Guidelines for self-monitoring of blood glucose (SMBG) and ketones, and preferred formulary choices of blood glucose and ketone meters, test strips and lancets in adults, young people and children who have diabetes in Kent and Medway

The information in this document is correct to best intentions at the time of approval through governance routes. This document is for use within the NHS only and is not for commercial or marketing purposes. This document serves as guidance and to share best practice. This guidance does NOT override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

These guidelines are intended to assist healthcare professionals in the selection of appropriate blood glucose (and ketone) meters, test strips and lancets for, and in giving appropriate advice to, patients who need to self-monitor their blood glucose (SMBG). The recommendations are applicable to adults, young people, and children, with diabetes. This document supersedes existing guidelines that were in place across Kent and Medway for the prescribing of these devices. These guidelines do not include continuous glucose monitoring (CGM) devices or associated prescribing guidance - this document is available on the Kent and Medway formulary pages.

In April 2023, NHS England published "Commissioning recommendations following national assessment of blood glucose and ketone meters, testing strips and lancets". The commissioning recommendations separate blood glucose and ketone meters, test strips, and lancets into four categories:

Category	Patient Cohort	Explanation
1a	Type 1 diabetes or ketosis prone Type 2 diabetes	Meters and test strips which are suitable for most people that also require a ketone testing meter. (Most people with Type 1 diabetes (especially those at risk of DKA) need to have a meter with ketone testing functionality, even if they use continuous glucose monitoring (CGM). Also, during pregnancy, some women with diabetes may become ketone-prone and require such a meter. These meters can be initiated by a diabetes specialist).
1b		As per 1a, plus require additional functionality.
2	Type 2 diabetes	Meters and test strips which are suitable for most people with Type 2 diabetes. (These are suitable for most people with diabetes where only glucose monitoring is required).
3	Type 2 diabetes (additional functionality)	Meters and test strips which are suitable for people with Type 2 diabetes that require additional functionality. (As per NHS England, "additional functionality" includes features such as: on-board carbohydrate counting calculator, large display for visual impairment, and extra memory for Group 2 drivers). (E.g., some of these meters include carbohydrate counting and insulin bolus advisor functionality via a separate mobile phone app, which patients may find useful if they have been taught to adjust their insulin in response to their carbohydrate intake).
4	Type 1 and 2 diabetes	Lancets which are suitable for most people, and which are suitable for people that require additional functionality.

NHS Kent and Medway have developed a "preferred" local formulary for Kent and Medway for use across primary and secondary care, suitable for prescribing in the local health economy. Choice was based upon the commissioning recommendations set out in the NHS England document, the meters which have already been on the formularies across Kent and Medway to maintain familiarity, cost-effectiveness, clinical functionality, patient usability/convenience, and service available from the manufacturing company e.g., free device, education, technical advice provided.

All recommended devices, as a minimum, are compliant with the ISO Standard ISO 15197:2015, measure in mmol/l and provide plasma-calibrated meter readings only. All meters have a shelf-life ≥3 years. No coding or calibration of meters is required. All meters are smart phone compatible.

Please see **Table 1** below for the preferred formulary choices for blood glucose and ketone meters, test strips and lancets. Meters should be selected appropriate to patient needs and preferences, in conjunction with a diabetes specialist. Patient education should be provided on supplying the meter by competent clinical staff.

The preferred formulary choices for meters are recommended for use in Kent and Medway and are expected to be suitable for most patients, but it is down to patient/healthcare professional decision/choice if a different meter is desired/required and other non-preferred meters may be considered. **These meters, however, should be based on the NHS England commissioning guideline document.** Occasionally, for specific individuals, diabetes specialist services will initiate an alternative meter to meet specific patient needs and will need to inform the GP of this to support ongoing prescribing of consumables.

When a **non-preferred** meter is used, the choice of meter should, wherever possible, take into consideration the cost of test strips in relation to similar meters. Example situations where a non-preferred meter may be required (list not exhaustive):

- Where a voice meter is required, e.g., visual impairments, a voice meter from the NHS England list is recommended e.g. **On Call Extra Voice**. Talking meters have audio cues to assist patients with visual impairments to use the meter. These currently only measure blood glucose
- For a patient who needs support in another language then an appropriate meter can be prescribed from the NHS England document
- Patients on insulin pumps have a blood glucose testing meter integrated with the insulin pump so the appropriate test strip needs to be prescribed from the preferred meters list (they are therefore automatically excluded). If a patient is using an insulin pump, their meter should not be switched in primary care. Please refer to the specialist if any review is required. Meters synchronised to insulin pumps should only be as per specialist advice. If a patient is on an insulin pump that requires a specific meter, that is not listed as a Kent and Medway preferred formulary choice and is not listed in the NHS England document, then this meter should be continued. Meters compatible with insulin pumps will normally be provided by specialist centres, but the test strips can be prescribed in primary care. Please note these meters do not usually have ketone testing functionality so a category 1 meter may also be needed
- If a patient is on dialysis, the **Contour Plus Blue** meter can be used which has a large easy to read display and allows patients to retest after 30 seconds (second chance sampling)
- Paediatric patients should aim to use meters on the preferred formulary, but there may be exceptions where other meters and lancets may be needed, such as Accu-Chek Instant or FastClix lancets to aid their engagement with blood glucose monitoring.

Table 1: Preferred Kent and Medway formulary blood glucose and ketone meters, test strips and lancets. See notes below

Category and Patient Cohort	Recommended Blood Glucose Meter and Image of Meter	Key Features (Please see NHS England document for full list of features)	Blood Glucose Test Strips and Cost per Pack/50 (As per NHSBSA Drug Tariff 1st April 2023)	Ketone Test Strips and Cost per Pack/10 (If relevant/meter also tests ketones) (As per NHSBSA Drug Tariff 1st April 2023)
1a & 1b: Type 1 diabetes or ketosis prone Type 2 diabetes (All patient cohorts requiring **additional functionality**) (Meters that measure blood glucose levels **and blood ketones**)	GlucoFix Tech GK (A. Menarini Diagnostics) 	• **Connectivity:** QuickLink NFC, Bluetooth, and USB cable • **Applications:** GlucoLog Lite, GlucoLog Web & RapidCalc Bolus Advice App, Glooko and Diasend • **Warnings:** Hypo/Hyper alert up to six settable acoustic alarms (3 glucose alarms & 3 ketone alarms) • **Alerts:** Hypo & hyper alerts & four markers available • **Other features:** No coding needed, meal markers, extra-large memory, strip ejector, averages 1, 7, 14, 30, 60, 90 days • **Recommended cohorts:** Carbohydrate counting, cognitive impairment, dexterity, group 2 driver, learning difficulties, no fixed abode, unable to read English, visually impaired.	GlucoFix Tech Sensors Test Strips £5.95 per Pack/50 0.5µL sample size	GlucoFix Tech B-Ketone Sensors Test Strips £9.95 per Pack/10 0.8µL sample size
	GlucoRx HCT (GlucoRx) **(group 1a only)** 	• **Connectivity:** Smart phone connectivity to 'GlucoRx Voyager.' USB cable for free Windows software: 'GlucoRx HealthCare Management System' & 'GlucoRx Voyager.' GlucoRx meter and Voyager are integrated with (I) Apple Health app (II) 'Vision' • **Applications:** Diasend®/Glooko® and Eclipse Remote Platform (https://www.eclipselive.org) • **Warnings:** High & low results, ketone warning with glucose results ≥15mmol/L, high/low temperature, low battery • **Alerts:** Error messages for used test strip insertion, problem in operation, premature strip removal, insufficient blood volume • **Other features:** Auto QC tagging, day averages, discreet testing, haematocrit correction technology, meal markers, strip ejector, 4 alarms • **Recommended cohorts:** Dexterity issues, DVLA group 2 drivers, learning difficulties, no fixed abode, unable to read English, visually impaired, multiple language support.	GlucoRx HCT Glucose Test Strips £8.95 per Pack/50 1.0µl sample size	GlucoRx HCT Ketone Test Strips £9.95 per Pack/10 1.0µl sample size

Group 2: **Type 2 diabetes** Meters and strips which are suitable for the majority of people with Type 2 diabetes	GlucoFix Tech GK (A. Menarini Diagnostics) 	• **Connectivity:** QuickLink NFC, Bluetooth and dedicated USB cable • **Applications:** GlucoLog Lite, GlucoLog Web & RapidCalc Bolus Advice App, Glooko and Diasend • **Warnings:** Hypo/hyper alert up to six settable acoustic alarms (3 glucose alarms & 3 ketone alarms) • **Alerts:** Hypo & hyper alerts & four markers available • **Other features:** No coding needed, meal markers, extra-large memory, strip ejector, averages 1, 7, 14, 30, 60, 90 days.	GlucoFix Tech Sensors Test Strips £5.95 per Pack/50 0.5µL sample size	GlucoFix Tech B-Ketone Sensors Test Strips £9.95 per Pack/10 0.8µL sample size
	GlucoRx Q (GlucoRx) 	• **Connectivity:** Smart phone connectivity to free 'GlucoRx Voyager.' USB cable for free Windows software: 'GlucoRx HealthCare Management System' & 'GlucoRx Voyager.' GlucoRx meter and Voyager are integrated with (I) Apple Health app (II) 'Vision' • **Applications:** Diasend®/Glooko® and Eclipse Remote Platform (https://www.eclipselive.org) • **Warnings:** High & low results, high/low temperature, low battery • **Alerts:** Error messages for used test strip insertion, problem in operation, premature strip removal, insufficient blood volume • **Other features:** Alternative site testing, day averages, discreet testing, meal markers, 4 alarms	GlucoRx Q Test Strips £5.45 per Pack/50 0.7µl sample size	N/A
	Finetest Lite (Neon Diagnostics) 	• **Connectivity:** Bluetooth, USB cable & smart phone connectivity • **Applications:** Glooko Mobile App, Diasend Uploader, Finetest Lite App • **Warnings:** Inserting used strips, low blood volume, low battery, high/low temperature, operation issues. • **Alerts:** Hypo & hyper alerts, 3 meal markers, 5 programmable alarms • **Other features:** One-Step Bluetooth pairing, unlimited memory, auto strip ejector, easy to use buttons, no coding needed, programable average readings, alternate site testing.	Finetest Lite Test Strips £5.95 per Pack/50 0.5µL sample size	N/A
3: **Type 2 diabetes (additional functionality), and gestational diabetes** Eg o Cognitive	1st line recommendation in NHS England document: AgaMatrix Agile  (AgaMatrix)	• **Connectivity:** Bluetooth • **Applications:** AgaMatrix diabetes manager app, ALLY diabetes patient management system, GDm-Health, Diasend, Glooko, Apple Health, My mHealth, Social Diabetes • **Warnings:** Low/dead battery, temperature, faulty strip • **Alerts:** High & low level results • **Other features:** Auto-synchronisation, auto-detection of QC, fasting tag, simple pairing, kit contents: 10 strips, 10 lancets, 2 spare batteries, control solution.	AgaMatrix Agile Test Strips £5.99 per Pack/50 0.5µL sample size	N/A

<table>
<tr>
<td>Impairment
o Carbohydrate counting
o Dexterity
o Gestational diabetes requiring GDmHealth™ app compatibility
o Group 2 Driver
o Learning Difficulties
o No Fixed Abode
o Unable to read English
o Visually Impaired</td>
<td>2nd line recommendation in NHS England document: WaveSense JAZZ Wireless (AgaMatrix)
  </td>
<td>• Connectivity: Bluetooth
• Applications: AgaMatrix diabetes manager app, ALLY diabetes patient management system, GDm-Health, Diasend, Glooko, Apple Health, My mHealth, Social Diabetes
• Warnings: Faulty strip, low/dead battery, temperature
• Alerts: High & low results
• Other features: Auto-detection of QC, auto-synchronisation, simple pairing.</td>
<td>WaveSense JAZZ Test Strips

£8.74 per Pack/50

0.5µL sample size</td>
<td>N/A</td>
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<tr>
<td colspan="4">Paediatric patients - see notes above (situations where non-preferred meters may be required), and what the NHS England document recommends for type 2 paediatric patients:
<table>
<tr><th colspan="2">Type 2 diabetes Paediatrics</th></tr>
<tr><th>First Line</th><th>Second Line</th></tr>
<tr><td>Connect 2 Pharma – On Call Extra Mobile and On Call Extra Voice</td><td>GlucoRx – GlucoRx Nexus Blue</td></tr>
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Lancets and Lancing Devices

(Lancets which are suitable for most people, and which are suitable for people that require additional functionality)

Lancing devices are usually supplied free of charge with the meters. They cannot be prescribed on an FP10 prescription. Most single use lancets can fit several devices. General notes for lancing devices and lancets:

- The higher the gauge (G) of the lancet, the smaller the diameter of the needle. If a patient complains of pain with a higher gauge, then 33G should be recommended.
- Lancets of 0.28mm to 0.38mm costing less than £3.00 per 100 lancets are suitable for most patients. Ensure the quantities prescribed are in line with the frequency of testing.
- The lancets supplied with the preferred meters listed above generally meet this requirement, but please review for more cost-effective options. This includes: **GlucoRx Lancets (0.31mm/30G) £4.50 per 200 lancets *(preferred cost-effective lancets)*, Glucoject Lancets PLUS (0.2mm/33g) £3.77 per 100 lancets, AgaMatrix Ultra-Thin Lancets (0.2mm/33G and 0.35mm/28G) £5.43 per 200 lancets, Greenlan Lancets (0.35mm/28G) £3.00 per 100 lancets.**

Newly Diagnosed Patients with Diabetes

All patients newly diagnosed with diabetes should be assessed by a healthcare professional, and if self-monitoring of blood glucose (SMBG) is required, they should be supplied with a suitable meter that is listed in the preferred Kent and Medway formulary (Table 1). Training should be provided on the correct use, storage, and interpretation of readings by the issuing clinician.

Patients with Diabetes Already on Treatment

If patients already diagnosed with diabetes are already using blood glucose or ketone meters that are not listed in the preferred Kent and Medway formulary (Table 1), they should be offered an alternative meter at the earliest opportunity/review that is in the preferred list. Patients may use their existing meter until such a time when they and/or their diabetes specialist decide it is appropriate for them to change.

Patients should not be automatically swapped without discussing the change with them and making sure they have received appropriate training on the use of the new meter. Change should be discussed with patient/the patient should be contacted about the change and sent training/links/resources on how to use meter.

- It is important that any change in glucose testing equipment does not disrupt patients' pattern of blood glucose testing as advised by their diabetes specialist, who may also require downloading of data via software.
- When a patient is switched from their existing meter to a preferred formulary meter, they should be asked to use up their entire supply of test strips/lancets before ordering a supply of the new ones to minimise waste.
- When switching meters, the test strips and lancets for the old meter should be removed from the repeat prescription and placed in past medicines on the practice computer system.

Supply and Purchase of Meters

All recommended suppliers/manufacturers will provide the recommended meters, lancing devices, and ongoing free control solutions to all NHS organisations/healthcare settings (in primary care and secondary care) to issue to patients, and to service users/patients with diabetes, free of charge.

Clinics, practices, and other healthcare settings are advised not to keep stock of non-preferred meters for use within the local health economy.

There is no need for patients to purchase a meter, and in the absence of justifiable reasons, they should be dissuaded from doing so without first consulting their diabetes specialist. Patients should be made aware that test strips or lancets will not be prescribed on the NHS for a meter that has **not** been obtained from their healthcare professional(s) in line with the preferred list of meters.

Technical Support

All suppliers will provide free technical support via freephone telephone number, meter training and support material for both patients and healthcare professionals.

Please note that all concerns about meter/strip malfunctions or errors should be reported to the MHRA. They should also be reported via any local reporting systems.

Supplier Contact Information for preferred meters (see NHS England document for other meters)

Meter (and Supplier)	Contact Details
GlucoFix Tech GK (A. Menarini Diagnostics)	Sam Maylott National ICS & HB Manager Email: smaylott@menarinidiag.com Technical Support: www.glucomen.co.uk/glucofix-tech
GlucoRx Q (GlucoRx)	Chris Chapman Chief Operating Officer Email: chris@glucorx.co.uk Technical Support: www.glucorx.co.uk
Finetest Lite (Neon Diagnostics)	Mr Alan Wheeler Email: alan@neondiagnostics.co.uk Office: 0800 0093378 Technical Support: www.neondiagnostics.co.uk
AgaMatrix Agile and WaveSense JAZZ (AgaMatrix)	Mr Will Spencer Email: wspencer@agamatrix.com Technical Support: www.agamatrix.co.uk

Blood Glucose: Self-monitoring Guidance and Prescribing Blood Glucose Test Strips

SMBG is an integral part of diabetes management for many individuals. SMBG is particularly useful for those on medication that requires dose adjustments (such as insulin), those who have fluctuations in blood glucose levels or those at increased risk of hypoglycaemia either due to medication, co-morbidities, or other factors. This guideline aims to provide guidance to support the optimal use of SMBG.

Points to Consider When Initiating Self-monitoring of Blood Glucose

- Clinicians should ensure that they promote equality for all patients when following this guidance
- Patients who self-monitor (and/or their carers) should be provided with the knowledge and skills to support them to incorporate SMBG and therapy adjustments into their diabetes care plan to attain agreed goals
- Patients must be given adequate training and support from appropriately trained/competent healthcare professionals around the purpose, interpretation, and actions to take with the meter readings
- Self-monitoring of blood glucose should always be an integral part of a wider agreed management plan and consider guidance from the Driver and Vehicle Licensing Agency (DVLA).
    - o The DVLA has guidance on SMBG requirements for individuals with diabetes. Healthcare professionals offering SMBG to patients who drive and are at risk of hypoglycaemia must consult the mandatory DVLA guidance and advise the patient. Please check the DVLA website for the most up to date information/guidance.
    - Assessing fitness to drive: a guide for medical professionals
    - Diabetes mellitus: assessing fitness to drive
    - Diabetes and driving

• Ensure the patient fits the relevant NICE criteria for self-monitoring of blood glucose. Do not routinely offer self-monitoring of blood glucose levels for adults with type 2 diabetes **unless** (as per NICE NG28, 2022):

- o the patient is on insulin
- o there is evidence of hypoglycaemic episodes
- o the patient is on oral medication that may increase their risk of hypoglycaemia while driving or operating machinery
- o the patient is pregnant or is planning to become pregnant. For more information, see the NICE guideline on diabetes in pregnancy.

See NICE guidelines NG28, NG17 and NG18 for further information on blood glucose testing in these populations, and for information on what structured assessments, which should be carried out at least annually, should include if patients with diabetes are self-monitoring their blood glucose levels.

• The quantity of test strips prescribed should match the expected need (see guide on next page). Both over- and under-prescribing should be avoided.

Blood Glucose Test Strip Guide Quantities to Prescribe

The quantity of test strips prescribed should match the expected need. Both over- and under-prescribing should be avoided. Patients should be reminded that if they are also using CGM devices to ensure that in date test strips are kept as back-up, in case of CGM failure or other reasons (e.g., readings from CGM not matching symptoms). (Please note, this is general advice and does not replace specialist input or override individual clinical needs. The suggested testing frequency below is only a guide; there may be situations where people may require testing more or less frequently depending on their individual needs and guidance from their specialist team. For example, more frequent testing would be required if hypoglycaemia is a concern or if the individual is experiencing hypoglycaemia.)

Diabetes Type	Treatment Group	Medication	Testing Frequency with blood glucose test strips	Rationale	Prescriptions requirements per month (or as specified)
Type 1 diabetes (see NICE NG17 adults, and NG18 for children and young people)	All people with Type 1 diabetes should be offered real-time (rt) or intermittently scanned (is) continuous glucose monitoring (CGM). Blood glucose testing should be offered as a back-up in case of CGM device failure, to confirm symptoms of hypoglycaemia, to support device calibration, or as an option for patients who decline CGM.	**Insulin injections**	**Not on CGM:** Adults should test ≥ 4 times a day, incl. before each meal and before bed. Children/ young people should test ≥ 5 times a day **On CGM:** 1-2 times a day in addition to scanning glucose levels >8 times, where needed	• SMBG is an integral part of treatment to avoid hypoglycaemia and manage hyperglycaemia • Patients should be taught to monitor blood glucose and these should be reviewed annually • Increase frequency during periods of illness; before, during and after sport; if frequency of hypoglycaemia increases; before/during pregnancy/breastfeeding; where glucose levels are changing rapidly on CGM or otherwise needed • Follow legal requirements for testing e.g., DVLA	**3-4 boxes (150 -200 strips) for people not on CGM** **1-2 boxes every 1-2 months (50-100 strips) for people on CGM. If on CGM offer this on a "variable use repeat" on EMIS**
Continuous subcutaneous insulin infusion therapy (CSII)	People with Type I diabetes requiring an CSII (or 'insulin pump') in line with NICE TA151, who are not on a closed loop system using CGM	**Insulin via a pump**	At least 4– 6 times per day.	• More frequent monitoring required is during establishment of therapy and times of illness. • CGM can be used to monitor glucose level prior to driving (except for lorry and bus drivers) unless experiencing symptoms of hypoglycaemia or glucose level is ≤ 4.0 mmol/l. • For people on CGM, finger prick testing is required to confirm hypo symptoms, calibrate the CGM device or as a back-up in case of device failure (SMBG is required in case of pump malfunction/failure until the pump device is replaced). Seek specialist advice if needed • Follow legal requirements for testing e.g., DVLA	**3-4 boxes (150 -200 strips) for people not on CGM** **1-2 boxes every 1-2 months (50-100 strips) for people on insulin pump + CGM. If on CGM offer this on a "variable use repeat" on EMIS**
Intensive management or loss of	Frequent testing essential in newly diagnosed; children under 5 years; acutely unwell; carbohydrate counting; due to a patient's lifestyle (for example, driving for a long period		More than 10 tests daily	Seek specialist advice. A management plan should be developed and agreed with the individual. Many of these patient groups (e.g., hypo unawareness) should be offered continuous glucose monitoring with blood glucose testing as a back-up.	**5 boxes (250 strips) for people not on CGM** **1-2 boxes every 1-2 months (50-100 strips) for people on CGM. N.B. some CGM devices not**

hypoglycaemia awareness	of time, undertaking high-risk activity or occupation, travel) and not on CGM.				**licensed for young children. If on CGM offer this on a "variable use repeat" on EMIS**	
Diabetes in pregnancy (see NICE NG3)	Preconception, pregnant women with pre-existing diabetes, gestational diabetes.	**Metformin, sulfonylurea, insulin, or diet**	Metformin/SU, 1 insulin injection per day or diet: test at least 4 times a day. On 2 or more insulin doses a day: test 7-8 times a day	**All** pregnant women should test **min. 4 times a day** to include both fasting and post-prandial readings. Women who are using CGM will not need frequent finger prick testing so will require fewer strips. Review quantities of strips after delivery.	**2 - 5 boxes (100 -250 strips)** **1-2 boxes every 1-2 months (50-100 strips) for people on CGM. If on CGM offer this on a "variable use repeat" on EMIS**	
Type 2 diabetes (see NICE NG28)	Diet & exercise alone with/without: Metformin, SGLT-2 inhibitor, pioglitazone, DPP4 inhibitor, GLP-1 mimetic (or any combination of these)		**SMBG not routinely recommended as part of routine care.**	• No hypo risk, monitor glycaemia via HbA1c • Motivated patients may wish to monitor effects of changes in diet/exercise (up to once a day, 2-4 times a week is sufficient) or if on steroids/unwell	**Issued only as clinically required with patient education**	
	Sulphonylureas or glinides, alone or in conjunction with other therapies		2-4 times per day, when starting/changing dose. Once stable, test 2-4 times per week	• Monitoring can help titrate treatment and reveal or refute hypoglycaemia. Review medication. • Testing frequency can increase e.g., whilst fasting • **Follow legal requirements for testing e.g., DVLA**	**1 box (50 strips) every 2 months or as per agreed management plan**	
	Insulin therapy with/without oral hypoglycaemic agents Intermittently scanned CGM (also known as 'flash glucose monitoring') can be offered to some cohorts of patients with type 2 diabetes on multiple daily insulin (only when agreed local policy changes)	**Once daily insulin**	1-4 times a day, once stable 2-3 times a week	• Test more often when starting or changing treatment, when unwell or diabetes is unstable. • Readings should be taken as per specialist advice for people on intensive regimes • Assess patient understanding and use of results to adjust lifestyle and treatment • Follow legal requirements for testing e.g., DVLA • isCGM should be offered in line with NICE guidance but these patients may need to maintain finger prick testing as a back-up or to confirm symptoms	1-2 times daily testing	**1-2 boxes (50-100 strips) every 1-2 months**
		Twice daily insulin	2-4 times a day, once stable 2-3 times a week		>Twice daily testing	**3-4 boxes (150 -200 strips) for people not on CGM** **1-2 boxes every 1- 2 months (50-100 strips) for people on isCGM. If on CGM offer this on a "variable use repeat" on EMIS**
		More than twice daily insulin	At least 4 times a day			

Ketones: Self-monitoring Guidance and Prescribing Blood Ketone Test Strips

People with type 1 diabetes are at risk of diabetic ketoacidosis (DKA) and are therefore advised to test their ketone levels when unwell. Ketone self-monitoring, using ketone meters, for prevention of DKA should be taught as part of 'sick-day rules' to facilitate self-management of an episode of hyperglycaemia. Advise patients with type 1 diabetes to check their ketones if they are feeling unwell or present with symptoms of hyperglycaemia (see NICE NG17 for adults and NG18 for children and young people, and NG3 for diabetes in pregnancy):

- o Adults can measure ketones in either blood or urine. Current best practice is to measure **blood ketones**
- o Children, young people, and pregnant women (or women with Type 1 diabetes who are planning on becoming pregnant) should measure blood ketones (offer appropriate meter)

Please be aware that people taking an SGLT2i, and children and young people taking insulin for diabetes may develop DKA with normal blood glucose levels.

Please remind patients not to use strips after their expiry date, which may be reduced once the pack is opened. Quantities prescribed should be appropriate to avoid wastage (see "Ketone test strip quantities to prescribe" below). If large quantities are being requested, review diabetes control and discuss appropriate use with patient. **Please note that ketone test strips come in packs of 10. Please prescribe quantities that are suitable.**

When patients require a ketone meter, and are started on/switched to a meter which tests ketones from the preferred formulary list, patient education and training should be provided on initiating/supplying the meter and ketone test strips by competent clinical staff which should include:

- When and how to use the ketone meter and ketone test strips
- How to interpret the results and knowing action to take should they have high ketone levels
- How to store ketone strips and being aware of expiry dates
- Reiterating the sick day rules.

The trend diabetes Competency framework for diabetic nursing statement 6.5 and 6.6 may be appropriate competency criteria for diabetes specialist nurses.

The Trend UK leaflet "Type 1 Diabetes: What to do when you are ill" and "Type 2 Diabetes: What to do when you are ill" may be useful to give to/discuss with patients.

Educational programmes are vital for people with diabetes, particularly concerning what to do in cases of illness. Please consider referral if appropriate to a local type 1 diabetes education programme if the patient has not attended a course previously.

Please teach patients to interpret **blood ketone** results as follows, as per NHS on diabetic ketoacidosis (DKA):

	Ketone Level	
Green	<0.6mmol/L	Normal reading
Amber	0.6-1.5mmol/L	Slightly increased risk of DKA. Extra insulin is required. Follow advise from diabetes team. Re-test in 2 hours
Red	1.6-2.9mmol/L	Increased risk of DKA. Contact diabetes team or GP as soon as possible
WARNING	≥3mmol/L (Or urine ketone of 2+ or greater)	Very high risk of DKA. Seek medical help immediately. Medical emergency

Patients who develop ketosis may need to test every 2 hours, depending on ketone levels, until blood ketones return to a satisfactory level.

Ketone Test Strip Quantities to Prescribe

Diabetes Type	Treatment Group	Medication	Testing Frequency	Rationale	Prescriptions requirements (as advised by specialists)
Type 1 diabetes	Adults Children & young people Pregnancy	Insulin	During periods of illness or hyperglycaemia	• Ketone testing is required to facilitate self-management. • Adults can monitor blood or urine ketones. Children/young people and pregnant women should only measure blood ketones, using the appropriate meter.	Minimum of 1 box of 10 strips, as needed. For children & young people, more ketone test strips may be required - consider 2 boxes of 10 strips when required. **(Please note reduced shelf life once box opened)**
Type 2 diabetes	People at high risk of recurrent diabetic ketoacidosis (DKA) as identified by the diabetes specialist service		During periods of illness or hyperglycaemia following **specialist recommendation only**	• Recurrent DKA may warrant home ketone monitoring. • Do not issue ketone strips solely for use by patients prescribed an SGLT-2 inhibitor, but if a patient on one of these agents presents unwell, their blood ketone levels should be checked by a healthcare professional even if blood glucose levels are in the normal range.	Not required routinely

(Please note - ketone testing for paediatric patients can be more frequent in the initial period following diagnosis whilst optimising insulin treatment and glucose control. Ensure patients are prescribed an appropriate supply of ketone test strips. Use of ketone strips during pregnancy may also be high).

It is recommended that strips are prescribed to allow patients to maintain a supply of one box in the home. Patients must take responsibility for ensuring a replacement box is supplied before their current strips expire.

Acknowledgements

Based on, with thanks, guidelines developed by:

- NHS England: Commissioning recommendations following the national assessment of blood glucose and ketone meters, testing strips and lancets
- Diabetes Medicines Management Advisory Group (DMMAG) for Birmingham and Solihull Integrated Medicines Optimisation Committee (BSol IMOC) (formerly BSSE APC): Guidelines for self-monitoring of blood glucose and meter choice in adults and children
- South East London Integrated Medicines Optimisation Committee: Self-monitoring of Blood Glucose (SMBG) in Adults and Young People – Frequency of Monitoring Guidance