

Initiating Two Bag System for DKA Acute Management

Recognition of DKA

DKA is life threatening and can occur in existing or new-onset diabetes, including Type 1 and Type 2.

Diagnostic criteria:

- Hyperglycemia (random blood glucose greater than 11 mmol/L)
- Acidosis (pH less than 7.3 or HCO₃ less than 18 mmol/L)
- Ketonuria/ketonemia (moderate/large urine ketones or beta-hydroxy-butyrate greater than or equal to 3 mmol/L)

Table 1.0 – DKA Severity

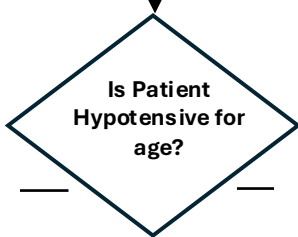
	Mild	Moderate	Severe
pH	7.2-7.29	7.1 – 7.19	Less than 7.1
HCO ₃ (mmol/L)	10 - 17	5 - 9	Less than 5

Initial Management

- Continuous cardiorespiratory monitor
- Assess ABCs, vital signs (including BP) + neurovitals (GCS, pupils)
- Rapid bedside glucose, blood ketones (if available)
- O2 10-15 Lpm via non-rebreather mask if severe DKA (see Table 1.0)
- Peripheral IV access x 2; do not delay IO if severe DKA and IV unsuccessful after 2 attempts
- Bed rest, consider elevation of head of bed to 30° or higher
- Start fluid resuscitation immediately (see below)
- Patient must be NPO
- Serum glucose, electrolytes, venous gas, urea, creatinine, osmolality, ketones (BHBA)
- Urinalysis for glucose, ketones
- Consider other investigations:
 - Cultures (e.g., blood, urine, throat) if evidence of infection
 - ECG to assess T-wave changes if hyperkalemia or delay in obtaining serum K level

Fluid Resuscitation

Bolus must be completed prior to insulin and ongoing maintenance with Two Bag System



Yes

No

Administer NS 10 mL/kg (MAX 500ml) IV bolus over 15 minutes repeat as needed if hypotension persists

NS 10-20 mL/kg (MAX 1 L) over 60min based on degree of dehydration

Reassess vital signs and perfusion after each bolus

Signs of Increased Intracranial Pressure

- GCS less than or equal to 13, severe/progressive headache, focal neurological signs, incontinence, and/or inconsolability
AND/OR
- Cushing's triad: High BP, Low HR, abnormal breathing

Cerebral Injury Management

- Elevate head of bed to 30°; keep head midline
- Repeat electrolytes
- After initial fluid resuscitation, run IV fluids at 75% of rate outlined in Rehydration Table below
- Monitor BP and perfusion closely to avoid hypotension and prevent further cerebral injury
- Administer 3% NaCl 5 mL/kg (MAX 250 mL) IV over 10 minutes OR mannitol 0.5-1 g/kg (MAX 100 g) IV over 15 minutes
- May repeat hyperosmolar agent dose x 1 after 30 minutes if no improvement or use alternate agent
- Once stabilized, recommend stat head CT

CAUTION:

Intubation and ventilation are HIGH RISK procedures for patients with DKA. Avoid intubation unless there is acute respiratory failure. Goal to prevent rise in ETCO₂ during intubation

Consults

CritiCall (1-800-668-4357 (HELP))

Consultation should be considered for patients with any of the following high-risk features:

- Impaired consciousness (e.g., GCS less than 14) or signs of increased intracranial pressure
- Uncorrected Severe acidosis (pH less than 7.10 or HCO₃ less than 5 at presentation)
- Hypotension for age
- Electrolyte imbalance requiring frequent monitoring/active care (e.g., verified hyperkalemia, significant hyperchloremia/hypokalemia)
- New diagnosis in age less than 2 years

Table 2.0

- Rehydrate with IV NS as per Table 2.0
- TFI is inclusive of IV fluid rate and rate of insulin infusion. **If signs of cerebral injury, DKA TFI to be set at 75% of rate below.**

Weight (kg)	5 – 9.9	10 – 19.9	20 – 39.9	40 or Over
Rate (TFI) (ml/kg/hr)	6.5	6	5	4 (max 400 ml/hr)

Ongoing IV Fluids & Insulin

INSULIN - Start regular insulin infusion 0.05 units/kg/hr* - 0.1 units/kg/hr IV after 1 hour of IV fluids.

If K less than 3.5mmol/L, start at 0.05 units/kg/hour call tertiary care centre - CritiCall: 1-800-668-4357 (HELP)

Insulin Infusion: Add 50 units to 500 ml NS → 1 ml = 0.1 units.

- Consider increased insulin infusion concentration for patients requiring fluid restriction or high BMI, based on unit policy. Ex. 50 units in 100ml (1ml = 0.5 units) or 100 units in 100ml (1ml = 1 unit)

***Recommendation to consider using 0.05 units/kg/hr of insulin for children less than 5 years of age, refractory hypoglycemia, refractory hypokalemia and for transport.**

NEVER bolus IV insulin

DO NOT administer sodium bicarbonate unless indicated for hyperkalemia with ECG changes OR CPR

DKA 2-Bag System Set Up

Step 1: Determine Insulin Infusion Rate

(Insulin Infusion to be delivered in separate IV from 2-Bag System)

Step 2: DKA 2-Bag System Total Fluid Rate = TFI in ml – Insulin Rate in ml

Total Fluid Rate is adjusted based on patient's blood sugar in table 3.1 and 3.2 based on serum potassium levels

Table 3.1 – Potassium Greater than 5.5

Bag A and Bag B fluid rates set based on glucose levels below

Glucose	Bag A NS	Bag B D10NS
Greater than 18	100%	0%
15 - 18	75%	25%
12 – 14.9	50%	50%
9 – 11.9	25%	75%
Less than 9	0%	100%

Table 3.2 – Potassium Less Than or Equal to 5.5

Bag A and Bag B fluid rates set based on glucose levels below

Glucose	Bag A NS+K 40mEq/L KCL	Bag B D10NS+K 40mEq/L KCL
Greater than 18	100%	0%
15 - 18	75%	25%
12 – 14.9	50%	50%
9 – 11.9	25%	75%
Less than 9	0%	100%

Blood sugar changes greater than 8 mmol/L please page MD/NP prior to changes in 2-Bag System

Admissions and Ongoing Monitoring

- Continuous cardiorespiratory monitor
- Q 1 hour: Point of Care Blood glucose
 - Fluid: ins and outs
- Q 2 hours: BP and neurovitals (GCS, pupils), serum glucose, electrolytes, venous blood gas until ready to transition to subcutaneous insulin

Note:

This algorithm was developed as a guidance to support hospitals when using the two-bag system for managing DKA. It is not meant to replace the TREKK Pediatric Diabetic KetoAcidosis (DKA) Algorithm (known as the TREKK guidelines), and is instead meant to be used as a supplement to those and any other hospital guidelines for the 'two-bag system'.

This was developed by Ontario's West Region Pediatric Advisory Group's Clinical Quality Initiatives: DKA Working Group.

Abbreviations

NPO – Nothing by mouth	ABCs – Airway, Breathing and Circulation	CPR – Cardiopulmonary Resuscitation
HR – Heart rate	BP – Blood pressure	IV – Intravenous
ECG – Electrocardiogram	GCS – Glasgow Coma Score	TFI – Total fluid intake
CT – Computed Tomography Scan	IO – Intraosseous	HCO ₃ – Bicarbonate
NS – Normal saline	D10 – 10% Dextrose	KCl – Potassium chloride
MD – Medical Doctor	K – Potassium	ETCO ₂ – End-tidal carbon dioxide
NP – Nurse Practitioner		BMI – Body mass index