Emergency Department Guideline
Diabetic Ketoacidosis (DKA)

Objective: To rapidly identify and begin treatment for the pediatric patient presenting with Diabetic Ketoacidosis (DKA).

Indication:
1. Pediatric patients with known Diabetes Mellitus (DM) presenting to the Emergency Department with elevated blood glucose levels.
2. Pediatric patients referred to the Emergency Department with the diagnosis of new-onset DM.
3. Pediatric patients presenting with related signs and symptoms for possible DKA, such as Kussmaul breathing, poor peripheral perfusion, altered mental status, a history of weight loss, polyuria, polydipsia, or polyphagia.

Diagnostic Criteria for DKA:
1. To meet criteria for entering DKA protocol, patients should meet one of the clinical indications listed above, and the following biochemical parameters:
   a. Glucose value >200 mg/dL (may be <200 mg/dL in rare situations, especially in infants)
   b. Serum bicarbonate <20 mEq/L
   c. Venous blood pH <7.3
   d. Presence of elevated serum ketones by bedside meter (>1.5 mmol/L) or positive urine ketones (moderate-large).

Evaluation/Intervention:
1. Check triage vital signs, weight (in kg), oximetry, neurologic status.
2. Assign Emergency Department nurse and room for patient, place patient on cardiac monitor.
   a. IV Bolus: Start IV, and draw blood for labs. Give an IV bolus of 20cc/kg NS (maximum 1 liter) over 20-30 minutes.
   b. Initial DKA labs: I-STAT or glucometer glucose, ketone level using bedside blood ketone monitor (if available), Chemistry-7, calcium, magnesium, phosphorus, beta-hydroxybutyrate level (or other serum ketone study), Venous Blood Gas.
4. For patients who meet the above DKA Diagnostic Criteria:
   a. **Ongoing DKA labs:**
      i. I-STAT or glucometer glucose every 1 hour
      ii. Serum electrolytes every 2 hours until serum HCO3 ≥18mEq/L
      iii. Serum ketones by bedside meter Q 2 hours until <0.6 mmol/L.
      iv. Other studies as indicated: Consider insulin, c-peptide, HgbA1c, diabetes antibody panel (GAD-65, IA-2, anti-insulin) for new-onset DM patients
   b. Consider infectious work-up as clinically indicated (if CBC obtained, initial WBC will likely be elevated and may not be indicative of underlying infection).
   c. **Additional IV Fluid orders:** Repeat bolus of 10-20 cc/kg NS as needed for signs of compensated shock (consult with ED Attending physician prior to administration of additional fluid boluses).
   d. **After completion of initial bolus, start IV maintenance fluid:** D5-0.45NS IV at 2X maintenance rate.
      i. KCl should NEVER be added if serum potassium is ≥6.0
      ii. If serum potassium is <6.0, add KCl 40mEq/L to IV maintenance fluid.
   e. **Insulin drip:** Start immediately after completion of initial fluid bolus.
      i. Mix 50 u human regular insulin in 500 cc NS (1.0 u/cc final concentration).
      ii. Run 50 cc of solution through IV tubing to saturate binding sites on the tubing.
      iii. Infuse IV piggyback at a rate of 0.1 u/kg/hr (0.1 cc/kg/hr) on programmable IV pump for children >3 years of age.
      iv. Infuse IV insulin drip rate of 0.05u/kg/hr (0.5 cc/kg/hr) for children ≤3 years of age.
   f. **If serum Glucose <250mg%:** Change IV maintenance fluid to D10-0.45NS with above appropriate potassium supplementation at the same 2X maintenance rate.
   g. **If serum Glucose <250mg%, while D10-0.45NS IV maintenance fluid is already infusing:** Decrease IV insulin infusion by 0.025 u/kg/hr and consider increasing dextrose concentration to D15-0.45NS with appropriate potassium supplementation
   h. Continue IV insulin infusion with IV maintenance fluid infusion until serum HCO3 is ≥18mEq/L.
   i. **Neurologic Checks** (mental status, pupil response) Q1 hour.
      i. For signs of cerebral edema (altered mental status, severe headache, hypertension and bradycardia) consider Mannitol 0.25-0.5 gms/kg IV bolus.
      ii. 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.
**Diabetic Ketoacidosis (DKA)**

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Division of Pediatric Emergency Medicine

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**Disposition**

1. Consider hospital admission (or transfer to University of Minnesota Masonic Children’s Hospital) for any of the following indications:
   a. Patient has a new diagnosis of Diabetes and meets DKA criteria
   b. Patient has initial labs with venous pH <7.20, or serum bicarbonate <15 mEq/L
   c. Patient is unable to tolerate oral fluids after 4 hours of DKA protocol therapy in the ED

**Documentation:**

1. Document triage vital signs, weight in kg, oximetry, neurologic status.
2. Ongoing vital signs and cardiac monitoring per patient acuity, with a minimum of q1 hour vitals and neurologic checks.
3. Documentation of initial laboratory values, time to initiation of IV fluids, type of fluids used, rate of fluids, time to initiation of insulin, any changes in mental status.