

TREATMENT OF PEDIATRIC DIABETIC KETOACIDOSIS (DKA)

EMERGENCY DEPARTMENT MANAGEMENT OF PEDIATRIC PATIENTS IN DKA

- Obtain height and weight, monitor vital signs, including blood pressure on all patients
- Do a bedside glucose determination
- Assess the degree of hydration and mental status
- Obtain a urine sample for glucose and ketones
- Draw BMP, venous/arterial pH, serum acetone, and CBC
- If signs of circulatory shock are present, give a bolus of normal saline (20 mL/kg)
 - **DO NOT** give more than one bolus unless evidence of shock persists
- Consult with a pediatric endocrinologist or your pediatric critical care center as soon as possible
- Begin IV maintenance and replacement fluids with normal saline at a rate of 1½ to 2x maintenance fluids (maximum: 3500 mL/m²/day)
- Follow blood glucose every hour
- Follow venous/arterial blood gas at presentation, 2 hours later, then every 4 hours following
- Start 2-bag system of IVF as soon as possible
- Maintain blood sugar between 250 and 300 mg/dL while acidosis is resolving

DO NOTs:

- Do not give more than 20 mL/kg as a single fluid bolus
- Do not give more than a total of 30 mL/kg of bolus fluids unless the patient is in shock
- Do not bolus insulin
- Do not give sodium bicarbonate unless severe acidosis (pH < 6.9) is refractory to fluid and insulin administration

Criteria for PICU Admission

- Arterial pH < 7.3 or venous pH < 7.25
- Altered mental status
- Severe dehydration

**PEDIATRIC INTENSIVE CARE MANAGEMENT
OF PEDIATRICS PATIENTS IN DKA**

1. **Measure body weight in kg** kg
 Calculate body surface area ($\sqrt{ht (cm) \times wt (kg)/3600}$) m²
2. **Regular Insulin 50 unit/50 mL NS** (1 unit/mL); infuse 0.1 unit/kg/hour.
 NO BOLUS DOSES
 0.1 unit/kg x _____ kg = _____ divided by 1 unit/mL = _____ mL/hr

3. **IV Fluids**

- a. Boluses received previously (in ED or at outside hospital) = _____ mL
 b. Boluses received in PICU
 (not to exceed 20 mL/kg NS, unless in shock) = _____ mL
 c. Total Boluses received (a + b) = _____ mL
 d. Calculate free water deficit from table below

Degree of Dehydration	Water Deficit
Mild	5% = 50 mL/kg
Moderate	8% = 80 mL/kg
Severe	10% = 100 mL/kg

- Water Deficit: _____ kg x _____ mL/kg = _____ mL
- e. Calculate remainder of free water deficit (d – c) = _____ mL
 f. Calculate maintenance fluid requirements for the next 48 hours
 200 mL/kg for the first 10 kg of body weight
 + 100 mL/kg for the next 10 kg of body weight
 + 40 mL/kg for the remainder of body weight mL/48h
 g. Calculate total amount of fluids for the next 48 hours (e + f) _____ mL
 h. Determine **hourly IV rate** (g/48) _____ mL/hr
 i. Adjust the rates of two IV solutions (one containing dextrose, one without) based on blood glucose levels (see table below)
 j. **IF SERUM POTASSIUM IS GREATER THAN 6.5 mMol/L, infuse 0.45% NaCl + 77 mEq/L Na Acetate at calculated hourly rate (h) and recheck potassium in 1 hour.**
Once serum potassium is less than 6.5 mMol/L and patient is urinating, begin IV fluids as indicated below.

Blood Glucose Level	Bag "A" – No Dextrose 0.9% NaCl + K Phos 15 mMol/L + K Acetate 20 mEq/L	Bag "B" – With Dextrose D10 – 0.45% NaCl + Na Acetate 70 mEq/L +K Phos 15 mMol/L + K Acetate 20 mEq/L
Greater than 350	100% hourly IV rate _____ mL/hr	0% hourly IV rate Zero mL/hr
301 – 350	75% hourly IV rate _____ mL/hr	25% hourly IV rate _____ mL/hr
251 – 300	50 % hourly IV rate _____ mL/hr	50% hourly IV rate _____ mL/hr
201 – 250	25% hourly IV rate _____ mL/hr	75% hourly IV rate _____ mL/hr
Less than 200	0% hourly IV rate zero mL/hr	100% hourly IV rate _____ mL/hr
Less than 100	0% hourly IV rate zero mL/hr	HOLD INSULIN AND RECHECK GLUCOSE IN 30 MIN 100% hourly IV rate _____ mL/hr

Bicarbonate is **NOT** recommended unless there are ventricular arrhythmias associated with acidosis

Close neurologic observation to detect any changes consistent with cerebral edema:

- Severe headache
- Change in sensorium
- Change in blood pressure
- Pupillary abnormalities
- Bradycardia
- Posturing
- Incontinence

If any of the above signs are encountered, rapid intervention is imperative (intubation, mild hyperventilation, mannitol bolus 0.25 to 0.5 g/kg IV). Neuroimaging as soon as patient is clinically stable.

Follow laboratory parameters:

- Initial – CBC, CMP with magnesium, phosphorus, amylase, lipase, serum acetone, glycohemoglobin, ABG or VBG
- If new onset – above labs + serum insulin (prior to starting insulin therapy), islet cell antibody, anti-GAD 65, insulin antibody
- Blood glucose by meter every 1 hour
- VBG/ABG with electrolytes at presentation, 2 hours later, then every 4 hours following
- BMP, magnesium, phosphorus every 12 hours
- Once bicarbonate reaches 15, recheck serum acetone

Most patients can be taken off insulin drip and start subcutaneous insulin regimen when all of the following criteria have been met

- Ketoacidosis has significantly resolved, arterial pH ≥ 7.3 or venous pH ≥ 7.25 AND serum bicarbonate ≥ 15
- Patient feels hungry
- Patient has bowel sounds
- Patient has stopped vomiting

Keep the insulin drip running for 30 minutes after the first dose of subcutaneous insulin has been given. IVF fluids are generally not needed once DKA is resolved and the patient is transitioned to subcutaneous insulin and oral diet. If fluids need to be continued, they should not contain dextrose.