



**Wolverhampton
Diabetes Care**

What Care to Expect

The Management of Diabetic Keto-Acidosis

- Diabetic keto-acidosis must be managed to the standard agreed protocol.

Diabetic keto-acidosis is a life threatening condition in which diabetes control is severely destabilised. All patient with diabetes who are have an inter-current illness or who are vomiting, drowsy or dehydrated must be assessed for the presence of urinary ketones and further evaluated for the presence of keto-acidosis.

If you have diabetes and are ill, test your blood more regularly, adjust you treatment to try and get good control, test for ketones in your urine if you know how to. Never stop your tablets or insulin in this situation. If your blood sugars remain high, and especially if you start vomiting, then seek medical help as a matter of urgency. You medical team will ensure you are fully evaluated as outlined in this protocol.

Effective management of the ill diabetic patient can prevent ketosis.

When ketosis is present, effective management can prevent keto-acidosis.

If keto-acidosis is present then it must be managed according to the protocol to ensure effective resolution which minimises the risk of morbidity and mortality

Inform the Diabetes team as soon as possible

Date:

Time of admission:

Surname	Unit No
Forename	
Address	DOB
Postcode	(or affix patient label)

The Management of Adult Diabetic Ketoacidosis (DKA) and Hyperosmolar Non-Ketotic Coma (HNKC)

DKA: is a life threatening condition requiring prompt diagnosis and treatment, and should be excluded in all people who are hyperglycaemic, dehydrated, drowsy or vomiting or presenting with abdominal pain, myocardial infarction or stroke. All patients should be seen as early as possible by the diabetes team.

DIAGNOSIS: Blood glucose > 15mmol/l, pH < 7.25, Bicarbonate < 17mmol/l, urine ketones +++. Blood gas analysis mandatory. Rarely DKA presents in acidotic ketostix -ve patients or patient may have Lactic Acidosis. In non-acidotic patients consider HNKC (osmolality $2 \times \text{Na} + 2 \times \text{K}^+ + \text{Glucose} + \text{Urea} > 320$). Patients who do not meet these criteria but are unwell and in pre-DKA may need to follow the protocol but only with specialist advice from the diabetes team.

BASELINE INVESTIGATIONS

Procedure	Date	Time	Signature
Lab blood glucose			
U & E			
Blood gases			
Urine / ketones			
Blood count			
ECG			
CXR			
MSSU			
Blood cultures			

Repeat blood gases, U&E, lab blood glucose at 2 hours and then every 4 hours until pH normal. U&Es with Bicarbonate if previous blood gases show improving acidosis. U&Es every 2 hours if K+ not in normal range. Repeat ECG at 24 hours.

MANAGEMENT: Initial management of DKA / HNKC is identical. Management must be started in the admitting area without delay and the medical registrar contacted promptly. Always arrange admission to Diabetes speciality ward (D18) or if the patient is in a coma - the patient should be managed in the Critical care Unit.

DO NOT USE SINGLE BAG COMBINED GLUCOSE / INSULIN / K+ INFUSIONS IN DKA

KEEP NIL BY MOUTH UNTIL TRANSFER TO S/C INSULIN

- INSULIN:
- a) Stat 10 Units IM Actrapid followed promptly by
 - b) Insulin infusion 6 ml/hr (50 Units Actrapid in 50ml 0.9% Sodium Chloride - discard 10ml through tubing before attaching to patient because insulin binds to plastic)
If no fall in blood glucose at 4 hours, increase to 10 ml/hr
Only when blood glucose - < 10mmol/l should IV insulin rate be reduced to 3 ml/hr(see recovery phase management). Ward nurses should check pump / connections every hour and document remaining volume.

FLUIDS: KEEP PATIENT NIL BY MOUTH

- 1 litre in 1/2 hour Start with IV 0.9% Sodium Chloride. When blood glucose ≤ 10mmol/l change to 5%
- 1 litre in 1 hour glucose at same rates. Do not change back to 0.9% Sodium Chloride if BMs rise. Use
- 1 litre in 2 hours x 2 10% glucose if BM falls below 5 mmol/l. Consider modifying insulin infusion rate if no
- 1 litre in 4 hours x 2 improvement.
- 1 litre in 6 hours repeat

In hypovolaemic patients who remain hypotensive (systolic < 100) after 2 litres of fluid consider plasma expansion with 1 or 2 additional units 4.5% human albumin (PPF) or gelofusine. Great caution in the elderly and in patients with cardiac / renal disease. Reduce rate (4 litres in 24 hours) and consider CVP monitoring.

Potassium (K⁺)

No K⁺ in the first litre. Subsequently add as follows:- according to repeat U + E's.

Serum K ⁺	<3.5	3.5 - 5.5	>5.5	
KCL (mmol/l)	40	20	0	per litre bag of fluid

MONITORING: ECG monitor, hourly obs, close fluid balance, urinary catheter if no urine passed in 4 hours. CVP in elderly / cardiac patients. Repeat as above.

ADDITIONAL MANAGEMENT: Avoid bicarbonate unless severe life-threatening acidosis is not responding by 2 hours of above management (pH < 7.0, 200ml 1.26% NaHCO₃ + 20mmol/KCL over 30 mins) but should be discussed with Consultant Physician first. Avoid NG tube unless patient comatose and vomiting, then insert with the patient in left lateral position and head down. Aspirate hourly. In HNKc avoid 0.45% sodium chloride unless sodium remains > 160mmol/l 2 hours after onset of therapy. No more than 2 litres. Antibiotics if obvious infection - patients often hypothermic, pyrexia masked, WBC is usually high.

RECOVERY PHASE: When blood glucose ≤ 10mmol/l, reduce insulin infusion and change to 5% glucose (see above). Follow hourly variable insulin infusion as below, - **do not stop insulin and do not reduce rate below 3 ml/hr.** If blood glucose drops <5mmol/L use 10% glucose to maintain blood glucose 5-10. Do not stop glucose infusion if glucose rises > 10mmol/L but increase insulin as below. Do not vary this insulin regime without diabetes specialist advice.

Hourly BG Monitoring	0 - 5	5 - 10	10.1 - 20	15.1 - 20	20 +
Insulin infusion ml/hr	3	3	4	5	6
	10% Glucose		Continue 5% Glucose		

Aim to convert to s/c insulin at breakfast or lunch, never late in the day or night time.

ORAL INTAKE AND SC INSULIN: Commence oral fluids when pH normal and patient alert and not vomiting. Transfer to diet and s/c insulin after 24 - 36 hours. In patients previously on insulin increase their usual daily dose by a third. Patients new to insulin will need 0.5 - 1u/kg daily in divided doses. Remember to continue the IV insulin / glucose infusion for 1 hour after the first s/c dose.

REFER: It is Mandatory to inform Diabetes team ASAP - seek out of hours advice from a Diabetes Consultant as required. Management plan should be made with the diabetes team. Follow up must be arranged with the Diabetes Team.

REFERENCES:

- Alberti KGMM. Low dose insulin in the treatment of diabetic keto-acidosis. Archives of Internal Medicine 1977:137 1367-76.
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- Lebovitz, H. Diabetic keto acidosis. The Lancet 1995; 345 767-772.

