

# SBUMC PEDIATRIC DKA PROTOCOL

(modified 01/23/2010)

This protocol is intended as a guide – individual patient modifications may be necessary.

## Criteria for PICU Admission (any of the following):

- Venous pH < 7.25 or serum CO<sub>2</sub> < 14 and vomiting.
- Venous pH < 7.2 or serum CO<sub>2</sub> < 12 regardless of vomiting
- Altered mental status
- Severe vomiting/dehydration
- Glucose > 700

Patients not meeting any of these criteria may be candidates for subcutaneous insulin on the inpatient floor on the Peds. Endocrine service.

Arterial blood gas is NOT indicated unless specifically there is a problem with pulmonary function or cardiac function.

## Therapy Time Line

### 1<sup>st</sup> hour

- NPO. NG tube if unconscious.
- IV, D-stick
- Labs – chem 8, Mg, Phos, CBC, VBG
  - For new onset, also: Anti glutamic acid decarboxylase, anti islet cell and anti insulin antibodies, anti tissue transglutaminase IGA, total IGA, anti TPO antibodies, anti thyroglobulin antibodies, freeT4 and TSH.
  - If type of diabetes uncertain for new onset, add serum insulin and c-peptide.
- 20 cc/kg Normal Saline fluid bolus over 30-60 minutes
  - If poor perfusion or shock is present, give fluid bolus over 10-20 min and consider additional bolus if shock not resolved
- Start insulin therapy provided BS > 200 mg/dl (see below)
- Order insulin drip.
  - While waiting for drip, if BS > 200 give regular or short acting insulin (Humalog / Novolog) 0.1 to 0.2 u/kg SQ.

### 2<sup>nd</sup> hour

- Contact Peds Endo and PICU
- Start 2nd IV (for insulin drip)
- Repeat dextrose stick
- Continue NS at 1½ times maintenance
- If available, start insulin drip
- Correct electrolyte abnormalities

### 3<sup>rd</sup> hour

- By 3<sup>rd</sup> hour, patient should be in ICU
- Start / continue insulin drip
- Change fluids to contain potassium (see below)

## Fluid / Electrolyte Therapy

Two Bag Fluid system allows titration of serum blood sugar (see **Dextrose** below)

Bag A: ½ NS + Potassium (see below)

Bag B: D10W + ½ NS + Potassium (see below)

Potassium concentration: Add equal amounts of KCl and Kphos

If K < 5, add 20 mEq/L KCL + 20 mEq/L Kphos

If K = 5-5.5, add 10 mEq KCl/L + 10 mEq/Kphos/L

If K > 5.5, hold potassium until K < 5.5 mEq/L. Add it when K < 5.5 mEq/L

## Fluid Rate

Total fluid rate is 1½ times maintenance until the acidosis is resolved.

## Insulin

Goal of therapy is to resolve the ketoacidosis – insulin is necessary to do this.

Insulin should be given SQ, or by IV infusion\*. IV bolus has too short a ½ life to be effective

**While waiting for IV insulin drip, start Regular or Short acting insulin 0.1-0.2 u/kg SQ.**

Once insulin drip available, start insulin infusion: 0.1 Units/kg/hr

Standard Pediatric concentration: 100 Units Regular Insulin/100 cc NS (1 cc = 1 Units)

Prime all IV tubing because insulin binds to the plastic tubing

May be piggybacked into IV fluids, especially at low infusion rates to allow delivery

If serum glucose falls < 200 mg/dl despite 10% dextrose in the IV fluids, rate of insulin administration may be decreased to 0.075 – 0.05 units/kg/hr.

## Dextrose

Dextrose sticks should be monitored every 1 hour

Add dextrose when serum glucose < 300 mg/dl.

Amount of dextrose given should be titrated to maintain dextrose sticks 200 – 300 mg/dl.

2 Bag System to allow rapid titration of dextrose:

Each bag contains ½ NS + the appropriate amount of potassium.

The bags differ as follows:

Bag A contains no dextrose

Bag B contains D10

**Increase dextrose** by increasing the rate of Bag B and decreasing the rate of Bag A.

**Decrease dextrose** by decreasing the rate of Bag B and increasing the rate of Bag A.

The following table provides the percentage of hourly rate from each bag to result in a final dextrose delivery. The rate should be periodically adjusted to maintain the blood sugar in the 200-300 mg/dl range.

Final Concentration Dextrose Delivered	Bag A (½NS + K)	Bag B (D10 + ½ NS + K)
D 0	100 %	0 %
D 2.5	75 %	25 %
D 5	50 %	50 %
D 7.5	25 %	75 %
D 10	0 %	100 %

**Sodium bicarbonate** is almost never necessary in the treatment of DKA.

Any consideration of bicarbonate administration requires the input of the Endo or PICU attending.

**Ongoing Monitoring:**

- Never put the patient on autopilot
- Dextrose stick every 1 hour
- Neuro exam every 30 – 60 minutes
- VBG every 2-4 hours
- Serum electrolytes every 4 hours
- Make sure that Intake>Output – consider foley catheter if patient is in shock or if resuscitation is not straightforward
- UA every 8 hours for glucose and ketones

**Neurologic Complications**

**Every patient with DKA is at risk for cerebral edema.**

**Signs and symptoms – change in mental status, bradycardia, hypertension, dilated or unequal pupils, respiratory failure, incontinence, vomiting after initial improvement**

**For neurologic deterioration consider head CT and mannitol (0.5 – 1 gram/kg)**

**If intubation is necessary use strict increased ICP precautions**

\*In cases of shock where there is poor subcutaneous perfusion and where no there is a delay in establishing an IV insulin drip, regular insulin can be given IM 0.1 u/kg/hr.