Diabetic Ketoacidosis

Clinical Practice Guidelines

Monroe Carell Jr. Children's Hospital at Vanderbilt

Patient arrives with clinical concern for DKA*(see inclusion criteria):
- Order BMP, VBG, urine ketones
- **Patients with altered mental status should be excluded from this guideline, only receive IV fluids with normal saline, and be discussed with endocrinology**

If patient meets inclusion criteria:
- Consult Endocrine
- Begin rehydration with Normal Saline (NS) 20 mL/kg bolus (or 1L if >/=50kg)

Signs of uncompensated shock after first bolus?

Yes → Discuss with Endocrine and PICU

No →
- Check neuro (GCS) status every hour
- Check bedside glucose every hour
- Start ½ Normal Saline (0.45% NS) at 1.5-2.0x maintenance IV fluid (MIVF) via **2 bag method**** max fluid rate 250ml/hr (below)
- Glucose infusion rate determined by the patient's blood sugar**
- BMP q6h on 5-11 schedule as medically appropriate
- Continue long acting insulin regimen if known diabetic
- If new onset or on insulin pump discuss with endocrinology for long acting insulin plan as well as plan for new pump site

Begin insulin infusion at 0.1 units/kg/hr

K< 5.0?

No →
- Continue rehydration with 1.5-2.0x MIVF by 2 bag method** with ½ NS as base solution, no potassium supplements
- Recheck potassium with next scheduled labs

Yes →
- Continue rehydration with 1.5-2.0x MIVF by 2 bag method**with ½ NS as base solution; add a total of 40 mEq/L of K^+ to IV fluids (as K Acetate 20mEq/L and KPO_4 20 mEq/L)
- When no vomiting in 4hrs and patient is alert, may have 1ml/kg of sugar free clears, up to 60ml/hr

Anion gap ≤12 on BMP & Bicarb ≥12 on BMP?

No → (back to K< 5.0?)

Yes → Is patient on an insulin pump?

Yes →
Transition to insulin pump
- Ensure basal rate has been on for at least 30 minutes prior to meal
- Check baseline pre-meal glucose
- Allow patient to eat appropriate diet
- Give meal insulin through insulin pump
- Stop insulin infusion 30 minutes after meal insulin given through pump, and switch to dextrose free fluids

No →
Transition to scheduled SQ insulin
- Check baseline pre-meal glucose
- Allow patient to eat appropriate diet
- Give scheduled SQ insulin
- Ensure long acting insulin given within last 24 hours
- Stop insulin infusion 30 minutes after SQ insulin given if eating, and switch to dextrose free fluids

*Inclusion Criteria

Patient must meet *all* of the following:
- pH< 7.3
- Bicarb on BMP ≤ 15
- Glucose ≥ 200
- Ketosis by urine or blood testing (send with first void, but do not delay initiation of insulin infusion if patient meets other criteria for DKA)

AND *any* of the three listed below:
- History of previously diagnosed Insulin Dependent Diabetes Mellitus (IDDM)
- History of significant Non-Insulin Dependent Diabetes Mellitus
- History consistent with new onset IDDM (polyuria, polydipsia, polyphagia)

**2 Bag Method: *Total IV Fluid (TIVF) = 1.5-2xMIVF*

Patient's Glucose	1st Bag (D_0 solution)	2nd Bag (D_{10} solution)
BG <200	0% TIVF	100% TIVF
BG 200-300	50% TIVF	50% TIVF
BG >301	100% TIVF	0% TIVF
BG <70	• Maintain insulin infusion • Give 15 g carbs (ex. juice cup), If altered mental status give D25 • Check blood glucose in 15 minutes	

Exclusion Criteria

If patient meets any of the following exclude from protocol and discuss treatment plan with Endocrinology
- Age < 3 years
- Altered mental status
- If corrected sodium ≤ 130 mEg/L
- If corrected sodium ≥ 150 mEq/L

Corrected plasma sodium = measured plasma or serum sodium concentration + (2*(serum glocose-100)/100)

- Hyperosmolar Hyperglycemic Syndrome with or without DKA
- Significant dehydration/ketosis without insulin deficiency from any other cause, such as:
  - -Appendicitis or other abdominal crisis
  - -Steroid induced hyperglycemia
  - -Ketosis from other metabolic/genetic causes

Warnings and emergency therapies

Symptomatic Cerebral Edema from DKA is a clinical emergency

Pediatric DKA is associated with a higher incidence of cerebral edema and stroke

- Monitor electrolytes during treatment closely, rapid changes in glucose and/or sodium may indicate rapid fluid shifts and increase risk for cerebral injury
- For concern of cerebral edema, consider hypertonic saline administration: 3-5ml/kg (1.5-2.5 meq/kg) over 10 minutes (max of 500ml), use caution if corrected Na ≥ 150mEq/L as hypertonic saline may worsen hypernatremia/hyperosmolarity
- If fever of > 38 C is present , the work up should include a fever/ infection evaluation while treating DKA

Bicarbonate administration is associated with increased morbidity/mortality from cerebral edema and should be reserved for dire situations after consultation with a Pediatric Endocrinologist

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