MIL

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This Medicines Information Leaflet is produced locally to encourage safe prescribing that is cost effective to the NHS. Information will be given on quality improvement issues and the costs to hospital and community.

Guidelines for Management of Diabetic Ketoacidosis (DKA) in Adults

Diabetic ketoacidosis (DKA) is an acute metabolic complication of diabetes caused by absolute or relative insulin deficiency in patients with diabetes. The most common causes are omission of insulin, underlying infection, and new-onset diabetes.

This Medicines Information Leaflet (MIL) summarises the Trust's guidelines for managing DKA in adults. Guidelines must be read in conjunction with the *Adult DKA Management Flowchart* on page 2 of this document.

Confirming diagnosis – all three must be present

1. Glucose above 11 mmol/L or known diabetes
2. Ketonaemia above 3mmol/L (see below for discussion of capillary ketone measurement)
3. pH below 7.3 and/or Bicarbonate ($HCO3^-$) below 15 mmol/L

⚠ Euglycaemic DKA ("euDKA")

Ketonaemia and acidosis **CAN** occur with a normal blood glucose. **Check blood ketones in all unwell patients with diabetes on a SGLT2 inhibitor** (ie dapagliflozin, canagliflozin or empagliflozin). If raised, check pH and escalate.

Arranging Care

Patients with DKA have severe metabolic derangement and require intensive bedside monitoring. All cases of suspected DKA should be referred to and assessed by the on-call medical team as soon as possible.

- Those with **Severe DKA** should be considered for management in a high-dependence or intensive care environment (see below flowsheet for criteria)

In patients presenting with ketosis (ketone levels above 3mmol/L), but without significant acidosis, treatment with variable rate intravenous insulin infusion (Variable-RIII) can prevent the onset of acidosis.

Best Practice Tariff requires **early** Diabetes Specialist Team involvement. Therefore, all patients with DKA should be referred *within 24 hours*.

Referrals to the Diabetes Specialist will be automatically submitted once the PowerPlan is launched. Manual referrals can be submitted via Requests & Prescribing on EPR (Power Chart).

Emergency Treatment and Investigations

- **Airway:** If the patient is not maintaining their airway (GCS below 10) contact the ICU team (JR – Bleep 4138, Churchill Bleep 5505). Consider an NG tube in persistent vomiting or obtunded patients.
- **Breathing:** Monitor oxygen saturation and respiratory rate.
- **Circulation and blood pressure:** Insert two large bore cannulas, take blood, and start intravenous fluids (see flowchart below). If severely fluid depleted, give 500 ml 0.9% sodium chloride by IV infusion over 15-20 minutes, and repeat if necessary. Contact the ICU team if systolic BP is below 90 mmHg despite 3 boluses of 500ml of sodium chloride 0.9%.
- **Diagnosis:** Baseline investigations: urea, creatinine, venous glucose **venous** blood gas (including glucose and lactate), FBC, clotting and CRP. Anion gap should be calculated and recorded. An infection screen including urinalysis, blood and urine cultures and CXR should be considered. ECG should be recorded and consider measuring High Sensitivity Troponin.
- Measure capillary ketone levels using Freestyle Precision Pro™ meter (measures up to a level of 8mmol/L, see below).
- Start a fixed rate insulin infusion (FRII) at a rate of 0.1 unit/kg/h (see flowchart below). If the blood glucose concentration falls below 14 mmol/L, reduce the FRII rate by 50% and start a 10% glucose infusion at a rate of 125ml/h.

When prescribing in DKA use the PowerPlan:

- Insulin – Adult management of diabetic ketoacidosis (DKA) PowerPlan

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Diabetic ketoacidosis (DKA) in adults

BP	Blood pressure	IV	Intravenous	FRIII	Fixed rate IV insulin infusion	POC	Point-of-care
GCS	Glasgow coma scale	ICU	Intensive care unit	SpO_2	Oxygen Saturation	s/c	subcutaneous

Recognition: all three must be present

Diabetes	**K**etones	**A**cidosis
Glucose above 11 mmol/L* *May be normal in euglycaemic DKA	Ketonaemia above 3 mmol/L	Venous pH below 7.3 and/or Bicarbonate below 15 mmol/L

⚠ Severe DKA: consider ICU review ⚠

pH below 7.0 | Ketones above 6 mmol/L | Bicarbonate (HCO_3^-) below 5.0 mmol/L | Potassium (K^+) below 3.5 mmol/L | GCS below 12 or AVPU not A | SpO_2 below 92% | Systolic BP below 90mmHg | Heart rate below 60 or above 100 | Anion gap above 16 mmol/L | Difficult IV access

Clinical assessment

1. Degree of dehydration 2. Consciousness level 3. Evidence of aetiology 4. Medication history (incl. insulin) 5. Weight

Glucose management

Aim for 3 mmol/L per hour decrease in blood glucose

IV human soluble insulin
(50units in 50mL pre-filled syringe)
0.1 unit/kg/h (FRIII)*
*seek advice if greater than 15 units/h

↓

Continue long-acting s/c insulin **or**
start Lantus 0.2 units/kg

↓

Suspend other diabetes medications

Fluids

- Give fluid bolus if systolic BP < 90 mmHg
- Caution if at risk of fluid overload

0.9% Sodium chloride 1L over:	Bag order:
1 hour	1st
2 hours	2nd
2 hours	3rd
4 hours	4th
4 hours	5th
6 hours	6th

Potassium

- Aim to keep within 4-5 mmol/L
- DO NOT add K^+ into the 1st bag

Serum K^+ level	Supplement per L/fluid
Above 5.5 mmol/L	Nil
3.5 – 5.5 mmol/L	40 mmol/L
Below 3.5 mmol/L	Seek advice

Monitoring

- pH, HCO_3^-, K^+ at 60 minutes, then 2-hourly
- POC glucose, ketones and urine output hourly

Targets

- HCO_3^- increasing by 3 mmol/L per hour **AND**
- Glucose reducing by 3 mmol/L per hour

Specific situations

Targets not met:

- Increase FRIII by 1 unit/h & escalate

Glucose below 14 mmol/L:

- Add 10% glucose 125 ml/h infusion
- Decrease FRIII rate by 50% to 0.05 unit/kg/h

No urine output for 4h:

- Consider urinary catheterisation

DKA resolution

- Ketones below 0.6 mmol/L **AND**
- Venous pH above 7.3

- start short-acting s/c insulin with the next meal
- continue FRIII for 1 hour after the 1st s/c insulin dose

Referrals

Oxford & Horton Sites

In-hours: inpatient Diabetes Nursing Team

- EPR Requests & Prescribing: Diabetes Adult Inpatient

Out of hours: Diabetes/Endocrine SpR via OUH switchboard

References

JDBS guidance | Consensus statement
Book Chapter | BMJ Best Practice

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Oxford University Hospitals NHS Foundation Trust
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