Alberta Health Services

Form Title **Diabetic Ketoacidosis Pediatric Inpatient Order Set (for Sites Using D10W Solutions)**

Form Number **21165Bond**

Alberta Health Services

Diabetic Ketoacidosis Pediatric Inpatient Order Set (for Sites Using D10W Solutions)

Refer to Diabetic Ketoacidosis, Pediatric - Emergency and Inpatient for the Pediatric DKA Management Algorithm

Select orders by placing a (✓) in the associated box

Physician _____

Last Name *(Legal)*	First Name *(Legal)*
Preferred Name ☐ Last ☐ First	DOB*(dd-Mon-yyyy)*
PHN	ULI ☐ Same as PHN / MRN
Administrative Gender ☐ Male ☐ Female ☐Non-binary/Prefer not to disclose (X) ☐ Unknown	

Weight _____ Kg

Admission/ Discharge/ Transfer

☐ Admit to inpatient unit under care of Dr. _____

Patient Care

☑ Weigh patient, daily

Diet

☑ NPO

☐ Sugar free oral fluids when serum bicarbonate greater than or equal to 18 mmol/L
(mild acidosis/ketosis may still be present).

Monitoring

Vital signs and neurovitals are indicated at a minimum of every hour in the initial 1-4 hours; more frequently as indicated (based on severity and care setting)

☐ Notify physician if:
- Decreased or changing level of consciousness *(restless, irritable, drowsy, obtunded)* especially after initial improvement
- Headache, hypertension, vomiting, incontinence, cranial nerve palsies, oxygen desaturation

Initial *(for 4 hours)*

☑ Vital signs: heart rate, blood pressure, respiratory rate, temperature; every _____ hour
☑ Neurovitals: level of consciousness, Glasgow coma scale (GCS) every _____ hour
☑ Vital signs: Continuous Pulse oximetry or cardiac monitor
☑ Intake and Output: Strictly monitor intake and output hourly

After clinical improvement

Vital signs and neurovitals are indicated every 2 to 4 hours if DKA is improving and level of conciousness is normal

☐ Vital signs every _____ hours
☐ Neuro vital signs every _____ hours
☐ Intake and Output: Monitor fluid volume intake and output every 4 hours

Point of Care Testing

Frequent blood glucose point of care testing is required while adjusting insulin/IV in first 1-4 hours of presentation; may be reduced to every 2 hours if blood glucose is stable

Initial *(until blood glucose stable at 10 to 15 mmol/L for 4 hours)*

☑ Blood Glucose Monitoring - POCT, by finger poke every hour AND PRN; *Check blood glucose using glucometer at the bedside **prior to administering any IV fluids**)*
☐ Urine Ketones - POCT with each void *(optional: if testing readily available)*

After clinical improvement *(once blood glucose has been stable at 10 to 15 mmol/L for 4 hours)*

☐ Blood Glucose Monitoring - POCT, by finger poke; every _____ hours AND PRN by Glucometer
☐ Discontinue Urine Ketones POCT when ketones negative for _____ void

Prescriber Name	Prescriber Signature	Date *(dd-Mon-yyyy)*	Time *(hh:mm)*

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Physician _____

Laboratory Investigations Repeating

Chemistry

☐ Hemoglobin A1C *(if not done in Emergency or within the last 30 days)*

☐ Obtain and repeat the following labs every _____ hours

(The following are recommended at a minimum of every 4 hours to monitor response to therapy)

☑ Sodium (Na)
☑ Potassium (K)
☑ Chloride (Cl)
☑ Glucose Random
☑ Bicarbonate

☐ Repeat the following labs every _____ hours

(the following are recommended at a minimum of every 8 hour to monitor response to therapy)

☐ Serum osmolality
☐ Creatinine
☐ Urea
☐ Calcium
☐ Beta-hydroxybutyrate
☐ Phosphate
☐ Magnesium
☐ Discontinue lab investigations when insulin infusion has been discontinued.

Blood Gases

Capillary or venous blood gases are acceptable.

☐ Blood gas capillary every 4 hours
  ☐ *(optional)* Alternate collection with chemistry every 4 hours to monitor labs every 2 hours
☐ Blood gas venous every 4 hours
  ☐ *(optional)* Alternate collection with chemistry every 4 hours to monitor labs every 2 hours
☐ Ionized calcium every 4 hours *(if not included with blood gas result)*

Fluid Management

Proceed to detailed re-hydration calculations after the first hour of initial fluid management (see attached) *Proceed to detailed rehydration calculations. Until detailed fluid calculations are completed continue initial IV infusion rate (1.5 x maintenance for mild/ moderate DKA and 2 x maintenance for severe DKA).*

Avoid over hydration, total fluid should not exceed 2X maintenance

To avoid inadequate rehydration and in the context of challenging hydration assessment in DKA:

• Used attached calculation sheet based on mild, moderate or severe DKA
• Order total hourly fluid rate of Bag A and Bag B based on this calculation

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Physician _____

Fluid Management (Continued)

Total Hourly Fluid Rate based on Detailed Fluid Calculations: See Attached

☑ Total IV fluids (excluding insulin) = _____ mL/hr ***for the next 48 hours or until IV is discontinued***

- **Total Hourly Fluid Rate = Bag A (saline) + Bag B (saline and dextrose)**

☑ IV should be reduced by the amount of oral intake once oral fluids are ordered to maintain total hourly fluid rate.

1. Initiate Bag A *(Use when blood glucose greater than 17 mmol/L. Once blood glucose approaches 17 move to Bag A + Bag B system)*

If additional potassium is required in addition to 40 mEq/L potassium in IV fluids, follow local policy regarding availability of IV fluids containing 60 mEq/L of KCL

☐ 0.9% NaCl with _____ mEq/L KCL *(recommended 40 mEq/L)* at calculated total hourly fluid rate = _____ mL/hour

2. Add Bag B once blood glucose is less than or equal to 17 mmol/L

☑ 10% Dextrose System with 0.9% NaCl

Start with a combination of Bag A and Bag B that provides a dextrose concentration of D10W/0.9% NaCl with 40 mEq KCL

This is accomplished by:

• **Bag A: 0.9% NaCl with _____ mEq/L KCL** *(recommended 40 mEq/L)* • **Rate:** *(0% of total hourly fluid rate = total hourly fluid rate X 0)* = _____ **mL/hour**	**AND**	• **Bag B: D10W/0.9% NaCl with _____ mEq/L KCL** *(recommended 40 mEq/L)* • **Rate:** *(100% of total hourly fluid rate = total hourly fluid rate X 1)* = _____ **mL/hour**

☑ Titrate dextrose infusion to maintain blood glucose 8-15mmol/L. Adjust with each hourly blood glucose level *(by Blood Glucose Monitoring POCT)*

If blood glucose is **greater than 15 mmol/L** →	Increase Bag A *(saline)* rate and decrease Bag B *(saline and dextrose)* rate by 25% of total hourly fluid rate
If blood glucose is **less than 10 mmol/L** →	Decrease Bag A rate *(saline)* and increase Bag B rate *(saline and dextrose)* by 25% of total hourly fluid rate
If blood glucose is **between 10 to 15 mmol/L** →	No changes to IV rates for either solution.

Total hourly fluid rate _____ mL/hour X 0.25 = _____ mL/hour *(Amount by which the the IV fluid rate of each bag will change with each adjustment, maintaining total hourly fluid rate)*

☐ If blood glucose decreases more than 5 mmol/L per hour, contact physician.

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Physician _____

Medications

Insulin Infusion

To be ordered after patient has received 1 to 2 hours of IV fluids and is hemodynamically stable.

If metabolic acidosis is not improving after 4 hours, re-evaluate to ensure rehydration calculations are correct, insulin infusion is properly mixed, and that intravenous are not occluded, are patent and infusing. Once these are re-evaluated, if no improvement consider consulting pediatric endocrinology and/or PICU.

☐ Humulin Regular insulin(1 unit/mL in 0.9%NaCl) at a starting dose of 0.1 units/kg/hour = _____ units/hour = _____ mL/hour intravenous

Additional DKA orders as required

Oral Potassium Supplementation

If additional potassium is required in addition to 40 Eq/L potassium in IV fluids, follow local policy if available regarding availability of IV fluids containing 60 mEq/L of KCL, or consider oral potassium supplementation (may cause vomiting).

☐ Potassium Chloride _____ mEq *(1 mEq/kg/dose)* PO every 12 hours for _____ doses *(if patient has normal level of consciousness, even if NPO. 1- 3 doses recommended)*

Ongoing Fluid Management

For most patients 0.9% NaCl can be used with DKA resolution. If a decrease to 0.45% NaCl is required (e.g. in the case of hyperchloremia) it should only be considered if corrected sodium is 140 to 150 mmol/L and stable and patient has received 4 to 5 hours of fluid.

If additional potassium is required in addition to 40 Eq/L potassium in IV fluids, follow local policy regarding availability of IV fluids containing 60 mEq/L of KCL, or consider oral potassium supplementation (may cause vomiting).

☐ Change Bag A to 0.45% NaCl with _____ mEq KCl/L

☐ Change Bag B to D10W/0.45% NaCl with _____ mEq KCl/L

☐ Continue titration of Bag A and Bag B as established on page 3

☐ For infusion rate change orders as required, contact the most responsible practitioner

Phosphate

If serum phosphate is less than 0.4 mmol/lL, consider administering in a separate sodium phosphate (NaPO4) infusion if possible. If pre-mixed NaPO4 IV solution bags are not available, an IV infusion of NaPO4 can be prepared by using vials of sodium phosphate. Mixing and administration instructions are on Insite. Use local infusion protocols and order sets if available.

If phosphate is given, monitor serum Ca, Mg, and PO4 levels minimum every 4 hours to avoid hypocalcemia.

☐ _____

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Physician _____

Detailed Fluid Calculations

Body Weight in kilograms: kg *(a)*

Step	Clinical Decision Support			Calculation
1. Identify percentage dehydration based on severity of DKA *Refer to Diabetic Ketoacidosis, Pediatric - Emergency and Inpatient for the severity of DKA*	**Severity of DKA**	**% Dehydration**	**Extent of Dehydration** *(mL/kg)*	**Extent of dehydration =** _____mL/kg (b)
	Mild to Moderate DKA	*6%*	*60mL/kg*	
	Severe DKA	*9%*	*90mL/kg*	
2. Calculate total fluid deficit	Multiply: **(body weight in kg) x (extent of dehydration in mL/kg)**			Body weight (a) X dehydration mL/kg (b) **= Total fluid deficit** _____mL (i)
3. Calculate the remainder of the fluid deficit (ii) after the initial 1-2 hours of fluid management	Amount of IV fluid received in first 1-2 hours: _____ mL (c) Subtract: **[Total fluid deficit (i)] - [amount NS given first 1-2 hrs (c)]**			(i) – (c) =_____mL (ii) **= Fluid deficit (ii) to be given over the next 48 hours** in addition to maintenance fluids
4. Calculate maintenance fluid requirements for the next 48 hours	**24-hour maintenance requirements: based on body weight:** **10 kg or less** = 100 mL/kg/24 hours **11–20 kg** = 1000 mL + 50 mL/kg/24 hours for each kg greater than 10 **Greater than 20 kg** = 1500 mL+20 mL/kg/24 hour for each kg greater than 20 = _____ mL maintenance for 24 hours Multiply by 2 = _____ **48 hour maintenance (iii)**			24 hour maintenance requirements X 2 =_____mL (iii) **= Maintenance fluid requirements for the next 48 hours**
5. Calculate the total amount of fluid still to be given over 48 hours	Ongoing fluid losses (i.e gastric losses): _____ mL (v) ***Total Fluid to be given over 48 hours*** ***Add:*** FLUID DEFICIT **(ii)** + MAINTENANCE FLUIDS **(iii)** *Note: Additional Losses (ie vomiting/ diarrhea) are NOT included; If added losses are occurring, measure losses and replace in addition.*			(ii) + (iii) = _____**mL (v)** **= Total Amount of Fluid to be given in next 48 hours (v)**
6. Calculate hourly fluid rate for the next 48 hours.	Total amount of fluid to be given in 48 hours mL (v) /48 hours = hourly rate of fluid replacement *(in mLs/hr)* *****Note: If calculated fluid deficit replacement rate PLUS maintenance is greater than 2x maintenance ie in severe DKA in a larger child) use a maximum rate of 2x maintenance.***			(v) mL/48 hours =_____**mL/hr** = **Total Hourly Fluid Rate** ***(**maximum rate is 2x 48 hour maintenance)***