

Ketone testing in people with type 1 diabetes: advice for prescribers in primary care

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Key recommendation: all insulin treated patients with type 1 diabetes should have adequate and appropriate access to ketone testing strips; please consult local formularies for preferred choices. If you are unsure about local arrangements or advice, please contact your specialist diabetes team.

Current situation in London – Ketone testing strips

The ketone metrics are new to the diabetes prescribing dashboard for 2017/18. Year on year prescribing of blood ketone testing strips has increased in 28 CCGs, with the London average now 12.8 blood ketone testing strips per person with type 1 diabetes per year, with a range across CCGs of 5.9 to 24.5. These typically come in boxes of 10, and expire 6-24 months after opening (please see individual packet inserts).

Conversely, the number of urine ketone testing strips has decreased in the majority of CCGs, with the London average decreasing -5% to 15.7 strips per person with type 1 diabetes per year with a range across CCGs of 6.3 to 30.2. These typically come in boxes of 50 and expire 3-24 months after opening (please see individual packet inserts).

Adequate access to ketone testing strips is encouraged and ideally areas should have guidance and formulary choices in place. Urine testing strips are typically cheaper but they may not be suitable for individuals or as accurate as blood ketone testing. Access to both urine and blood testing should be available. Organisations should be aware that there are a number of low acquisition cost alternatives now available for blood testing of ketones.

***Recommendation from the Responsible Diabetes Prescribing Group Report 2017/18: 'A review of local meter formularies (for both blood glucose and blood ketone testing) should be regularly undertaken with both specialist and primary care colleagues.'* A meter comparison table is available to NHS LPP members [here](#).¹**

What does NICE say?

NICE (NG17 – type 1 diabetes in adults) recommends that ketone monitoring (blood or urine) should be considered as part of 'sick-day rules' for adults with type 1 diabetes, to facilitate self-management of an episode of hyperglycaemia.² NICE (NG18 – diabetes in children and young people) recommends that children and young people with type 1 diabetes should be offered blood ketone testing strips and a meter, and their family members or carers (as appropriate) advised to test for ketonaemia if they are ill or have hyperglycaemia. Special attention should be applied to the specified ('use-by') date.³

What are ketones?

Glucose is an important energy source for the body, but we need insulin to use it. If the body does not have enough insulin then it will make energy by breaking down fat, which produces fatty acids that the liver turns into ketones. These are released into the bloodstream for energy.

Why is it important to know ketone levels and who for?

Some level of ketones in the blood is normal. However, if the level becomes very high then this will make the blood too acidic, leading to illness and potentially organ damage. People with diabetes who are treated with insulin are at higher risk than the general population of having higher ketone levels – particularly during times of illness - and are at risk of a condition called diabetic ketoacidosis.

What are ketone test strips?

Ketone test strips are classed as “detection strips” and can be found listed in part IXR of the Drug Tariff. Those available are listed in two different sections, depending on what bodily fluid they test (urine or blood) for the presence of ketones. Blood testing of ketones utilises detection of β -hydroxybutyrate whilst urine testing detects acetoacetate.

When should people with type 1 diabetes test for ketones?

During periods of illness, glucose levels may rise. If insulin is not adjusted accordingly, then ketone levels can also rise. Therefore, during any period of illness, insulin treated patients should test ketone levels as well as glucose levels. “Sick day rules” are an important part of an individual’s diabetes management plan and should detail what to do during illness, including how often to test glucose and ketones and how to adjust insulin dosages.

What do the results on ketone test strips mean?

Results on blood testing strips are presented as mmol/L. Results on urine testing strips are presented as numbers of + and graduation of colour intensity, but these correlate approximately with mmol/L levels. The individual’s management plan should cover actions needed for at least the ranges listed below (continued monitoring required, insulin dosage adjustment and when to seek medical assistance).

Urine strip reading	Nil	+	++	+++ or ++++
Blood strip reading	Below 0.6	0.6 to 1.5 mmol/L	1.5 to 3 mmol/L	Above 3 mmol/L

What are the consequences of not testing for ketones, as and when appropriate?

If high ketone levels are not adequately addressed these can lead to diabetic ketoacidosis and the need for an emergency admission and inpatient treatment.

For further information please contact the London Diabetes Clinical Network on england.diabetes-ldncn@nhs.net.

References:

1. NHS LPP Responsible Diabetes Prescribing Group. Diabetes prescribing in primary care in London 2017/18, 30th July 2018. Retrieved from <http://www.lpp.nhs.uk/categories/medicines-optimisation-pharmacy-procurement/task-and-finish-groups/responsible-diabetes-prescribing-group/supporting-resources-for-diabetes-prescribing/self-monitoring-blood-glucose-meters-comparison-tool/> on 14/01/2019
2. NICE. Type 1 diabetes in adults: diagnosis and management. August 2015.
3. NICE. Diabetes (type 1 and type 2) in children and young people: diagnosis and management. August 2015.