

Pediatric Diabetic KetoAcidosis (DKA) Algorithm

Recognition of DKA

DKA can occur in existing or new-onset diabetes, including Type 1 and Type 2. Consider in tachypneic patients with no chest findings.

Diagnostic criteria:

- Diabetes (random blood glucose >11 mmol/L)
- Acidosis (pH <7.3 or HCO₃ <18 mmol/L)
- Ketonuria/ketonemia (moderate/large urine ketones or beta-hydroxybutyrate ≥3 mmol/L)

Alert Pediatric Referral Centre

DKA Severity

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

Initial Management

- Continuous cardiorespiratory monitor
- Assess ABCs, vital signs (including BP) + neurovitals (GCS, pupils)
- Bed rest, elevate head of bed to 30°
- Rapid bedside glucose, blood ketones (if available)
- O₂ 10-15 Lpm via non-rebreather mask if severe DKA
- IV access x 2; do not delay IO if severe DKA and IV unsuccessful after 2 attempts
- Start fluid resuscitation immediately (see below)
- Serum glucose, electrolytes, venous gas, urea, creatinine, osmolality, ketones
- 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 (Dehydration is a key feature of DKA and its complications, including acute kidney injury)

- Administer NS or RL 20 mL/kg (MAX 1 L) IV bolus over 20 minutes (rapid push over 5-10 min if patient is hypotensive)
- Repeat NS or RL 20 mL/kg (MAX 1 L) IV bolus if ongoing hypoperfusion (cap refill ≥3 sec centrally, cool extremities)
- Reassess vital signs and perfusion after each bolus

Signs of CEREBRAL INJURY?

- GCS ≤13, severe/progressive headache, focal neurological signs, incontinence, and/or inconsolability AND/OR
- Cushing's triad: ↑BP, ↓HR, abnormal breathing

YES

Cerebral Injury Management

- Elevate head of bed to 30°; keep head midline
- 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 min OR mannitol 0.5-1 g/kg (MAX 100 g) IV over 15 min
- Update Pediatric Referral Centre
- May repeat hyperosmolar agent dose x 1 after 30 min if no improvement or use alternate agent
- Head CT not required prior to treatment or transport

NO

CAUTION!

Intubation and ventilation are **HIGH RISK** procedures for patients with DKA. Unless there is acute respiratory failure, consult your Pediatric Referral Centre/Transport Team **PRIOR** to intubation. The patient's ETCO₂ must **NOT** be allowed to rise prior to/during intubation.

Ongoing IV Fluids & Insulin

- Rehydrate with IV NS or RL as per Rehydration Table below. Run IV fluids at 75% of rate if concern for cerebral injury

Rehydration Table

Weight (kg)	5 - <10 kg	10 - <20 kg	20 - <40 kg	≥40 kg
Rate (mL/kg/hr)	6.5	6	5	4 (max 500 mL/hr)

- **Potassium:** If serum K <5.5 mmol/L, add **40 mmol/L KCl** to IV fluid
- **Insulin:** Start regular insulin infusion 0.1 units/kg/hr IV **after 1 hour of IV fluids** (delay insulin if K <3.5 mmol/L)
- **Dextrose:** Change to dextrose-containing solution (e.g., D5NS, D5RL, D10NS or D10RL) with added KCl when glucose is <17 mmol/L OR is decreasing by >5 mmol/L/hr after insulin is started. For ongoing fluid management, see CPEG Pediatric DKA Algorithm: Ongoing Management

NEVER bolus IV insulin

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

Ongoing Monitoring Until Transfer

- Continuous cardiorespiratory monitor; BP and neurovitals (GCS, pupils) Q 30 min (more frequent in severe DKA)
- Q 1 hour: Blood glucose
Fluid ins and outs, indwelling catheter if necessary
- Q 2 hours: Serum glucose, electrolytes, venous gas, urea, creatinine

Pediatric Referral Centre Update

- Difficult vascular access
- Ongoing fluid management for persistent hypoperfusion
- Additional treatment for cerebral injury
- Airway management
- Transport

Hyperosmolar Hyperglycemic State (HHS)

- Serum glucose >33.3 mmol/L, effective serum osmolality >320 mOsm/kg, HCO₃ >15 mmol/L, pH >7.25
- More dehydrated, severe electrolyte abnormalities, minimal acidosis/ketosis, negative/trace ketones
- Initiate fluid resuscitation as for DKA; HHS patients need more aggressive fluid resuscitation than those with DKA
- Discuss management with Pediatric Referral Centre, see CPEG HHS Algorithm