



Guidance on Ketone Testing for healthcare professionals

This guidance is for adults with type 1 diabetes but may also be applicable to a very small number of high risk patients with type 2 diabetes.

What is Diabetic Keto Acidosis (DKA)?

DKA is a potentially life-threatening complication of diabetes caused by a lack of insulin in the body.

It occurs when the body is unable to use blood sugar (glucose) because there isn't enough insulin. Instead, it breaks down fat as an alternative source of fuel. This causes a build-up of a potentially harmful by-product called ketones. It is a medical emergency with a significant morbidity and mortality and should be diagnosed promptly and managed intensively. Precipitating conditions include infection/acute illness and inadequate insulin or non-compliance.

Prevention

Education is key for people with diabetes, particularly concerning what to do in cases of illness ('sick day rules');

Ketone Testing

Blood ketone strips with education and training are effective at detecting ketonaemia. 2-4 hours.

Within Northamptonshire the meter of choice that test for ketones is:

- GlucoRx HCT meter.
 - GlucoRx HCT Ketone Test Strips - £9.95* / 10

Patients who develop ketosis will need to test on a 2 hourly basis until blood ketones return to a satisfactory level. It is recommended that strips are prescribed in quantities to allow patients to maintain a supply of two boxes in the home. If a patient does not use blood ketone test strips within approximately one year then a prescription for replacement strips will need to be issued before their expiry.

*Based on Drug tariff Price (Dec 2019)

Acknowledgement to Aylesbury Vale CCG and Chiltern CCG

Ketone Testing Strips for Adults - Who should Have Them and Why

THE FOLLOWING HIGH RISK ADULT PATIENTS SHOULD RECEIVE KETONE TESTING STRIPS TO SELF-MONITOR WHEN REQUIRED

- Insulin pump users
- Patients with a history of admissions with ketoacidosis within last 2 years
- HbA1c >11% (97 mmol/mol) or blood glucose often > 20 mmol/l
 - People with T1 Diabetes who may become unwell and need to self-manage their illness
- Pregnant patients with type 1 diabetes
- Newly diagnosed type 1 diabetes



The local specialist diabetes team will identify high risk patients through admissions and out-patient appointments.

For those identified as needing testing strips:



Specialist diabetes team will support

- Initiating ketone monitoring
 - Provide training and education
- how to use strips
when to use strips
What to do with result



If patient is not receiving care at a specialist centre then GP responsibilities are to

- Initiate and Provide on-going strips to patients
- Reinforce training on meter use
- Reinforce education on dealing with high ketone levels so that patients knows what to do if reading is high

**Advice for Patients to Manage their Type 1 Diabetes During illness such as Flu
Or Diarrhoea or Vomiting**

Sick Day Rules

What	How	Why
Insulin	DON'T stop your insulin. Take all doses.	Unwell patients with diabetes often have greater insulin requirements to maintain normal glucose levels even if they are not eating.
Fluids	Drink plenty of sugar-free fluids	It is easy to become dehydrated due to the illness and also if your blood glucose rises.
Food	Try to eat normally. Sugar free fluids are recommended BUT if you have no appetite or cannot eat then substitute your usual food for palatable sources of carbohydrate e.g. sips of Lucozade/fizzy drinks (not diet), cereals.	This will enable you to manage your diabetes.
Blood glucose testing	Test every 2 to 4 hours.	This will enable you to manage your diabetes.

Action for Patients

Test ketone if you feel unwell even if glucose is normal

- if your blood glucose remains above 14 mmol/l after 4hours then check your ketone levels.
- Check blood ketones if you have blood test strips
- Otherwise use urine test strips. Urine ketones 3+ or above seek medical advice
- If your blood glucose falls rapidly or is less than 4mmol/l take frequent sips of Lucozade/fizzy drinks (not diet)

Self-Management of Ketoacidosis: This leaflet is designed for health care professionals to support adults who have Type 1 diabetes who are taking meal-time and background insulins. Patients should follow their own specific written instructions supplied during structured education programme if different from below. If seriously unwell or drowsy seek medical advice immediately

TESTING FOR KETONES IN THE BLOOD?

If you feel unwell you should check for ketones

Ketones less than 1 mmol/l	<p>This is not worrying; treat raised glucose as usual</p> <p style="text-align: center;">Drink at least a mug of sugar-free fluid every hour Do not stop any long acting insulin* injections , use corrections doses as usual</p>
Ketones between 1 and 3 mmol/l	<p>Take action to bring level of ketones down with extra insulin:</p> <ul style="list-style-type: none"> • Take an extra dose of the type of insulin you use at meal-times (short acting). • Give 10% of your average total daily insulin dose e.g. if you take 60 units of insulin in a day (total dose of both types of insulin added together), give an extra dose of 6 units. <i>(if part units are part of the percentage then round up to the next whole number)</i> • If you are due a meal-time injection, take the meal time dose as well as the extra insulin dose. • Check blood ketone and glucose levels after 2 hours. • If the ketone level is still over 1, give the same extra insulin dose again • If there is no improvement in ketone levels, reassess hydration status and clinical picture <p style="text-align: center;">Drink at least a mug of sugar free fluid every hour Do not stop any long acting insulin* injections</p>
Ketones 3 mmol/l or higher	<p>This is a dangerous level:</p> <ul style="list-style-type: none"> • Give 20% of your average total daily insulin dose e.g. if you take 60 units of insulin in a day (total dose of both types of insulin added together), give an extra dose of 12units. <i>(if part units are part of the percentage then round up to the next whole number)</i> <p>Check ketone and glucose levels after 2 hours. If the ketone level is still over 3, give the same extra insulin dose again and consider seeking medical advice or referring to A and E without delay, particularly if vomiting</p> <p>In the meantime:</p> <p style="text-align: center;">Drink at least a mug of sugar free fluid every hour</p>

* Long acting insulins: Insulatard, Humulin I, Insuman Basal, Lantus, Semglee, Abasaglar/Glargine, Levemir/Detemir and Tresiba/Degludec