Diabetic Ketoacidosis (DKA)/Hyperglycemic Hyperosmolar State (HHS) Guidelines for Adults

I. Diagnosis

DKA Guideline for Diagnosis	*HHS Guideline for Diagnosis*
❖ Plasma glucose > 250 mg/dL ❖ Arterial pH < 7.30 ❖ Venous pH < 7.25 ❖ Serum Bicarbonate < 15-18 mmol/L ❖ Moderate ketonemia/ketonuria ❖ Anion Gap > 12	❖ Plasma glucose > 600 mg/dL ❖ Serum Osmolality > 320 mOsm/kg ❖ Arterial pH > 7.30 ❖ Venous pH > 7.25 ❖ Serum Bicarbonate > 18 mmol/L ❖ Mild or absent ketonemia/ketonuria

II. Laboratory Values

a. Order every 2 hours for 6 hours then every 4 hours until anion gap <12
   i. ABG/VBG (VBG preferred for patient comfort)
   ii. Chem-10

b. Capillary blood glucose (CBG) every 1 hour while on insulin infusion

III. Fluid therapy

a. Infuse 2-4 L of normal saline (NS or LR) in first hour and continue fluid boluses until hypotension and/or tachycardia have resolved
b. Maintenance Fluid 5-10 mL/kg (typically 250-500mls/hr)
   i. Na^+ > 135 mEq/L 0.45% NaCl or LR
   ii. Na^+ < 135 mEq/L 0.9% NaCl or LR
c. Use caution and consider reduction of fluid resuscitation for patients:
   i. > 65 years old, CHF, ESRD, ESLD, or hypoxemia
d. Add dextrose to fluids when glucose <200 for DKA or <300 for HHS

IV. Potassium (K^+) Replacement

a. **In renal insufficiency give 50% of normal dose**
   i. Greater reductions in potassium dose may be necessary if patient is anuric
b. When serum K^+ < 3.3 mEq/L, place order and begin potassium replacement PRIOR to initiating insulin infusion (to avoid precipitating dysrhythmias or cardiac arrest)
c. Order IV, PO or combination potassium chloride for initial K^+ based on reference range below
   i. Potassium chloride 20 mEq IV q6h PRN for serum K 3.9-4.0
   ii. Potassium chloride 40 mEq IV q6h PRN for serum K 3.6-3.8
   iii. Potassium chloride 60 mEq IV q6h PRN for serum K 3.3-3.5
   iv. Potassium chloride 80 mEq IV q6h PRN for serum K < 3.3
      1. Check potassium after infusion complete and re-dose as needed to keep K >4
d. Switch to PO if patient can tolerate
   i. Potassium chloride 40 mEq PO q6h PRN if K <4

V. Phosphorus Replacement

a. IV Sodium phosphate or Potassium phosphate (use sodium phosphate if K^+ > 4.0 or renal insufficiency)
    i. 15 mmol IV q6hrs PRN for serum Phos 1.5-1.9 mg/dl
    ii. 18 mmol IV q6hrs PRN for serum Phos 1.0-1.4 mg/dl
    iii. 21 mmol IV q6hrs PRN for serum Phos < 1.0 mg/dl
b. Switch to PO alone if patient can tolerate and phos > 1.5 mg/dl
    i. Phosphate Replacement (Na + K) 2 packets PO q6h

VI. Insulin infusion

a. Consider insulin bolus prior to initiation of infusion
    i. 0.1 units/kg
b. Order insulin infusion (100 Regular units per 100 mL NS)
c. **Start insulin infusion at 0.1 units/kg/hr** (preferred management in the Emergency Department) or Column 3 on titration form at UNCH CH
d. Place appropriate titration in comments section
    i. Diabetic ketoacidosis insulin titration
    ii. Hyperglycemic hyperosmolar state insulin titration
    iii. Adjust insulin infusion rate as needed to achieve a decrease in serum glucose of 50-75mg/dl per hour

VII. Converting from IV insulin infusion to subcutaneous insulin

- Assess patient's intake status, and once they are eating and acidosis resolved initiate a multi-dose insulin regimen
- Patients with known diabetes may be given usual home dose of medium- or long-acting insulin prior to onset of DKA/HHS
- Newly diagnosed diabetes, total insulin should be 0.5 units/kg/day
    - Insulin glargine plus lispro (give 50% as glargine and 50% as short-acting lispro divided into 3 doses with meals)
    - NPH Insulin (2/3 with breakfast and 1/3 with dinner)
    - Continue IV insulin infusion for 1 hour after initiating regular insulin and 2 hours after initiating NPH or glargine insulin

***Renal Insufficiency defined as Clcr<50 ml/min or UOP < 0.5ml/kg/hr**