

IREDELL HEALTH SYSTEM

Adult Diabetic Ketoacidosis (DKA) or Hyperglycemia Hyperosmolar Syndrome (HHS)	
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Critical Care Committee Department of Medicine P&T Committee	Date: 03/2023 Date: 04/2023 Date: 04/2023

Diabetic Ketoacidosis (DKA) and Hyperglycemia Hyperosmolar Syndrome (HHS) are considered the two most serious acute metabolic complications of diabetes. DKA is described as uncontrolled hyperglycemia, metabolic acidosis and increased total body ketone concentration. HHS is characterized by severe hyperglycemia, hyperosmolality and dehydration in the absence of significant ketoacidosis.

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

Policy:

- An insulin infusion may be administered while a patient is in the Emergency Department or admitted to the Critical Care Unit.
- Notify provider for K+ < 3.3 mEq/L or > 5.5 mEq/L. An insulin infusion shall not be started without potassium replacement if K+ < 3.3 mEq/L.
- While patients are receiving IV insulin, Blood Glucose (BG) POC shall occur *every hour* along with a Basic Metabolic Panel (BMP) *every 4 hours*.
- For drop of BG greater than 100 mg/dL in one hour, NOTIFY provider at any time during treatment.
- If patient is on insulin drip for total of less than 4 hours, notify provider for transition insulin dose.

Procedure:

STEP 1 Insulin Drip Management for Blood Glucose > 250 mg/dL

A non-dextrose containing IV fluid shall be initiated by provider during initial stages of DKA/HHS management.

IV insulin Bolus (if ordered) – may be administered *via the IV pump*.

$$0.15 \times \text{_____ kg} = \text{_____ units} \text{ **Maximum bolus amount is 12 units.}$$

Initiation of IV insulin drip: 0.1 unit/kg/hr = _____ units/hr (units/mL)

Adjust Insulin Rate according to the below chart HOURLY:

Glucose Level	Intervention
IF BG decreases by less than 50 mg/dL	Increase rate by 50% (multiply rate by 1.5)
IF BG decreases by 50 – 100 mg/dL	Continue current rate
IF BG decreases by 100 mg/dL	Decrease rate by 50% (multiply rate by 0.5)
IF BG increases at all	Increase rate by 100% (multiple rate by 2)

**If rate increases to more than 16 units/hour, NOTIFY provider before proceeding.*

Once Blood Glucose is \leq 250 mg/dL

- 1) Decrease insulin infusion rate by 50% (multiple rate by 0.5)
- 2) **Discontinue Step 1 of insulin management and transition to Step 2 (adjustments detailed below) for insulin management**
- 3) Obtain order from provider to change IV fluids to D5 ½ NS at same rate of previous IV fluids in Step 1. Ensure that anion gap is \leq 12 OR sodium bicarb is \geq 18 mEq/L.

STEP 2 Insulin Drip Management for Blood Glucose \leq 250 mg/dL

Glucose Level	Intervention
Decrease $>$ 100 mg/dL at one time	<ul style="list-style-type: none"> • Decrease infusion rate by half (multiple rate by 0.5) • Recheck BG in 1 hour
$<$ 70 mg/dL	Stop infusion, give D50W 25 mL IV Push and NOTIFY provider
70 – 90 mg/dL	<ul style="list-style-type: none"> • Stop infusion • Recheck glucose every hour until glucose is $>$ 180 mg/dL, • Restart infusion at half the previous rate (multiple rate by 0.5) when glucose is $>$ 180 mg/dL
91 – 120 mg/dL	<ul style="list-style-type: none"> • Decrease infusion rate by half (multiply rate by 0.5) of the current rate and recheck glucose in 1 hour • If infusion stopped, notify provider and recheck glucose every hour until glucose $>$ 180 mg/dL
121 – 140 mg/dL	<ul style="list-style-type: none"> • Decrease infusion rate by 1 unit/hour, recheck glucose in 1 hour • If infusion stopped, notify provider and recheck glucose every hour until glucose is $>$ 180 mg/dL.
141 – 180 mg/dL	<ul style="list-style-type: none"> • No change in infusion rate and recheck glucose in 1 hour. If no change in infusion rate needed for 3 consecutive hours, decrease glucose monitoring to every 2 hours. • If infusion stopped, notify provider and recheck glucose every hour until glucose is $>$ 180 mg/dL. • Restart infusion at half the previous rate when glucose $>$ 180 mg/dL.
181 – 200 mg/dL	<ul style="list-style-type: none"> • If glucose increasing, increase infusion rate by 1 unit/hour and recheck glucose in 1 hour • If glucose decreasing or the same, continue current rate and recheck glucose in 1 hour
201 – 250 mg/dL	<ul style="list-style-type: none"> • If glucose increasing, increase infusion rate by 1.5 units/hour and recheck glucose in 1 hour • If glucose decreasing or the same, continue current rate and recheck glucose in 1 hour
251 – 300 mg/dL	<ul style="list-style-type: none"> • If glucose increasing, increase infusion rate by 2 units/hour and recheck glucose in 1 hour • If glucose decreasing or the same, continue current rate and recheck glucose in 1 hour
301 – 350 mg/dL	<ul style="list-style-type: none"> • If glucose increasing, bolus 10 units of regular insulin <i>via infusion pump</i> AND increase infusion rate by 2 units/hour. Recheck glucose in 1 hour. • If glucose decreasing or the same, continue current rate and recheck glucose in 1 hour.
$>$ 350 mg/dL	<ul style="list-style-type: none"> • If glucose increasing, bolus 15 units of regular insulin <i>via infusion pump</i> AND increase infusion rate by 2 units/hour. Recheck glucose in 1 hour. • If glucose decreasing or the same, continue current rate and recheck glucose in 1 hour.

Once Blood Glucose is \leq 250 mg/dL, anion gap is closed (\leq 12) AND serum bicarbonate is \geq 18 mEq/L, see steps below for transition dose for *DKA patients*:

Obtain order from provider to initiate long-acting insulin for transition from IV insulin to SQ:

Insulin detemir 0.125 units/kg SQ q12h

If CrCl $<$ 60 ml/min and / or Age $>$ 70: adjust to 0.1 units/kg SQ q12h

- Patient should be tolerating diet. If patient NPO or not tolerating diet, contact provider for further clarification.

- Insulin infusion shall be continued for 2 hours following dose of long-acting insulin.
- NOTIFY provider if BG > 480 mg/dL after initiation of long-acting insulin.

For patients with HHS, IV insulin infusion can be tapered and a multiple-dose (basal-bolus), subcutaneous insulin schedule started when the serum glucose falls below 250 to 300 mg/dL. Contact provider for orders.

INITIAL EFFECTIVE DATE: 09/2023

DATES REVISIONS EFFECTIVE:

DATES REVIEWED (no changes):