

**DIABETIC KETOACIDOSIS (DKA)  
Hyperglycemic Hyperosmolar State  
(HHS) ADULT**

Weight (kg)
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Bulleted orders are initiated by default, unless crossed out and initialed by the physician / prescriber. Boxed orders () require physician / prescriber check mark () to be initiated.

1. **ALLERGIES:** See Allergy /ADR record
2. **ADMISSION INSTRUCTIONS:** Admit to \_\_\_\_\_
3. **CODE STATUS / MOST**
  - Refer to completed Medical Orders for Scope of Treatment (MOST) #829641
4. **CONSULTS:**
  - Diabetes Educator     Dietitian     Pharmacist     Intensivist     Internal Medicine
  - Other \_\_\_\_\_
5. **DIET:**
  - Ice chips     Clear Fluids     Diabetic full fluids, if not vomiting
6. **ACTIVITY:**
  - Ambulate as tolerated     Other \_\_\_\_\_

*Hyperosmolar patients are at risk for thrombosis, refer to Venous Thromboembolism (VTE) Prophylaxis - Adult (Document #829495)*
7. **MONITORING**
  - Neurovitals, Temp, BP, HR, and RR stat, then Q30MIN for 1 hour, then Q2H for 24 hr or until resolution of the condition and as required.
  - Intake and output: strict in and out until IV discontinued
  - Blood glucose monitoring by meter Q1H while on IV insulin, then AC meals and HS while on subcutaneous insulin
  - Continuous cardiac monitoring until condition is resolved
8. **LABORATORY**

**STAT**

  - CBC, Lytes4, albumin, urea, Creatinine (incl GFR), Glucose Random, lactate, Osmol [CHEM], and Urine Analysis
    - BHCG Screen     Quantitative (if pregnancy a potential)
  - Blood Gas:  Venous    **\*\*OR\*\***     Arterial

**ONGOING**

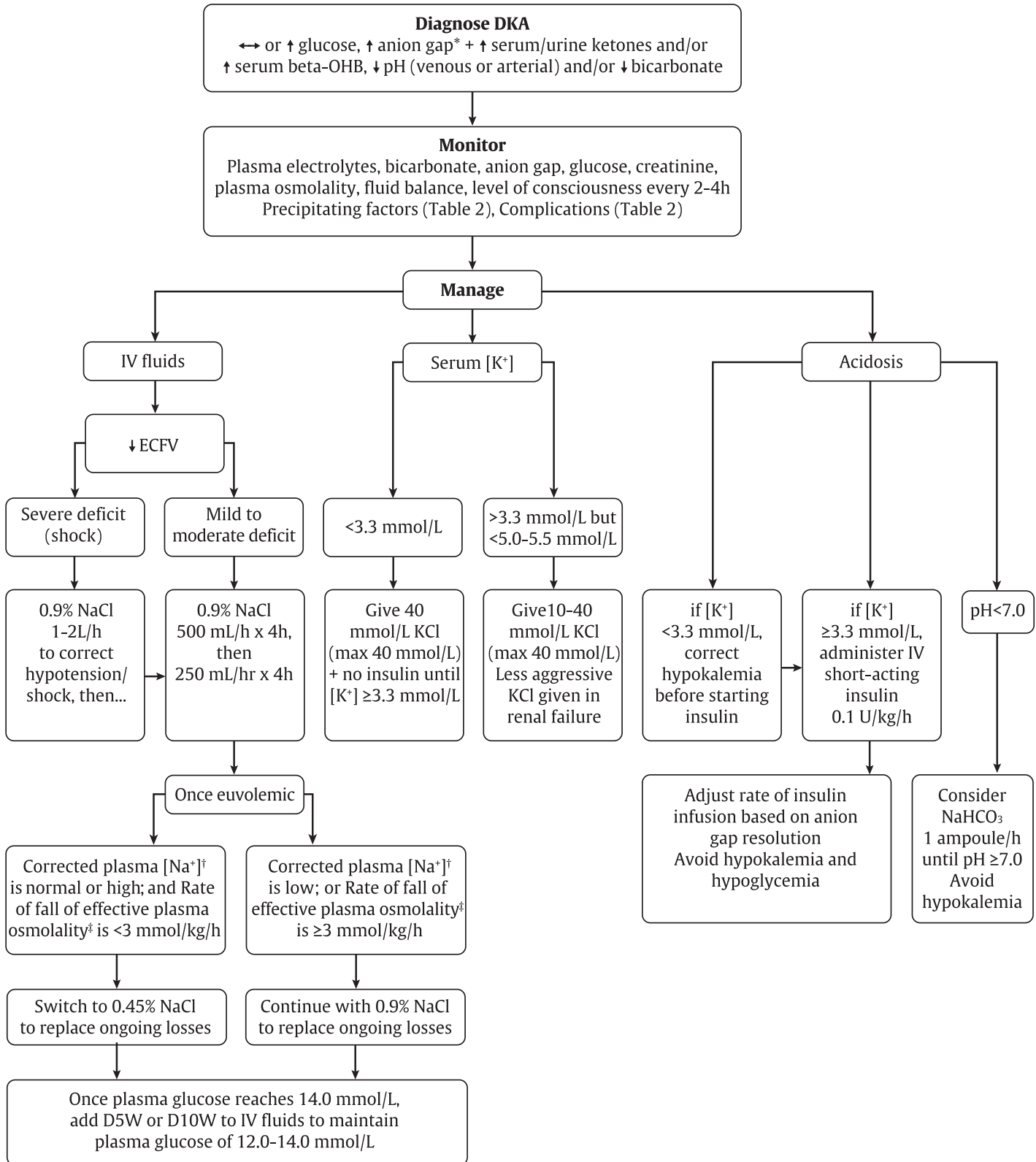
  - Lytes4 Q1H for next 4 hours
  - Lytes4 Q2H for next 8 hours (re-assess prior to reducing frequency)
  - Glucose Random Q2H for next 12 hours
  - Urea, Creatinine (incl GFR) Q12H x 1

**NOTE:** Assessment required prior to reduction in frequency of Lytes4  
Prescriber to review frequency requirements at 12 hours post initiation of order set
9. **DIAGNOSTICS**
  - ECG 12 STAT
10. **TREATMENTS**
  - Foley catheter

Date (dd/mm/yyyy)	Time	Prescriber's Signature	Printed Name or College ID#
/ /			

# Canadian Diabetes Association Clinical Practice Guidelines (2018) DKA Emergencies in Adults

J. Goguen, J. Gilbert / Can J Diabetes 42 (2018) S109–S114



**Figure 1.** Management of diabetic ketoacidosis in adults.

Beta-OHB, beta-hydroxybutyric acid; DKA, diabetic ketoacidosis; ECFV, extracellular fluid volume; IV, intravenous.

\*Plasma glucose may be lower than expected in some settings.

\*\*Anion gap = plasma [Na<sup>+</sup>] – plasma [Cl<sup>-</sup>] – plasma [HCO<sub>3</sub><sup>-</sup>].

<sup>†</sup>Corrected plasma [Na<sup>+</sup>] = measured [Na<sup>+</sup>] + 3/10 × ([plasma glucose (mmol/L)] – 5).

<sup>‡</sup>Effective plasma osmolality = [Na<sup>+</sup>] × 2 + [plasma glucose (mmol/L)], reported as mmol/kg.

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## 11. INTRAVENOUS THERAPY AND HYDRATION (IV)

**Severe Fluid Deficit (SHOCK)**

- sodium chloride 0.9% IV at 2 L/hr in first hour, OR \_\_\_\_\_ L/hr in first hour, THEN sodium chloride 0.9% IV at 500 mL/hr for 4 hours, then 250 mL/hr for 4 hours

**\*\*OR\*\***

**Mild to Moderate Fluid Deficit**

- sodium chloride 0.9% IV at 500 mL/hr for 4 hours, THEN 250 mL/hr for 4 hours

**\*\*When Hydration complete\*\***, notify physician for maintenance IV therapy

## 12. MEDICATIONS

### Potassium chloride (KCL)

- potassium chloride (KCl) 40 mmol (= 40 mEq) by minibag IV over 4 hours** (if central line, may infuse over 2 hours) **PRN** for serum K+ less than 3.3 mmol/L
- potassium chloride (KCl) 20 mmol (= 20 mEq) by minibag IV over 2 hours** (if central line, may infuse over 1 hour) **PRN** for serum K+ 3.3 to 4.9 mmol/L
- HOLD** potassium chloride (KCL) for serum K+ greater than 5 mmol/L or if urine output is not documented
- Total K+ from all IVs not to exceed 20 mEq/hr per peripheral line or 40 mEq/hr per central line

### Insulin Human (Regular) Infusion

- insulin human regular \_\_\_\_\_ units/H IV  
(start infusion at 0.1 units/kg/H × \_\_\_\_\_ kg = \_\_\_\_\_ units/H, rounding off to whole unit)  
(Minibag – 100 units insulin in 100 mL NS or Syringe – 50 units insulin in 50 mL NS = final concentration 1 unit/mL)

Insulin Infusion Titration Table	
<b>Blood Glucose</b> (target 12 – 14 mmol/L)	<b>Insulin Infusion</b> (Do <b>not</b> decrease insulin infusion to <b>zero</b> until DKA is resolved and physician order is received)
Blood Glucose greater than 14 mmol/L	0.1 units/kg/H
Blood Glucose drops by 4.1 mmol/L to 6 mmol/L in one hour	Decrease insulin infusion by 50%
Blood Glucose drops by 6.1 mmol/L or greater in one hour	Decrease insulin infusion by 50% and call prescriber
Blood Glucose 12 mmol/L – 14 mmol/L	Call prescriber for orders to add dextrose and reduce insulin infusion
<b>Potassium (K+)</b>	
Serum potassium (K+) is less than 3.3 mmol/L	<b>HOLD</b> insulin infusion and correct hypokalemia ( <i>see above</i> )
<b>Anion Gap</b>	
If anion gap is greater than 12 and does not decrease over two hours	Call prescriber
If anion gap is greater than 12 and decreasing	Titrate insulin as outlined above

Date (dd/mm/yyyy)	Time	Prescriber's Signature	Printed Name or College ID#
/ /			

# ADULT DIABETIC KETOACIDOSIS (DKA) PROTOCOL AND THE HYPERGLYCEMIC HYPEROSMOLAR STATE (HHS)

Adult = 18 years of age and older

Laboratory Diagnostic Criteria for DKA and HHS			
Parameter	Normal Range	DKA	HHS
Plasma Glucose (mmol/L)	4.2 to 6.4	Greater than or equal to 14*	Greater than or equal to 34
Arterial pH*	7.35 to 7.45	Less than or equal to 7.30	Greater than 7.30
Serum Bicarbonate (mmol/L)	22 to 28	Less than or equal to 15	Greater than 15
Effective serum osmolality (mmol/kg) $[Na^+] \times 2 + [Glucose (mmol/L)]^\dagger + [Urea (mmol/L)]$	275 to 295	Less than or equal to 320	Greater than 320
Anion Gap = plasma $[Na^+] - plasma [Cl^-] - plasma [HCO_3^-]^\dagger$	Less than 12	Greater than 12	Variable
Serum Ketones	Negative	Moderate to high	None or trace
Urine Ketones	Negative	Moderate to high	None or trace

Reference: Adapted from CMAJ April 1, 2003; 168(7):859-866

\* Rare but possible DKA without elevated glucose in the case of starvation, pregnancy or use of SGLT2i (Sodium Glucose co-transporter inhibitors)

† If venous pH is used, a correction of 0.03 must be made.

† From Canadian Diabetes Association 2008 Clinical Practice Guidelines. May 2010. pS66-S76

## Resolution of Condition and Parameters to Switch to Subcutaneous Insulin:

### Resolution of DKA and HHS

Glucose less than 13 mmol/L, normalized level of consciousness, tolerating oral intake and all of the following:

- Sodium bicarbonate greater than 18 mmol/L
- Anion gap less than 12
- Venous pH greater than 7.3

### Switching to SC insulin

Start patient on both basal and bolus insulin, or restart insulin pump. Refer to documents below, depending on whether the patient is eating or needs to be NPO for tests or surgery.

- Insulin Subcutaneous Adult – NPO Acute Care: Document #829524
- Insulin Subcutaneous Adult – Eating Acute Care: Document #829523
- Insulin Pump Management in Emergency and Acute Care Order: Document #826387

## Sodium Bicarbonate Guideline:

Consider if pH less than 7 after 1 hour of hydration and patient in shock. May cause hypokalemia.

Write order for: sodium bicarbonate 50 mEq in 1 L sodium chloride 0.45% IV over 1 hour.

## Guidelines for Maintenance Intravenous Therapy and Suggested Template for Writing an Order

When fluid hydration (see section 11) is complete, physician provides direction to move to maintenance IV therapy

- For corrected plasma sodium ( $Na^+$ ) less than or equal to 145 mmol/L:  
Sodium chloride 0.9% at \_\_\_\_\_ mL/hr, include KCL as required
- For corrected plasma sodium ( $Na^+$ ) greater than 145 mmol/L:  
Sodium chloride 0.45% at \_\_\_\_\_ mL/hr, include KCL as required
- When BG less than 14 mmol/L change maintenance to the following:
  - D5W + sodium chloride 0.9% at \_\_\_\_\_ mL/hr, include KCL as required, **\*\*OR\*\***
  - D5W + sodium chloride 0.45% at \_\_\_\_\_ mL/hr, include KCL as required