

UNC Pediatric DKA Guidelines

This is a general guideline and does not represent a professional care standard governing providers' obligations to patients. Care is revised to meet individual patient needs. This is a quality improvement document and should not be part of the patient's medical record.

A. Admission

1. Confirm DKA: plasma glucose ≥ 200 mg/dl; ketones; pH ≤ 7.3 , $\text{HCO}_3^- \leq 15$ mmol/L
2. Vital signs Q1 hr
3. Neuro checks Q1 hr
4. Strict I/O
5. Continuous cardiopulmonary monitoring
6. Bedrest (bathroom privileges when stable)
7. NPO

B. IV Fluids

Use the following algorithm to calculate fluid RATE:

1. Body weight in kilograms: (1) _____ kg
2. Establish extent of dehydration (decreased BP, tears, skin turgor, capillary refill, increased hematocrit) (*dry oral mucosa is not reliable measure of extent of dehydration because open mouthed, Kussmaul respirations will make the mucosa dry)

	<u>Infants</u>	<u>Children</u>	
Mild:	5% = 50 ml/kg	3% = 30 ml/kg	
Moderate:	10% = 100 ml/kg	6% = 60 ml/kg	
Severe:	15% = 150 ml/kg	9% = 90 ml/kg	(2) _____ ml/kg
3. Multiply (1) x (2) for total fluid deficit: (3) _____ ml
4. Give normal saline bolus if patient is hemodynamically unstable or shocky.
Recommend 5-10 ml/kg over 1-2 hours, max should be < 30 ml/kg.
(If patient has already received a fluid bolus at an OSH, that total should also go in blank 4) (4) _____ ml
5. Calculate remainder of fluid deficit after bolus:
subtract (4) from (3): (5) _____ ml
6. Calculate maintenance fluid requirements for the next 48 hours:
200 ml/kg for the first 10 kg body weight
+ 100 ml/kg for the next 10 kg
+ 40 ml/kg for the remaining kg (6) _____ ml/48 hrs
7. Calculate the total amount of fluid to be given for your patient over the next 48 hours. Add (5) + (6) (7) _____ ml/48 hrs
8. Calculate the hourly fluid rate for fluid replacement:
Divide (7) by 48 (8) _____ ml/hr

9. Fluid selection

- a. Use NS as the initial fluid, at the rate determined in (8). Continue for 1-2 hours.
 - i. If child is hypokalemic and has had adequate urine output, may add 20-40 mEq/L KCl
 - ii. If the child is coming from an outside hospital and has already had some initial resuscitation, and/or has been started on insulin, skip this step and start the 2 bag method on arrival to the PICU.
- b. After 1-2 hours of resuscitation with NS, begin a "2 bag method" (and discontinue the NS).
 - i. Y together: NS with 20 mEq/L KCl + 13.6 mmol/L KPO₄ and
D10 NS with 20 mEq/L KCl + 13.6 mmol/L KPO₄

*Use your clinical judgment. Above fluid recommendation is for serum K⁺ = 3.1 – 5.5. If patient is hyperkalemic with serum K⁺ > 5.5, remove K⁺ from fluids. If patient is hypokalemic with serum K⁺ < 3.1, may order more K⁺ than described above. EPIC order set has recommended K⁺ content for fluids based on serum K⁺ levels.

*You should expect that you will need to change the additives in the fluids based on frequent monitoring of electrolytes as described below.

*(13.6 mmol/L KPO₄ = 20 mEq/L KPO₄)

- c. Fluid rate of the 2 bag system is determined by serum glucose level:

Glucose > 350 mg/dl: Run NS + additives at 100% of calculated rate [from line (8)]

Glucose 250 – 350 mg/dl: Run NS at 50% rate, run D10 NS at 50% rate

Glucose < 250 mg/dl: Run D10 NS + additives at 100% rate

*If at any point the glucose falls by more than 100 mg/dl in the previous hour, nursing staff should notify MD, and should then run D10 NS + additives at 100% rate

C. Insulin

- a. It is no longer indicated to start insulin on presentation of DKA, as it is thought to increase mortality.
- b. Insulin should be initiated after 1-2 hrs of resuscitation with NS (at the time of starting the 2 bag method described above).
- c. When indicated, begin an infusion of Regular insulin at 0.1 units/kg/hr

D. Labs & Monitoring

- a. On admission for all patients:
 - i. VBG or CBG
 - ii. Chem 10: Na, K, Cl, CO₂, BUN, Cr, glucose, Ca, Mg, Phos
 - iii. Serum ketones
 - iv. Hemoglobin A1C
 - v. Urinalysis
 - vi. CBC

- b. For NEW onset DKA patients:
 - i. C-peptide
 - ii. GAD-65 antibodies
 - iii. Islet cell antibodies
 - iv. Insulin antibodies
 - v. TSH, free T4
 - vi. TTG
 - vii. Serum total IgA
- c. Ongoing labs:
 - i. Accucheck Q1 hour
 - ii. CBG or VBG, electrolytes (Na, K, Cl, CO₂, iCa, glucose) Q4 hours
 - iii. Phos Q4 hours if patient has Phos in IV Fluids
 - iv. Chem 10 (Na, K, Cl, CO₂, BUN, Creatinine, glucose, Ca, Mg, Phos) Q8 hrs
 - v. Urine for ketones Q void or Q6 hours if foley in place

E. Notify MD

- a. Blood glucose < 80 mg/dl or > 400 mg/dl
- b. Blood glucose falls > 100 mg/dl
- c. Potassium < 3.0 mmol/L or > 5.0 mmol/L
- d. Phosphorous < 2.0 mg/dl
- e. Onset of headache or worsening headache
- f. Any mental status change
- g. Alteration of vital signs

F. Additional Notification

- a. Physicians are to notify the Medical Director of Pediatric Diabetes or the Pediatric Endocrinologist on call in case of insulin-related hypoglycemia requiring IV glucose treatment.

Katherine C. Clement, MD

Associate Professor of Pediatrics & Anesthesiology, Division of Pediatric Critical Care

(8/7/17)