Emergency Department Guideline
Pediatric Diabetic Ketoacidosis (DKA)

Inclusion criteria:
Patient in any of the following three groups:
1. Patient referred to the ED with diagnosis of new-onset diabetes mellitus (DM)
2. Patient presenting with signs and symptoms of possible DKA AND supporting lab data confirming hyperglycemia AND metabolic acidosis/ketonemia (see box)
3. Patient with known diabetes mellitus (DM) presenting to the ED with elevated blood glucose levels AND signs or symptoms of possible DKA

Triage considerations:
- ESI Triage level 2
  - Level 1 if mental status changes, major VS abnormality
- Full set of vital signs, including blood pressure
- Room promptly
- Notify MD of possible DKA patient, discuss timing of lab draw (before or after physician H&P)

Laboratory studies:
- In all patients:
  - iStat CG-8 (or VBG if CG-8 not available)
    - If not available, lab VBG and POCT blood glucose
  - Serum ketones
  - BMP
  - Mg
  - Phos

Signs and symptoms of possible DKA:
- Kussmaul breathing
- Poor peripheral perfusion
- Altered mental status
- Weight loss
- Polyuria, polydipsia,
- Nausea or vomiting

Lab criteria for this protocol:
- BG > 200 mg/dl
- Serum HCO₃ < 20 mEq/L
- Venous pH < 7.3
- Serum ketones > 3 mmol/L
- Moderate to large urine ketones
Pediatric Diabetic Ketoacidosis (DKA)

July 2016

Division of Pediatric Emergency Medicine

Ongoing fluid selection – twice maintenance rate

<table>
<thead>
<tr>
<th>Glucose &gt;300 mg/dL</th>
<th>K &lt; 5.5 mEq/L</th>
<th>K ≥ 5.5 mEq/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>D5-NS + 40 mEq KCl/L</td>
<td>D5-NS</td>
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<tr>
<td>Glucose ≤300 mg/dL</td>
<td>D10-NS + 40 mEq KCl/L</td>
<td>D10-NS</td>
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<tr>
<td>Glucose ≤300, already on D10</td>
<td>Continue current fluids and decrease insulin to 0.03 units/kg/hr.</td>
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<td>If persists, increase rate of fluids to 2.25X maintenance followed by 2.5X maintenance if needed.</td>
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- **Insulin:**
  - Start insulin drip immediately AFTER completion of initial fluid bolus (after approximately one hour) **only if potassium is >3.3 mEq/L**
    - 1 unit/ml regular insulin in NS at 0.05 unit/kg/hr
    - If potassium is ≤3.3 mEq/L, recheck in 30 minutes. Consider low-dose IV bolus KCl if ≤ 2.5.
  - Continue IV insulin infusion until serum HCO₃ ≥ 18 mEq/L or transfer to PICU
  - Patients with mild DKA (HCO₃ 15-19 mEq/L) may begin on SQ insulin or insulin via their existing insulin pump at the discretion of the endocrinology consultant
    - Have parents change infusion set and pump site if on pump and they have supplies.
- **Mannitol:**
  - Consider for signs of cerebral edema (altered mental status, severe headache, hypertension, bradycardia)
    - 0.25-0.5 gm/kg IV bolus
  - High risk patients for cerebral edema: Younger patients <5 years of age, those with an initial pH <7.0, newly diagnosed DM patients, and significantly dehydrated patients with marked elevations in BUN
- **3% (hypertonic) saline:**
  - Consider as second line therapy after mannitol for signs of cerebral edema (altered mental status, severe headache, hypertension, bradycardia)
    - 2-6 ml/kg IV/IO, max infusion rate 20 ml/min

**Consultations:**
- Pediatric endocrinology for all patients

**Reassessments:**
- Continuous cardiorespiratory monitoring with pulse ox for ill-appearing patients
- VS with BP q1h for other patients
- Neuro checks q1h (mental status, pupillary response)

**Differential diagnosis:**
- New onset DM
- Pump failure or noncompliance in known diabetic patients
- Viral or other infectious trigger of poor glucose management
- Other metabolic acidosis due to dehydration, ingestion

**Discharge or Admission criteria:**
- PICU

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Who needs an insulin drip?
- Serum HCO₃ < 15 mEq/L
- Venous pH < 7.2
- Mental status changes, shock, concern for impending cerebral edema, or other severe illness
- Do NOT start if K≤3.3
- Discuss with endocrine if uncertain
o All patients on insulin drip
o Mental status changes or vital sign instability raising concern for impending cerebral edema

- Inpatient floor
  o Known or new-onset diabetics who meet criteria for SQ insulin management (confer with pediatric endocrinology—typically known DM patients with mild DKA)

- Discharge home
  o Known or new-onset diabetics who are tolerating PO and SQ insulin without acidosis (i.e. patients who were suspected to have DKA but do not)
  o Close follow-up arranged via endocrinology
    ▪ Including next-day education appointments for new-onset—on call endocrinologist will assist in arranging appointments
  o Discretion of endocrinology attending

Quality measures:

- IVF started within first 30 minutes
- Appropriate fluid choice
- ED LOS for PICU patients