Guidance and formulary for blood glucose and ketone meters, testing strips and lancets for adults, children and young people.

Author(s) (name and post):	Claire Hand, Lead Medicines Optimisation Pharmacy Technician
Version No.:	Version 2
Approval Date:	11/10/2023
Review Date:	11/10/2025

Contents

1 Introduction

This guidance has been updated following input from adult and paediatric specialist diabetes services, community specialist diabetes services, midwifery and people living with diabetes. It is an update to the previous 2020 guidance 'Adult Guidance for the supply of blood glucose and ketone meters, test strips and lancets in Primary care' [1] and provides choices for meters based on the NHS England Commissioning Recommendations following national assessment of blood glucose and ketone meters, testing strips and lancets, April 2023. [2]

The national assessment was conducted following a detailed evaluation process that considered both quality and cost using a national specification, which was developed alongside various stakeholders, including diabetes specialist nurses, consultant physicians, diabetes pharmacists and people living with diabetes.

Meters from the national recommendations were reviewed locally by diabetes specialist nurses, consultant physicians, primary care clinicians, and people living with diabetes and following discussion with stakeholder's including diabetes midwifery, formulary choices were agreed. Choices were kept to a limited but varied range to facilitate prescriber familiarity and ensure sufficient choice for individual preference.

Updates within this guidance:

- Changes to first line meters for both Type 1 and Type 2 diabetes
- Updated criteria for use of FreeStyle Optium Test Strips with FreeStyle Libre 2
- Lancet recommendations for all devices
- Addition of information on Dexcom One real-time Continuous Glucose Monitoring device
- Strip recommendations for people using insulin pumps and compatible meters

2 Key Practice Points

General

- Testing should form part of a wider program of management where the results are used to inform diet, lifestyle or treatment changes and conform with DVLA requirements where appropriate [3, 4].
- Ensure patients fit NICE criteria for self-monitoring of blood glucose in type 2 diabetes [5]:
    - Using insulin
    - Evidence of hypoglycaemic episodes
    - Take oral medication that may increase their risk of hypoglycaemia when driving or operating machinery
    - Pregnant or is planning to become pregnant
- Patients who self-monitor must be given adequate training in self-monitoring techniques as this is one of the leading causes for erroneous results.

- Patients and health care professionals should be clear about what they hope to achieve by testing, including interpretation and any action to take with out-of-range readings.
- For patients that self-test, an assessment of self-monitoring of blood glucose should be undertaken with each annual review. Competence, need, frequency and any excess use should be addressed.

Supply of meters

- Meters can be obtained free of charge from manufacturers by all GP surgeries or specialist diabetes clinics, to issue *free* to patients. There is no need for any person with diabetes to purchase a meter.
- Patients should be dissuaded from buying their own meter without consulting their GP, practice nurse or diabetes specialist first.
- Prescribing of test strips and lancets for off-formulary meters purchased by a patient will not be supported.
- Clinics and practices are advised not to accept stock of non-formulary meters from manufacturers for distribution within the local health economy.

Existing patients on non-formulary blood glucose meters

- If a patient has had their existing meter for more than 18 months, consider a review and switch to a formulary approved meter, with patient consent.
- If there are clinical concerns or supply issues with a patient's current meter, it is recommended that the patient is reviewed and offered a formulary-approved meter – specialist input may be required to facilitate this.
- Avoid "bulk switching" of glucose meters without patient involvement/consent.
- Patients switching meters should be switched to a meter with the same functionality as the old meter with regards to blood glucose and ketone testing (if appropriate).
- The formulary meters are expected to be suitable for the majority of patients but it is recognised that some patients may have individual needs and may require an alternative choice. This requires discussion with a member of the diabetes specialist team.
- If a patient is using an insulin pump, specialist CGM, insulin correction doses or is carbohydrate counting, their meter should not be switched without referral or discussion with a member of the diabetes specialist team.

Users of FreeStyle Libre 2 system or Dexcom ONE

- Most patients using the FreeStyle Libre 2 system use the FreeStyle LibreLink app on a mobile phone to manage their diabetes control. These patients should be provided with a formulary glucose meter as a back-up to the system, and to use where clinically indicated. Readers are available for patients who do not have a mobile phone that is compatible with the app.
- If the patient is using the Libre 2 reader to calculate insulin doses via the bolus advisor, they can be prescribed FreeStyle Optium Glucose Test Strips and FreeStyle Optium β-Ketone Test Strips, if needed, which insert into the Libre 2 reader to

enable blood glucose and ketone readings. In all other circumstances a separate formulary meter will be required.

- Most patients using the Dexcom ONE system use the Dexcom ONE app on a mobile phone to manage their diabetes control. These patients should be provided with a formulary glucose meter as a back-up to the system, and to use where clinically indicated. Receivers are available for patients who do not have a mobile phone that is compatible with the app, however a separate formulary meter will still be required.

Issuing new blood glucose meters

- All new patients starting to self-monitor their blood glucose should be issued a formulary meter. A formulary meter should also be used whenever offering a replacement meter.

Supply of lancets

- There are a range of universal-fit different sized lancets available on prescription at a cost of <£3 per 100 lancets, that fit most of the standard lancing devices.
- If the brand of lancets supplied with the formulary meter is cost-effective it may be prescribed. However, if the lancet brand costs >£3 per 100 lancets, prescribe our preferred universal fit lancet; AgaMatrix ultrathin lancet 0.35mm/28gauge.
- People currently prescribed our preferred universal fit lancet; AgaMatrix ultrathin lancet 0.35mm/28gauge may continue to use this brand if they wish.
- The higher the gauge (G) of lancet, the smaller the diameter of the lancet needle.
- Lancets are for single use only; patients should be provided with adequate sharps-disposal bins.
- Multi-device lancets and their lancing device e.g. FastClix drum should be restricted to those with a specific need e.g. those with dexterity problems, needle phobia, or visual impairments. Sharps bins do not need to be issued to patients using FastClix devices and not using injectable treatments. Note: This should only be a small cohort of patients due to increased access to CGM.

3 Summary of meters on formulary

Patient specific consideration

Meter Name	Compatible test strips and price (Drug Tariff, Aug 23)	Compatible Lancets
Category 1 – T1DM, blood glucose and ketone testing		
GlucoFix Tech GK (Menarini)	GlucoFix Tech Sensors Test Strips (glucose, £5.95 for 50) GlucoFix Tech β-Ketone Sensor (ketones, £9.95 for 10 – none supplied with meter, prescribe separately)	Glucoject Lancets PLUS (Menarini) 0.2mm/33G (£5.50 for 200) or universal fit AgaMatrix Ultra-Thin lancets (£5.43 for 200)
CareSens Dual (Spirit)	CareSens Pro (glucose, £9.95 for 50) KetoSens (ketones, £9.95 for 10)	CareSens (Spirit) 0.31mm/30G or 0.36mm/28G (£2.95 for 100) or universal fit AgaMatrix Ultra-Thin lancets (£5.43 for 200)
Category 2 – T2DM, blood glucose testing		
GlucoFix Tech GK (Menarini)	GlucoFix Tech Sensors Test Strips (glucose, £5.95 for 50)	Glucoject Lancets PLUS (Menarini) 0.2mm/33G (£5.50 for 200) or universal fit AgaMatrix Ultra-Thin lancets (£5.43 for 200)
Contour Plus Blue (Ascensia)	Contour Plus (glucose, £5.95 for 50)	Microlet (Ascensia) 0.5mm/28G (£2.99 for 100) or universal fit AgaMatrix Ultra-Thin lancets (£5.43 for 200)
Category 3 – Blood glucose testing with additional functionality		
Gestational diabetes WaveSense JAZZ *WIRELESS* (AgaMatrix)	WaveSense JAZZ test strips (glucose, £8.74 for 50)	AgaMatrix Ultra-Thin lancets (£5.43 for 200)
Reserve – supply chain issues Tee2+ (Spirit) or any other cost-effective, suitable meter featured in NHS England Commissioning recommendations	***Only use in case of supply chain issues with other formulary meters*** TEE2 (glucose, £7.75 for 50) or other compatible test strips with chosen meter from recommendations	CareSens (Spirit) 0.31mm/30G or 0.36mm/28G (£2.95 for 100) or universal fit AgaMatrix Ultra-Thin lancets (£5.43 for 200)
Dyscalculia Contour Plus Blue (Ascensia)	Contour Plus (glucose, £5.95 for 50)	Microlet (Ascensia) 0.5mm/28G (£2.99 for 100) or universal fit AgaMatrix Ultra-Thin lancets (£5.43 for 200)
Talking meter with audio cues (suitable for paediatrics with type 2 diabetes) On Call Extra Voice (Connect 2 Pharma)	On Call Extra Test Strips (glucose, £5.20 for 50) *PIP code:4152997*	On Call (Connect 2 Pharmacy) 30G (£2.75 for 100) or universal fit AgaMatrix Ultra-Thin lancets (£5.43 for 200)
Category 4 – Specialist Pump Meters		
Insulin pump Combo (Accu-chek)	***Regular calibrations required – do not reduce number of test strips when using CGM with this pump*** Aviva Test Strips (glucose, £16.61 for 50)	FastClix (Roche) 0.3mm/30G (£5.90 for 200)
Insulin pump Medtronic 640G, 670G, 770G	***Regular calibrations required – do not reduce number of test strips when using CGM with this pump*** Contour Next test strips (glucose, £15.82 for 50)	Microlet (Ascensia) 0.5mm/28G (£2.99 for 100)
Insulin pump Medtronic 780G	Accu-chek Guide Link (glucose, £16.21 for 50)	FastClix (Roche Diabetes Care Ltd) 0.3mm/30G (£5.90 for 204)

4 Summary of formulary meters features and specification

	Category 1 – T1DM, blood glucose and ketone testing		Category 2 – T2DM, blood glucose testing		Category 3 – Blood glucose testing with additional functionality		
					Gestational	Reserve	Talking meter
Name of meter	GlucoFix Tech GK	CareSens Dual	GlucoFix Tech GK	Contour Plus Blue	WaveSense JAZZ *WIRELESS*	*Tee 2 +*	On Call Extra Voice
Image							
Glucose test strips & quantity supplied with meter (Expiry once open)	Glucofix tech glucose, x 10 with meter (12 months from opening)	CareSens Pro, x 10 with meter (2 years from manufacture)	Glucofix tech glucose, x 10 with meter (12 months from opening)	Contour Plus x 5, more available on request (2 years from manufacture)	WaveSense JAZZ x 25 with meter (expiry 6 months)	TEE2 x 10 with meter (expiry 2 years from manufacture)	On Call Extra x 10 with meter (expiry 6 months)
Lancets supplied with meter and quantity	Glucoject x 10 with meter	CareSens Lancets x 10 with meter	Glucoject x 10 with meter	Microlet Lancets x 5 with meter. More available on request.	AgaMatrix Ultra-Thin lancets x 30 with meter	CareSens Lancets x 10 with meter	OnCall Lancets x 10 with meter
Ketone test strips (expiry once open)	Glucofix tech Ketone – 12 months (No strips supplied with meter - needs to be prescribed separately)	Yes, KetoSens test strips, x2 with meter (18 months from manufacture)	N/A	N/A	N/A	N/A	N/A
Ability to download results	Yes - QuickLink NFC, Bluetooth and dedicated USB cable	Yes - Bluetooth and USB/Smartphone	Yes - QuickLink NFC, Bluetooth and dedicated USB cable	Yes - Bluetooth, USB Cable, Smart phone connectivity	Yes - Bluetooth	Yes - Bluetooth and USB	Yes - USB download capability
Supported by smart phone application ('app') as stated by manufacturer	GlucoLog Lite, GlucoLog Web & RapidCalc Bolus Advice App, Glooko formerly Diasend (iOS and Android)	Smart Log, Hedia, Glooko formerly Diasend (iOS and Android)	GlucoLog Lite, GlucoLog Web & RapidCalc Bolus Advice App, Glooko formerly Diasend (iOS and Android)	Contour Diabetes App, Glooko formerly Diasend, (iOS and Android) Tidepool and Diabetes My Way	AgaMatrix diabetes manager app ALLY, GDm-Health, Apple Health, Glooko formerly Diasend, My mHealth, Social Diabetes	SmartLog app (iOS & Android).	On Call Diabetes Management Software
Suitable for visually impaired	Yes - extra-large top lit screen	Yes – large clear display with white characters on black background	Yes - extra-large top lit screen	Yes - large screen with visual colour cues on meter (Green, Red and Amber)	Yes – small screen with white characters on black background	Yes – large display	Yes - large meter/ display, audio descriptions guide user through testing, high contrast strip port
Suitable for individuals with dexterity problems	Yes - wide strip, large port and ejector button	Yes	Yes - wide strip, large port and ejector button	Yes	Yes, although meter is small relative to other meters	Yes	Yes - test strip ejector, easy press buttons
Suitable in pregnancy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Patient/clinician helpline, or to order supplies	0800 243667 myglucomen@menarinidiag.com	0800 881 5423 info@spirit-healthcare.co.uk	0800 243667 myglucomen@menarinidiag.com	0345 600 6030 diabetessupport@ascensia.com	0800 093 1812 customercare@agamatrix.co.uk	0800 881 5423 info@spirit-healthcare.co.uk	020 8651 0361 info@OnCallMeters.co.uk

5 Guidance regarding frequency of blood glucose testing and quantities to supply on repeat prescription

Diabetes Type	Treatment Group	Medication	Testing Frequency with blood glucose test strips	Rationale	Guide to prescription 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	• 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 box (50 strips) every 1 - 3 months for people on CGM**
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**	Not on CGM 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. 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 box (50 strips) every 1 - 3 months for people on insulin pump + CGM or as per agreed management plan**
Diabetes in pregnancy (see NICE NG3)	Preconception, pregnant women with pre-existing diabetes, gestational diabetes. All pregnant women with Type 1 diabetes should be offered CGM. CGM should be considered for some cohorts of pregnant women with insulin-treated diabetes (see NICE/local guidelines)	**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 box (50 strips) every 1 - 3 months for people on CGM**

Diabetes Type	Treatment Group	Medication	Testing Frequency with blood glucose test strips	Rationale	Guide to prescriptions requirements per month (or as specified)
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, 24 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		Periodic testing to meet needs at that time, or 1-2 tests daily, varying times inc pre- and 2 hours post meal, or 4 tests per day x 2 days 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 1 - 2 months or as per agreed management plan**
	Insulin therapy with/without oral hypoglycaemic agents. CGM can be offered to some cohorts of patients with type 2 diabetes on multiple daily insulin (see NICE/local guidelines)		Up to 4 tests per day each day including pre- and 2 hours post-meal depending on insulin regimen	• 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 • CGM 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 - 3 boxes (50 -150 strips) every 1 – 2 months for people not on CGM** **1 box (50 strips) every 1 - 3 months for people on CGM**

6 Ketones: self-monitoring guidance and strip quantities to prescribe

- Ketone monitoring should be taught as part of 'sick-day rules' to facilitate self-management of an episode of hyperglycaemia to prevent diabetic ketoacidosis (DKA) from developing.
- Advise patients with type 1 diabetes to check their ketones if they are feeling unwell or present with symptoms of hyperglycaemia (see CKS NICE guidance)
- Adults can measure ketones in either blood or urine. Current best practice is to measure blood ketones.
- Children, young people, and pregnant women should measure blood ketones (offer appropriate meter).
- Be aware that people taking an SGLT2i, and children and young people taking insulin for diabetes may develop DKA with normal blood glucose levels.
- 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 guidance below). If large quantities are being requested, review diabetes control and discuss appropriate use with patients.

Ketones: self-monitoring guidance and strip quantities to prescribe					
Diabetes Type	**Treatment Group**	**Medication**	**Testing Frequency with blood glucose test strips**	**Rationale**	**Prescriptions requirements per month (or as specified)**
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 (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 recommendations 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 even if blood glucose levels are in the normal range.	Not required routinely

Irrespective of glucose readings or diabetes treatments used, if the individual is acutely unwell the healthcare professional should test blood ketones.

If the individual is ketotic (> 0.6 mmol/L), consider admission to hospital for assessment:

- ✓ At diagnosis of diabetes
- ✓ In any person with diabetes who is acutely unwell, irrespective of the glucose level, as part of sick day management
- ✓ In people with diabetes with severe nausea/vomiting
- ✓ In acidosis and if there is a history of alcohol excess
- ✓ When screening for euglycaemic diabetic ketoacidosis, e.g. in people prescribed SGLT2i ('gliflozins').
- ❖ **Pregnant women who have diabetes and who are unwell or vomiting irrespective of glucose level should be admitted to hospital for emergency assessment if they have ketones.**
- ❖ **The ketone level determines what action needs to be taken.**

For more information on interpreting blood ketone and blood glucose levels and managing diabetes during illness please refer to the TREND Diabetes guidance on Managing Diabetes During Intercurrent Illness guidance.

7 References

1 Shropshire, Telford and Wrekin Clinical Commissioning Group, Adult Guidance for the supply of blood glucose and ketone meters, test strips and lancets in Primary care, May 2020 https://www.shropshiretelfordandwrekin.nhs.uk/wp-content/uploads/STWCCG-and-TRUST-Guide-for-Meter-Prescribing-in-Primary-Care-ADULTS-Feb-2022.pdf (Accessed 17/08/2023)

2 Commissioning recommendations following the national assessment of blood glucose and ketone meters, testing strips and lancets, Version 1, 11 April 2023. Available from https://www.england.nhs.uk/wp-content/uploads/2023/04/PRN00037-commissioning-recommendations-blood-glucose-and-ketone-meters-testing-strips-and-lancets-april-23.pdf (Accessed 17/08/2023)

3 Driver and Vehicle Licensing Agency. Diabetes mellitus: assessing fitness to drive (Guidance). March 2016 (updated June 2022). Available from https://www.gov.uk/guidance/diabetes-mellitus-assessing-fitness-to-drive#diabetes-mellitus (Accessed 17/08/2023)

4 TREND UK. Diabetes: Safe Driving and the DVLA. May 2019. Available from https://trenddiabetes.online/wp-content/uploads/2019/05/A5_Driving_TREND.pdf (Accessed 17/08/2023)

5 NICE. Type 2 diabetes in adults: management. NG 28. 2015 (updated June 2022). Available from https://www.nice.org.uk/guidance/ng28/chapter/1-Recommendations#blood-glucose-management-2 (accessed 17/08/2023

6 TREND UK. Managing Diabetes During Intercurrent Illness. 2022. Available from https://trenddiabetes.online/wp-content/uploads/2022/04/HCP_Illness_TREND_2022.pdf (Accessed 18/10/2023)

7 TREND UK. Monitoring in Adult Diabetes: Glucose and Ketones. July 2020. Available from https://trenddiabetes.online/portfolio/monitoring-in-adult-diabetes-glucose-and-ketones/ (Accessed 27/09/2023)