Height ___________ cm
Weight ___________ kg

Allergies ___________

### Emergency Department (ED) ADULT Diabetic Ketoacidosis (DKA) and Hyperosmolar Hyperglycaemic State (HHS) Initial Management Order Set

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*** In HHS: Consider less or no insulin, and No sodium bicarbonate. Fluids may need individualization.***

☐ Complete Best Possible Medication History Reconciliation and Prescriber Order Form (ORD37)

#### Consultants

☐ Dr.: ___________ to assume care (preferably Critical Care)

#### Diet

☐ Diet as tolerated

#### Vitals

☐ Cardiac Monitoring

☐ HR, RR, BP, SpO₂ and neurovital signs (CNS) q30minutes x 4 hours, then q1h x 4 hours

☐ Intake and output q1h

☐ Foley to Urometer (regular use is discouraged, restrict to cases of shock or obstruction)

#### Lab Investigations

☐ CBC  ☑ S. Ketones  ☑ S. Osmolarity  ☑ Magnesium, Calcium, and Phosphorus

Lab Investigations to be done STAT THEN 1 hour after IV Bolus initiated THEN q3h x2

☐ Na, K, Cl  ☑ TCO₂  ☑ Glucose  ☑ Creatinine  ☑ Urea  ☑ Venous Blood Gases  ☑ Anion Gap

##### Additional Lab Investigations

☐ Capillary Blood Glucose STAT then q1h

☐ Troponin  ☐ Lipase  ☐ AST, ALT, GGT  ☐ INR  ☐ Albumin

☐ ABG  ☐ Other: ___________

#### Symptom Management

Maximum from all sources in 24 hours: acetaminophen = 4,000 mg AND ibuprofen = 2,400 mg

☐ acetaminophen 650 mg PO or PR q4h PRN

☐ ibuprofen 400 mg PO q6h PRN

☐ morphine ___________ mg IV q ___________ h PRN (avoid use of narcotics when possible)

☐ ondansetron 4 mg IV q8h PRN

☐ dimenhydrinate 25 – 50 mg IV q6h PRN (for patients at low risk for falls and/or delirium)

☐ Other: ___________

☐ Other: ___________

#### IV Fluids and Electrolytes

Initial Bolus (for vascular compromise and signs of shock)

☐ sodium chloride 0.9% ☐ 1,000 mL OR ☐ 2,000 mL IV x1 dose

☐ Telephone Order

Ordering Practitioner, Designation ___________  Signature ___________  Date/Time (dd/mm/yyyy hhmm) ___________

If Telephone Order

Ordering Physician ___________  Date (dd/mm/yyyy) ___________  Time (hhmm) ___________
**IV Fluids and Electrolytes Continued…**

- **Replacement Fluid**
  - sodium chloride 0.9% at 500 mL/h for 4 hours, **THEN**
  - sodium chloride 0.9% at 250 mL/h for 4 hours (inform MD if new pulmonary crackles develop)
  - Once blood glucose is 14 mmol/L or less,
    - Change maintenance fluid to 5% dextrose in water with sodium chloride 0.45%
    - Reduce insulin infusion to half current rate
  - If blood glucose is less than 4 mmol/L, follow Medical Directive: Adult Hypoglycemic Management
    - Once there is urine output, if serum potassium (as reassessed after every new result):
      - is between 3.3 and 5 mmol/L, Add 20 mmol KCL to each Liter of above fluid
      - is less than 3.3 mmol/L, Add 40 mmol KCL to each Liter of above fluid
  - magnesium 2 g in mini-bag over 1 hour
  - If Arterial pH is less than 7, infuse sodium bicarbonate 50 mmol in 200 mL of 5% dextrose in water over 1 hour
  - Other: ____________________________

**Glucose Management**

- Do **NOT** give a bolus of IV insulin
- Do **NOT** infuse insulin if serum potassium is less than 3.3 mmol/L
- regular insulin 25 units in 250 mL sodium chloride 0.9%
  - regular insulin IV infusion at ________ units/h (0.05 – 0.1 units/kg/h = 0.5 – 1 mL/kg/h)
- Other: ____________________________

**Additional Orders**

- ____________________________
- ____________________________
- ____________________________
- ____________________________
- ____________________________
- ____________________________

☐ Telephone Order

Ordering Practitioner, Designation: ____________________________
Signature: ____________________________
Date/Time (dd/mm/yyyy hh:mm): ____________________________

If Telephone Order

Ordering Physician: ____________________________
Date (dd/mm/yyyy): ____________________________
Time (hh:mm): ____________________________

☐ Read Back
Emergency Guidelines for Managing the Adult with Diabetic Ketoacidosis (DKA)

1. **Diagnose Diabetes Ketoacidosis (DKA)**
   - glucose, anion gap and serum/vanilla ketones and/or serum beta-OHB, pH (venous or arterial) or bicarbonate

2. **Monitor**:
   - Plasma Electrolytes, Anion gap, Glucose, Creatinine, Plasma Dextrose, fluid balance, level of consciousness q2-4h

3. **Manage**
   - **IV Fluids**
     - LECFV
   - **Serum K**
     - ≤ 3.3 mmol/L
     - > 3.3 mmol/L but is ≤ 6.5 mmol/L

4. **Acidosis**
   - IF K is ≤ 3.3 mmol/L, correct hypokalemia before starting insulin
   - IF K is > 3.3 mmol/L, administer short acting insulin 0.1U/kg

5. **Serum bicarbonate ≤ 7.0**
   - sodium bicarbonate 1 mmol/kg or 10 mmol/l sodium bicarbonate added to 200 mL 5% Dextrose (or sugar water if available) over 1 hour
   - Repeat q2-4h until pH ≥ 7.0
   - Avoid hypokalemia

6. **After hypokalemia has been corrected, switch 0.9% NaCl to 0.48% NaCl (with KCl). However, if plasma osmolality is falling more rapidly than 3 mmol/kg/h and/or the corrected plasma sodium is reduced, maintain IV fluids at higher osmolality (i.e. may need to maintain on 0.9% NaCl).**

7. **Anion gap = plasma [Na+] - plasma [Cl-] - plasma [HCO3-]**

8. **Corrected plasma [Na+] = Measured [Na+] + (180 - x glucose [mmol/L]) - 8**

9. **Effective plasma osmolality = (1.83 + [Na+] x 2) + ([glucose [mmol/L]) + [urica acid [mmol/L]) reported as mmol/kg**

10. **Critical Fluid Volume**
    - Beta-OHB
    - Beta-hydroxybutyric acid

From: Canadian Diabetes Association Clinical Practice Guidelines: Management of DKA in adults

**RECOMMENDATIONS**

1. In adult patients with DKA, a protocol should be followed that incorporates the following principles of treatment: 1) fluid resuscitation, 2) avoidance of hypokalemia, 3) insulin administration, 4) avoidance of rapidly falling serum osmolality, and 5) search for precipitating cause (as illustrated in Figure 1) (Grade B, Consensus).

2. In adult patients with HHS, a protocol should be followed that incorporates the following principles of treatment: 1) fluid resuscitation, 2) avoidance of hypokalemia, 3) avoidance of rapidly falling serum osmolality, 4) search for precipitating cause, and 5) possibly insulin to further reduce hyperglycemia (as illustrated in Figure 1) (Grade D, Consensus).

3. Point-of-care capillary blood glucose may be measured in the hospital in patients with type 1 diabetes with capillary glucose >14.0 mmol/L, or screen for DKA, and a beta-hydroxybutyrate >5 mmol/L, regardless further testing for DKA (Grade B, Level 2 [90-30]).

4. In individuals with DKA, IV 8.5% sodium chloride should be administered initially at 500 mL/h for 4 hours, then 350 mL/h for 4 hours (Grade B, Level 2 [90-37]). The insulin infusion rate should be maintained until the resolution of ketosis (Grade B, Level 2 [90-37]), as measured by the normalization of the plasma anion gap (Grade D, Consensus). Once the plasma glucose concentration reaches 14.0 mmol/L, the dextrose should be started to avoid hypoglycemia (Grade D, Consensus).

5. In individuals with DKA, an infusion of short-acting IV insulin of 0.10 U/L should be used (Grade B, Level 2 [90-37]). The insulin infusion rate should be maintained until the resolution of ketosis (Grade B, Level 2 [90-37]), as measured by the normalization of the plasma anion gap (Grade D, Consensus). Once the plasma glucose concentration reaches 14.0 mmol/L, IV dextrose should be started to avoid hypoglycemia (Grade D, Consensus).

Abbreviations:
- DKA, diabetic ketoacidosis
- HHS, hyperosmolar hyperglycemic state
- IV, intravenous