

NGN NCLEX 2026 • FLUID & ELECTROLYTES • PEDIATRIC PRIORITY

Dehydration

Fluid Volume Deficit

A water and electrolyte loss that exceeds intake — driving hypovolemia, hypoperfusion, and (in infants and young children) **rapid decompensation**. Among the highest-stakes pediatric NCLEX topics.

FLUID & ELECTROLYTES

PEDIATRIC HIGH-YIELD

HYPOVOLEMIC SHOCK

NCJMM READY



SOURCE NOTE

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SECTION 01

Definition & Overview

- **Dehydration** = body water output > intake → fluid volume deficit (FVD) with electrolyte loss.
- Causes hypovolemia → ↓ tissue perfusion → if unrecognized, **hypovolemic shock**.
- **Children & infants decompensate faster**: higher % body water, larger BSA-to-mass ratio, immature kidneys.

THREE FLUID-LOSS PATTERNS

Isotonic • Hypotonic • Hypertonic

Isotonic (most common): Na & H₂O lost proportionally. Vomiting, diarrhea, hemorrhage.

Hypotonic: more Na than water lost. Diuretics, adrenal insufficiency.

Hypertonic: more water than Na lost. Fever, hyperventilation, diabetes insipidus.

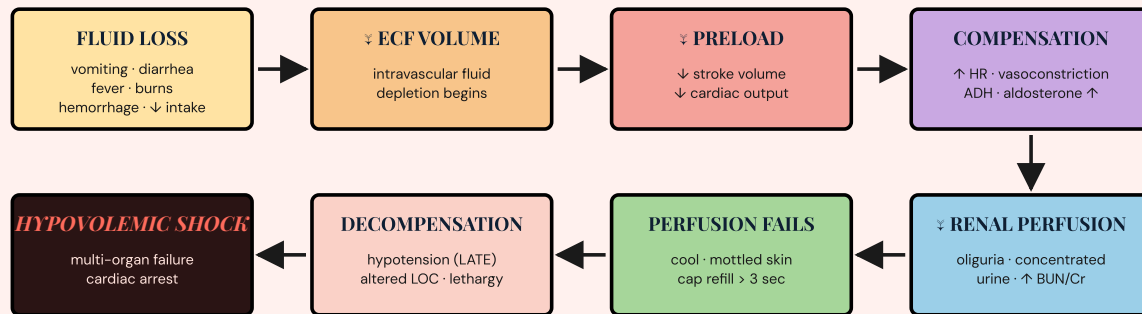
Why pediatrics are different

Infants are ~75–80% water (adults ~60%). Their kidneys cannot concentrate urine well, fever spikes higher, and a small absolute fluid loss represents a **large percentage** of total body water. A 1 kg (2.2 lb) loss in a 10 kg infant = **10% body weight** = severe dehydration.

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SECTION 02

Pathophysiology (Simplified)



Why pediatric BP stays normal until it suddenly doesn't

Children mount a strong sympathetic response. Tachycardia, narrowed pulse pressure, and prolonged cap refill come **first**. By the time BP drops, they are in **decompensated shock**.

— DO NOT WAIT FOR HYPOTENSION TO ACT —

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SECTION 03

Signs & Symptoms by Severity

Pediatric Classification (% body-weight loss)

MILD • < 5% INFANT / < 3% CHILD

Mild Dehydration

- Slightly dry mucous membranes
- Thirst, may be irritable
- Normal HR, BP, cap refill
- Urine output mildly decreased
- Fontanelle **flat**
- Tears present

MODERATE • 5-10% / 3-9%

Moderate Dehydration

- Dry mucous membranes, no tears
- Sunken fontanelle (infant)
- **Tachycardia**, normal-low BP
- Cap refill 2-3 sec
- Decreased skin turgor (tenting)
- Urine output < 1 mL/kg/hr
- Irritable → lethargic

SEVERE • > 10% / > 9%

Severe Dehydration

- Parched mucous membranes
- **Deeply sunken** fontanelle/eyes
- Marked tachycardia, weak/thready pulse
- **Hypotension** (LATE sign)
- Cap refill > 3 sec, mottled/cool
- Anuria or < 0.5 mL/kg/hr
- Lethargic / unresponsive

Adult Clinical Picture

EARLY

- Thirst, dry mouth, dry mucous membranes
- Decreased urine output, concentrated/dark urine
- Mild tachycardia • postural lightheadedness
- Weight loss (1 kg = 1 L fluid)

PROGRESSING

- Orthostatic hypotension (drop $\geq$ 20 mmHg systolic on standing)
- Flat neck veins (supine)
- Poor skin turgor (less reliable in elderly)
- $\uparrow$ urine specific gravity (>1.030), $\uparrow$ BUN, $\uparrow$ Hct, $\uparrow$ Na
- Confusion, weakness, oliguria

RED FLAG FINDINGS — ACT IMMEDIATELY

- Capillary refill > 3 seconds (pediatric — a single most predictive sign)
- Sunken anterior fontanelle in an infant
- No tears when crying • no wet diaper in 6+ hours (infant) or 8+ hours (child)
- Lethargy or altered LOC in a child who was previously irritable
- Hypotension in a child — this is decompensated shock, NOT early
- Mottled or cool extremities with weak peripheral pulses

- Urine output < 1 mL/kg/hr (peds) or < 30 mL/hr (adult)

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SECTION 04

Priority Nursing Interventions • ABC Framework

A

AIRWAY

Position to maintain a patent airway. Lethargic/obtunded patients are at risk for aspiration — turn to side, suction at bedside, NPO until LOC stabilizes.

B

BREATHING

Assess RR, depth, work of breathing. Tachypnea may reflect metabolic acidosis (loss of bicarbonate via diarrhea → Kussmaul-like compensation). Apply continuous SpO₂. Give supplemental O₂ if shock signs present.

C

CIRCULATION — THE PRIORITY IN DEHYDRATION

- **Establish IV access** — two large-bore peripheral IVs; intraosseous (IO) if access fails in < 90 sec (pediatric shock).
- **Isotonic bolus:** 0.9% NS or LR — **20 mL/kg over 5–20 min** (pediatric); may repeat ×3 (up to 60 mL/kg) before suspecting septic/cardiogenic etiology. Adult: 500–1000 mL bolus.
- Continuous cardiac & SpO₂ monitoring; recheck VS after every bolus.
- **NEVER use D5W or hypotonic fluid for initial resuscitation** — causes cerebral edema.

ONGOING ASSESSMENT

Monitor & Document

- **Strict I&O** hourly (Foley if severe — output goal: **1–2 mL/kg/hr peds, ≥30 mL/hr adult**)
- **Daily weights** — same scale, same time, same clothing (1 kg = 1 L)
- VS q15min during resuscitation → q1h until stable
- Skin turgor (over sternum/abdomen in infants/elderly)
- Mucous membranes, fontanelle, cap refill, peripheral pulses
- LOC — use age-appropriate scale (FLACC, GCS)

LABS TO TREND

Diagnostic Watch

- **Serum Na, K, Cl, HCO₃** (correction must be slow — Na change < 12 mEq/L/24 hr)
- **BUN/Cr** (ratio > 20:1 suggests prerenal/dehydration)
- **Hct & hemoglobin** (elevated from hemoconcentration)
- **Urine specific gravity** > 1.030 = dehydration
- Serum glucose, ABG (acidosis common in diarrhea)
- Lactate (perfusion marker)

Pediatric Resuscitation Roadmap

Mild–Moderate (peds): Oral rehydration solution (ORS) — **50–100 mL/kg over 4 hours**, small sips by syringe or spoon every 1–2 minutes. Continue breastfeeding.

Severe (peds): 20 mL/kg NS or LR IV bolus over 5–20 min → reassess → repeat up to 3 times → switch to maintenance once perfusion restored.

Maintenance (4-2-1 rule): 4 mL/kg/hr for first 10 kg + 2 mL/kg/hr for next 10 kg + 1 mL/kg/hr for each kg above 20.

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SECTION 05

Pharmacology • IV Fluids & Oral Rehydration

FLUID / CLASS	TONICITY	USE	KEY NURSING CONSIDERATIONS
0.9% NS Normal Saline	Isotonic	First-line resuscitation, hypovolemia, hyponatremia, blood compatibility, shock	Risk of hyperchloremic acidosis with large volumes. Compatible with blood products.
Lactated Ringer's (LR)	Isotonic	Burns, trauma, GI losses, surgical fluid loss, severe dehydration	Contains K ⁺ , Ca ²⁺ , lactate. Avoid in renal failure (K ⁺) and severe liver failure (can't metabolize lactate). Do not mix with blood.
D5W	Isotonic in bag → hypotonic in body	Free water replacement, hypernatremia, drug dilution	NEVER for resuscitation. Causes cerebral edema. Provides ~170 cal/L only.
0.45% NS (½ NS)	Hypotonic	Cellular rehydration after initial resuscitation, hypernatremic dehydration	Watch for cerebral edema, ↓ BP, fluid shifts. NOT for shock, head injury, or burns.
D5 ½ NS + 20 mEq KCl	Hypertonic in bag	Common pediatric maintenance fluid once voiding confirmed	Confirm urine output BEFORE adding K⁺. Hold KCl if anuric or hyperkalemic.
3% NaCl	Hypertonic	Severe symptomatic hyponatremia, ↑ ICP	ICU only. Slow correction (Na ≤ 12 mEq/L/24 hr) to prevent osmotic demyelination.
Oral Rehydration Solution (ORS) Pedialyte, WHO ORS	Slightly hypotonic	Mild–moderate pediatric dehydration — first-line per AAP/WHO	Glucose–Na cotransport mechanism. Give in small frequent sips. Continue breastfeeding. Do NOT substitute juice, soda, or plain water.
Antiemetics (ondansetron)	—	Single-dose ondansetron may help failed oral rehydration in pediatric gastroenteritis	Monitor QT interval. AAP supports single-dose use to facilitate ORS success.

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SECTION 06

NCLEX Test Traps · Wrong vs. Right

✗ WRONG THINKING

"The infant's BP is normal — they're stable enough to wait for the IV team."

✓ RIGHT ACTION

Hypotension is a **late, ominous** sign in children. Tachycardia, prolonged cap refill, mottled skin = decompensating NOW. Establish access immediately; IO if PIV fails.

✗ WRONG THINKING

"Give the dehydrated infant plain water or apple juice — anything to get fluids in."

✓ RIGHT ACTION

Use **Oral Rehydration Solution (Pedialyte)**. Plain water can cause **hyponatremia + seizures**. Juice/soda are hyperosmolar and worsen diarrhea.

✗ WRONG THINKING

"Start D5W bolus to resuscitate the hypotensive patient."

✓ RIGHT ACTION

Isotonic only for resuscitation: 0.9% NS or LR. D5W is functionally free water — causes cerebral edema and worsens hemodynamics.

✗ WRONG THINKING

"Add KCl to the IV bag before the patient voids — just be efficient."

✓ RIGHT ACTION

NEVER give potassium until urine output is confirmed (≥ 30 mL/hr adult / 1 mL/kg/hr peds). Otherwise risk of fatal hyperkalemia.

✗ WRONG THINKING

"Hold all feeding and use the BRAT diet for a child with diarrhea."

✓ RIGHT ACTION

Current AAP guidance: **continue age-appropriate regular diet** after rehydration. BRAT is no longer recommended (insufficient protein/fat). Breastfeeding should NEVER be stopped.

✗ WRONG THINKING

"The patient's serum sodium is 165 — correct it quickly with rapid IV fluids."

✓ RIGHT ACTION

Correct Na slowly — no more than 10–12 mEq/L per 24 hours. Rapid correction = **cerebral edema** (in hypernatremia) or **osmotic demyelination** (in hyponatremia).

✗ WRONG THINKING

"Skin turgor is normal in the elderly patient, so she's well-hydrated."

✓ RIGHT ACTION

Skin turgor is **unreliable in elderly** (loss of elasticity). Trust **mucous membranes, urine output, mental status, weight changes, and orthostatics**.

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SECTION 07

Patient & Family Education

CAREGIVERS OF INFANTS & CHILDREN

Sick Day Plan

- At first signs of vomiting/diarrhea — start **ORS (Pedialyte)** in small frequent sips (5 mL by syringe every 1–2 min).
- **Continue breastfeeding.** Do not stop formula or regular diet once rehydrated.
- **Avoid:** apple juice, soda, sports drinks, broth-only diets.
- Track wet diapers — call provider if **fewer than 1 wet diaper every 6 hours** (infant) or no urination for 8 hours (child).

ADULTS & OLDER ADULTS

Daily Hydration Habits

- ~2 L (8 cups) fluid/day — more in heat, exercise, fever, or illness.
- Don't wait for thirst (especially elderly — thirst response is blunted).
- Weigh self daily; report > 2 lb in 24 hrs or > 5 lb in a week.
- Limit caffeine and alcohol when sick — both worsen fluid loss.

Call the Provider Immediately If...

- No wet diaper for 6+ hours (infant) or no urination for 8+ hours (child/adult)
- Sunken eyes, sunken fontanelle, no tears when crying
- Lethargy, unresponsiveness, or inability to wake child
- Persistent vomiting (unable to keep any fluid down for > 4–6 hours)
- Blood in stool or vomit; high fever (>102°F/39°C) with poor intake
- Confusion, dizziness on standing, fainting (adult)

Prevention

- Frequent hand-washing during GI illness outbreaks.
- Rotavirus vaccine in infancy.
- Hot-weather precautions: hourly fluid sips, avoid peak sun, cool clothing.
- Pre-hydrate before exercise; replace electrolytes with prolonged activity (> 1 hr).

Home ORS Recipe (Emergency Only)

- 1 liter clean water
- 6 level teaspoons sugar
- ½ teaspoon salt
- Mix until dissolved; commercial ORS is always preferred when available.

Per WHO emergency guidelines — for use only when commercial ORS is unobtainable.

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SECTION 08

Memory Boosters & Mnemonics

"FAST" — Pediatric Dehydration Assessment

- F**ontanelle — sunken in infants
- A**lertness — irritable → lethargic
- S**kin turgor — tents, dry mucous membranes
- T**ears — absent when crying

"DRY" — Classic Triad

- D**ecreased urine output (concentrated/dark)
- R**apid pulse (tachycardia is EARLY)
- Y**ellow concentrated urine, dry mucous membranes

Urine Output Goals

Infant/young child: ≥ 2 mL/kg/hr

Older child: ≥ 1 mL/kg/hr

Adult: ≥ 30 mL/hr (or 0.5 mL/kg/hr)

⚡ *Below these = inadequate perfusion*

4-2-1 Rule • Pediatric Maintenance

4 mL/kg/hr for first **10 kg**

+ 2 mL/kg/hr for next **10 kg**

+ 1 mL/kg/hr for each kg **over 20**

Example: 25 kg child → $(4 \times 10) + (2 \times 10) + (1 \times 5) = 65$ mL/hr

"20-20-20" Pediatric Shock Bolus

20 mL/kg

20 minutes (or faster — push if severe)

Up to 3 times (60 mL/kg total)

If still hypotensive after 60 mL/kg → think sepsis, cardiogenic, or hemorrhage

"Cool • Pale • Dry" vs "Warm • Pink • Moist"

Cool, pale, dry, mottled + cap refill > 3 sec = **poorly perfused** 🚫

Warm, pink, moist + cap refill < 2 sec = adequate perfusion ✓

The single fastest bedside perfusion check in a child.

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SECTION 09 • NGN 2026

NCJMM Clinical Judgment Scenario

Scenario

A **9-month-old infant** (weight 8 kg) is brought to the ED. The caregiver reports **3 days of vomiting and watery diarrhea** — 8 episodes in the last 12 hours, only 1 wet diaper in 18 hours. The infant has had limited intake of breastmilk and refused offered Pedialyte.

On arrival: HR 188, RR 52, BP 70/40, SpO₂ 96% RA, T 38.4°C. Anterior fontanelle and eyes appear sunken, no tears when crying. Mucous membranes parched. Capillary refill 4 seconds. Skin mottled and cool to mid-calf. Infant lethargic, minimally responsive to voice.

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STEP 1 — RECOGNIZE CUES

Identify clinically significant findings.

- **Significant:** sunken fontanelle & eyes, no tears, parched mucous membranes, cap refill 4 sec, mottled skin, HR 188 (tachycardia), BP 70/40 (low for age), 1 wet diaper / 18 hrs, lethargy, T 38.4°C, 3 days diarrhea/vomiting
- **Non-significant:** SpO₂ 96% RA (within normal limits)

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STEP 2 — ANALYZE CUES

Group cues and link to clinical meaning.

- Fontanelle/eyes/mucous membranes/no tears = **severe fluid volume deficit** (≥10% body water loss)
- Tachycardia + hypotension + cap refill > 3 sec + mottled skin + lethargy = **decompensated hypovolemic shock**
- Days of GI losses + fever = isotonic-to-hypertonic dehydration with likely **metabolic acidosis**

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STEP 3 — PRIORITIZE HYPOTHESES

Rank what is most urgent.

1. **Hypovolemic shock — IMMEDIATE THREAT TO LIFE** (decompensated)
2. Electrolyte derangement (Na, K, HCO₃) & metabolic acidosis
3. Acute kidney injury (prerenal) from prolonged hypoperfusion
4. Underlying cause: viral gastroenteritis vs. bacterial vs. surgical abdomen — workup once stabilized

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STEP 4 — GENERATE SOLUTIONS

Plan interventions in priority order.

- Establish **two large-bore PIVs**; if not within 90 sec → **intraosseous (IO) access**
- **0.9% NS 20 mL/kg = 160 mL bolus** over 5–20 min, may repeat ×3
- Continuous cardiac/SpO₂ monitoring; reassess after each bolus
- STAT labs: CBC, BMP, glucose, lactate, blood gas, urinalysis & specific gravity

- Keep NPO until LOC improves; weigh on admission
- Do **NOT** add KCl until urine output confirmed

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STEP 5 — TAKE ACTION

Implement, document, escalate.

- IO placed in proximal tibia (PIV failed); 160 mL NS bolus delivered over 10 min
- Cardiac monitor, SpO₂, BP cuff applied; supplemental O₂ via blow-by
- Labs drawn from IO line; weight obtained (8 kg)
- Rapid response/PICU notified; provider at bedside
- Caregiver informed; consent for IV/IO obtained

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STEP 6 — EVALUATE OUTCOMES

Did the interventions work?

- **Effective:** HR ↓ to 150, BP 86/52, cap refill 2 sec, mucous membranes moist, child reactive to caregiver voice, first wet diaper produced (urine output 2 mL/kg/hr)
- **Continue:** transition to maintenance fluids (D5 ½ NS + 20 mEq KCl/L at 32 mL/hr per 4-2-1 rule), advance ORS as tolerated, monitor electrolytes q4h
- **If ineffective** (still tachycardic, hypotensive after 60 mL/kg): consider sepsis workup, vasoactive support, broader differential