

### Blood glucose and ketone monitoring: self-monitoring guidance for diabetes

This resource is meant to be used as a guide to aid decision making around the frequency of blood glucose and ketone testing and the quantity of strips that patients may require. This is general guidance and should be used alongside individual patient treatment plans, it does not replace specialist advice provided by the diabetes team. Advice on choice of blood glucose meters is available on the APC website, [Guidance for selecting blood glucose testing strips, lancets and needles](#).

Prior to initiating self-monitoring of blood glucose consider:

- Patients who self-monitor must receive adequate training that includes the purpose, interpretation and what actions are required depending on their readings
- Self-monitoring of blood glucose should always be part of a wider agreed management plan and take into account [DVLA advice for drivers](#).
- Short-term self-monitoring in patients who do not normally test their glucose may be useful to help understand blood glucose fluctuations over a period, and support treatment escalation as appropriate. It can also be a useful tool for patient education.
- Frequency of testing may need to increase on a short-term basis e.g. during periods of illness, or lifestyle changes. Prescribing of glucose test strips should be adjusted to support any increased short-term clinical need.
- NICE guidance states that if patients with diabetes are self-monitoring their blood glucose levels; a structured assessment should be carried out at least annually. The assessment should include:
  - the person's self-monitoring skills
  - the quality and frequency of testing (frequency can go up as well as down – address any inappropriate usage)
  - checking that the person knows how to interpret the blood glucose results and what action to take
  - the impact on the person's quality of life
  - the continued benefit to the person
  - the equipment used e.g. not to use strips past their expiry date

### Blood glucose monitoring: self-monitoring guidance for diabetes

Diabetes type, treatment group and medication	Frequency of blood glucose testing/rationale	Guide to quantity of blood glucose test strips needed
<b>Type 1 diabetes: insulin</b> Adults, children and young people (CYP)  <a href="#">NICE NG17</a> and <a href="#">NICE NG18</a>	Testing is essential for ALL patients. Most adults will need to monitor at least 4 times a day.  Children and young people should test at least 5 times a day.  Testing times should include pre-meals, before bed, when feeling hypoglycaemic, driving and around exercise.  See Type 1 diabetes box below for when increased frequency of testing is required and <a href="#">DVLA advice for drivers</a> .  Ketone monitoring also required (see ketone testing table below).	3-4 boxes (50 strips each) every month should be enough for most patients however access to test strips should not be restricted.
<b>Type 1 diabetes requiring insulin via a pump: continuous subcutaneous insulin infusion therapy (CSII or insulin pump)</b> Adults and CYP  <a href="#">NICE TA151</a>	Testing is essential for ALL patients. Most will need to monitor at least 5-6 times a day.  See Type 1 diabetes box below for when increased frequency of testing is required and <a href="#">DVLA advice for drivers</a> .  Ketone monitoring also required (see ketone testing table below).	3-4 boxes (50 strips each) every month should be enough for most patients however access to test strips should not be restricted.

<p><b>Type 1 diabetes general advice:</b> Situations that may require additional monitoring. Adults and CYP</p>	<p>Frequent testing, up to 10 times a day may be required in some circumstances:</p> <ul style="list-style-type: none"> <li>• Newly diagnosed patients</li> <li>• Children under 5 years</li> <li>• During periods of illness</li> <li>• Patients undertaking carbohydrate counting</li> <li>• Due to patient's lifestyle (e.g. driving for long periods of time (<a href="#">DVLA advice for drivers</a>), undertaking high-risk activity or occupation, travel).</li> <li>• HbA1c target not achieved</li> <li>• Impaired hypo awareness/ frequent hypos</li> <li>• Before, during and after sport</li> <li>• Lifestyle changes/ disruptions to routine</li> <li>• Pre-conception</li> <li>• Pregnancy and breastfeeding</li> </ul>	<p>5 boxes (50 strips each) every month should be enough for most patients however access to test strips should not be restricted.</p>
<p><b>Gestational diabetes</b> All women with diabetes planning a pregnancy, pregnant women with diabetes, gestational diabetes</p> <p>Metformin, sulfonylureas, insulin or diet</p> <p><a href="#">NICE NG3</a></p>	<p>Metformin, sulfonylureas or diet: testing frequency at least 4 times a day.</p> <p>Insulin: testing frequency 7-8 times a day.</p> <p>Testing should include a range of fasting and post-prandial blood glucose measurements e.g. should include a range of pre and post-meals, as well as before bed, when feeling hypoglycaemic, driving and around exercise.</p> <p>If Type 1 diabetes, then ketone monitoring also required (see ketone testing table below).</p>	<p>3-5 boxes (50 strips each) every month should be enough for most patients however access to test strips should not be restricted.</p>
<p><b>Type 2 diabetes (adults): Diet + exercise ONLY</b> Or <b>Type 2 diabetes (adults). Diet + exercise + certain medicines only:</b></p> <ul style="list-style-type: none"> <li>• Metformin</li> <li>• Pioglitazone</li> <li>• Gliptins (alogliptin, saxagliptin, sitagliptin)</li> <li>• Gliflozins (canagliflozin, dapagliflozin, empagliflozin)</li> <li>• Acarbose</li> <li>• GLP-1 receptor agonists (semaglutide, lixisenatide, dulaglutide, liraglutide)</li> </ul>	<p>No need for regular daily blood glucose testing. If patient wants to carry out self-testing, then they may choose to self-fund – it should not be routinely prescribed.</p> <p>There is no hypo risk with these medicines. Monitor glycaemia via HbA1c, check no more than once every 3 months.</p> <p>See 'Type 2 diabetes: clinical situations that may require additional monitoring' box below. If consultation indicates monitoring is required, then issue as an acute prescription.</p> <p>In some patient groups there may be a short term need to test two to four times a week (one test per day at different times of the day) e.g. newly diagnosed patients, symptomatic patients, changing clinical picture.</p>	<p>Nil</p> <p>1 box (50 strips each) every 2-4 months, issue as an acute prescription.</p>
<p><b>Type 2 diabetes (adults). Diet + exercise + certain medicines only:</b></p> <ul style="list-style-type: none"> <li>• Sulfonylureas (gliclazide, glipizide, tolbutamide)</li> <li>• Glinides (repaglinide)</li> <li>• Any of the above in conjunction with other therapies</li> </ul> <p><a href="#">NICE NG28</a></p>	<p>Patients need to test two to four times a week (one test per day at different times of the day) if at risk of hypoglycaemia, especially during illness/medication changes, checking for hypoglycaemia. See 'Type 2 diabetes: clinical situations that may require additional monitoring' box below.</p> <p>It is useful for patients to occasionally test four times daily, e.g. pre-meals and before bed to give a full blood glucose profile.</p> <p>Drivers should follow legal requirements for testing, <a href="#">DVLA advice for drivers</a>.</p>	<p>1 box (50 strips each) approx. every 2 months.</p> <p>Drivers may require additional quantity depending on type of license and driving activity.</p>

<p><b>Type 2 diabetes (adults). Diet + exercise + once daily insulin (with or without oral medicine):</b></p> <ul style="list-style-type: none"> <li>• Insulin degludec (Tresiba®)</li> <li>• Insulin detemir (Levemir®)</li> <li>• Insulin glargine (Semglee®, Lantus®)</li> <li>• Isophane insulin (Insulatard®, Humulin I®, Insuman Basal®)</li> </ul>	<p>Patients stabilised on insulin should regularly test once a day, (test at different times of the day). Newly initiated patients may require more intensive testing until insulin therapy is stabilised. See 'Type 2 diabetes: clinical situations that may require additional monitoring' box below.</p> <p>It is useful for patients to <b>occasionally</b> undertake 1-4 weeks of four times daily testing, e.g. pre-meals, before bed and when feeling hypoglycaemic to give a full blood glucose profile.</p> <p>Drivers should follow legal requirements for testing, <a href="#">DVLA advice for drivers</a>.</p>	<p>1-2 boxes (50 strips each) every 1-2 months</p> <p>Drivers may require additional quantity depending on type of license and driving activity.</p>
<p><b>Type 2 diabetes (adults). Diet + exercise + twice daily insulin (with or without oral medicine):</b></p> <ul style="list-style-type: none"> <li>• Insulin detemir (Levemir®)</li> <li>• Isophane insulin (Insulatard®, Humulin I®, Insuman Basal®)</li> <li>• Biphasic insulin (NovoMix® 30, Humalog® Mix 25/50, Humulin M3®, Insuman® Comb 15/25/50)</li> </ul>	<p>Patients stabilised on insulin should regularly test up to twice a day, (test at different times of the day). Newly initiated patients may require more intensive testing until insulin therapy is stabilised. See 'Type 2 diabetes: clinical situations that may require additional monitoring' box below.</p> <p>It is useful to occasionally undertake 1-4 weeks of four times daily testing, e.g. pre-meals, before bed and when feeling hypoglycaemic to give a full blood glucose profile.</p> <p>Drivers should follow legal requirements for testing, <a href="#">DVLA advice for drivers</a>.</p>	<p>1-2 boxes (50 strips each) every 1-2 months</p> <p>Drivers may require additional quantity depending on type of license and driving activity.</p>
<p><b>Type 2 diabetes (adults). Diet + exercise + multiple daily insulin (with or without oral medicine)</b></p>	<p>Patients should regularly test two to four times a day, (test at different times of the day). See 'Type 2 diabetes: clinical situations that may require additional monitoring' box below.</p> <p>It is useful to occasionally undertake 1-4 weeks of four times daily testing, e.g. pre-meals, before bed and when feeling hypoglycaemic to give a full blood glucose profile.</p> <p>Drivers should follow legal requirements for testing, <a href="#">DVLA advice for drivers</a>.</p>	<p>3-4 boxes (50 strips each) every month</p> <p>Drivers may require additional quantity depending on type of license and driving activity.</p>
<p><b>Type 2 diabetes (Children and Young People)<sup>1</sup></b></p>		
<p><b>Newly diagnosed type 2 diabetes, until metabolic control is achieved.</b></p>	<p>Patients should test before all meals (including a morning fasting blood glucose), 2 hours post-meals and at bedtime.</p>	<p>5 boxes (50 strips each) every month</p>
<p><b>After metabolic control is achieved: On oral agents only</b></p>	<p>Patient testing should be Individualised with a combination of pre and 2-hour post meal testing guided by their diabetes team.</p>	<p>Approx. 2 boxes every month</p>
<p><b>Single long-acting insulin only</b></p>	<p>Patients should test daily fasting/pre-breakfast blood glucose and three times a week should test 2 hours post meals.</p>	<p>2 boxes every month</p>
<p><b>Oral agent (e.g. metformin) plus a single injection of a long-acting insulin</b></p>	<p>Patients should test blood glucose twice daily (fasting and 2-hour post meals).</p>	<p>2 boxes every month</p>
<p><b>Multiple Daily Insulin (e.g. basal bolus regimen)</b></p>	<p>Patients should test blood glucose three times daily (before every meal) and at bedtime.</p>	<p>3 boxes every month</p>
	<p>Additional information for all CYP Type 2 diabetes patients:</p> <p>See 'Type 2 diabetes: clinical situations that may require additional monitoring' box below.</p> <p>Drivers should follow legal requirements for testing, <a href="#">DVLA advice for drivers</a>.</p>	<p>Drivers may require additional quantity depending on type of license and driving activity.</p>

<p><b>Type 2 diabetes general advice:</b> Situations that may require additional monitoring. Adults and CYP</p>	<p>Monitoring should be considered (additional monitoring if patient already testing) in the following circumstances:</p> <ul style="list-style-type: none"> <li>• Intercurrent illness</li> <li>• Newly initiated therapy</li> <li>• When therapy is changed or intensified</li> <li>• Increased risk of hypoglycaemia</li> <li>• If steroids are co-prescribed (midday, before evening meal and 2 hours after)</li> <li>• Patients with post prandial hyperglycaemia</li> <li>• Pre-conception</li> <li>• Lifestyle changes/disruptions to routine/fluctuating levels of activity</li> <li>• On percutaneous endoscopic gastrostomy (PEG) feed</li> </ul>
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Ketone monitoring: self-monitoring guidance for diabetes		
Diabetes type, and treatment group	Frequency of blood ketone testing/rationale	Guide to quantity of blood ketone test strips needed
<p><b>Type 1 diabetes</b> Adults, CYP and pregnancy</p>	<p>Testing should be carried out during periods of illness or hyperglycaemia.</p> <p>Ketone monitoring should be taught as part of 'sick day rules', patients should be taught to check ketones if they feel unwell or present with symptoms of hyperglycaemia.</p> <ul style="list-style-type: none"> <li>• Adults – best practice is to measure blood ketones, but ketones can also be measured in urine if appropriate/patient preference.</li> <li>• Children, young people, and pregnant women should measure blood ketones.</li> </ul>	<p>1 box of 10 strips, as needed. (NB. Reduced shelf life once box opened)</p>
<p><b>Type 2 diabetes</b> People at high risk of recurrent diabetic ketoacidosis (DKA) as identified by diabetes specialist service</p>	<p>Testing should be carried out during periods of illness or hyperglycaemia following specialist recommendation only.</p> <p>Recurrent DKA may warrant home ketone monitoring.</p> <p>Do not prescribe ketone strips solely for use by patient prescribed SGLT-2 inhibitors e.g. gliflozins, but if a patient on these agents presents unwell, blood ketone levels should be checked even if blood glucose levels are in normal range.</p>	<p>Not required routinely.</p>

Adapted, with thanks, from the Birmingham, Solihull and Sandwell (BSSE) health economy DMMAG (Diabetes Medicines Management Advisory Group) Blood Glucose Monitoring; Guidance on self-monitoring of glucose and ketones.

References:

1. Children and Young People's West Midlands Diabetes Network. Diagnosis and management of Type 2 Diabetes (T2DM) in Children and Young People (CYP): Clinical Practice Guideline. 1<sup>st</sup> Ed June 2019.