

Dehydration

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Definitions

- Dehydration: loss of water without sodium or potassium, in absence of water intake will lead to hypernatremia
- Hypovolemia: loss of fluid which contains sodium and potassium and leads to reduced plasma volume
- Hypernatremia: serum sodium >145 mmol/L, often caused by dehydration
- Hyponatremia: serum sodium <135 mmol/L, can be euvolemic, hypovolemic or hypervolemic

Risk Factors

- Acute illness (especially if there is fever, vomiting or diarrhea)
- Decreased cognitive function
- Reduced oral intake
- Absence or altered thirst mechanism

Common Forms of Hypovolemia

Form of Hypovolemia	Causes
Hypernatremic	-Loss of hypotonic fluids -Can be secondary to vomiting, diarrhea, fever, limited fluid intake, diuretics, skin losses (i.e. burns, sweating), hyperglycemia causing osmotic diuresis, diabetes insipidus
Hyponatremic	-Renal causes: diuretics, osmotic diuresis from DKA or HHS, adrenal insufficiency, salt wasting nephropathy, cerebral salt wasting Note: diuretics and osmotic diuresis can cause either hypernatremic or hyponatremic hypovolemia -Extrarenal causes: GI losses from diarrhea or vomiting, skin losses from sweating or burns, third spacing from sepsis or pancreatitis
Isotonic	-Bleeds, extreme GI losses from vomiting and diarrhea, trauma

Signs and Symptoms

- Fatigue, weakness, malaise, thirst, postural dizziness
- Oliguria, confusion, obtundation, cyanosis, abdominal pain, chest pain
- Diminished skin turgor, dry oral mucous membranes, decreased JVP, orthostatic tachycardia, orthostatic hypotension
- Hypovolemic shock
 - Hypotension, tachycardia, peripheral vasoconstriction, hypoperfusion, oliguria and altered mental status

Dehydration Risk Screening Tool Mnemonic

- D – diuretics
- E – end of life
- H – high fever

- Y – yellow urine turns dark
- D – dizziness, as in orthostasis
- R – reduced oral intake
- A – axilla dry
- T – tachycardia
- I – incontinence
- O – oral problems
- N – neurologic impairment
- S – sunken eyes

Investigations

- Urine output: less than 0.5 ml/kg/h suggests volume depletion
- Bloodwork abnormalities
 - BUN and creatinine may be elevated
 - Hematocrit may be high
 - Electrolyte abnormalities
 - Acid base disturbances
 - Elevations in liver enzymes or troponins (if hypovolemia is severe enough o cause ischemia)
 - Urine sodium concentration: typically low in hypovolemia
- POCUS for IVC assessment
 - Diameter <1cm and obvious collapses with inspiration= hypovolemic

Pediatrics

- Signs and symptoms
 - Fewer wet diapers, irritability, lethargy, loss of consciousness
 - Sunken fontanelles, absence of tears
- Degree of dehydration

Degree of Dehydration	% Weight Loss	Signs and Symptoms
Mild	3-5	Increased thirst, slightly reduced urine output
Moderate	6-9	Tachycardia, dry mucous membranes, sunken eyes and fontanelles, reduced skin turgor
Severe	>9	Low blood pressure, mottling, lethargy or coma

Fluid Management

- Main treatment is oral rehydration therapy and IV fluids
- Oral rehydration
 - Best option for both kids and adults
- IV fluids
 - If patient can't tolerate PO fluids
 - If patient is hemodynamically unstable with abnormal vital signs-> bolus doses of crystalloid (1-2 20 ml/kg boluses in children and 1-2 500cc-1L boluses in adults)
 - Once patient is stable, start maintenance fluids

- Kids: 4:2:1 rule (4ml/kg/h for the first 10kg of the child’s weight, 2ml/kg/h for the 2nd 10kg and 1ml/kg/h for each kg above 20kg)
 - Use 0.9% normal saline with 5% dextrose with 10-20mEq of KCl to each litre of fluids
- Adults: 80 cc’s/hour of half normal saline in 5% dextrose with 20mEq of KCl for each litre of fluid
 - Consider ongoing fluid losses

Treatment

- Identify precipitating illness or cause and treat concurrently
- Once underlying cause is addressed, the hope is that the patient will feel well enough to maintaining fluid balance on their own by eating and drinking

Cause	Treatment
Medication (i.e. diuretics)	Stop or reduce doses
Hyperglycemia causing osmotic diuresis	Fluids and insulin per DKA/HHS pathway
Infection	Treat underlying infection with appropriate antibiotics + antipyretics to bring down fever
Emesis	Antiemetics and identify underlying cause for vomiting

Pregnant Patients

- At higher risk of dehydration
 - Higher water intake requirements
 - Pregnancy specific conditions such as hyperemesis gravidarum
- Dehydration in pregnancy is associated with
 - Gestation hypertension and pre-eclampsia
 - Gestational diabetes
 - Preterm birth
 - Oligohydramnios
 - Low fetal birth weight
- Treat aggressively with oral rehydration or IV fluids