

Gastroenteritis and Dehydration

Most gut bugs are viruses that clear on their own. The job is to replace lost water and salt before dehydration crashes the heart and kidneys.

THE ONE-LINE TRUTH

A germ (virus or bacteria) inflames the gut, causing vomiting and diarrhea that pour water and salt out of the body—dehydration is the real danger.

The chain — how it unfolds

1. A virus (like rotavirus or norovirus) or bacterium (like Salmonella or Campylobacter) enters the gut, usually from contaminated food, water, or hand-to-mouth contact. — why: The pathogen survives stomach acid, reaches the small or large intestine, and attaches to or invades the cells lining the gut wall (enterocytes), starting the infection.
2. The pathogen damages the gut lining and triggers inflammation. — why: Viruses kill enterocytes directly, flattening the villi and destroying the absorbing surface. Bacteria release toxins or invade the mucosa, and the immune system floods the area with cytokines (like IL-1, TNF- α , IL-8) and white blood cells, causing swelling, redness, and pain—this is inflammation. The damaged lining can no longer absorb water and salt properly.
3. Fluid and electrolytes pour into the intestine instead of being absorbed, and the gut squeezes hard to expel the invader. — why: Inflammation opens channels that let water, sodium, potassium, chloride, and bicarbonate flood from the blood into the gut lumen (secretory diarrhea). Toxins (like cholera or E. coli toxins) can force this secretion even without deep damage. Meanwhile, nerve signals and inflammatory mediators make the intestinal smooth muscle contract in strong, fast waves (hypermotility), pushing contents out rapidly as watery diarrhea. If the stomach is inflamed too (gastritis), it squeezes upward, causing vomiting.
4. Vomiting and diarrhea together pour water, sodium, potassium, and bicarbonate out of the body, faster than the child can drink to replace them. — why: Each loose stool can contain 10–20 mL/kg of fluid in a young child; frequent vomiting blocks oral intake. Within hours, total body water falls and blood volume (the amount of fluid in the blood vessels) drops—this is dehydration. Young children have less reserve and higher baseline fluid needs (per kilogram), so they dehydrate faster than adults.

5. The heart and blood vessels try to compensate by speeding up the pulse, tightening vessels, and slowing urine to keep blood flowing to the brain and heart. — why: Baroreceptors sense low blood volume and activate the sympathetic nervous system, releasing norepinephrine and epinephrine. The heart beats faster (tachycardia), blood vessels in the skin and gut constrict (cold, pale extremities), and the kidneys activate RAAS and ADH to hold onto sodium and water (dark, scanty urine). These tricks keep blood pressure up for a while—compensated shock—but they cannot fix ongoing losses.
6. Physical signs of dehydration appear: dry mouth and lips, sunken eyes, sunken soft spot (fontanelle) in infants, poor skin turgor (skin tents when pinched), reduced tears, and delayed capillary refill. — why: These are all visible clues that water has left the tissues and blood. The mucous membranes dry because saliva production drops. The eyes and fontanelle sink because the tissues behind them lose volume. Skin loses elasticity (turgor) because the interstitial (between-cell) fluid is depleted. Each finding is part of one story: falling total body water.
7. If dehydration worsens without treatment, compensation fails and the child tips into decompensated hypovolemic shock. — why: When 15–20% of body water is lost, the heart can no longer pump enough blood even at a fast rate. Blood pressure falls (hypotension), blood flow (perfusion) to the brain drops (causing confusion, lethargy, or unconsciousness), kidneys shut down (acute kidney injury, no urine output), and cells starve for oxygen, producing lactic acid (lactic too much acid in the blood (acidosis)). The child becomes pale, cold, unresponsive, and if not resuscitated immediately with IV fluids, progresses to multi-organ failure, cardiac arrest, and death.
8. In most viral and self-limited bacterial cases, the immune system clears the pathogen over 3–7 days, inflammation resolves, the gut lining heals, and normal absorption returns—if fluids have been replaced and the child has not crashed. — why: Antibodies, T cells, and gut-resident immune cells kill or neutralize the pathogen. Dead enterocytes are shed and replaced by stem cells in the crypts of the villi, regenerating the lining. Once inflammation settles, the villi regrow, absorptive function returns, and stool becomes formed again. This is why oral rehydration and time cure most gastroenteritis—the body does the work if you keep it alive with fluids.

Spot it — what you see, and why

- Watery diarrhea (loose, runny poop): The virus or germ irritates the lining of the intestines, making them leak water and salts instead of soaking them up, so the poop becomes thin and watery.
- Vomiting (throwing up): The infection triggers the brain's vomiting center and irritates the stomach lining, causing the body to push stomach contents back up and out.

- **Belly cramps or pain:** The intestines squeeze and twist harder than normal as they try to push out the infection, and the inflamed lining sends pain signals to the brain.
- **Dry mouth and lips:** When the body loses water through diarrhea and vomiting faster than it can replace it, saliva production drops and the mucous membranes (the wet tissue inside the mouth) dry out.
- **Sunken eyes:** Dehydration (not enough water in the body) shrinks the soft tissue around the eyes, making them look hollow or sunken into the face.
- **Decreased urination (less pee or no wet diapers):** The kidneys hold onto every drop of water they can when the body is dehydrated, so they make much less urine (pee) to protect what little water is left.

Red flags — act now

- Blood in the stool or black, tarry poop
- No tears when crying, no urine for 6-8 hours, or sunken soft spot on baby's head
- Extreme sleepiness, confusion, or the child is too weak to stand or drink
- Severe belly pain that does not go away or gets worse
- High fever (over 102°F or 39°C in infants under 3 months, or over 104°F or 40°C in older children)

Treat it — in this order

1. Oral rehydration solution (ORS) — a precise mix of salt, sugar, and water that matches what the gut absorbs best → Sugar in ORS pulls sodium and water into the blood through the intestine wall, even while diarrhea is happening. This refills the blood volume and prevents dehydration from becoming dangerous. ORS works for mild to moderate dehydration and is safer and cheaper than IV fluids.
2. Intravenous fluids (normal saline or lactated Ringer solution) if the child cannot drink, is vomiting everything, or has severe dehydration with shock → Fluid goes straight into a vein, bypassing the sick gut entirely. This rapidly restores blood volume, raises blood pressure, and delivers oxygen to the brain, heart, and kidneys. IV fluids can save a life when the child is too dehydrated to absorb oral fluids.
3. Ondansetron (Zofran) — a medicine that blocks the vomiting signal in the brainstem → Ondansetron stops the nausea center in the medulla (the lower part of the brainstem that controls vomiting) from firing. This lets the child keep down ORS and rehydrate by mouth instead of needing an IV. Studies show it cuts the need for IV fluids and hospital admission.

4. Antibiotics (azithromycin for Shigella or Campylobacter, ceftriaxone for invasive Salmonella, metronidazole for C. difficile) — only when a dangerous bacteria is confirmed → Antibiotics kill the bacteria, stop toxin production, and reduce inflammation in the gut wall. This shortens the illness and prevents the infection from spreading into the blood in high-risk children (babies, immunocompromised patients). For Shigella, antibiotics also reduce spread to others.
5. Zinc supplementation (10–20 mg daily for 10–14 days) in children under 5 in low-resource settings → Zinc helps the gut lining heal faster and shortens diarrhea by about one day. It also reduces the chance of another diarrhea episode in the next 2–3 months. WHO recommends this in areas where children often lack zinc in their diet.

Your top priorities at the bedside

1. Assess dehydration status using the WHO or CDC clinical dehydration scale: check capillary refill (how fast blood comes back when you press skin), skin turgor (skin elasticity), mucous membranes (wet or dry inside mouth), tears, and urine output — why: Dehydration severity determines whether the child needs oral rehydration solution at home, rapid oral rehydration in clinic, or IV fluids; severe dehydration causes poor organ blood flow (perfusion) (blood flow to organs) and shock
2. Obtain accurate weight in kilograms on the same scale before and after rehydration — why: Weight loss is the most accurate measure of fluid deficit (how much water the body lost); each kilogram lost equals 1 liter of fluid deficit, which guides how much fluid to replace
3. Start oral rehydration therapy with WHO ORS solution: give 50–100 mL/kg over 2–4 hours for mild-to-moderate dehydration, offering small frequent sips every 5 minutes — why: ORS contains the right balance of glucose (sugar) and electrolytes (salts) to maximize sodium and water absorption in the intestine through the SGLT1 transporter, even when the gut is inflamed; small frequent amounts reduce vomiting