

## **DEFINITION**

Dehydration is defined as an abnormal decrease in volume of circulating plasma.

Dehydration implies loss of water from both extracellular (intravascular and interstitial) and intracellular spaces and most often leads to elevated plasma sodium and osmolality. Hypovolemia is a generic term encompassing volume depletion and dehydration. Volume depletion is the loss of salt and water from the intravascular space.

Mild, moderate, and severe dehydration corresponds to deficits of < 5%, 5-10%, and > 10% respectively.

## **IMMEDIATE CONSULTATION REQUIRED IN THE FOLLOWING SITUATIONS**

- Moderate to severe dehydration
  - Altered mental status
  - Weak rapid pulse
  - Marked decreased urine output
  - Sunken fontanel
  - Hypotension
  - Delayed capillary refill > 2 seconds
- Is unable to tolerate fluids by mouth
- Infant < 6 months of age
- Toxic appearing child: Toxic appearing infants and children may be pale or cyanotic and are often lethargic or inconsolably irritable. In addition, they may have tachypnea and tachycardia with poor capillary refill.
- Hypotonia
- Malnutrition
- Hematemesis
- Absent bowel sounds
- Focal abdominal pain
- Bloody stool
- Seizure activity
- Immunocompromised client
- Inability of the child's care to be managed at home

**DEHYDRATION PEDIATRIC**

Refer to SRNA CDT Gastroenteritis Pediatric Including Acute Diarrhea and Acute Vomiting as a follow-up to this CDT.

**CAUSES**

The mechanisms of dehydration may be broadly divided into three categories:

1. Decreased intake due to diseases such as stomatitis.
2. Increased output from diarrhea or osmotic diuresis from uncontrolled diabetes mellitus.
3. Increased insensible losses such as with fever.

Pediatric dehydration is frequently the result of increased output from gastroenteritis, characterized by vomiting and diarrhea. However, vomiting and diarrhea may be caused by other processes, such as:

- Infections
- Increased intracranial pressure
- Gastroenteritis
- Obstruction
- Hepatitis
- Liver failure
- Appendicitis
- Peritonitis
- Intussusception
- Volvulus
- Pyloric stenosis
- Drug toxicity (ingestion, overdose, drug effects)
- Fever
- Sweating
- Burns

**PREDISPOSING AND RISK FACTORS**

- Infection
- Trauma
- Gastroenteritis (vomiting and diarrhea)
- Fever

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- Gastrointestinal (GI) obstruction
- Stomatitis
- Burns
- Ascites
- Pyloric stenosis
- Renal failure
- Food and water poisoning
- Adverse outcome of antibiotic therapy [e.g., *Clostridium difficile* (*C. difficile*)]
- Metabolic causes (e.g., new-onset diabetes mellitus)
- Food allergies or intolerance
- Central nervous system related (e.g., increased intracranial pressure)
- Parenteral infection [e.g., otitis media, urinary tract infection (UTI), pharyngotonsillitis]
- GI ulcers
- Pyloric stenosis
- Surgical conditions (e.g., appendicitis)
- Medications or drug use
- Pregnancy (vomiting)
- Eating disorder (vomiting)

Newborns and young children have a much higher water content than adolescents and adults and are therefore more prone to loss of water, sodium, and potassium during illness.

### **HISTORY**

The goal of the history and physical examination is to determine the severity and etiology of the child's condition. Accurate classification of the degree of dehydration as mild, moderate, or severe allows for appropriate therapy.

Obtaining a complete history from the parent or caregiver is important because it provides clues to the type of dehydration present. The following information is important:

- Feeding pattern and fluids given
- Fluid loss (e.g., vomiting, diarrhea)

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- Number of wet diapers compared with normal, suggesting oliguria or anuria
- Activity level
- Possible ingestions that may cause vomiting
- Heat and sunlight exposures for insensible losses
- Onset, duration, and timing (e.g., relationship to meals, at night) of symptoms of pain, diarrhea, and vomiting
- Immunization status
- Recent exposure to illness, injury, or stress
- Fever
- Vomiting (onset, duration, frequency, volume, colour)
- Diarrhea (duration, frequency, consistency, blood, or mucus)
- Fluid intake (volume, frequency, type)
- Lethargy
- Irritability
- Weight loss
- Contact with others who are ill
- Travel
- Past medical history (including diabetes, cardiac disease, renal disease, cystic fibrosis)
- Parental/caregiver concern regarding no tearing or depressed fontanel
- Associated symptoms (including ear pain, UTI symptoms, vision changes, cough, headache, seizures, polydipsia, polyuria, polyphagia, anorexia)

All body systems must be reviewed and assessed to ascertain underlying cause of dehydration.

**PHYSICAL FINDINGS**

Assessment of Dehydration

According to the World Health Organization (WHO), a client exhibiting two of the following signs can be considered to have some amount of dehydration.

Consultation with a physician/RN(NP) is needed if this is present:

- Restlessness, irritability
- Sunken eyes

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- Thirsty, drinks eagerly
- Skin pinch goes back slowly

According to the WHO, a client exhibiting two or more of the following signs can be considered to have severe dehydration. Consultation regarding medical transport with a physician/RN(NP) is needed in this situation:

- Lethargic or unconscious
- Sunken eyes
- Not able to drink or drinking poorly
- Skin pinch goes back very slowly

General

- Weight, ill appearance, level of alertness, lethargy, irritability

Head, Eyes, Ears, Nose, Throat (HEENT)

- Presence of tears, dry or moist mucous membranes, and whether the eyes appear sunken

Cardiovascular:

- Heart rate and quality of pulses

Respiratory:

- Rate and quality of respirations (the presence of deep, acidotic breathing suggests severe dehydration).

Abdomen:

- Abdominal tenderness, guarding, and rebound, bowel sounds. Tenderness on exam should prompt consideration of diseases other than gastroenteritis.

Back:

- Flank/costovertebral angle tenderness increases the likelihood of pyelonephritis.

Rectal:

- Quality and colour of stool, presence of gross blood or mucus

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**Extremities:**

- Capillary refill time (> 2 sec), warm or cool extremities

**Skin:**

- Abdominal rash may indicate typhoid fever (infection with *Salmonella typhi*).
- Jaundice may indicate viral or toxic hepatitis.
- The slow return of abdominal skin pinch suggests decreased skin turgor and dehydration, while a doughy feel may indicate hyponatremia.

**DIFFERENTIAL DIAGNOSIS**

Dehydration is a symptom. The goal is to find the underlying cause of the symptom.

Viruses are the most common cause of dehydration in children.

- Diabetic ketoacidosis
- Gastritis and peptic ulcer disease
- Giardiasis
- Hemolytic uremic syndrome
- Hepatitis
- Inflammatory bowel disease
- Pancreatitis
- Appendicitis
- Foreign body ingestion
- Intussusception
- Pyloric stenosis
- UTI and pyelonephritis
- Septic shock

**COMPLICATIONS**

- Complications depend on the cause of the loss of fluid.
- Complications are related to shock from decreased total body water, hypoxemia, and tissue acidosis.
- Death usually occurs with severe complications when severe dehydration is not addressed by prompt rehydration.

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**INVESTIGATIONS AND DIAGNOSTIC TESTS**

- Tests are dependent on suspected cause(s). These may include urinalysis, blood tests, stool for culture and sensitivity, occult blood, and/or ova and parasites.

**MAKING THE DIAGNOSIS**

- Abdominal tenderness with or without guarding should prompt consideration of other causes outside of gastroenteritis.
- Abdominal rash may indicate typhoid fever, whereas jaundice may indicate viral hepatitis.
- Frequent watery stools are more consistent with viral gastroenteritis.
- Stools with blood or mucus are indicative of a bacterial pathogen.
- Long duration of diarrhea (> 14 days) is more consistent with a parasitic or non-infectious cause of diarrhea.
- When symptoms of vomiting predominate, consider other causes such as gastroesophageal reflux disease (GERD), diabetic ketoacidosis, pyloric stenosis, acute abdomen, or UTI.
- Abdominal pain that precedes vomiting and diarrhea is more likely due to abdominal pathology.
- Presence of fever, chills, myalgia, rash, rhinorrhea, sore throat, and cough are indicative of a systemic infection.
- History of recent antibiotic use increases the likelihood of *C. difficile*.
- History of travel to endemic areas prompts consideration of parasitic disease.

**MANAGEMENT AND INTERVENTIONS**

**Goals of Treatment**

- Maintain adequate hydration
- Rehydrate
- Prevent complications
- Make the appropriate diagnosis
- Treat shock or impending shock (e.g., give oxygen and fluids)

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**Appropriate Consultation**

- Consult a physician/RN(NP) as soon as possible for any infant or young child with signs of moderate to severe dehydration. If the child has presented with severe signs (e.g., shock), prepare child for transfer to hospital.

**Non-Pharmacological Interventions**

- Consult a physician/RN(NP) for treatment if child is moderately or severely dehydrated.

**Fluid Management**

- Oral therapy is always safer than, and as effective as, intravenous therapy.
- Oral replacement therapy is contraindicated in children with protracted vomiting (even with small frequent feedings); severe dehydration with shock; impaired consciousness; paralytic ileus; and monosaccharide malabsorption.
- Oral replacement therapy (e.g., Pedialyte, Gastrolyte) should be given frequently and in small amounts while gradually increasing the volume until the child drinks as desired (e.g., 5 mL every 1-2 minutes, can give 150-300 mL/hour).
- Use of a pre-mixed solution (e.g., Pedialyte, Gastrolyte) is safest.
- Carbonated beverages and sweetened fruit juices **should not** be used for rehydration purposes due to their high carbohydrate and low electrolyte content.
- Parents and caregivers **should not** offer plain water to children with gastroenteritis to avoid hyponatremia and hypoglycemia.
- Continue breastfeeding for fluid requirements if child is able to suck effectively. Supplement with Pedialyte/Gastrolyte.
- When a bottle-fed child is able to return to formula, consult a physician/RN(NP) about changing to a soy-based formula (e.g., Prosobee, Isomil). Switch back to regular formula in 7-10 days. Do not go back to Pedialyte/Gastrolyte unless there is a marked increase in stools while on the soy formula.

**Mild - Moderate Dehydration**

- Start rehydration with oral replacement solution: 50-100 mL/kg over 4 hours at an approximate rate of 1-2 mL/kg every 5 minutes (this is the fluid deficit volume). Close observation is recommended.
- Reassess after 4-hour interval by monitoring urine output (e.g., number of wet

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- diapers per hour). If there has been no measurable improvement the child is to be transferred.
- From 4 to 24 hours, give oral replacement therapy as the child desires, ensuring replacement of maintenance requirements and any losses.
  - Give extra oral replacement solution after each emesis (e.g., 2 mL/kg) or diarrheal stool (e.g., 5-10 mL/kg).
  - Give fluid frequently in small amounts.
  - Monitor urine output (output should be at least 1 mL/kg body weight per hour or normal amount of wet diapers for that child).
  - Continue breastfeeding; if child is bottle-fed, early re-feeding of child's normal formula (within 6-12 hours) is recommended.
  - Full, age-appropriate diet should be reinstated after 4 hours if possible.
  - Delay re-feeding only if there is severe, protracted vomiting.

**Pharmacological Interventions**

- Antispasmodic and antidiarrheal agents should not be used. Explain to the parents or caregiver that it is best to consider the diarrhea as a purging process, to rid the intestinal tract of organisms. The most important part of managing diarrhea is the replacement of lost fluids. There is also a very limited role for antiemetic agents.
- Antimicrobial agents are usually not indicated, even for bacterial infection. An exception is gastroenteritis caused by *Giardia lamblia* which after a diagnosis is confirmed by a positive stool culture and is usually treated as follows:
  - MetroNIDAZOLE (Flagyl) 15 mg/kg/day orally, divided three times daily for 5 days (maximum dose 750 mg/day)

**Client and Caregiver Education**

- Parent, caregiver and child handwashing with soap after toileting, before meals and especially by the parent/caregiver after diaper changing.
- Diaper changing areas should be separate from eating areas.
- Disinfection of diaper changing area: 70% alcohol solution or bleach will kill rotavirus. Prepare in a spray bottle.
- Water purification: boil water for 20 minutes or use chlorine tablets or solution.
- Vaccination to prevent viral illnesses - rotavirus vaccination for infants.

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**Prevention**

- Vaccines (rotavirus)
- Handwashing
- Ensure meat is fully cooked
- Hygienic food preparation practices

**Monitoring and Follow-Up**

- Re-evaluate the child with mild symptoms (treated at home) every 24 hours for 2 days. Be sure to recheck the child's weight. Ensure that the parent or caregiver is aware of the signs and symptoms of dehydration. Instruct him or her to return immediately if dehydration occurs or worsens or if the child cannot ingest an adequate quantity of fluid. Monitor output by assessing the number of diapers. The frequency should return to pre-diagnosis levels.

**Referral**

- Transfer any child with moderate to severe dehydration as soon as possible.
- Consult a physician/RN(NP) for child with underlying comorbidity (e.g., congenital abnormalities, diabetes, complex medical history, or when diagnosis of underlying cause is uncertain).

**DOCUMENTATION**

- As per employer policy

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