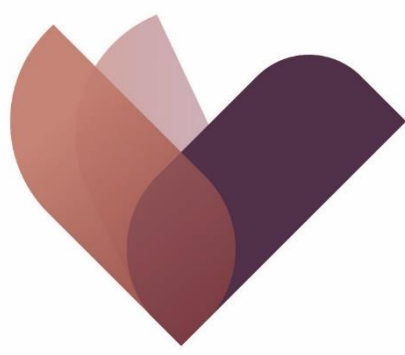




Waterloo Regional Health Network

Pediatric Diabetic Acidosis (DKA) Clinical Pathway for Two-Bag System

Recognition of DKA

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

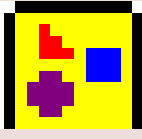
Diagnostic criteria:

- Hyperglycemia (random blood glucose greater than 11 mmol/L)
- Acidosis (pH less than 7.3 and/or bicarbonate 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
Bicarbonate (mmol/L)	10-17	5-9	Less than 5

Initial Management



USE POWER PLAN “ED PED Diabetic Ketoacidosis Initial Mgmt Fluid Resuscitation (DKA, 2-bag system)”

- ED provider to call pediatrician for consultation
- Bedrest with head of bed elevation of 30 degrees or higher
- Patient must be NPO
- Oxygen Therapy SpO₂ goal greater than 92% PRN
- Continuous cardiorespiratory monitoring and pulse oximetry
- Vital signs q15 min
- Neurological assessment and Pediatric Glasgow Coma Scale q15 min
 - If neurologic deterioration (headache, irritability, decreased LOC, nausea, decreased HR) repeat point of care glucose to rule out hypoglycemia and notify provider STAT
- Point of care blood glucose q1 hour
- Urinalysis for glucose and ketones
- Other labs:
 - Electrolytes, glucose random, urea, creatinine, osmolality serum, blood gas venous [once, q2 hour-ATC]
 - CBC, Calcium, albumin, magnesium, phosphorus [once]
- Consider other investigations:
 - Blood culture, if evidence of infection
 - CT head, assess for cerebral edema
 - ECG 12 Lead to assess T-wave changes if hyperkalemic or delay in obtaining serum K level



Fluid Resuscitation

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

Yes

Is the patient hypotensive for age?

No

Administer sodium chloride 0.9% 10 mL/kg IV (MAX 500 mL) IV bolus **over 15 minutes**. Repeat as needed if hypotension persists.

Administer sodium chloride 0.9% 10 mL/kg IV (MAX 1 L) **over 60 minutes** based on degree of dehydration.

Reassess vital signs and perfusion after each bolus.

Initial Maintenance Infusion

Rehydrate with IV sodium chloride 0.9% as per Table 2.0 for a total of 1 hour (including bolus duration).

Total fluid intake (TFI) is inclusive of IV fluid rate and insulin infusion rate.

Table 2.0 TFI rate calculation

Weight (kg)	5-9.9	10-19.9	20-39.9	40 kg or greater
TFI rate (mL/kg/hr)	6.5	6	5	4 (max. 400 mL/hr)
75% TFI rate (mL/kg/hr)	4.9	4.5	3.75	3

If signs of cerebral injury, DKA TFI to be set at 75% of TFI rate in Table 2.0.

See PAGE 2 for PED DKA Admission (2-bag Protocol)

Signs of Cerebral Injury

Pediatric 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 2.0 below
- Monitor BP and perfusion closely to avoid hypotension and prevent further cerebral injury
- Administer 3% sodium chloride 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.

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



Notify provider after first hour of IV fluids if point of care BG is less than 15 mmol/L OR greater than or equal to 25 mmol/L OR decreasing by more than 8 mmol/hour.
Notify MRP if potassium is less than 3 mmol/L or greater than 6 mmol/L.

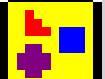


Waterloo Regional Health Network

Pediatric Diabetic Acidosis (DKA) Clinical Pathway for Two-Bag System- PAGE 2

Ongoing IV Fluids & Insulin

PROVIDER TO COMPLETE "Pediatric DKA Fluid Calculations" power form prior to orders.

USE POWER PLAN "PED DKA Admission (DKA, 2 bag system, phased)". 

Insulin to be ordered by pediatrician only. If patient is @Queen's Blvd, consult pediatrics before ordering.

Insulin Infusion Dosing - 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 3.5 mmol/L, start at 0.05 units/kg/hour and call tertiary care centre - CritiCall: 1-800-668-4357 (HELP)

*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 Step Up

Step 1: Confirm Total Fluid Intake (TFI)

TFI is ordered by provider using Table 2.0

Step 2: Determine Insulin Infusion Rate

Insulin rate (mL/hr) = insulin dose (unit/kg/hr) ÷ insulin concentration (unit/mL) x weight (kg)

Step 3: Determine DKA Two Bag Rate

Nurse to complete ad hoc form "Pediatric DKA Fluid Calculations" to verify rates hourly.

Two bag rate (mL/hr) = TFI (mL/hr) - insulin rate (mL/hr)

Two-bag rate (Bag A + Bag B) is adjusted based on patient's POC glucose in **Table 3.0** based on serum potassium levels.

Table 3.0 Bag A and Bag B fluid rates set based on glucose levels below.

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

If K is greater than or equal to 5.5 mmol/L:

BAG A: Sodium chloride 0.9%

BAG B: Dextrose 10%- Sodium chloride 0.9%

If K is less than 5.5 mmol/L:

BAG A: Sodium chloride 0.9% + 40 mEq/L potassium chloride

BAG B: Dextrose 10%- Sodium chloride 0.9% + 40 mEq/L potassium chloride

- Ensure patient has voided prior to starting any IV fluids with potassium.



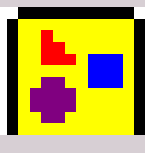
If signs of cerebral injury, DKA TFI to be set at 75% of TFI rate in **Table 2.0**.

Use the subphase "**PED DKA with Cerebral Injury Mgmt (2 bag system)**" to order.

Notify provider prior to changes in two-bag system if:

- Blood sugar changes greater than 8 mmol/L per hour,
- BG less than 8 mmol/L at any time,
- Potassium less than or equal to 3 mmol/L,
- Potassium greater than 6 mmol/L,
- New or worsening signs of cerebral injury, or
- Acidosis is corrected (pH greater than 7.3 and bicarb greater than or equal to 18 mmol/L).

Admission and Ongoing Monitoring

- Vital signs and neurological assessment: q30 min x 2 hours, then q1 hour
- Continuous cardiorespiratory monitor
- Point of care glucose q1 hour 
- Complete "**Pediatric DKA Fluid Calculations**" Power Form q1 hour
- Labs:
 - Electrolytes, random glucose, urea, creatinine, serum osmolality q2 hours
 - Hemoglobin A1c, TSH, FT4, thyroid receptor antibodies, celiac disease testing, IgA immunoglobulin, Calcium, Albumin, Magnesium and Phosphorus once



Insulin Continuous Infusion Preparation [Concentration 0.1 units/mL]

Add 25 units of insulin regular 100 unit/mL (= 0.25 mL) to 250 mL sodium chloride 0.9% bag

If preparation uses the insulin syringe that is transferred to another syringe with a blunt needle, syringe flushing is required.

OR If preparation is using a 1 mL syringe with a blunt needle, do not flush syringe.