Acute Dehydration ED and General Inpatient Management v2

Using the Guideline

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

This guideline is intended to be used for **patients in the *ED and general medical units*** who meet the below inclusion criteria. It may or may not be appropriate to use for patients admitted to the ICU. Critical Care attendings and fellows will determine appropriateness of use for each patient.

Inclusion Criteria for this Guideline

- Dehydration from acute fluid loss generally developing over 48 hours or less, usually from gastroenteritis

Exclusion Criteria for this Guideline

- Patient in shock – may reenter guideline after shock treated
- Admitted to Critical Care
- Chronic renal failure
- Congestive heart failure
- Primary endocrine disorders associated with dysregulation of sodium and water balance (SIADH, DI)
- DKA or Hyperosmolar hyperglycemia coma – follow DKA protocol; HHS ICU management (hyperosmolar dehydration)
- Acute GE in an Oncology patient who is currently hospitalized and receiving fluids based on a treatment protocol

Key to using guideline

- *This is a guideline, not a policy. Patient variation and other factors may impact management decisions. Patients must meet inclusion criteria and not meet one or more of the exclusion criteria.*
- "Jump to" boxes contain hyperlinks to other pages of the guidelines. Clicking on the underlined word or phrase will take you to the page.
- Green boxes represent steps in an algorithm
- Yellow shapes represent decision branch points or key points of concern/caution

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Types and Phases of Dehydration

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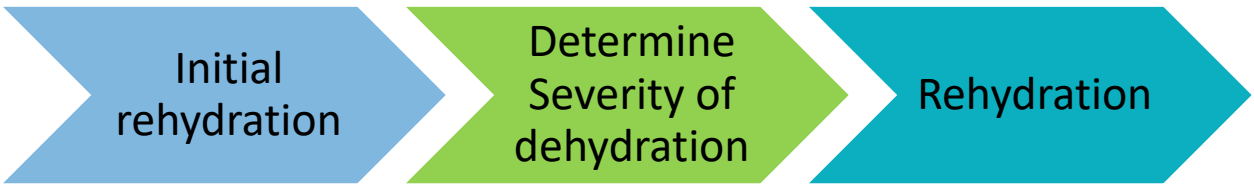
Types of Acute Dehydration:
- Isonatremic
- Hyponatremic
- Hypernatremic

Phases of Acute Dehydration Management



- High level overview of initial rehydration phase
- Determining severity of dehydration based on clinical exam
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- ORT Dosing for initial rehydration phase
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Initial Rehydration Phase Algorithm

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

Inclusion Criteria
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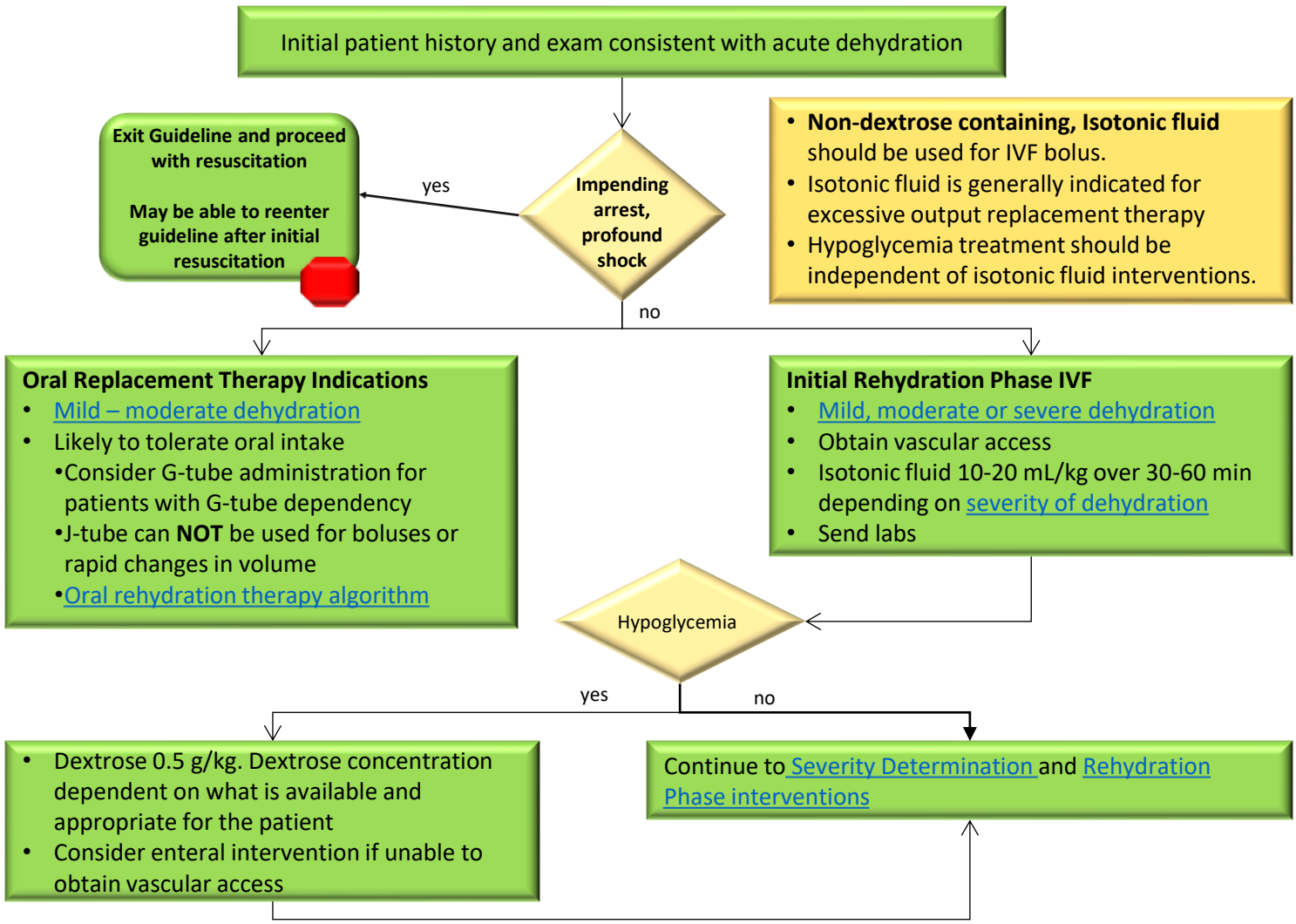
Exclusion Criteria



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Determining Severity of Dehydration

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Exclusion Criteria

Using the Table
- Table reflects findings for *isonatremic* dehydration.
- These findings *overestimate* the degree of dehydration for hyponatremia dehydration and *underestimate* the degree of dehydration for hypernatremia.
- Not all si/sx in a column need to be present to select that category. Select the most severe category.
- *=Best predictors of dehydration

Powers KS.Peds in Review. 2015;36:274-285

Clinical Signs	Mild (3-5%)	Moderate (6-9%)	Severe (≥10%)
Systemic Signs	Increased thirst	Irritable	Lethargic
Urine output	Decreased	Decreased	Oliguria or anuria
Mucous membranes	Tacky	Dry	Parched
Skin turgor*	Normal	Reduced	Tenting
Capillary refill*	Normal	Mildly delayed	Markedly delayed
Skin temperature	Normal	Cool	Cool, mottled
Anterior fontanelle	Normal	Sunken	Markedly sunken
Heart rate	Normal	Increased	Markedly increased or ominously low
Blood pressure	Normal	Normal to low	Low
Respirations*	Normal	Deep, may be increased	Deep and increased or decreased to absent

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ED Oral Rehydration Therapy for Initial Rehydration Phase

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

Inclusion Criteria

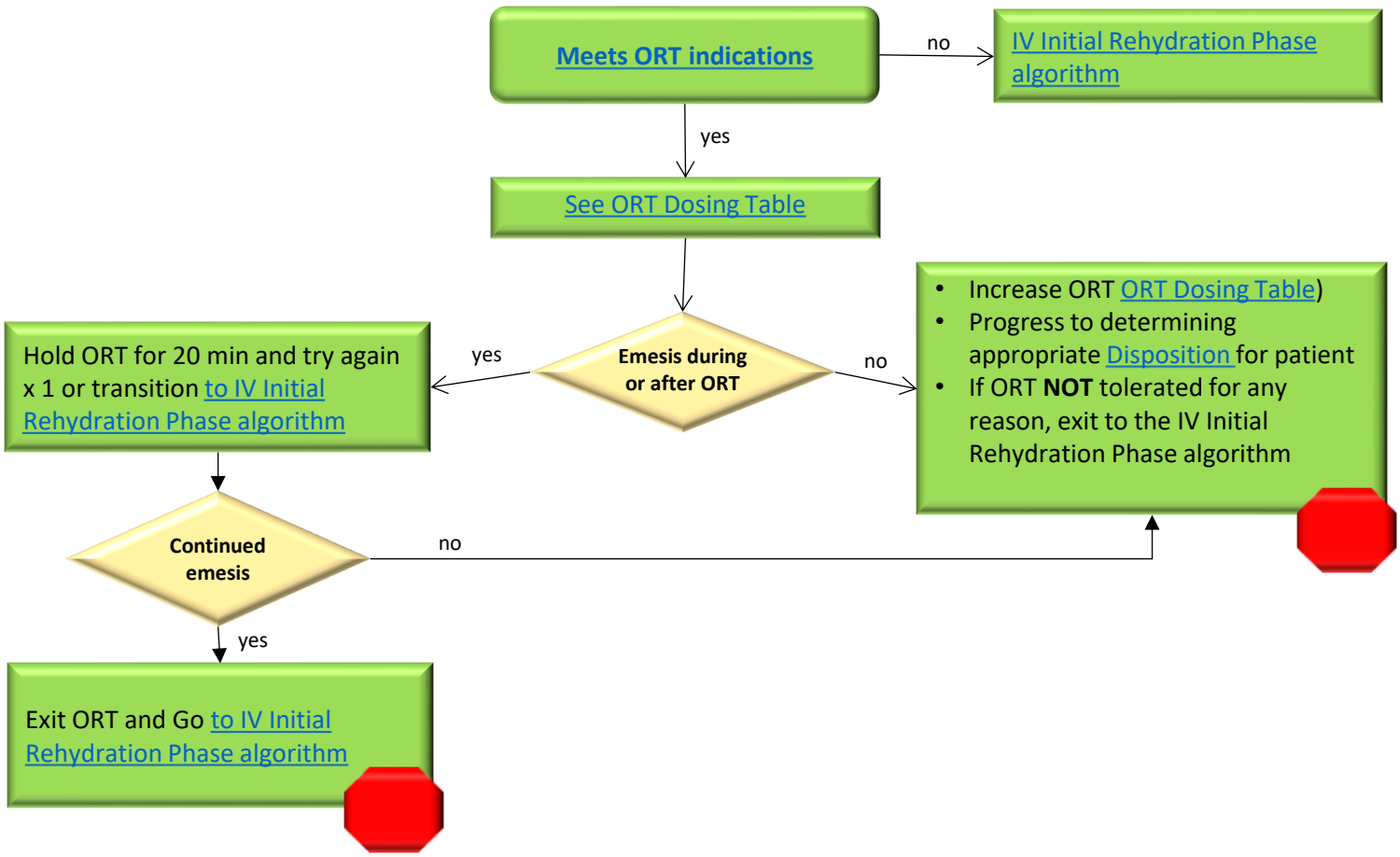
- Dehydration from acute fluid loss, generally developing over 48 hours or less, usually from gastroenteritis

Exclusion Criteria

Ondansetron (Zofran)

- Give prior to ORT challenge unless patient has prolonged QT syndrome
- Administration to patients less than 6 mo requires an attending/fellow order
- If emesis during or after ORT and hasn't already received a dose
- May use G-tube in patients who are enteric tube dependent

Labs generally not indicated in ORT pathway.



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ED Initial Rehydration Phase IV Algorithm

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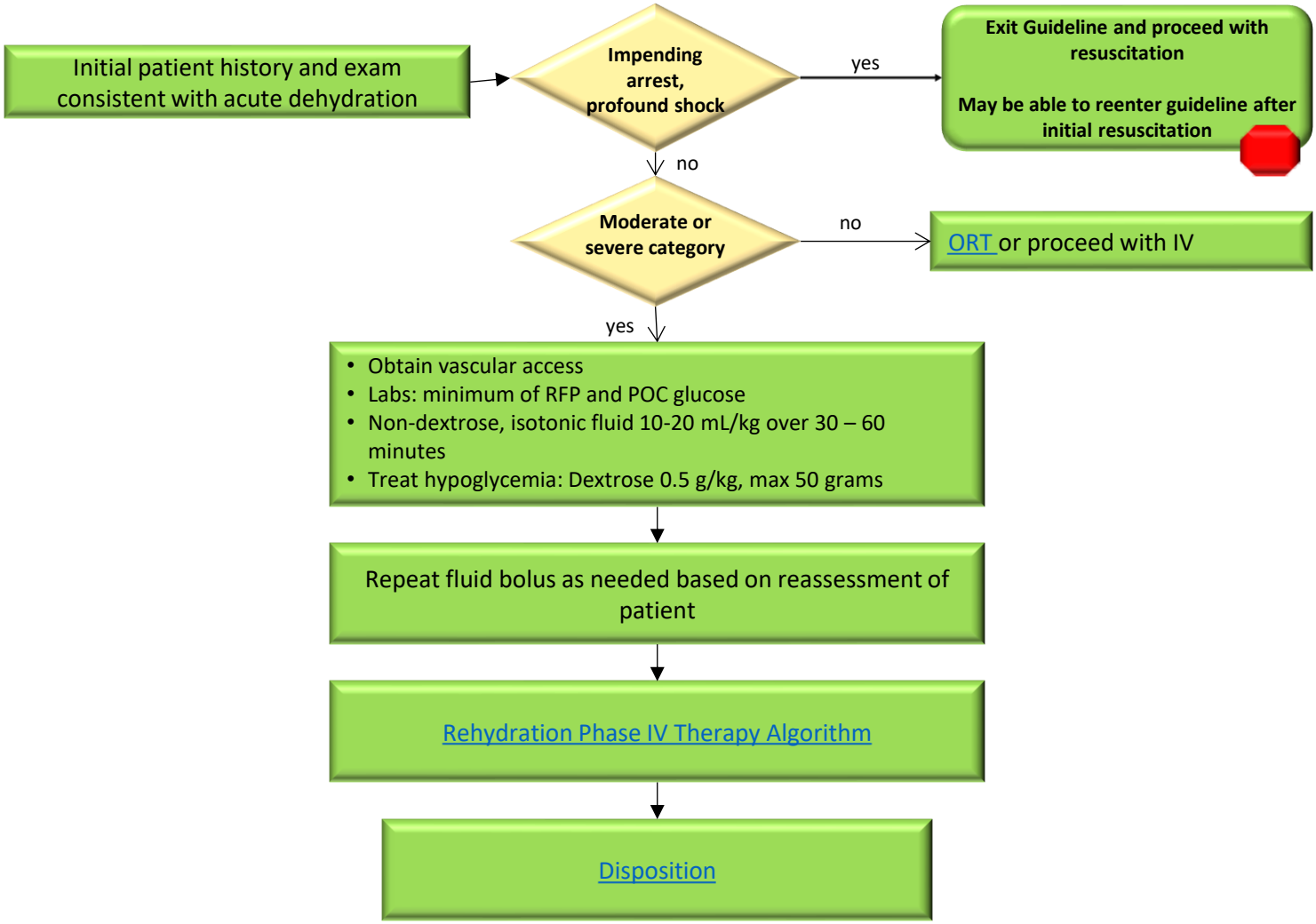
- Dehydration from acute fluid loss, generally developing over 48 hours or less, usually from gastroenteritis

Exclusion Criteria

- **Non-dextrose containing, Isotonic fluid** should be used for IVF bolus.
- Isotonic fluid is generally indicated for initial replacement therapy
- Hypoglycemia treatment should be independent of isotonic fluid interventions.



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Disposition from ED

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Home	General Medical-Surgical Unit	Intensive Care Unit
Adequately rehydrated; tolerating oral intake well, family educated, follow up as appropriate **AND** Doesn't have any other reason for admission	Sodium 125 – 160 mEq/L **AND** Doesn't have any other reason for ICU admission (JFK CCC Admission Policy)	Needs ICU for reasons other than sodium level **OR** Sodium less than 125 **OR** Sodium more than 160

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Acute Dehydration ED and General Inpatient Management v2

Rehydration Phase IV Therapy Algorithm ED and General Medical Unit

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

Inclusion Criteria
- Dehydration from acute fluid loss, generally developing over 48 hours or less, usually from gastroenteritis

Exclusion Criteria

Initial patient history and exam consistent with acute dehydration.

yes

Impending arrest, profound shock

no → Additional fluid bolus (Initial Rehydration Phase) based on physical assessment, evaluation of ins and outs prior to admission

yes

Exit Guideline and proceed with resuscitation

May be able to reenter guideline after initial resuscitation

GI illness is resolving quickly,
- Oral (enteral tube) intake may be initiated before completion of the Rehydration Phase.
- Decrease IVF rate as enteral intake increases
- May stop Rehydration Phase early if patient is voiding appropriately, tolerating enteral intake.

Mild Dehydration
- ORT or IV rehydration

IV Rehydration
- Isonatremia **(Na 130-150 mEq/L)**
- Hyponatremia **(Na 125 - 130 mEeq/L)**
- Hypernatremia **(Na 151 -160 mEq/L)**

Additional Management
- **Repeat fluid bolus** may be needed during the Rehydration Phase depending on amount of ongoing losses
- **Losses may need replacing during the rehydration phase**
- IV accessed lost prior to completion of rehydration phase.
- Transition to care after completion of Rehydration Phase

Monitoring
- Daily weights
- Strict ins and outs. Bladder catheter may be needed
- Serial RFP– usually q6-12 hr for 24-48 hr for general medical patients
- Composition of fluid as well as rate may need to be adjusted during the rehydration phase.
- Continuous CR monitoring

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Acute Dehydration Fluid Orders

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*If appropriate for patient's electrolytes, it is appropriate and cost-effective to continue the IVF started in the ED or referring hospital rather than entering a new order. Be aware that the rate may need to be increased or decreased based on your fluid calculation.

Dehydration Type	Typical Fluid Order for Rehydration Phase	Special Considerations
For patients with acute dehydration admitted to the intensive care unit, the critical care team will guide the Rehydration Phase fluid rate and composition after the patient is admitted		
Isonatremic Dehydration (Na 130-150)	D5NS PLUS KCl 20 - 40 mEq/L depending on serum potassium OR D5LR PLUS KCL 20 mEq/L Total fluid rate/hr = (maintenance fluid rate/hr) + (remaining deficit fluid / 24 hr)	• If a significant metabolic acidosis is present (manifested by a low serum bicarbonate, then substitute a buffer (bicarbonate or acetate) for some of the chloride. The amount of buffer is dependent on the severity of the acidosis. • If phosphorus is low, then change the potassium to Kphosphate. • Frequent electrolyte monitoring is crucial to good outcomes. The ordered fluids may need to be changed depending on electrolyte changes during the Rehydration Phase
Hyponatremic dehydration Na 125-130 AND patient admitted to a general medical unit	D5NS + KCl 20-40 mEq/L Total fluid rate/hr = (maintenance fluid rate/hr) + (remaining deficit fluid /24 hr)	• If a significant metabolic acidosis is present (manifested by a low serum bicarbonate, then substitute a buffer (bicarbonate or acetate) for some of the chloride. The amount of buffer is dependent on the severity of the acidosis. • If phosphorus is low, then change the potassium to Kphosphate. • Frequent electrolyte monitoring is crucial to good outcomes. The ordered fluids may need to be changed depending on electrolyte changes during the Rehydration Phase
Hypernatremic dehydration Na 150-160 AND admitted to a general medical unit	D5NS Total fluid rate/hr = (maintenance fluid rate/hr) + (remaining deficit fluid /48 hr)	• Add potassium as needed • Depending on the level of hyperchloremia, Rehydration Phase IVF may need less chloride. May replace with sodium bicarbonate, sodium acetate. May also change to LR • Frequent electrolyte monitoring is crucial to good outcomes. The ordered fluids may need to be changed depending on electrolyte changes during the Rehydration Phase

Indications for altering standard IVF composition

1. Serum bicarbonate 15 or less:
   - Normal or low potassium: D5NS + K Acetate 40 mEq/L OR D5LR + K Aetate 20 mEq/L
2. High potassium and acidotic:
   - D51/2NS + $NaHCO_3^-$ 50 mEq/L or D51/2NS + Na Acetate 50 mEq/L
3. Significant change in electrolytes during Rehydration Phase

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Isonatremic Dehydration Management in General Medical Unit

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

Inclusion Criteria

- Dehydration from acute fluid loss, generally developing over 48 hours or less, usually from gastroenteritis

Exclusion Criteria

	Determining degree of dehydration and pathophysiology	Management and monitoring	Complications at admission and during rehydration
Isonatremic Dehydration (130-150 mEq/L)	Acute gastrointestinal illness with equal loss of sodium and water As dry as you look. Use Dehydration Severity Table to determine % dehydration. Use fluid rate calculator in order set to determine remaining fluid deficit. Formulas	Fluid composition and rate **Input:Output** should be progressively more positive. Initially may need to replace ongoing losses 1:1. • As rehydration target reached, adjust replacement ratio or discontinue to prevent over-hydration. Daily weights are key to documenting rehydration success. Patient should return to their pre-dehydration weight. Minimal ongoing losses: Q12 hr RFP until Rehydration Phase completed. More than minimal ongoing losses: Q6hr RFP until ongoing losses subside.	Minimal risk of morbidity and mortality even with severe dehydration unless presents in shock or out of hospital arrest Complications are rare, usually iatrogenic, and can be minimized by appropriate monitoring (labs, input/output)

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Hyponatremic Dehydration Management in General Medical Unit

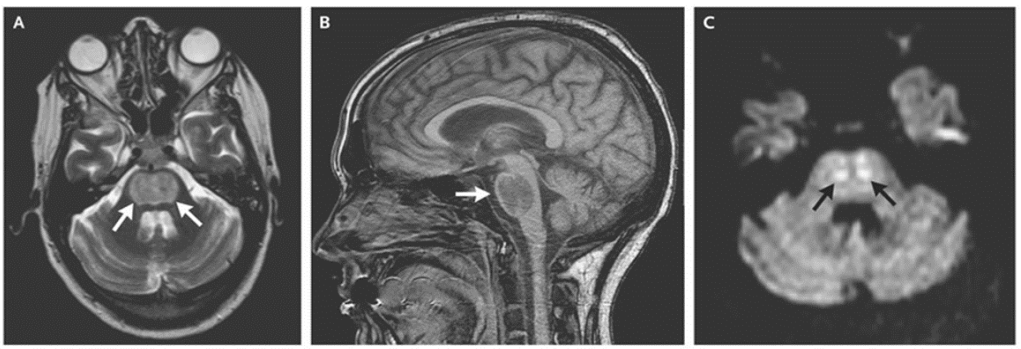
Approvals and Bibliography | Summary of Version Changes | Background and Rationale

Inclusion Criteria

- Dehydration from acute fluid loss, generally developing over 48 hours or less, usually from gastroenteritis

Exclusion Criteria

	Determining Degree of Dehydration Pathophysiology	Management and Monitoring	Complications at Admission and During Treatment
Hyponatremic dehydration (less than or = 129 mEq/L)	Acute gastrointestinal illness resulting in loss of more sodium than water **Not as dry as your look** due to shift of water from extracellular to intracellular compartment to maintain osmotic equilibrium between the intra- and extracellular compartments. Thus, when determining % dehydration severity using the table, subtract 3 – 5%. Usually hypochloremic The lower the sodium the more likely the patient will be irritable, lethargic or seizing. Hyponatremia lowers the seizure threshold.	3% saline 3 – 5 mL/kg if patient seizing or other acute neurologic deterioration due to hyponatremia. Requires attending approval in a general medical unit. May administer it through a PIV in urgent/emergent situation. Correct over 24 hours. Target sodium change is an increase of 20 mEq/L over 24 hours. Consider correcting even slower if hyponatremia an ddehydration thought to occur over several days. Fluid composition and rate **Input:Output** should be progressively more positive. Initially may want to replace ongoing losses 1:1. As rehydration target reached, adjust replacement ratio or discontinue to prevent over-hydration. Daily weights are key to documenting rehydration success. Patient should return to their pre-dehydration weight. q6 hr RFP until sodium more than 130, then q12 hr until rehydration target met; more frequent if in ICU	At Admission • Seizures, including status epilepticus • Cerebral edema • Intracranial hypertension During Treatment • Cerebral edema • Intracranial hypertension • Seizures, including status epilepticus • Osmotic demyelination Syndrome (previously known as central pontine demyelinosis) with too rapid correction of hyponatremia/osmolarity



Osmotic demyelination syndrome (ODS) is a concentrated, frequently symmetric, noninflammatory demyelination within the central basis pontis. 10% will have extrapontine demyelination. The exact mechanism for why this occurs is not known. Signs and symptoms include pseudobulbar palsy and spastic quadriplegia: head and neck weakness, dysphagia, dysarthria, horizontal gaze paralysis, vertical ophthalmoparesis, confusion, hyperactive reflexes. It may take months for a patient to recover. Chronic neurologic deficits are likely.

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Hypernatremic Dehydration Management in General Medical Unit

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Exclusion Criteria

	Determining Degree of Dehydration Pathophysiology	Management and Monitoring	Complications at Admission and During Treatment
Hypernatremic dehydration (more than 150 mEq/L)	Lose more water than sodium but still have a sodium deficit **Drier than you look** due to shift of water from intracellular to extracellular compartment and then lost through vomiting or diarrhea. Thus, when determining % dehydration severity using the table, add 3 – 5%.	• Usually hyperchloremic and more likely to have significant metabolic acidosis compared to the other two categories • Depending on severity of hypernatremia, consider not adding potassium to fluids until urine output establish due to risk of renal vein thrombosis • Fluid composition and rate • Due to hyperosmolarity and risk of cerebral edema, rehydration occurs over at least 48 hours. Change of approximately 15 mEq/L in Na level per 24 hours • If history reveals that the patient may have become hypernatremic over several days, decrease in sodium even slower. • **Input:Output** should be progressively more positive. Initially may want to replace ongoing losses 1:1. As rehydration target reached, adjust replacement ratio or discontinue to prevent over-hydration. • Daily weights are key to documenting rehydration success. Patient should return to their pre-dehydration weight. • Q6 hr RFP until sodium less than 150, then q12 hr until rehydrated	At Admission • May have renal vein thrombosis and/or renal failure from hyperviscosity at time of presentation. • May have subdural, subarachnoid, and/or intracranial hemorrhage at time of presentation due to “brain shrinkage” (cellular dehydration). During Treatment • Cerebral edema and herniation may occur during rehydration. • May develop sinus venous thrombosis early in course if moderate/severe dehydration.

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Key Formulas

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	Formula
Fluid Deficit	• Step 1: wet weight calculation Wet weight(kg) = Dehydrated (current) weight(kg) x 100 / 100 – % dehydration • Step 2: Total fluid deficit (mL) = [wet weight(kg) – current weight(kg)] x 1000
Remaining Fluid Deficit	Total fluid deficit(mL) – fluid given during initial rehydration phase
Sodium Deficit	Na(actual) – Na(desired) / Na(actual) X 1000 mL x 0.6 L/kg = mL of free water deficit
Free Water Deficit	

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Loss of Vascular Access during Rehydration Phase

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

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Exclusion Criteria

Choosing to transition from IVF rehydration to enteral intake will generally go well. Strict attention must be paid to ins and outs during this transition as the patient is at risk for becoming significantly dehydrated if enteral intake is inadequate and/or losses increase.

Loss of Vascular access prior to completion of Rehydration Phase

Still significant GI losses OR needs IV access for other reasons

no

yes

Begin age and illness appropriate diet if:
- More alert, interested in food and wants to drink **AND**
- Vomiting, if it was a persistent problem, has resolved **AND**
- If hypo- or hypernatremic dehydration, sodium now between 130-150 **AND**
- No contraindication to transitioning to enteral intake
- Continue to monitor electrolytes, ins and outs based on patient status

With rare exceptions, vascular access **MUST** be restored. *Attending approval required to not restore vascular access.*

Bottle or Breast fed infant
- Calculate amount of fluid that infant should receive to complete Rehydration Phase. Divide total by frequency of feeding to get amount per feed. If too large, the baby may need to feed more frequently.
- Breast fed babies can still feed at the breast. Nurse will need to ask questions related to adequacy of breast feeding for purposes of ins and outs
- Continue monitoring losses
- If unable to tolerate required volume or losses increase, vascular access should be restored.
- Continue lab monitoring for remainder of rehydration phase
- Discontinue IVF orders
- Transition to post-Rehydration Phase care

Normal development and able to drink *without* assistance
- Order age appropriate diet and **UNRESTRICTED** access to fluids
- Continue monitoring losses. If losses increase beyond enteral intake, vascular access must be restored.
- Continue lab monitoring for remainder of rehydration phase
- Discontinue IVF orders
- Transition to post-Rehydration Phase care

Abnormal development or unable to drink without assistance
- Calculate amount of fluid that child should receive to complete Rehydration Phase. Divide total by frequency of feeding to get amount per feed. If too large, then increase frequency of feeding.
- Parent/Nurse must ensure ordered intake is achieved
- Continue monitoring losses
- If unable to tolerate required volume or losses increase, vascular access should be restored.
- Continue lab monitoring for remainder of rehydration phase
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Care after completion of Rehydration Phase

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Exclusion Criteria

Rehydration completed (24 hours for iso- and hyponatremic dehydration; 48 hours for hypernatremic dehydration)

- Decrease IV fluid rate to maintenance rate
- Adjust fluid composition based on electrolytes
- Introduce enteral liquids and food if no contraindication to enteral intake. If breast feeding, ensure adequacy of breast feeding (see below) to prevent reoccurrence of dehydration.
- As tolerates enteral liquids and food, decrease/discontinue IVF
- If still having abnormal output, continue to measure ins and outs and give additional fluid as needed to prevent dehydration from reoccurring.
- Continue to monitor electrolytes, daily weights, ins and outs based on patient status
- Discharge when appropriate

Determining Adequacy of breast feeding

- Time spent at each breast (more than 10 minutes)
- Mother feels like breast(s) were emptied
- Baby had usual latch and suck according to the mother

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ORT fluid goals for Initial Rehydration Therapy

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Weight	Up to 6 Hour Goal
10 kg or less	Goal volume • 30 – 50 mL/kg for mild dehydration • 60-90 mL/kg for moderate dehydration Give 5 mL (mild) or 10-15 mL (moderate) every 5 – 10 minutes
10.1 – 20 kg	Goal volume • 30 – 50 mL/kg for mild dehydration • 60 – 90 mL/kg for moderate dehydration Give 15 mL (mild) or 20 – 25 mL (moderate) every 10- 20 minutes
20.1 – 40 kg	Goal volume • 30 – 50 mL/kg for mild dehydration • 60-90 mL/kg for moderate dehydration Give 20 – 30 mL (mild) or 40 – 60 mL (moderate) every 10- 20 minutes
> 40 kg	Goal volume • 1500 mL or more for mild dehydration • More than 2000 mL for moderate dehydration

Adapted from Powers KS. Peds in Review. 2015;36:274-285

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Section Title: Reference table for ORT fluids and composition

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The table below serves as a reference for types of solutions that are available for oral rehydration therapy (ORT). Solutions that are appropriate for ORT are usually moderately high in carbohydrates, contain higher amounts of sodium and potassium, and are more isotonic than inappropriate solutions.

At NHC, solutions for ORT may vary from time to time.

It is OK to use a fluid from the not appropriate list if that is what is available and the child is willing to drink it.

TABLE 2. Composition of Oral Rehydration Solutions and Commonly Used Beverages

Powers KS. Peds in Review. 2015;36:274-285

SOLUTION/BEVERAGE	CARBOHYDRATE (g/L)		SODIUM (mEq/L [mmol/L])	POTASSIUM (mEq/L [mmol/L])	BASE (mEq/L [mmol/L])	OSMOLARITY (mOsm/kg [mmol/kg])
Pedialyte®	Dextrose	25	45	20	30	250
Enfalyte®	Corn Syrup	30	50	25	30	200
CeraLyte®	Rice	40	70	20	10	235
World Health Organization (2002)	Glucose	13.5	75	20	30	245
Not Appropriate for Rehydration						
Gatorade®	45		20	3	3	280–360
POWERADE®	58		10	3	1	403
Apple Juice	100–150		3	20	0	700
Tea	0		0	0	0	5
Ginger Ale	90		3.5	0.1	3.6	565
Cola	100–150		2	0.1	13	550
Chicken Broth	0		250	5	0	450

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IVF Composition, Tonicity, and Osmolarity

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

Tonicity: measure of non-penetrating solutes through a semipermeable membrane, reflects the osmotic pressure gradient between two solutions. Sodium and the anions which bind to it are the primary determinants of tonicity.

Osmolarity: measure of penetrating solutes and non-penetrating solutes through a semipermeable membrane

Fluid	Tonicity	Osmolarity	Sodium (mmol/L)	Potassium (mmol/L)	Chloride (mmol/L)	Other
Normal Saline	Isotonic	300	154	0	154	None
Lactated Ringers	Isotonic	273	130	5.4	112	Ca-1.8 Lactate 27
Plasmalyte	Isotonic	294	140	5	98	Mg 3 Acetate 27 Gluconate 23
Normosol-R	Isotonic	295	140	5	98	Mg 3 Acetate 27 Gluconate 23
3% normal saline	Hypertonic	1026	513	0	513	None
7% normal saline	Hypertonic	2464	1232	0	1232	None
D10W	Hypotonic	505	0	0	0	Glu 100 g/L
D5NS	Isotonic	560	154	0	154	Glu 50 g/L
D5 1/2NS+ KCL 40 mEq/L	Hypotonic	487	77	40	117	None

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Overview of Acute Dehydration

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

Scope of problem

- Diarrheal disease and dehydration account for 14%-30% of worldwide deaths among infants and toddlers
- In the US, diarrheal illness generates more than 1.5 million office visits, 200,000 hospitalizations, and 300 deaths per year

Etiology of acute dehydration

- Fluid loss
  - GI tract: diarrhea, vomiting (including GT losses, ostomy losses)
  - Skin: fever, sweat, burns
  - Urine: glycosuria, diuretic therapy, obstructive uropathies, interstitial disease, neurogenic and nephrogenic diabetes insipidus

Types of acute dehydration

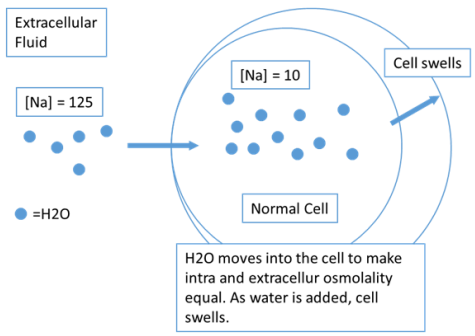
- Isonatremic (isotonic)
- Hyponatremic (hypotonic)
- Hypernatremic (hypertonic)
- Other hyperosmolar state such as severe hyperglycemia (synonym – hypertonic)

Loss of other electrolytes in dehydration

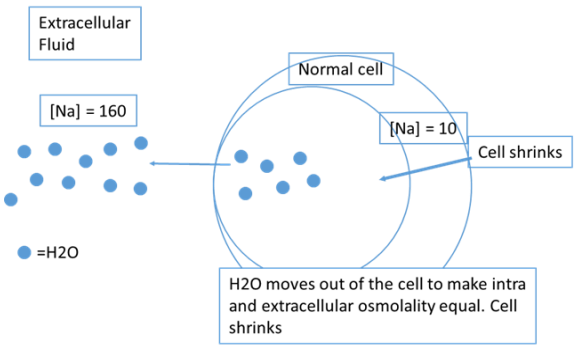
- Predominance of vomiting: loss of chloride leading to a hypochloremic metabolic alkalosis. Pyloric stenosis frequently leads to a hyponatremic hypochloremic metabolic alkalosis.
- In severe acidosis, cations such a potassium, magnesium, and calcium are lost in the urine as the body strives to maintain electric neutrality.

Impact of osmolarity on cell size

Hyponatremic Dehydration



Hypernatremic Dehydration



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Physiology of Water and Electrolyte Balance in the Body

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Water and Electrolytes in the Body

Intracellular and Extracellular Compartments

- ICF:ECF = 2/3:1/3
- Water content varies by age and body composition
  - 75% of body weight in infants
  - 60% of body weight in adolescents and adults

Distribution of electrolytes between the intracellular and extracellular compartments

ICF (mEq/L)	ECF
Sodium: 10-18	Sodium: 135-145
Potassium: 120-145	Potassium 4-5.5
Ion Calcium: $1x10^{-4}$	Ion Calcium: 0.9-1.3
Magnesium: 15-25	Magnesium: 0.7-1.2
Chloride: 2-6	Chloride: 98-106
Phosphate: 8-20	Phosphate: 0.7-1.3

Derivation of maintenance fluid rate:

Metabolism at a resting state uses water and produces water.

Route of loss	mL/100 kcal metabolized energy
Insensible Skin Lungs	 -30 -15
Renal	-55
GI	-10
Water of oxidation	+15
Total for maintenance	-100

Caloric expenditure (metabolism) and the 4-2-1 Rule* (Holliday and Seger method)

Body Weight	Daily caloric expenditure	Daily water requirements
Up to 10 kg	100 kcal/kg	100 mL/kg
11 – 20 kg	1000 kcal + 50 kcal/kg for each kg in excess of 10 kg	1000 mL+ 50 mL for each kg in excess of 10 kg
More than 20 kg	1,500 kcal + 20 kcal/kg for each kg in excess of 20 kg	1,500 mL+ 20 mLfor each kg in excess of 20 kg

*Anything that changes metabolism, decrease or increase, impacts the water needed to maintain euvolemia.

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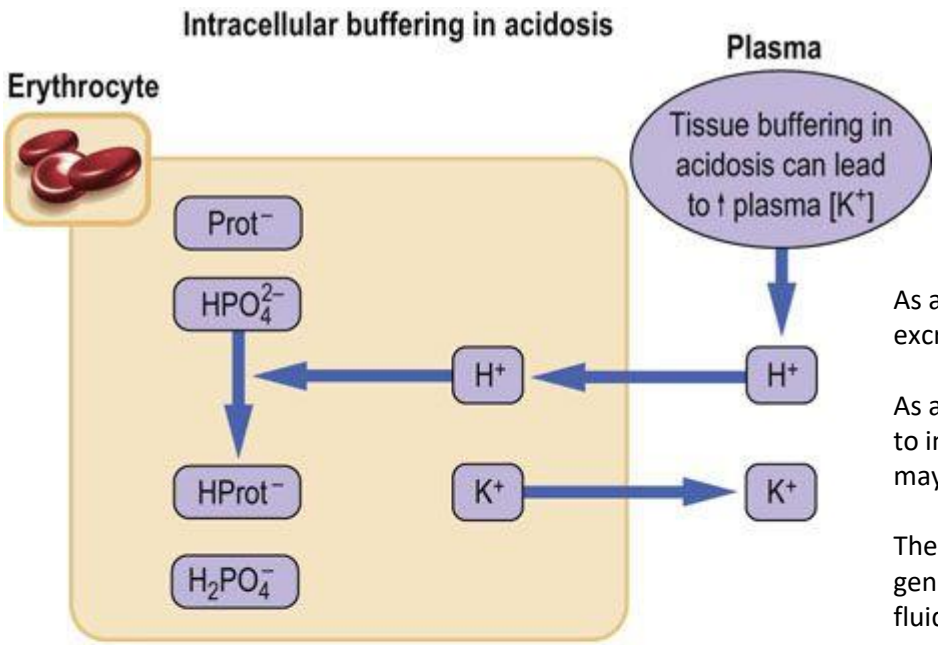
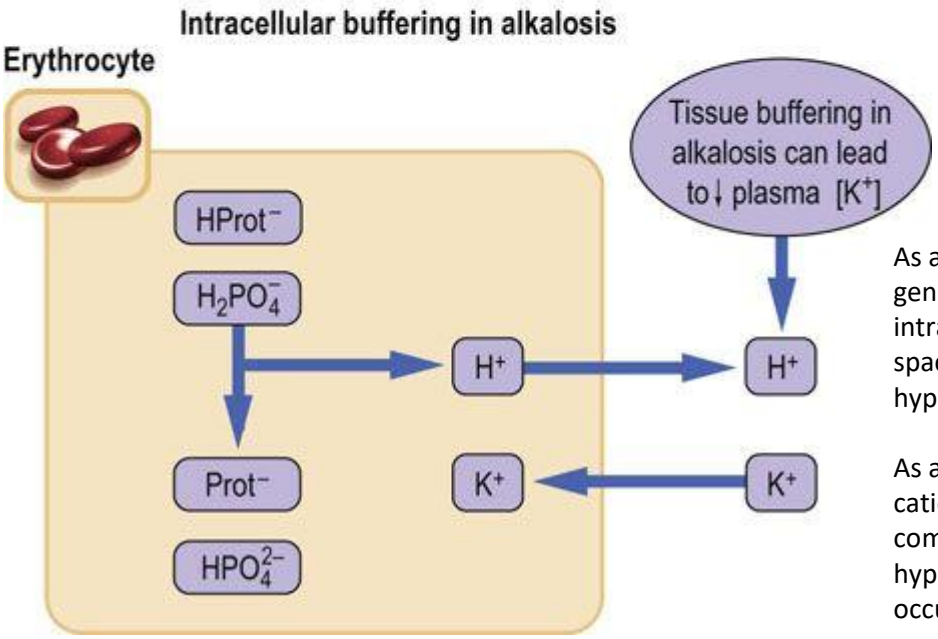


As acidosis worsens, potassium is excreted in the urine and lost from body.

As acidosis corrects, potassium shifts back to intracellular compartment and patient may have severe hypokalemia.

The loss of potassium is why potassium is generally added to the Rehydration Phase fluids.



As alkalosis worsens, hydrogen ions are generated and move from the intracellular space to the extracellular space. The patient may have severe hypokalemia.

As alkalosis corrects, potassium and other cations will return to the extracellular component and patient may experience hyperkalemia although this is an unusual occurrence.

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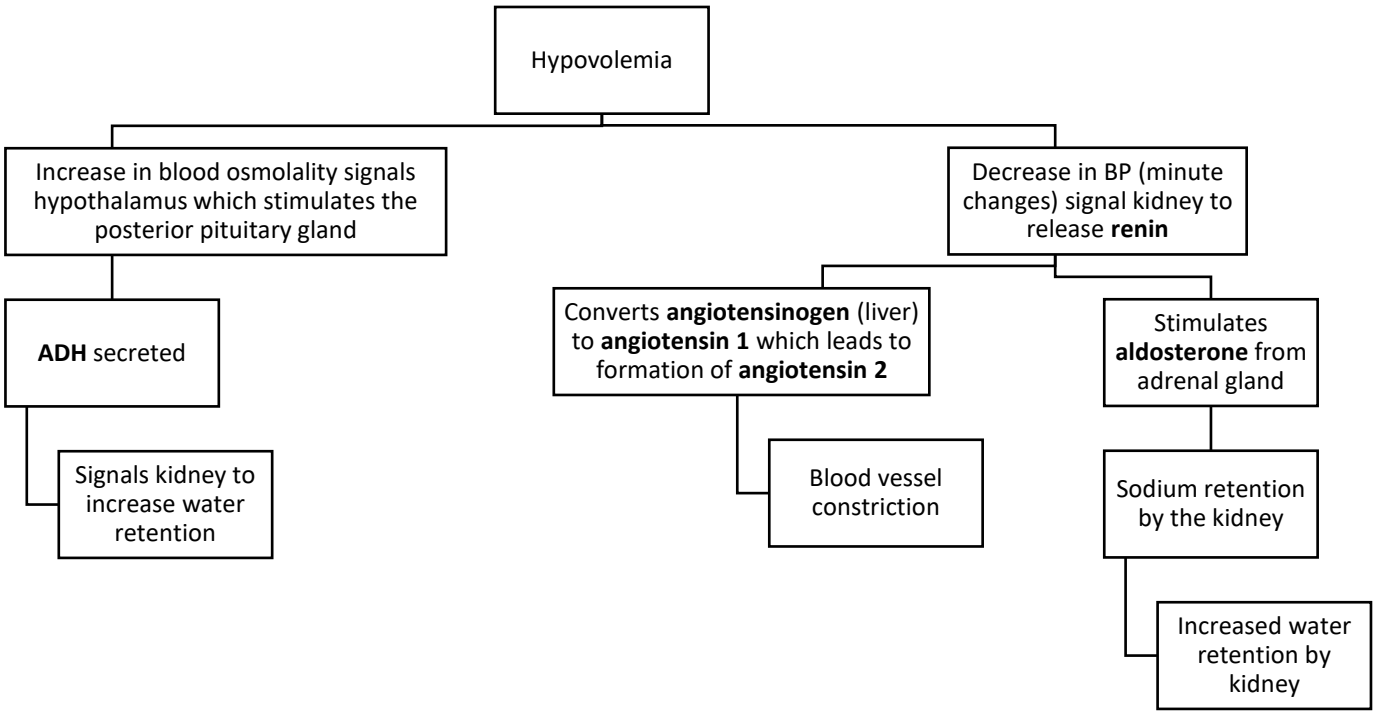
Section Title: Endocrine response to hypovolemia

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

Hypovolemia originates from 1)loss of water from the body (vomiting, diarrhea, skin), 2)vasodilation (relative hypovolemia), and 3)loss of water from the vascular space into the interstitial spaces due to capillary leak.

Body's Response to Hypovolemia



Impact of acute dehydration on electrolytes

- Sodium, potassium, chloride, calcium, and bicarbonate may all be impacted in dehydration. Alterations are dependent on the source of loss and the degree of metabolic acidosis that develops.
- In general, the body strives for cation/anion balance as well as neutral pH.
  - If sodium increases, chloride increases.
  - If chloride increases, sodium increases.
  - If sodium increases, other cations have to decrease. If sodium decreases, other cations increase.
  - If chloride increases, HCO_3^- has to decrease. If chloride decreases, HCO_3^- has to increase
  - If H^+ ions increase (metabolic acidosis), total body potassium decreases. If H^+ ions decrease (metabolic alkalosis), serum potassium increases
- As hydration status improves and acid-base balance restored, other electrolyte derangements may become apparent or worsen.

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Section Title: Writing Team and Approvals

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

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6. Santillanes G, Rose E. Evaluation and management of dehydration in children. Emerg Med Clin N Am. 2018;36:259-273. DOI: 10.1016/j.emc.2017.12.004.

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Section Title: Version History

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Version	Date	Guideline Owner	Summary of Edits	Next Revision Due
1	9/2021	Klint Schwenk, MD	Not applicable - New	10/2023
2	6/2025	Klint Schwenk, MD	1. No changes made	6/2029

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Section Title: Disclaimers and Restriction

Approvals and Bibliography | Summary of Version Changes | Background and Rationale

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