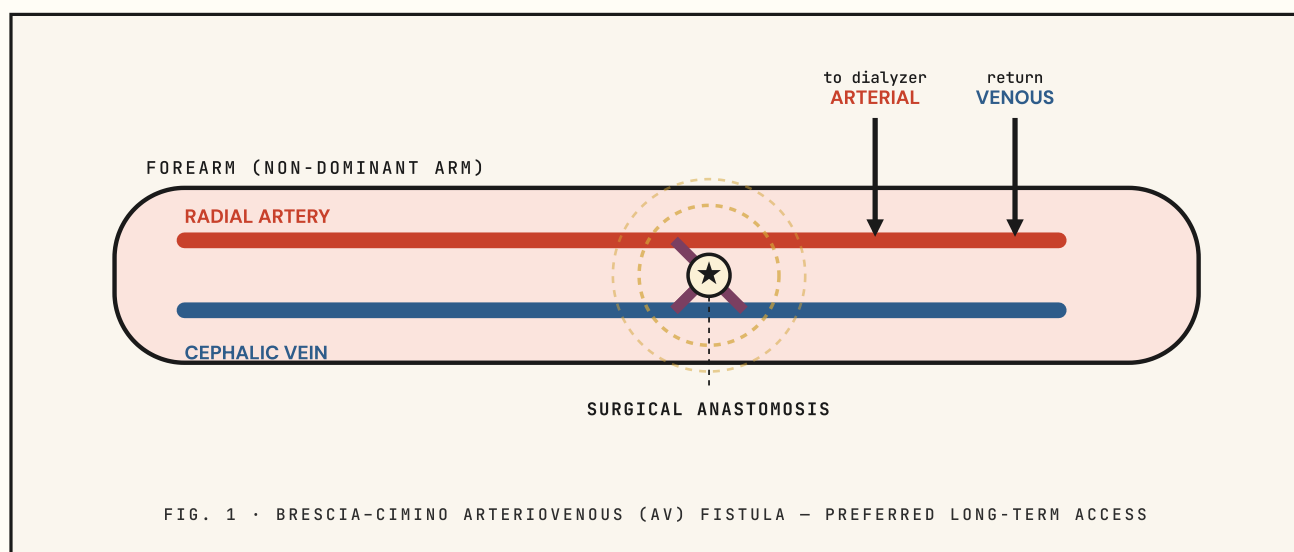
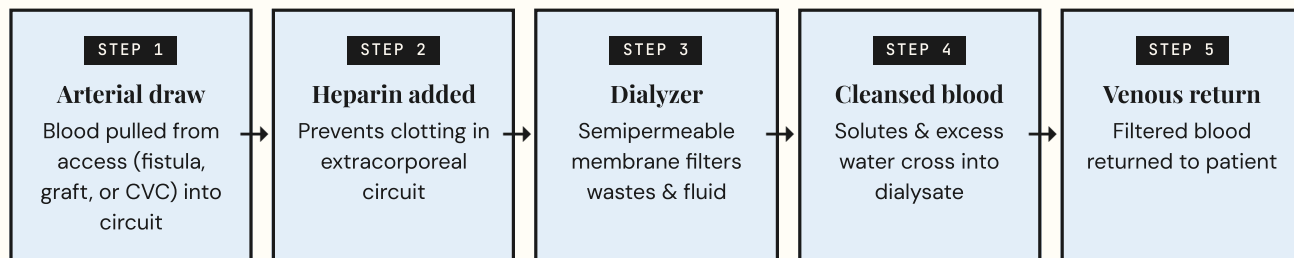
KEY PRINCIPLES HD works by **diffusion** (solutes move from high to low concentration), **osmosis** (water follows solutes), and **ultrafiltration** (pressure–driven fluid removal).

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MECHANISM & VASCULAR ACCESS

How the Circuit Works

The HD circuit removes blood through one needle/port, passes it through a heparinized dialyzer, and returns it through a second needle/port. The dialysate flows **countercurrent** to the blood to maximize diffusion gradients.



PREFERRED • LASTS YEARS

AV Fistula

Native artery → vein anastomosis. Needs **4–6 weeks** to mature before use. Lowest infection & clot risk.

SYNTHETIC • MONTHS-YEARS

AV Graft

Synthetic tubing (PTFE) between artery and vein. Usable in **2–4 weeks**. Higher clot/infection rate than fistula.

TEMPORARY • USE IMMEDIATELY

Central Venous Catheter

Internal jugular or subclavian. Used for **acute** dialysis or while fistula matures. *Highest infection risk.*

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ASSESSMENT • INDICATIONS • ACCESS PATENCY

What to Recognize



Uremic Symptoms (WHEN HD IS NEEDED)

- ✗ **Neuro:** confusion, lethargy, asterixis, seizures
- ✗ **GI:** nausea, vomiting, anorexia, metallic taste
- ✗ **Skin:** pruritus, uremic frost, sallow/grey color
- ✗ **Cardiac:** pericardial friction rub, hypertension
- ✗ **Resp:** Kussmaul breathing (acidosis), pulmonary edema
- ✗ **Hematology:** anemia, easy bruising

✓ Patent AV Access (NORMAL FINDINGS)

- ✓ **Thrill** palpable — buzzing/vibration over site
- ✓ **Bruit** auscultated — whooshing sound with stethoscope
- ✓ Warm extremity, capillary refill < 3 sec
- ✓ No redness, drainage, or tenderness
- ✓ Distal pulses present
- ✓ **ASSESS THRILL & BRUIT EVERY SHIFT**



RED FLAG • ACCESS NOT WORKING

Loss of Thrill or Bruit = EMERGENCY

Absence of thrill/bruit, cool/pale extremity, severe pain, or bleeding from site → suggests **clotting, stenosis, or thrombosis**. Notify HCP immediately. Access loss = no dialysis = life-threatening for ESKD patient.

PRE-HD ASSESSMENT

Baseline VS

Weight (compared to dry weight), BP both arms, temperature, lung sounds, edema, last electrolytes (especially **K⁺**), access site.

POST-HD ASSESSMENT

Compare & Watch

Weight loss = fluid removed. Recheck BP (orthostatics), bleeding from access (apply firm pressure 10–15 min), LOC, electrolytes.

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PRIORITY NURSING CARE • ABC FRAMEWORK

What the Nurse Does

AIRWAY • BREATHING

Respiratory Status

- ✓ Auscultate lungs pre/post HD (crackles → overload)
- ✓ Monitor SpO₂ during session
- ✓ Position semi-Fowler's if dyspneic

CIRCULATION

Hemodynamics

- ✓ VS q15–30 min during dialysis
- ✓ Watch for hypotension (#1 complication)
- ✓ Cardiac monitor if hyperkalemic

AV Access Protection — The "Never" Rules

- ✗ **NEVER** take BP, draw blood, or start IV in the access extremity
- ✗ **NEVER** allow constrictive clothing, jewelry, or watches on the access arm
- ✗ **NEVER** let the patient sleep on the access arm or carry heavy objects with it
- ✗ **NEVER** use the fistula for routine IV access — it is for dialysis only
- ✗ **POST-A SIGN** at the bedside: "NO BP / NO IV — LEFT (or RIGHT) ARM"

Medication Timing Around HD

HOLD BEFORE HD

Dialyzable Drugs

Hold **antihypertensives** (would cause profound hypotension during fluid removal) and **water-soluble vitamins** until after dialysis — they are filtered out.

GIVE AFTER HD

Replace What Was Lost

Administer **B-complex vitamins, folic acid, vitamin C** after dialysis. Erythropoietin and iron typically given post-HD or per protocol.

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RENAL REPLACEMENT PHARMACOLOGY

Key Medications

DRUG / CLASS	MECHANISM / USE	KEY SIDE EFFECTS	NURSING CONSIDERATIONS
Heparin	Anticoagulant — prevents clotting in HD circuit	Bleeding, HIT (heparin-induced thrombocytopenia)	Monitor aPTT; hold pressure 10–15 min on access post-HD; avoid IM injections day of HD
Epoetin alfa (Epogen / Procrit)	Erythropoietin — stimulates RBC production for anemia of CKD	Hypertension, headache, thrombosis	Check BP before dose; monitor Hgb (target 10–11 g/dL — not normal range); supplement iron
Iron (Ferrous sulfate, IV iron)	Supports erythropoiesis; replaces blood-loss losses	GI upset, dark stools, anaphylaxis (IV iron)	PO: give with vitamin C, not with calcium/antacids. IV: test dose first.
Phosphate binders (sevelamer, calcium acetate)	Bind dietary phosphorus in the GI tract	Constipation, nausea, hypercalcemia (with Ca-based)	Give WITH meals — must be in the gut when food is present
Calcitriol / Vitamin D analogs	Activated vitamin D — kidneys can't convert; treats hypocalcemia & 2° hyperparathyroidism	Hypercalcemia, hyperphosphatemia	Monitor Ca, P, PTH levels
Sodium polystyrene sulfonate (Kayexalate) / patiromer	K ⁺ -binding resin — emergency hyperkalemia between dialysis sessions	GI upset, hypokalemia, hyponatremia, intestinal necrosis (rare)	Auscultate bowel sounds first; do not give with sorbitol if recent bowel surgery
Antihypertensives (ACEi, ARB, β-blocker)	BP control between sessions	Hypotension during HD	HOLD on dialysis days until after session unless ordered otherwise

 HIGH-RISK PEARL

Many drugs are dialyzed off

Always check whether scheduled meds are **dialyzable**. If yes, give *after* the session — otherwise the dose is lost. Examples include many antibiotics (vancomycin, aminoglycosides require renal dosing and timing), digoxin, lithium, and water-soluble vitamins.

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COMPLICATIONS & ACUTE MANAGEMENT

What Can Go Wrong & What to Do

COMPLICATION	RECOGNITION / CUES	PRIORITY MANAGEMENT
Hypotension (#1 complication)	Rapid fluid removal → BP drop. Dizziness, nausea, muscle cramps, diaphoresis, restlessness.	Slow or stop ultrafiltration · Trendelenburg/lower HOB · 0.9% NS bolus (100–250 mL) per protocol · Reassess dry weight
Muscle cramps	Painful cramping in legs/abdomen near end of session. From rapid Na ⁺ /fluid shifts.	Slow ultrafiltration · NS or hypertonic saline bolus · Reassess dry weight at next session
Disequilibrium Syndrome	Headache, nausea, vomiting, restlessness, confusion, SEIZURES . From rapid urea removal → cerebral edema. Most common in new dialysis patients .	Slow or stop HD · Notify HCP · Anticonvulsants per order · Prevent by shorter, slower initial sessions
Bleeding	From access site, GI tract, gums, or anywhere — secondary to heparin in circuit + uremic platelet dysfunction.	Hold firm pressure on access 10–15 min post-HD · Protamine sulfate if severe · No IM injections day of HD · Avoid ASA/NSAIDs
Air Embolism	SUDDEN dyspnea, cyanosis, chest pain, hypotension, churning heart murmur, ↓ LOC.	Clamp line · Position LEFT side, Trendelenburg (traps air in right ventricle) · 100% O ₂ · Notify HCP STAT
Infection (access)	Redness, warmth, drainage, fever, tenderness at access site. CVCs highest risk .	Blood cultures · IV antibiotics (often vancomycin) · Strict sterile technique with all access manipulation
Clotting / Thrombosis of access	Loss of thrill and bruit · cool, pale extremity · pain at site.	Notify HCP STAT · Likely needs thrombectomy or angioplasty · No dialysis until access restored
Hypoxemia	SpO ₂ drop during session. Common in elderly or COPD patients.	Apply O ₂ · Monitor ABGs · Slow rate
Hyperkalemia (between sessions)	Peaked T waves, widened QRS, weakness, dysrhythmias. K ⁺ > 5.0 mEq/L.	Cardiac monitor · IV calcium gluconate (cardioprotection) · Insulin + D50 · Kayexalate/patiromer · Emergency HD

COMPLICATION	RECOGNITION / CUES	PRIORITY MANAGEMENT
Fluid Overload	Crackles, JVD, S ₃ , weight ↑ between sessions, dyspnea, peripheral edema.	Strict I&O · Daily weight at same time · Limit fluid intake · Increase ultrafiltration
Hepatitis B / C exposure	Occupational and patient risk in HD units.	Vaccinate against Hep B · Universal precautions · Routine screening

 NCJMM PRIORITY · AIR EMBOLISM

Memorize the Position: LEFT SIDE + TRENDELENBURG

This is a frequent NCLEX item. Left lateral decubitus + head-down position traps the air in the right ventricle and away from the pulmonary outflow tract, allowing gradual absorption. Always paired with **clamp the line + 100% oxygen + notify provider**.

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COMMON CONFUSIONS & DISTRACTORS

NCLEX Test Traps

WRONG ANSWER

"Take BP on either arm." Students sometimes assume any arm works for routine VS.

RIGHT ANSWER

"Take BP on the arm OPPOSITE the access." Cuff pressure can collapse the fistula and cause thrombosis. Same rule applies to IVs, blood draws, and tight clothing.

WRONG ANSWER

"Give antihypertensives on schedule." Sounds like good medication adherence.

RIGHT ANSWER

"Hold antihypertensives on dialysis days until after the session." Otherwise the patient will become profoundly hypotensive during fluid removal.

WRONG ANSWER

Air embolism → Position RIGHT side / head up. Confusing this with other respiratory positions.

RIGHT ANSWER

Air embolism → LEFT lateral + TREDELENBURG. Traps air in the right ventricle, away from pulmonary outflow. Clamp line first.

WRONG ANSWER

"Use the fistula for IV antibiotics — it's already there." Convenience-based reasoning.

RIGHT ANSWER

The fistula is for DIALYSIS ONLY. Any other use risks infection (which would mean losing the access) and thrombosis. Use a peripheral IV in the opposite arm.

WRONG ANSWER

New patient with severe headache, nausea, confusion mid-HD → "Probably just hungry." Dismissing the cue.

RIGHT ANSWER

Disequilibrium Syndrome. Rapid urea removal pulls water into the brain → cerebral edema. Slow the session, notify HCP, prevent seizures. Most common in new dialysis patients.

WRONG ANSWER

Hgb target for CKD patient on EPO = 14–16 g/dL ("normal"). "Normalizing" isn't always safer.

RIGHT ANSWER

Target Hgb = 10–11 g/dL. Higher targets increase thrombosis, stroke, and cardiovascular events in CKD.

WRONG ANSWER

Give phosphate binder one hour before meals on empty stomach. Sounds like other binder drugs.

RIGHT ANSWER

Give phosphate binders WITH meals. They must be in the GI tract *at the same time* as dietary phosphorus to bind it.

WRONG ANSWER

Encourage the patient to drink lots of fluids to stay hydrated. Standard advice — but wrong here.

RIGHT ANSWER

Fluid restriction (typically ~1000 mL/day plus urine output). Excess fluid between sessions causes overload, hypertension, and difficult dialysis runs.

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PATIENT & FAMILY TEACHING

What to Teach



Protecting Your Access

- ✓ Check the **thrill (buzz) and bruit (whoosh)** daily — call the dialysis center if you lose either
- ✓ No BP cuffs, blood draws, or IVs in the access arm — **ever**
- ✓ No tight clothing, jewelry, watches, or sleeping on that arm
- ✓ No heavy lifting or carrying with the access arm (groceries, purses)
- ✓ Keep site clean and dry; report redness, warmth, swelling, or drainage
- ✓ Squeeze a rubber ball to encourage maturation of a new fistula



17 Treatment Schedule

- Attend **every** scheduled session — missing dialysis is life-threatening
- Sessions typically last 3–5 hours, 3 times per week
- Bring snacks, entertainment, warm layers — sessions can feel long and cold
- Have a backup transport plan



Diet & Fluid

- ✓ **Limit fluids** — typically about 1000 mL/day plus the previous day's urine output (per HCP)
- ✓ **Limit potassium** — avoid bananas, oranges, potatoes, tomatoes, salt substitutes
- ✓ **Limit sodium** — no processed foods, deli meats, canned soups, fast food
- ✓ **Limit phosphorus** — limit dairy, nuts, cola, chocolate; take phosphate binders **WITH** meals
- ✓ **Adequate high-quality protein** — protein is lost during dialysis
- ✓ Weigh yourself daily on the same scale at the same time



When to Call for Help

- ✗ Loss of thrill or bruit; cold, pale, or painful access arm
- ✗ Bleeding from access that does not stop with 15 minutes of firm pressure
- ✗ Fever, chills, drainage from access site
- ✗ Sudden weight gain > 2 lb/day or shortness of breath
- ✗ Severe headache, confusion, or chest pain
- ✗ Muscle weakness, palpitations (possible hyperkalemia)

PSYCHOSOCIAL • KEY TEACHING

Quality of Life

Acknowledge the emotional impact — dialysis is a lifelong commitment. Encourage support groups, counseling, and discussion of transplant candidacy. Sexual dysfunction, depression, and body-image concerns are common and should be addressed openly.

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MNEMONICS & PATTERN RECOGNITION

Memory Boosters

WHEN TO DIALYZE • AEIOU

A • E • I • O • U

- A** cid–base imbalance (severe acidosis)
- E** lectrolytes (refractory hyperkalemia)
- I** ntoxications (drug overdose, dialyzable poisons)
- O** verload (refractory fluid overload)
- U** remia (pericarditis, encephalopathy, severe symptoms)

ACCESS ASSESSMENT • TBI

T • B • I

- T** hrill — palpate (buzzing vibration)
 - B** ruit — auscultate (whooshing sound)
 - I** nspect — color, drainage, warmth, swelling
- No thrill + No bruit = No dialysis = call the HCP now.*

AIR EMBOLISM POSITION • LEFT

"Left + Down"

- L** eft lateral decubitus
- E** levate the feet (Trendelenburg)
- F** resh oxygen — 100% by mask
- T** ell the provider STAT

ACCESS PROTECTION • NEVER

"4 Nevers"

- 1** Never BP in that arm
- 2** Never IV/draw in that arm
- 3** Never tight clothing/jewelry on that arm
- 4** Never sleep on or carry weight with that arm

PATTERN RECOGNITION • "THE DIALYSIS PATIENT WHO..."

Quick Pattern Decoder

- ...has sudden severe headache + confusion mid-session → Disequilibrium Syndrome (slow HD)
- ...gets sudden dyspnea, chest pain, cyanosis → Air embolism (clamp + left + Trendelenburg)
- ...has muscle cramps + dizziness near end of session → Hypotension (slow ultrafiltration, NS bolus)
- ...lost the thrill/bruit → Clotted access (notify HCP STAT)
- ...gained 5 lb since last session + crackles → Fluid overload (review fluid restriction)

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NEXT GENERATION CLINICAL JUDGMENT MEASUREMENT MODEL

NCJMM 6-Step Scenario

CASE SCENARIO

A 64-year-old client with ESKD is receiving hemodialysis through a left forearm AV fistula. The session began 2 hours ago. The client reports a sudden severe headache, says "I feel like I'm going to be sick," and appears restless and confused. Vital signs: BP 168/96, HR 102, RR 22, SpO₂ 97%. This is the client's third dialysis session ever.

STEP 1 • RECOGNIZE CUES

Identify Relevant Data

Concerning: sudden headache, nausea, restlessness, new confusion, elevated BP, only 3rd dialysis ever (new patient).

Reassuring: SpO₂ normal, mild tachycardia/tachypnea but not severe.

STEP 2 • ANALYZE CUES

Connect the Pattern

New dialysis patient + neurologic symptoms (HA, nausea, confusion) + 2 hours into session = classic **Disequilibrium Syndrome**. Rapid urea removal from blood, water shifts into the brain → cerebral edema.

STEP 3 • PRIORITIZE HYPOTHESES

Most Likely Diagnosis

#1 Dialysis Disequilibrium Syndrome (most likely given timing + patient profile).

Rule out: hypertensive emergency, stroke, air embolism (no dyspnea/cyanosis), hypoglycemia.

STEP 4 • GENERATE SOLUTIONS

Plan Care

Slow or stop dialysis · Notify HCP · Anticipate orders for shorter/slower next session · Anticonvulsant readiness (seizure precautions) · Continued neuro checks · Reduce stimuli

STEP 5 • TAKE ACTION

Implement Priority

Slow the blood pump rate immediately per protocol · Stay with the client · Place call light within reach, side rails up · Notify nephrologist STAT · Initiate seizure precautions · Reassess VS and LOC every 5–10 min

STEP 6 • EVALUATE OUTCOMES

Reassess

Expected: HA improves, LOC returns to baseline, no seizure, BP normalizes.

Worsening: Seizure, deepening LOC, focal neurologic signs → escalate care, prepare for transfer to higher level of care.

Source Disclosure & References

Note: Hemodialysis was not present in the uploaded reference notes for this project. This infographic was compiled from standard NGN NCLEX 2026 references for clinical accuracy:

- ▶ Silvestri, L. A., & Silvestri, A. E. — *Saunders Comprehensive Review for the NCLEX-RN Examination* (renal/genitourinary chapters; ESKD & dialysis).
- ▶ ATI Nursing Education — *RN Adult Medical-Surgical Nursing* (Module: Renal Disorders & Renal Replacement Therapy).
- ▶ Lippincott — *Illustrated Reviews: Pharmacology & Medical-Surgical Nursing* (anticoagulation, ESA therapy, phosphate binders).
- ▶ National Kidney Foundation — KDOQI Clinical Practice Guidelines for Hemodialysis Adequacy and Vascular Access.
- ▶ NCSBN — *NCLEX-RN Test Plan 2026* (Reduction of Risk Potential; Physiological Adaptation; Pharmacological & Parenteral Therapies).

Clinical actions reflect best-evidence nursing practice as of 2026. Always follow facility policy and current provider orders.