# DIABETES – MONITORING GLYCAEMIC CONTROL

The North West London health and care partnership

## KEY PRINCIPLES OF PRACTICE

- 95% of the care people with Diabetes receive is self-care and all people should have access to high quality structured education programmes e.g. X-PERT, DESMOND, conversation maps
- The ability to monitor their own glucose level gives people with Diabetes the feedback they need in order to learn how to manage their condition optimally.
- The ability to self-monitor may be affected by their mental health: use PHQ4 (in primary and community care) to screen for anxiety and depression OR DDS2 (in secondary care) to screen for diabetes distress. Use 6 item COG for cognitive impairment (more prevalent in Diabetes after age 50). See slide 31 for tools
- Monitoring should be based on the individual's clinical needs and in the context of Diabetes education and self-management.
- People should receive appropriate training in the technique and the actioning of the results.
- The frequency of testing will be different for different people and will change with their circumstances. Any guidelines can only be used as a framework and then adapted to meet individual needs.
- People may move between different methods of monitoring dependent on their needs at that time.
- Equipment used for monitoring should be based on choice and agreed with patient.

## TYPE 2 DIABETES

- Routine self-monitoring of blood glucose is not usually required if people are achieving targets on therapy without the potential to cause hypoglycaemia (see the table on the next page).
- HbA1c is important in assessing the adequacy of blood glucose control and should be tested every 3-6 months.
- Structured education is essential for people with newly diagnosed and existing Diabetes.
- Checking for wellbeing is essential as 40% of people with diabetes have poor mental health (see slide 31) and this affects their ability to self-care
- People with Type 2 Diabetes usually have more stable glycaemic control. In practice, the level of monitoring will vary according to the treatment regimen used and the target level of glycaemic control set for/with the patient.
- DVLA requirements for testing when driving apply to people with Type 2 Diabetes treated with insulin, gliclazide, glimepiride, glibenclamide or another sulfonylurea, nateglinide or repaglinide.

## TYPE 1 DIABETES

- Approaches and targets should be individualised and agreed in consultation with people, as part of the care planning process.
- In addition to self-monitoring, HbA1c should be measured every 3-6 months.
- People prescribed insulin should be taught how to adjust therapy in line with their blood glucose monitoring and recognise patterns in their test results. This facilitates adjustments to medication to achieve targets for fasting and postprandial blood glucose, which both contribute to HbA1c.
- Checking for wellbeing is essential as 40% of people with diabetes have poor mental health and this affect their ability to self-care
  be alert to eating disorders and insulin dose manipulation if there is poor glucose control, low BMI or over concern with body shape and weight
- All results should be recorded with the time and date to provide a cumulative record as a basis for day-to-day changes in therapy. Most meters will store this information and some will allow download to a computer or smart phone

## DIABETES AND DRIVING

**People with Diabetes must inform the DVLA.**

- Those on insulin or oral hypoglycaemic agents which carry a risk of hypoglycaemia, such as sulfonylureas should monitor their glucose before driving. https://www.gov.uk/government/publications/information-for-drivers-with-diabetes
- Group 2 drivers (bus and lorry), on insulin or oral medicines which carry a risk of hypoglycaemia, are still required to check their blood glucose using finger prick testing for the purposes of driving.
- Must have awareness of hypoglycaemia. If there is a total loss of 'hypo' warning signs their license will be withdrawn.
- Must not have had >1 episode of severe hypoglycaemia requiring third party assistance while awake within the preceding 12 months. If they have had more than one episode they must inform the DVLA and their licence will be withdrawn for one year following the first episode.
- Trend Driving Leaflet; DVLA: A guide to insulin treated diabetes and driving
- All results should be recorded with the time and date to provide a cumulative record as a basis for day-to-day changes in therapy. Most meters will store this information and some will allow download to a computer or smart phone

- **People with blood glucose levels <5.0mmol/L should not drive until they have eaten; If <4.0mmol/L they should not drive.**

## GROUP 2 ENTITLEMENT

People with Diabetes on insulin can apply for any Group 2 licence providing the patient has:

- Had no episodes of hypoglycaemia requiring third party assistance within the previous 12 months.
- Full awareness of hypoglycaemia and can demonstrate understanding of its risks.
- Meter recorded evidence of regular monitoring (twice a day and at times relevant to driving).
- Been reviewed annually by an independent consultant diabetologist and provide at least 3 continuous months of readings.

Visit www.dft.gov.uk/dvla/medical

# DIABETES – FREQUENCY OF BLOOD GLUCOSE TESTING

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| | ADULTS WITH TYPE 2 DIABETES | | | ADULTS WITH TYPE 1 DIABETES |
|---|---|---|---|---|
| **Treatment** | **Diet and exercise**<br>**Metformin**<br>**Pioglitazone**<br>**DPP-4 inhibitors**<br>**SGLT-2 inhibitors**<br>**GLP-1 analogues*** | **sulfonylureas/meglitinides alone or in combination with other suitable hypoglycaemic agents except insulin** | **Insulin for Type 2 Diabetes: basal, twice daily fixed regimens or mixed insulins** | **Insulin: basal bolus or delivered by a pump**<br>**https://www.nice.org.uk/guidance/ta151** |
| **Usual Monitoring** | Not usually necessary (* except when initiating GLP-1 analogues in people taking a sulfonylurea – see next column)<br><br>Do not offer a meter unless a clear action based on test results has been agreed and for short term use only, e.g. to allow patient to adjust lifestyle when newly diagnosed | 4 tests per week, usually testing once week before each of the three daily meals and before bedtime<br><br>See advice on Diabetes and driving on previous page. | **Basal insulin:**<br>1-2 tests per day<br><br>**Premixed insulin:**<br>2-4 tests per day<br><br>People who rely on others for administration of mixed insulins may require more frequent testing, which is recommended prior to administration.<br>See advice on driving<br>Before meals and 2 hours after main meal<br>Tests before breakfast are essential to achieve the target fasting glucose<br>Additional tests pre-meal or 2 hours after food are helpful if fasting glucose is at target but HbA1c remains high | Usually 4 to 8 tests daily.<br>Test before meals and at bedtime as a minimum<br>Include two hour post meal testing to check correct carbohydrate ratios<br>Additional testing may be required to enable people with Type 1 Diabetes to drive safely |
| **Intensive Monitoring** | | Before meals and 2 hours after evening meal<br><br>*Intensive monitoring is essential during initiation of GLP-1 analogues for people already on sulfonylureas until stabilised | | Additional post prandial tests may be required to optimise the dose of the rapid acting insulin; include testing before meals and 1-2 hours after the largest meals<br>During periods of intensive monitoring additional supplies of strips may be required |
| **Prescribing** | Prescribe the minimum appropriate number of strips on acute | Prescribe on repeat<br>Additional supplies may be necessary for driving and intensive monitoring | Prescribe on repeat<br>Additional supplies may be necessary for driving and intensive monitoring | Prescribe on repeat.<br>**Restricting access to strips may destabilise control and adversely affect people's quality of life** |

**Intensive monitoring may be required in any of these situations**

| | |
|---|---|
| During intercurrent illness<br>Intermittent steroid therapy<br>Osmotic symptoms<br>Postprandial hyperglycaemia<br>Terminal care/end of life<br>People on the Diabetes Prevention Programme (diabetes remission programme i.e. REWIND) | To prevent development of acute complications<br>Pre-conception and pregnancy<br>Increased or regular intensive exercise<br>When HbA1c testing is unavailable<br>Impaired awareness of hypoglycaemia |

# TYPE 1 and TYPE 2 DIABETES – CHOICE OF GLUCOSE METER

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## PRINCIPLES

People and health care professionals should be clear about what they hope to achieve by self-monitoring blood glucose because monitoring in itself does not improve control. It is the interpretation of the result and the action taken that makes the difference.

Assessment of monitoring at least once a year is desirable and should include:

- Self-monitoring skills including the cognitive ability of the person using 6 item cognitive impairment test (especially if there are microvascular changes in other organs apart from the brain)
- The quality and frequency of testing
- The use made of the results obtained
- The continued benefit
- The impact on quality of life
- The equipment used

If the patient does not benefit from monitoring or if it is adversely affecting their quality of life, then it should be stopped.

Self-monitoring of blood glucose does not replace HbA1c testing, which should be carried out at suitable intervals as part of regular care.

Remember other health education (healthy diet, regular physical activity, maintaining a healthy psychological state ,maintaining a normal body weight and avoiding tobacco) to help people reduce their risk of Diabetes-related complications.

Provide Diabetes lifestyle leaflets and actively promote structured education and referral to IAPT if necessary.

## CHOOSING A BLOOD GLUCOSE METER

For people with type 2 diabetes, prescribed blood glucose test strips should cost less than £10 for a pack of 50 strips.
A wide variety of blood glucose meters are available where the cost of test strips is less than £10 per pack of 50.
For people with type 1 diabetes the preferred option is a combined ketone and blood glucose meter which utilises ketone strips (pack of 10) and blood glucose strips (pack of 50) costing less than £10 per pack for each (see slide 25).
Meters for testing glucose and ketones are usually provided free of charge from the manufacturer/supplier.

People prescribed FreeStyle Libre sensors on the NHS may be prescribed FreeStyle Optium blood glucose test strips (£16.30 per pack of 50) and FreeStyle Optium β-ketone test strips (£21.94 per pack of 10). Prescribers should check usage levels and prescribe appropriate quantities for these FreeStyle test strips.

People who need a meter with an in-built bolus adviser system should use an Accu-Chek Aviva Expert meter, Agamatrix Wavesense Jazz DoseCoach (for Type 2 diabetics only) or FreeStyle Libre Reader. Aviva blood glucose test strips (£16.21/pack 50), Wavesense Jazz (£8.74/ pack 50) and FreeStyle Optium blood glucose test strips (£16.30/pack 50) can be prescribed for people who have been advised to use these meters for the bolus adviser functionality.

People using insulin pumps with an in-built blood glucose meter should be prescribed blood glucose test strips compatible with their insulin pump system (see slide 26).

A decision to change meters should be used as an opportunity to review the purpose of testing and the interpretation of results as well as provide basic lifestyle advice and leaflets. If usage is low enough that one pot of strips lasts longer than its expiry date, review of the need for blood glucose monitoring is recommended.
The choice of meter and its functionalities and features should reflect the needs of the user. Some of the key functionalities to consider are show in the table below.

| Function/Feature | Comments |
|---|---|
| Memory | Memory of at least 500 and cannot be deleted by the user |
| Display screen | Size and readability of the information displayed on the screen |
| Voice function | For users who are blind or have visual impairment |
| Replacement batteries | Does the manufacturer replace batteries free of charge? |
| Customer support | Does the manufacturer provide a freephone number to a customer support service? |
| External data output | Can data be transferred from the meter? Is data transfer wireless or via a cable? |
| Compatibility with Remote diabetes management software | Is the meter compatible with remote diabetes management software (e.g. Diasend or Tidepool)? |

# TYPE 1 DIABETES – COMBINED KETONE AND GLUCOSE METERS

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| | Combined ketone and glucose meters | | | | |
|---|---|---|---|---|---|
| **Meter** | **4SURE Smart Duo** | **CareSens Dual Meter** | **Fora Advanced Pro GD40** | **GlucoMen Areo 2K** | **GlucoRx HCT & Ketone** |
| |  |  |  |  |  |
| **Compatible strips - glucose** | 4SURE<br>£8.99 for 1x50*<br><br>Expiry: 24 months from date of manufacture | CareSens PRO blood glucose test strips<br>£9.95 for 1x50*<br>Expiry: 12 months from first opening vial | Fora Advanced Pro GD40 (glucose)<br>£9.25 for 1x50*<br>Expiry: 6 months from first opening vial | GlucoMen Areo Sensor<br>£8.25 for 1x50*<br>Expiry: 12 months after first opening vial | GlucoRx HCT<br>£8.95 for 1x50*<br>Expiry: 6 months after first opening vial |
| **Compatible strips - ketone**<br><br>***Drug Tariff October 2020** | 4SURE β-ketone<br>£9.92 for 10*<br><br>Expiry: up to expiry date on foil packet (18 months from date of manufacture) | KetoSens<br>£9.95 for 10*<br><br>Expiry: up to expiry date on foil packet | Fora Advanced Pro GD40 (ketone)<br>£9.25 for 10* | GlucoMen areo Ketone Sensors<br>£9.95 for 10*<br>Expiry: up to expiry date on foil packet | GlucoRx HCT Ketone Test Strips<br>£9.95 for 10*<br>Expiry: up to expiry date on foil packet (18 months from date of manufacture) |
| **Lancets** | Any lancets which cost ≤ £5.00 for 200 | Any lancets which cost ≤ £5.00 for 200 | Any lancets which cost ≤ £5.00 for 200 | Any lancets which cost ≤ £5.00 for 200 | Any lancets which cost ≤ £5.00 for 200 |
| **Memory (no. of tests)** | 1000 | 1000 | 1000 | 730 Glucose + 100 Ketone | 1000 |
| **Replacement batteries** | 1 x 1.5V AAA<br>(replaced free of charge by company) | 2 x 3.0V lithium (CR2032)<br>(replaced free of charge by company) | 2 x 1.5V AAA | 2 x 3v CR2032<br>(replaced free of charge by company) | 2x AAA Batteries<br>(replaced free of charge by company) |
| **External output (e.g. to PC, phone)** | Bluetooth V4.0 or Micro USB | Bluetooth or PC via free cable supplied on request | Bluetooth connectivity | USB cable to PC. Smartphone via Bluetooth adapter | PC interface cable |
| **Software and compatibility** | Diasend Uploader | Diasend Uploader<br>SmartLog app | iFORA HM app | Diasend Uploader<br>GlucoLog software on PC or GlucoLog App on smartphone | Diasend Uploader |
| **Insulin Bolus Advisor app on smartphone** | Diabetes:M | N/A | N/A | RapidCalc | N/A |
| **Company contact** | Diagnostics-uk@nipro-group.com<br>Freephone 0800 0858808 | info@spirit_healthcare.co.uk<br>0116 2865000 | online support form<br>https://foracare.com/patient-related-inquires/ | myglucomen@menarinidiag.co.uk<br>Freephone 0800 243667 | info@glucorx.co.uk<br>Freephone 0800 007 5892 |

| | Omnipod | Accu-Chek Insight | Accu-Chek Combo | Medtronic | Cellnovo |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| **Compatible strips** *Drug Tariff October 2020 | FreeStyle Lite<br>£16.41 per 1x50* | Accu-Chek Aviva<br>£16.21 per 1x50* | Accu-Chek Aviva<br>£16.21 per 1x50* | Contour Next<br>£15.16 per 1x50* | Accu-Chek Aviva<br>£16.21 per 1x50* |
| **Compatible lancets** | Any lancets which cost ≤ £5.00 for 200 | Any lancets which cost ≤ £5.00 for 200 | Any lancets which cost ≤ £5.00 for 200 | Any lancets which cost ≤ £5.00 for 200 | Any lancets which cost ≤ £5.00 for 200 |
| **Expiry of test strips upon opening** | 6 months | 12 months | Expiry on outer packaging | 6 months | 6 months |

# Flash Glucose Monitoring Systems

Flash glucose monitoring is only available on the NHS in North West London for people with Type 1 diabetes, aged four years or over, who meet one of the criteria listed below:

**Indication 1**: People with type 1 diabetes on multiple daily injections or insulin pump therapy who test frequently (>8 times per day).
**Indication 2**: People with type 1 diabetes unable to routinely self-monitor blood glucose due to disability who require carers to support glucose monitoring and insulin management.
**Indication 3:** People with type 1 diabetes for whom the specialist diabetes MDT determines have occupational (e.g. working in insufficiently hygienic conditions to safely facilitate finger-prick testing) or psychosocial circumstances that warrant a 6 month trial of flash glucose monitoring with appropriate adjunct support.
**Indication 4:** People with any form of diabetes on haemodialysis and on insulin treatment and are clinically indicated as requiring intensive monitoring >8 times daily.
**Indication 5:** People with diabetes associated with cystic fibrosis on insulin treatment.
**Indication 6:** Pregnant women with type 1 diabetes (eligible for 12 months' supply of flash glucose monitoring inclusive of post-delivery period).
**Indication 7:** For those with type 1 diabetes and recurrent severe hypoglycaemia or impaired awareness of hypoglycaemia, NICE suggests that Continuous Glucose Monitoring with an alarm is the standard. Other evidence-based alternatives with NICE guidance or NICE TA support are pump therapy, psychological support, structured education, islet transplantation and whole pancreas transplantation. However, if the person with diabetes and their clinician consider that a flash glucose monitoring system would be more appropriate for the individual's specific situation, then this can be considered.

Initiation of people on flash glucose monitoring will be done by local diabetes specialist teams **ONLY** as per NHS London Clinical Networks recommendations and guidance produced by the North West London Collaboration of CCGs https://www.hounslowccg.nhs.uk/news,-publications-and-policies/publications.aspx?n=3850
FreeStyle Libre® measures the glucose in interstitial fluid and is not a complete substitute for finger-prick blood glucose testing.
Finger-prick blood glucose measurements will still be required in certain circumstances, including meeting requirements set by the Driver and Vehicle Licensing Authority (DVLA).

# PRESCRIBING BLOOD GLUCOSE TEST STRIPS, LANCETS AND PEN NEEDLES



| BLOOD GLUCOSE TEST STRIP REQUIREMENTS | LANCET REQUIREMENTS | INSULIN PEN NEEDLE REQUIREMENTS |
|---|---|---|
| Test strips usually come in packs of 50 which cannot be split. This table indicates quantities for usual testing. Additional supplies may be necessary for intensive testing e.g. to meet DVLA requirements for driving. If people are required to test regularly please prescribe on repeat prescriptions.<br>People should be encouraged not to over order or stockpile supplies. Additional supplies to meet a short term need should be prescribed on acute prescriptions. | Prescribe a low cost brand of lancets (≤ £5 per pack of 200)<br><br>Lancers (the finger pricking devices) are not available on prescription and replacement lancing devices are available from companies (usually free of charge). Lancets are for single use only and should be prescribed in quantities which correspond to the expected frequency of testing. | Prescribe a low cost brand of insulin pen needles (≤£4 per pack of 100 pen needles).<br>Most brands of pen needles are compatible with all devices.<br>Pen needles come in packs of 100.<br><br>Shorter needle lengths reduce the risk of intramuscular injection of insulin. The Forum for injection Technique (FIT) Uk considers the 4mm needle to be the safest pen needle for adults and children regardless of age, gender and body mass index (BMI).<br><br>For those currently using longer pen needle lengths (8mm or longer), it is advisable to change to a shorter needle length (6mm or less) but only after discussion with a healthcare professional, to ensure they receive advice on the correct injection technique. |

| Tests per day | Tests/28 days | Packs/frequency | Tests per day | Tests/28 days | Packs/frequency | Injections per day | 28 days | Packs/frequency |
|---|---|---|---|---|---|---|---|---|
| **1** | 28 | 8 /year | 1 | 28 | 2 x 200 packs / year | 1 | 28 | 4 x 100 packs /year |
| **2** | 56 | 1 pack /month;<br>14 packs/year | 2 | 56 | 4 x 200 packs / year | 2 | 56 | 8 x 100 packs /year |
| **4** | 112 | 2-3 packs/month;<br>29 packs/year | 4 | 112 | 8 x 200 packs / year | 3 | 84 | 11 x 100 packs /year |
| **6** | 168 | 3-4 packs/month;<br>44 packs/year | 6 | 168 | 11 x 200 packs / year | 4 | 112 | 15 x 100 packs /year |
| **8** | 224 | 4-5 packs/month;<br>58 packs/year | 8 | 224 | 15 x 200 packs / year | | | |