

Form Title **Diabetic Ketoacidosis Pediatric RURAL Emergency Order Set**

Form Number **21840Bond**

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Diabetic Ketoacidosis Pediatric RURAL Emergency Order Set

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

For more information, see Clinical Knowledge Topic **Diabetic Ketoacidosis, Pediatric**

Last Name (Legal)		First Name (Legal)	
Preferred Name <input type="checkbox"/> Last <input type="checkbox"/> First		DOB(dd-Mon-yyyy)	
PHN	ULI <input type="checkbox"/> Same as PHN	MRN	
Administrative Gender <input type="checkbox"/> Male		<input type="checkbox"/> Female	
<input type="checkbox"/> Non-binary/Prefer not to disclose (X)		<input type="checkbox"/> Unknown	

Weight _____ kg

Initial DKA Management (First Hour of Care) Orders

Key management steps in First Hour:

1. Labs to determine acidosis and blood glucose
2. Initiate fluid expansion over first hour
3. Initiate arrangements to transfer patient for subsequent patient care to a center with pediatric DKA expertise. May be a regional or tertiary site depending on your location and the status of your patient. Use RAAPID.
4. Determine DKA severity based on gas or bicarbonate to guide fluid management after the first hour: At initial assessment, children with DKA should be categorized in terms of severity based on initial lab testing. These categories guide rehydration calculations and inform the patient's risk of cerebral edema and requirements for monitoring:
 - **MILD DKA (pH 7.2-7.29 and HCO₃ 10-14 mmol/L):** should be admitted to hospital for intravenous (IV) fluid therapy, IV insulin infusion and close monitoring. The risk of cerebral edema in mild DKA is less than in moderate or severe DKA, however the risk of cerebral edema still exists.
 - **MODERATE DKA (pH 7.1-7.19 and HCO₃ 5-9 mmol/L):** should be admitted to hospital for intravenous (IV) fluid therapy, IV insulin infusion and close monitoring.
 - **SEVERE DKA (pH less than 7.1 and HCO₃ less than 5 mmol/L):** are at the highest risk for cerebral edema. These patients should be admitted to an area with providers experienced in the care of pediatric DKA, where more frequent observation is available.

Patient Care

- Notify physician if:
- Decreased or changing level of consciousness (restless, irritable, drowsy, obtunded, decreased motor or verbal response to pain) especially after initial improvement
 - Headache, hypertension, vomiting, incontinence, cranial nerve palsies, oxygen desaturation
- Other _____

Diet

- NPO
- Other _____

Monitoring

Vital Signs

- Monitor vital signs: heart rate, blood pressure, respiratory rate, temperature, oxygen saturation every _____ minutes
- Minimum of every hour in the initial 1-4 hours, more frequently if required*
- Cardiac Monitoring: Continuous Pulse oximetry or cardiac monitor
- Neurovitals: level of consciousness, Glasgow coma scale (GCS) to detect any changes concerning for cerebral edema every _____ minutes
- Intake and Output: Strictly monitor intake and output hourly
- Other _____

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Point of Care Testing

- Blood Glucose Monitoring – POCT, by finger poke **hourly**; Check blood glucose using glucometer at the bedside prior to administering any IV fluids
- If blood glucose decreases more than 5 mmol/L per hour, contact physician.
- Urine Ketones – POCT every void; _____; monitor at minimum every 4-8 hours
- Other _____

Laboratory Investigations
Initial Lab Orders - STAT *(unless already collected)*
Hematology

- Complete Blood Count (CBC) with differential

Chemistry
Once

- Sodium (Na) LEVEL
- Potassium (K) LEVEL
- Chloride (Cl) LEVEL
- Glucose Random LEVEL
- Bicarbonate (CO₂ Content)
- Creatinine LEVEL
- Urea
- Osmolality
- Calcium (Ca) LEVEL
- Beta-hydroxybutyrate – if available *(measure urine ketones OR beta-hydroxybutyrate)*
- Phosphate (PO₄) LEVEL
- Anion gap
- Hemoglobin A1C *(if not done in last 30 days)*
- Magnesium (Mg) LEVEL

Blood Gases

- Blood gas *(choose one based on site availability)*
 - Capillary
 - Venous mixed
 - Ionized calcium (iCa) LEVEL *(with gas if available)*

Microbiology

 Microbiology *(order appropriate cultures as indicated)*

- _____

Urine Tests

- Urinalysis Random; for ketones

Diagnostic Investigations

- Electrocardiogram - 12 Lead
- Chest X-ray PA and Lateral (GR Chest, 2 Projections)
- Chest X-ray portable (GR Chest, 1 projection)
- Other _____

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Fluid Management

Intravenous orders

Volume should be expanded to restore peripheral circulation. Most children with severe DKA appear very unwell due to some degree of dehydration and significant acidosis. It is rare for them to be in shock.

Follow the American Heart Association Pediatric Advanced Life Support (PALS) 2015 guidelines for a patient in shock, and **consider an additional diagnosis such as sepsis.**

Check blood glucose using glucometer at the bedside prior to administering IV fluids.

In the absence of shock in the first 1-2 hours:

Newer evidence supports up to 10 ml/kg in moderate to severe DKA

NaCl 0.9% 10 mL/kg/dose, IV over one hour to provide initial volume expansion. Do not infuse more rapidly than over 1 hour.

Dose: Weight in kg _____ x 10 mL/kg = _____ mL IV over 1 hour

NaCl 0.9% 20 mL/kg/dose, IV over one hour to provide initial volume expansion. Do not infuse more rapidly than over 1 hour.

Dose: Weight in kg _____ x 20 mL/kg = _____ mL IV over 1 hour

IF patient IS in decompensated shock (systolic blood pressure less than [70 + 2x(age in years)] mmHg):

NaCl 0.9% 20 mL/kg/dose, IV

Dose: Weight in kg _____ x 20 mL/kg = _____ mL IV rapidly

NaCl 0.9% 10 mL/kg/dose, IV

Dose: Weight in kg _____ x 10 mL/kg = _____ mL IV rapidly

Reassess vital signs and peripheral perfusion immediately following any bolus fluid administration

Repeat bolus if no improvement in heart rate or blood pressure, as necessary to restore adequate perfusion.

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Ongoing DKA Management (1-4 Hours after Presentation) Orders
Key management steps after the First Hour:

1. Continue fluids and add potassium. Rate based on DKA severity (1.5x maintenance for mild and 2x maintenance for moderate and severe DKA)
2. Initiate insulin after 1-2 hours of fluids
3. Continue to follow blood glucose carefully and when glucose reached 17 mmol/L, change to a solution with dextrose
4. Transfer- discuss with the transfer site transfer plans including the needed fluids and monitoring for transfer to manage glucose and potassium.

Laboratory Investigations

Repeat as needed or if unable to transfer within 4 hours

Chemistry
Every 2-4 hours, minimum of Q4H to monitor response to therapy

- Sodium (Na) LEVEL every _____ hours
- Potassium (K) LEVEL every _____ hours
- Chloride (Cl) LEVEL every _____ hours
- Glucose Random LEVEL every _____ hours
- Bicarbonate LEVEL every _____ hours

Every 8 hours

- Osmolality every 8 hours
- Creatinine (Cr) LEVEL every 8 hours
- Urea (BUN) every 8 hours
- Anion gap every 8 hours
- Calcium (Ca) LEVEL every 8 hours
- Beta-hydroxybutyrate – if available every 8 hours
- Phosphate (PO₄) LEVEL every 8 hours
- Magnesium (Mg) LEVEL every 8 hours

Blood Gases

Capillary or venous blood gases are acceptable.

- Blood gas capillary every 4 hours
- Blood gas venous every 4 hours
- Ionized calcium (iCa) LEVEL *(with gas if available)*

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Fluid Management

After initial volume expansion over first 1 hour (0.9%NaCl 10-20mL/Kg over 1 hour), an IV solution containing potassium is recommended if patient is voiding and urea and creatinine do not indicate pre-renal kidney insult. Hypotonic solutions should NOT be used in the initial management of DKA. Most patients can be continued on isotonic solutions for their whole DKA treatment.

Avoid over-hydration, total fluid should not exceed 2x maintenance in the first 24 hours

- Total hourly fluid rate = _____ mL/hr
 Mild or Moderate = 1.5x maintenance rate. Severe = 2x maintenance rate
Total Hourly Fluid rate = Bag A (saline) + Bag B (saline and dextrose)

To calculate the hourly maintenance fluid requirement:
 4 mL/kg/hour for the 1st _____ 10 kg (0 - 10 kg)
 + 2 mL/kg/hour for the next _____ 10 kg (11 - 20 kg)
 +1 mL/kg/hour for any additional kg above 20

Use when blood glucose greater than 17 mmol/L.

For most DKA patients with normal or lower initial potassium levels a solution with 40 mEq/L of KCl is recommended. If not available at your site use a solution with 20 mEq/L and ensure patient transfer as soon as possible. If potassium level is elevated, consider starting with potassium - free fluid.

- potassium chloride 20 mmol in NaCl 0.9% 1000 mL (20 mmol) at _____ mL/hour
 potassium chloride 40 mmol in NaCl 0.9% 1000 mL (40 mmol) at _____ mL/hour
 NaCl 0.9% at _____ mL/hr

Once glucose reaches 17 mmol/L ADD dextrose to IV fluid.

For most DKA patients with normal or lower initial potassium levels a D5W/0.9%NaCl solution with 40 mEq/L of KCl is recommended. If not available at your site use D5W/0.9%NaCl with 20 mEq/L and ensure patient transfer as soon as possible.

- potassium chloride 20 mmol in D5-NaCl 0.9% 1000 mL (20 mmol) at _____ mL/hr
 potassium chloride 40 mmol in D5-NaCl 0.9% 1000 mL (40 mmol) at _____ mL/hr

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Medications
Insulin Infusion (after receiving 1-2 hours of IV fluids)

Start insulin infusion after patient has received initial volume expansion over 1-2 hours and is hemodynamically stable. Transfer prior to adding insulin is recommended when feasible as there is less risk of hypoglycemia during transfer. Discuss with receiving consultant.

IV insulin boluses are always contraindicated. Early IV insulin infusion (within 1st hour of administration of fluids) may increase risk of cerebral edema.

If metabolic acidosis is not improving after 4 hours, re-evaluate that rehydration calculations are correct, insulin infusion is properly mixed, intravenous lines are not occluded, are patent and infusing.

Once these are re-evaluated, if no improvement consider consulting pediatric endocrinology and/or PICU.

insulin regular (e.g. Humulin R) 1 unit/mL in NaCl 0.9%; _____ units/ hour (0.1 units/Kg/hr) = mL/hr IV continuously

Analgesics and Antipyretics

acetaminophen (recommended dose 15 mg/kg/dose) _____ mg PO/PR every 4 hours PRN for fever or discomfort. (Maximum 75 mg/kg/day, 1000 mg/dose AND 4 grams/day whichever is less)

ibuprofen (recommended dose 10 mg/kg/dose) _____ mg PO every 6 hours PRN for fever or discomfort. (Maximum 400 mg/dose, less than 6 months, acetaminophen is preferred)

Other _____

Additional Fluids Orders if Required

- _____
- _____
- _____

Consults

- Consult Pediatrics
- Consult Pediatric Critical Care Medicine

Preparation for Transfer

Discuss with the receiving consultant the fluid to continue during transfer and which fluids should be prepared to take on transfer to enable management of potassium and to maintain glucose > 10 during transfer. Transfer prior to starting insulin is recommended when feasible as there is less risk of hypoglycemia during transfer. There may be options for managing glucose during transfer that do not require mixing additional solutions (such as briefly lowering insulin infusion rates).

Possible solutions to be available for transfer:

- potassium chloride 40 mmol in D5-NaCl 0.9% 1000 mL (40 mmol) _____ mL/hr *
- potassium chloride 40 mmol in D10-NaCl 0.9% 1000 mL (40 mmol) _____ mL/hr
(can be made by adding 100mL D50W to a 1 L bag of D5W-NaCl 0.9% with 40 mEq KCl/L)**
- potassium chloride 20 mmol in D10-NaCl 0.9% 1000 mL (20 mmol) _____ mL/hr
(can be made by adding 100mL D50W to a 1 L bag of D5W-NaCl 0.9% with 20 mEq KCl/L)

* D5W/NaCl 0.9% with 40 MEq/L KCl if premade not available, can be made by adding 100mL D50W to a 1 L bag of NS with 40 mEq KCl/L

**This can only be made if D5W/NaCl 0.9% with 40 MEq/L KCl is commercially available to use as a base solution.
If not, use a 20 mEq/L KCl fluid.

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