Pediatric Diabetic KetoAcidosis (DKA) Algorithm

**Recognition of DKA**

DKA can occur in existing or new-onset diabetes, including Type 1 and Type 2. Consider in tachypneic patients with no chest findings.

**Diagnostic criteria:**
- Diabetes (random blood glucose >11 mmol/L)
- Acidosis (pH <7.3 or HCO₃ <18 mmol/L)
- Ketonuria/ketonemia (moderate/large urine ketones or beta-hydroxybutyrate ≥3 mmol/L)
- Ongoing IV Fluids & Insulin
- Fluid Resuscitation
  - Ketonuria/ketonemia (moderate/large urine ketones or beta-hydroxybutyrate ≥3 mmol/L)

**Initial Management**
- Continuous cardiorespiratory monitor
- Assess ABCs, vital signs (including BP) + neurovitals (GCS, pupils)
- Bed rest, elevate head of bed to 30°
- Rapid bedside glucose, blood ketones (if available)
- O 10–15 Lpm via non-rebreather mask if severe DKA
- IV access x 2; do not delay IO if severe DKA and IV unsuccessful after 2 attempts
- Start fluid resuscitation immediately (see below)
- Serum glucose, electrolytes, venous gas, urea, creatinine, osmolality, ketones
- Urinalysis for glucose, ketones
- Consider other investigations:
  - Cultures (e.g., blood, urine, throat) if evidence of infection
  - ECG to assess T-wave changes if hyperkalemia or delay in obtaining serum K level

**Alert Pediatric Referral Centre**

**DKA Severity**

<table>
<thead>
<tr>
<th></th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7.2 – 7.29</td>
<td>7.1 – 7.19</td>
<td>≤7.1</td>
</tr>
<tr>
<td>HCO₃ (mmol/L)</td>
<td>10 – 17</td>
<td>5 – 9</td>
<td>≤5</td>
</tr>
</tbody>
</table>

**-fluids and insulin**

- Rehydrate with IV NS or RL as per Rehydration Table below. Run IV fluids at 75% of rate if concern for cerebral injury

**Fluid Resuscitation (Dehydration is a key feature of DKA and its complications, including acute kidney injury)**

- Administer NS or RL 20 mL/kg (MAX 1 L) IV bolus over 20 minutes (rapid push over 5–10 min if patient is hypotensive)
- Repeat NS or RL 20 mL/kg (MAX 1 L) IV bolus if ongoing hypoperfusion (cap refill ≥3 sec centrally, cool extremities)

**Signs of CEREBRAL INJURY?**

- GCS ≤13, severe/progressive headache, focal neurological signs, incontinence, and/or inconsolability AND/OR
- Cushing’s triad: BP, HR, abnormal breathing

**CAUTION!** Intubation and ventilation are HIGH RISK procedures for patients with DKA. Unless there is acute respiratory failure, consult your Pediatric Referral Centre/Transport Team PRIOR to intubation. The patient’s ETCO₂ must NOT be allowed to rise prior to/during intubation.

**Ongoing IV Fluids & Insulin**

- Rehydrate with IV NS or RL as per Rehydration Table below. Run IV fluids at 75% of rate if concern for cerebral injury

**Rehydration Table**

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>5 – &lt;10 kg</th>
<th>10 – &lt;20 kg</th>
<th>20 – &lt;40 kg</th>
<th>≥40 kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate (mL/kg/hr)</td>
<td>6.5</td>
<td>6</td>
<td>5</td>
<td>4 (max 500 mL/hr)</td>
</tr>
</tbody>
</table>

- Potassium: If serum K <5.5 mmol/L, add 40 mmol/L KCl to IV fluid
- Insulin: Start regular insulin infusion 0.1 units/kg/hr IV after 1 hour of IV fluids (delay insulin if K <3.5 mmol/L)
- Dextrose: Change to dextrose-containing solution (e.g., D5NS, D5SR, D10NS or D10LR) with added KCl when glucose is <17 mmol/L OR is decreasing by >5 mmol/L/hr after insulin is started. For ongoing fluid management, see CPEG Pediatric DKA Algorithm: Ongoing Management

**Ongoing Monitoring Until Transfer**

- Continuous cardiorespiratory monitor; BP and neurovitals (GCS, pupils)
- Blood glucose Fluid ins and outs, indwelling catheter if necessary
- Q 2 hours: Serum glucose, electrolytes, venous gas, urea, creatinine
- Q 1 hour: Blood glucose
- Continuous cardiorespiratory monitor; BP and neurovitals (GCS, pupils)
- Head CT not required prior to treatment or transport

**Pediatric Referral Centre Update**

- Difficult vascular access
- Ongoing fluid management for persistent hypoperfusion
- Additional treatment for cerebral injury
- Airway management
- Transport

**Cerebral Injury Management**

- Elevate head of bed to 30°; keep head midline
- After initial fluid resuscitation, run IV fluids at 75% of rate outlined in Rehydration Table below
- Monitor BP and perfusion closely to avoid hypotension and prevent further cerebral injury
- Administer 3% NaCl 5 mL/kg (MAX 250 mL) IV over 10 min OR mannitol 0.5–1 g/kg (MAX 100 g) IV over 15 min
- Update Pediatric Referral Centre
- May repeat hyperosmolar agent dose x 1 after 30 min if no improvement or use alternate agent
- Head CT not required prior to treatment or transport

**Hyponormol Hyperglycemic State (HHS)**

- Serum glucose >33.3 mmol/L, effective serum osmolality >320 mOsm/kg, HCO₃ >15 mmol/L, pH >7.25
- More dehydrated, severe electrolyte abnormalities, minimal acidosis/ketoacidosis, negative/trace ketones
- Initiate fluid resuscitation as for DKA; HHS patients need more aggressive fluid resuscitation than those with DKA
- Discuss management with Pediatric Referral Centre, see CPEG HHS Algorithm