

## Guidelines for Management of DKA

**DKA diagnosis:**  $\text{pH} \leq 7.3$ , +Serum Acetone, Anion gap  $>10-12$ , Glucose  $>250$  mg/dL.

Caveats: Prior insulin treatment may create 'euglycemic DKA'.

Other acid base disorders can affect  $\text{HCO}_3^-$  &  $\text{pH}$  ( $\leq 18$  mEq/L &  $\leq 7.3$  in pure DKA).

Initial Workup: Chem 7,  $\text{K}^+$ ,  $\text{Mg}^{++}$ ,  $\text{Ca}^{++}$ , Acetone, ABG, Sasm, CBC, LFT, Amyl/Lip, UA, CXR, EKG, Cx  
Identify precipitator & treat: insulin omission, infection, ischemia, abdominal process, etc.

Goals: Volume resuscitate, Correct Anion gap acidosis, Glucose 150-200 mg/dL, Correct  $\text{K}^+$  and  $\text{Mg}^{++}$

**FLUIDS:** 2 L Normal saline (0.9% NaCl) in 1<sup>st</sup> hr

Then 500 mL/hr x 2 Liters, followed by 250 (or 150) mL/hr

(If high serum  $\text{Na}^+$ , may use 0.45% Normal saline after volume resuscitated)

Fluid Goal: replace ~50% of estimated TBW deficit over 8 hours.

**CHANGE to D5 ½ NS @ 150 mL/hr when glucose  $<250$  mg/dL.** If volume is an issue, use D10.

REDUCE IVFs in CHF, end-stage liver or renal disease,  $>65$  yrs old, hypoxemia.

**INSULIN:** If  $\text{K} < 3.3$  mEq/L, hold insulin until actively correcting K

IV Insulin Bolus 0.1 Units/kg, then Insulin drip 0.1 Units/kg/hour.

Check FS glucose every 1 hour.

Initial Goal: ↓ Glucose by 50-75 / hour

If glucose not decreasing by  $\geq 50$  mg/dL in 1st hour → increase/ double IV insulin rate.

**When glucose  $< 250$  mg/dL, ADD D5 to IVF, 150 mL/hr & ↓ insulin drip to  $\leq 0.05$  U/kg/hour.**

Glucose goal = 150-200 mg/dL

Goal: Clear ketoacidosis using insulin and avoid hypoglycemia.

MD adjusts insulin drip rate. Can go as low as 0.5 Units/hour.

**POTASSIUM/ELECTROLYTES:** If initial  $\text{K}^+ < 3.3$ , replete  $\text{K}^+$  immediately and hold insulin until actively correcting (risk of severe hypoglycemia if give insulin first). Hold  $\text{K}^+$  repletion if pt has renal failure & urine output  $< 50$ cc/hr. Goal  $\text{K} = 4 - 5$  mEq/L.

$\text{K}^+ > 5$  mEq/L: No additional  $\text{K}^+$

$\text{K}^+ 4 - 5$  mEq/L: Add 20 mEq KCl /L to fluids x 2 Liters OR IV + PO total ~40mEq

$\text{K}^+ 3.3 - 4$  mEq/L: Add 40 mEq KCl /L to fluids x 2 Liters OR IV + PO total ~60mEq

$\text{K}^+ < 3.3$  mEq/L: Give IV+ PO Potassium, total 60-80 mEq, check  $\text{K}^+$  level every 1-2hr

**After initial repletion of K, follow K and replete as needed.**

$\text{Mg}^{++} < 1.5$  mg/dL: give 2 gms IV Magnesium Sulfate

Phos  $< 1$  mg/dL: give 0.24 mmol/kg Potassium Phosphate in 250cc fluid over 6 hours

Bicarb, consider using bicarbonate ONLY if  $\text{pH} < 7$

**LAB CHECKS:**

[] FSG every 1 hour

[] At 2 hours after initial treatment: Chem 7 ( $\text{K}^+$ ) and pH (VBG)

[] Every 4 hours until anion gap closed & lytes normal: Chem 7 ( $\text{K}^+$ ), Magnesium, Phosphorus

**CONVERSION TO SUBCUTANEOUS (SC) INSULIN:** when Anion gap < 12, HCO<sub>3</sub><sup>-</sup> >18 mEq/L, Glucose < 200 mg/dL, and patient clinically stable / ready to eat.

New onset DM: 1) **Weight based**

Total daily dose of insulin ~ 0.5 Units/kg per day

Basal (Glargine) = 0.25 Units/kg per day

Mealtime insulin (Aspart) = 0.25 Units/kg/day ÷ 3 = mealtime insulin dose

First meal: order 50% of calculated mealtime insulin dose to be given only after patient eats ≥ ½ meal.

Subsequent meals: depending on PO intake, give 20-100% dose of mealtime insulin (can give immediately after eats).

2) **Insulin Drip based:** total insulin over last 6 hours x 4 = Total IV units/day

Caution: this method may overestimate the patient's insulin needs.

Total IV units per day X 0.70 = Total Subcutaneous insulin

Total Subcut insulin ÷ 2 = Basal insulin dose

Total Subcut insulin ÷ 6 = Mealtime insulin dose. Use 1<sup>st</sup> meal rule.

Prior diagnosis of DM: start insulin as above OR restart home insulin basal/bolus insulin (if patient was adherent, controlled, and with no major hypoglycemia).

Administer SC basal insulin (Glargine) → stop insulin drip 2 HOURS later.

Diet orders: Add modification 'No Concentrated sweets'

**DIABETES EDUCATION OF THE PATIENT, including sick day management.**

Call Endocrine consult, 917-GLUCOSE, with questions.

## References

ADA Position Statement.. *Diabetes Care* 2004; 27, S94-S102.

Bull SV, et al. *Crit Care Med* 2007; 35: 41-45.

Kitabchi AE, Nyenwe EA. *Endocrinol Metab Clin N Am* 2006; 35: 725-751.

Ilag LL, et al. *Diabetes Research and Clinical Practice* 2003; 62: 23-32.