

Diabetic Ketoacidosis (DKA) Care Guidelines Emergency Department Management



Inclusion Criteria (Definition of DKA):

- Blood glucose (BG) > 200 mg/dl
 - Acidosis (bicarbonate < 15 or blood gas pH < 7.3)
 - Associated glycosuria, ketonuria & ketonemia
- Requires Critical Care level of care**

Initial Evaluation

Assessment: VS, weight, severity of dehydration, level of consciousness, acute trigger for DKA e.g. infection, trauma, failure to take insulin, pump failure

Laboratory: stat bedside BG, Panel 9, phosphorous, magnesium venous pH, pCO₂, pO₂, CBC, UA, appropriate cultures if infection suspected

Recommendations/Considerations

- The severity of DKA is defined by the degree of acidosis: **mild** – pH 7.2 – 7.3; **moderate** – pH 7.1 – 7.2; **severe** pH < 7.1
- Goal decrease in glucose no more than 100 mg/dl per hour
- If glucose decreases rapidly this may increase the risk of cerebral edema
- Monitor Na level correction to ensure NA rises as glucose decreases using calculation of corrected Na level

Severity of dehydration:

- **5%** - reduced skin turgor, dry mucous membranes, tachycardia
- **10%** - capillary refill \geq 3 seconds, sunken eyes
- **>10%** - weak or impalpable peripheral pulses, hypotension, shock, oliguria

Calculations:

- Anion gap = Na – (Cl+HCO₃); normal is 12 \pm 2 mmol/l
- Corrected sodium = measured Na + 1.6 X [(glucose mg/dl – 100) / 100]
- DKA at diagnosis is more common in children < 5 yrs of age
- Omission of insulin is the leading cause of recurrent DKA in adolescents

Causes of Morbidity and Mortality:

- **Cerebral edema**, which occurs in 0.5 – 1 % of all episodes of DKA, is the most common cause of mortality in children with DKA, Cerebral edema usually develops 4 – 12 hours into treatment, but it can occur at any time
- **Hypokalemia**
- **Na Bicarb should not be given without discussion with two attending physicians as this increases the risk of cerebral edema.**
- **For insulin drip, tubing must be manually primed.**

Correction of Dehydration

- Estimate fluid deficit
- Subtract initial bolus received
- Divide remaining deficit over 48 hours
- Add deficit replacement/hour to normal maintenance/hr = Total fluid rate per hour
- Re-evaluate I/O for excessive ongoing urine loss
- **Do not bolus > 40 mL/kg in 4 hours unless hypotensive or has significantly compromised perfusion**

Assess fluid status
Is the patient in Overt Shock?

No Overt Shock

(Normal BP for age, minimal mental status change, normal perfusion)

Yes Overt Shock

Resuscitate for Overt Shock-ICU consultation required

Give 20mL/kg boluses for NS. Reassess the neurologic status, GCS, and physical exam after each bolus. Can repeat boluses of 10mL/kg 0.9% NS to a combined bolus maximum of 40 mL/kg. Large fluid volumes increase risk of cerebral edema.
Assessed hemodynamically stable for transfer to PICU

Resuscitate: Begin fluid replacement before insulin therapy. Give 10-20 mL/kg of 0.9% normal saline (NS); administer over one hour. Can repeat boluses of 10mL/kg 0.9% NS; to a combined bolus maximum of 40 mL/kg in first 4 hours

After Fluid Boluses

IV Fluids NS + 20-40 K+/L at about 1.5 x maintenance

Insulin Drip
Ensure K level not low prior to starting insulin drip

Starting dose 0.05 to 0.1 units/kg/hr
Titrate insulin by 0.01 units/kg/hr to keep Blood Glucose between 150-300

Ongoing Monitoring

- BP, HR, RR
- Neuro checks every hour
- I/O measurements every hour
- Bedside BG every hour
- Panel 9 every 2 hours X 3 then every 4 hours if improving
- When BG <300. Add Dextrose 5% to IVF (D5 NS 1.5 x maintenance)

Neuro checks for S/S of cerebral edema every hour

Cerebral Edema Signs and Symptoms

Headache
Altered or fluctuating level of consciousness
Sustained heart rate deceleration
Abnormal and deteriorating neurological exam
Abnormal respiratory pattern
Recurrent vomiting
Rising blood pressure
Decreased oxygen saturation
Change in neuro status:
Restlessness,

Cerebral Edema Treatment

- Give mannitol 0.25-0.5 gm/kg may be repeated X 1 for a total max of 50 gm
- Ensure adequate circulation but if possible reduce fluid rate by one third
- Avoid maneuvers and drugs likely to increase intracranial pressure
- If intubation is necessary consider neurosurgery consult for intracranial pressure monitoring
- Treat suspected cerebral edema based on clinical criteria immediately. Do not delay treatment to obtain confirmatory CT scan.

If patient is delayed being assigned an inpatient bed more than 2 hours consider utilizing DKA Guidelines-Critical Care

Reassess the appropriateness of Care Guidelines as condition changes. This guideline is a tool to aid clinical decision making. It is not a standard of care. The provider should deviate from the guideline when clinical judgment so indicates

References

Diabetic Ketoacidosis Care Guideline for Emergency Department

American Diabetes Association. Standards of Medical Care in Diabetes – 2016. Diabetes Care. January 2016, Vol 39, Suppl 1.

Wolfsdorf JI, Allgrove J, et al. Diabetic Ketoacidosis and hyperglycemic hyperosmolar state. ISPAD Clinical Practice Consensus Guidelines 2014 Compendium. Pediatric Diabetes 2014; 15 (Supple. 20): 154-179.