

# **Cerebral Edema Treatment Pathway**

## **Evidence Based Outcome Center**



Risks for Cerebral Edema:	Signs of Cerebral Edema		
<ul> <li>New-onset diabetes</li> </ul>	• Severe headache		
<ul> <li>History of prolonged DKA (several days)</li> <li>Extended history of poor diabetic control leading to chronic</li> </ul>	<ul> <li>Mental status changes (e.g., irritability, decreased cooperation, disorientation, decreased level of consciousness)</li> </ul>		
hyperosmolality	<ul> <li>Many patients in DKA are lethargic, but this usually improves quickly on therapy.</li> </ul>		
<ul> <li>Age &lt; 5</li> <li>Mederate to covere ecidecia (corrum pl ( &lt; 7.2))</li> </ul>	<ul> <li>Bradycardia/hypertension/respiratory insufficiency (Cushing's triad)</li> </ul>		
<ul> <li>Moderate-to-severe acidosis (serum pH &lt; 7.2)</li> <li>Eleveted PUN</li> </ul>	• Be aware of the normal heart rate for the age.		
<ul> <li>Elevated BUN</li> <li>Provision of &gt; 4L/M2/day of fluids</li> </ul>	<ul> <li>The heart rate in a patient with DKA should decrease with IV fluid therapy, but not to below the normal range.</li> </ul>		
• Excessive swings of serum glucose, plasma osm., and serum pH	Recrudescence of vomiting		
<ul> <li>Variable rate of fluid replacement</li> <li>Rate of decrease of serum glucose &gt;100 mg/dL/hour</li> </ul>	<ul> <li>Most patients in DKA are vomiting on presentation, but this should improve on therapy.</li> </ul>		
• Failure of serum Na to increase as serum glucose decreases	<ul> <li>One or both pupils fixed and dilated</li> </ul>		
Rapidly decreasing plasma osmolality or critically low plasma	Papilledema		
osmolality during the first 24 hours of therapy	<ul> <li>Focal neurologic signs</li> </ul>		
<ul> <li>Osmolality may be calculated as: Posm = 2 [NA+] + [Glucose]/18 +[BUN]/2.8.</li> </ul>	<ul> <li>Polyuria secondary to diabetes insipidus or, conversely, oliguria secondary to syndrome of inappropriate antidiuretic hormone (SIADH)</li> </ul>		
<ul> <li>Recommend following serum Osm Q4h with clinical exam</li> </ul>	• Coma		

### Initiate treatment as soon as the condition is suspected and in the following order! Call PICU and Endocrinology

### **Airway Protection**

Intubation *may* be necessary for the patient with impending respiratory failure or GCS < 8, sustained hyperventilation has been associated with poor outcome.

#### Maneuvers and IV Fluids

- Reduce the rate of fluid administration by one-third.
- Elevate the head of the bed and keep head positioned midline

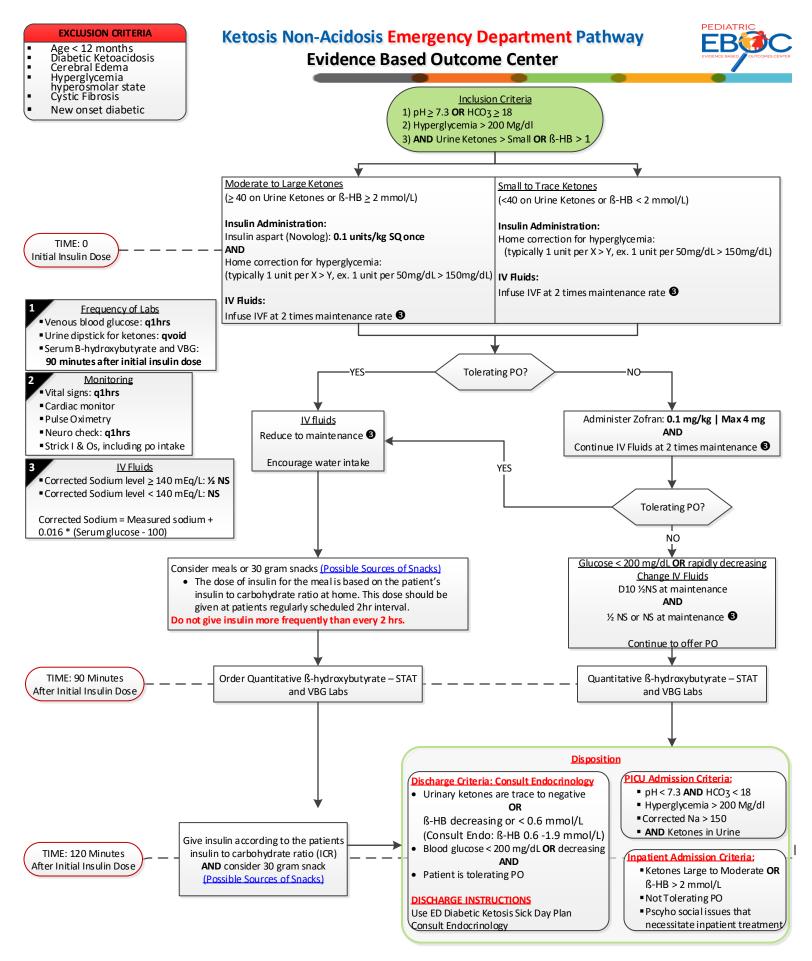
### Hyperosmolar Therapy

- Hypertonic saline (3%), 5–10 mL/kg over 30 minutes AND/OR
- Mannitol 0.5–1 g/kg IV over 20 minutes and repeat if there is no initial response in 30 minutes to 2 hours

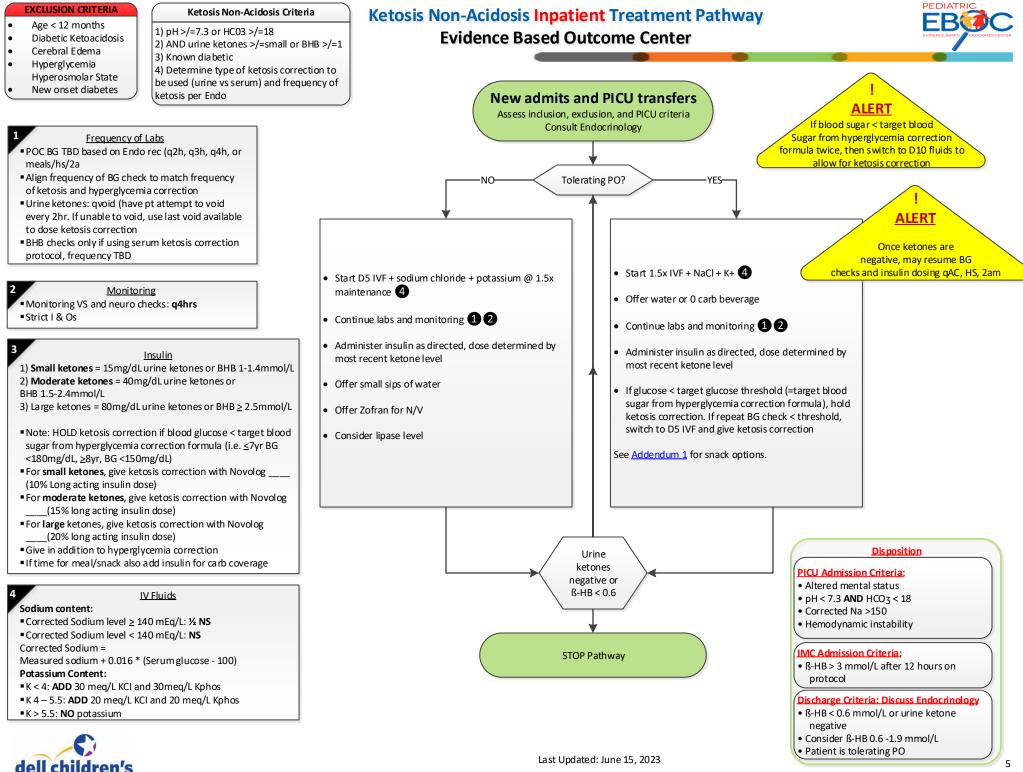
#### After Treatment Care and Considerations

- Consider Neurosurgery consult regarding possible ICP monitor
- After treatment for cerebral edema has been started, a cranial CT scan should be obtained to rule out other possible intracerebral causes of neurologic deterioration ( ≈10% of cases), especially thrombosis or hemorrhage, which may benefit from specific therapy.









Ascension

### **ADDENDUM 1**



# Assessment for patients at high risk for cerebral edema complications

- Age < 24 months
- GCS < 13 after volume resuscitation
- Presenting pH < 7.15
- Presenting HCO3 < 5 mEq/L
- Presenting  $PCO_2 < 10 \text{ mmHg}$
- Presenting BUN > 30 mg/dL
- Calculated Serum osmolality> 350 [ 2 x Na + (glucose/18) + (BUN/2.8)]
- Corrected Na < 140 mEq/L or decreasing at 2 hour labs
- Patient received IV bicarbonate or insulin bolus
- Patient received > 40 mL/kg total initial volume replacement (include fluids received prior to arrival to DCMC)
- Developmental delay or any condition that compromises communication
- Abnormal neurological exam after volume resuscitation
- Other organ system dysfunction
- History of Cerebral Edema
- Intractable vomiting
- Glucose > 800 mg/dL

# Hyperglycemic Hyperosmolar State (HHS) criteria

Hyperglycemic hyperosmolar state (HHS), also referred to as hyperosmolar nonketotic coma, may occur in young patients withT2DM, but rarely in T1DM subjects.

#### Criteria for HHS include:

- plasma glucose concentration >33.3 mmol/L (600 mg/dL)
- arterial pH >7.30
- serum bicarbonate >15 mmol/L
- small ketonuria, absent to mild ketonemia
- effective serum osmolality >320 mOsm/kg
- stupor or coma

## Possible sources of snacks

Snack	Volume	СНО	Snack	Volume	CHO
Saltine Crackers	1 Pkg (2 crackers)	4 grams	Graham Crackers	1 Pkg (3 crackers)	15 grams
Jello Snacks	1 Pkg (8oz)	17 grams	Pudding Snacks	1 Pkg (8oz)	23 grams
Peanut Butter Crackers	1 Pkg (6 crackers)	23 grams	Gatorade	8oz	14 grams

