A Guide for Using Flash Glucose Monitoring

Published November 2018

Review Nov 2019

An Overview of Flash Glucose Monitoring

This guide will provide you with some helpful information and advice.

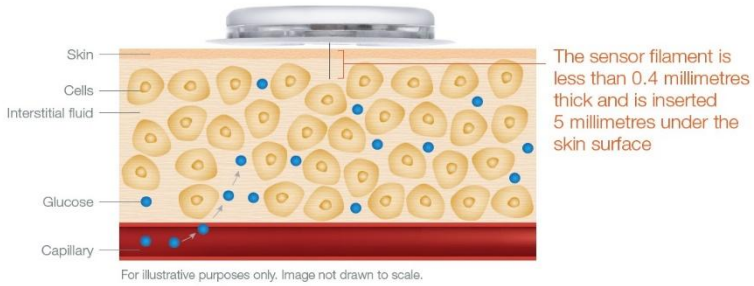
It is also advised that you complete the online module

'Libre Academy' (www.frestylediabetes.co.uk/freestyle-progress).

This will give you an insight into how best to use your Flash Glucose Monitoring (Flash GM) device to it's full potential.

Flash GM is a way to monitor your glucose level and observe your glucose trends. The sensor measures the glucose level in your interstitial fluid (fluid in between the cells under the skin). This provides an alternative method for monitoring our glucose levels, however there are still times when you will need to monitor your blood glucose via a finger-prick check.

Interstitial Fluid



(Abbott, 2018)

Using Flash GM can have a beneficial effect in showing you what is happening to your glucose level in between each finger-prick test, in particular overnight or after eating. It will inform you what has happened over the preceding hours in the form of a graph and will also provide you with an indication of how quickly your glucose level is changing.

The Diabetes Team in NHS Tayside can support you with using and interpreting this new technology.

Diabetes Specialist Nurses: 01382 632 725

Flash GM is particularly useful in helping assess:

- Glucose levels through the night
- Glucose trends after meals (different types of food)
- Effects of exercise on glucose (before, during and after)
- Effects of stress on glucose
- Response to treatment of hypoglycaemia (over or under-treatment)
- How well your basal insulin is working

However…

This may seem obvious, but Flash GM only works when it is used regularly. You have agreed that you will scan your sensor at least 6 times each day. In addition, it is essential to regularly review and respond to the patterns and results. If a problem developed – why did it happen? What can you do to avoid similar problems in the future? These issues are discussed in greater detail later on.

There is constant movement of glucose in our bodies between our blood and interstitial fluid. This means there is a 5-10 minute 'lag time' for the reading that you will have on your Flash GM device compared to a finger-prick test (Abbott, 2018).

Carbohydrate Counting

It is recommended that you need to be confident in these core skills of managing your diabetes before moving on to some of the more complicated 'fine-tuning' that the Flash GS can help with (Scottish Health Technologies Group, 2018).

We strongly recommend that you continue to use your bolus advisor to decide on your insulin dose (expert meter or pump)

You may wish to apply a further % adjustment to a mealtime dose based on FGS trend arrows – *please refer to the ACDC guidelines in reference and appendix

'Know Your Numbers'

Current nationally agreed guidance recommends that you should aim for the following blood glucose targets. However, you may have your own personal targets for your glucose levels which will be dependent on your own individual lifestyle and circumstances:

Fasting	Before Meals	2 hour after meals	Bedtime
5-7mmol/L	4-7mmol/L	5-9mmol/L	4-7mmol/L

You can confirm your individual targets with your diabetes team.

What do the arrows tell you?

Flash GM can provide you with an insight into how quickly your glucose levels are changing. So, at any given time, you will not only know what your current interstitial glucose level is, but also which way it is heading. Depending on the direction of the trend arrow, you can find out if your glucose levels are going up, going down or staying steady, facilitating better decision-making.

Direction of Arrow	In approximately 10 minutes.....	In approximately 30 minutes....
	Glucose will increase by at least 1 mmol/L	Glucose will increase by at least 3mmol/L
	Glucose will increase by 0.5-1 mmol/L	Glucose will increase by 1.5-3mmol/L
	Glucose will stay the same	Glucose will stay the same
	Glucose will fall by 0.5-1mmol/L	Glucose will fall by 1.5-3mmol/L
	Glucose will fall by at least 1mmol/L	Glucose will fall by at least 3mmol/L

Rates of change taken from Libre manual

You can use the arrows to predict highs and lows and, therefore, take action to prevent problems developing....

Remember if your glucose is falling (or rising fast) – your blood glucose will be lower (or higher) than the Flash GM value and should be confirmed with a finger-prick test.

Use your Flash GM trends to improve meal insulin dosing

This is one of the potential advantages of using Flash GM. Using the trend arrows at meal times can help reduce highs and lows after eating. When using information from a bolus advising or 'smart' BG meter the meter can calculate insulin for the carbohydrates, and possibly correct if your BG was above your target.

In addition to this you can now further adjust your calculated insulin dose using the trend arrow. Consider the following scenarios:

Trend arrow: ➔

Do what you would normally do. Aim to take your mealtime insulin 15 minutes before eating.

Trend arrow: ↗ or ↑

Consider increasing your mealtime insulin dose.

Trend arrow: ↘ or ↓

Consider reducing your mealtime dose and reduce the time between your dose and meal. Start the meal with carbohydrate.

(Abbott, 2018)

When you see arrows rising [↗, ↑] or falling [↘, ↓] it indicates that your glucose is changing. The Trend Arrows also indicate the speed at which your glucose is either rising or falling, which means you can estimate where you are going to be (see page 5). It is important to remember that other factors can also have an impact on your glucose. By using Flash GM, you may also begin to see the effect that stressful events can have on your glucose.

Responding to a LOW glucose level

- If you think that your glucose level is falling to less than 4mmol/L or if you feel unwell- it is essential that you check your **blood** glucose level.
- If hypoglycaemia develops, consume 15g of rapid acting carbohydrate (4-5 glucose tablets/.Jelly babies). Due to the lag between blood and interstitial glucose the trend may not begin to rise for 15 minutes. Watch for changes in the trend arrow.
- Aim to take action **before** hypoglycaemia develops. If the glucose is in target but falling rapidly (↓) check blood glucose. You may wish to have a long acting carbohydrate snack. It is also important that you consider whether exercise or 'stacking insulin' (previous recent doses of quick-acting insulin) may have contributed to the development of a low glucose.
- The Flash GM data will show you whether your usual response to hypoglycaemia results in under or over-treatment. If this is the case, you can adjust your approach in the future.

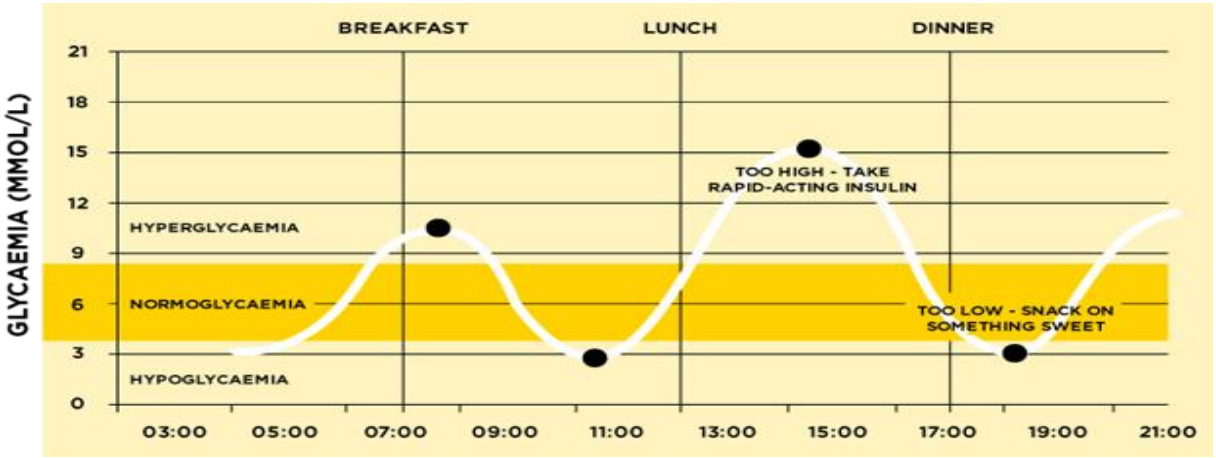
Responding to a HIGH glucose level

- Occasionally you may observe your glucose level rising, especially after a meal. Use extra quick acting insulin doses with caution. It may be safer to reflect on what you would do differently next time in relation to your mealtime insulin timing or dose, rather than reacting immediately.
- If you give extra insulin whilst your previous dose is still active, there is a risk of hypoglycaemia. **It is therefore important that you use your quick acting insulin for correctional doses with caution!**
- Remember, there is a risk of your cumulative insulin 'stacking' if you overuse your bolus (mealtime) insulin- this can significantly increase your risk of hypoglycaemia.

If you give extra insulin whilst your earlier dose is still working you will be at risk of hypoglycaemia!

Limit Glucose Variability

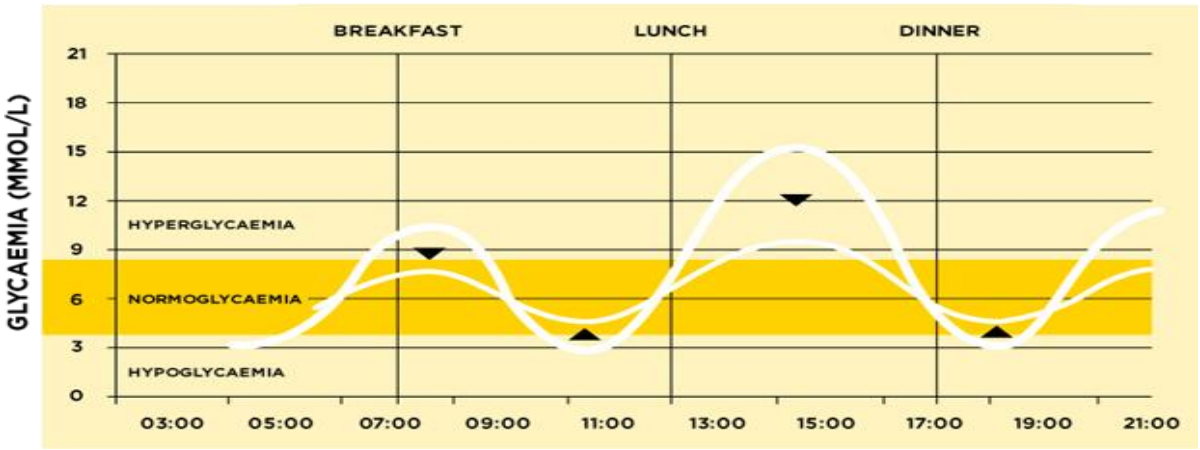
'Reducing variability' means smoothing out peaks in your blood glucose levels and avoiding swings between high and low. These types of swings can happen before and after meals, or if over-correcting for the symptoms of hypoglycaemia by taking sugary food or drink.



Trend Spotting

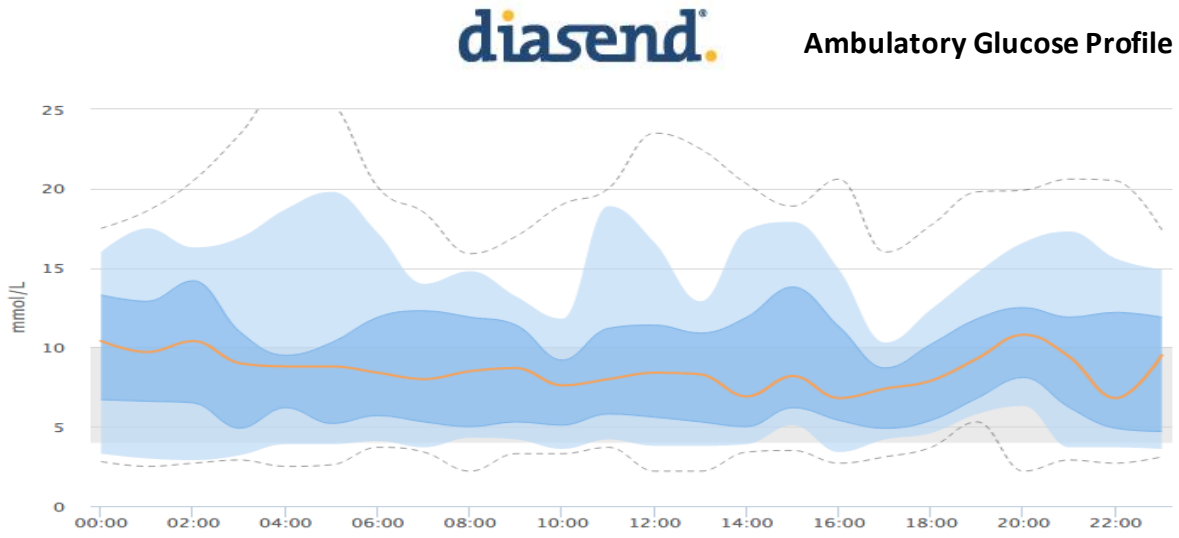
The key is learning to spot patterns in your daily glucose; this will happen naturally as you get into the habit of scanning regularly. The **Daily Patterns Report** can show you where you have most variability in your glucose readings day-to-day.

If you start to see that your glucose runs low or high at specific times of day, or in response to particular activities, these can then be identified and potentially avoided by making adjustments.

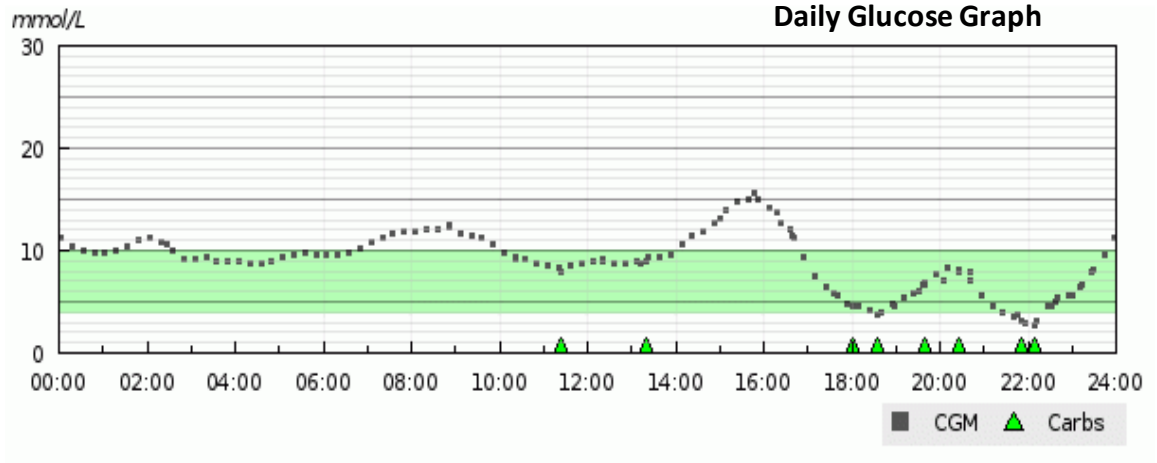


Reviewing Your Data

Use Diasend or Libre Link to review your Flash GM traces and use the daily glucose graph or the ambulatory glucose profile (see below). This will help uncover recurring patterns which may require a change in approach. Think about the decisions which worked well and what you could do differently, in future, to prevent highs and lows



Ambulatory glucose profile: a summary of the last 2 weeks to pick out recurring trends.



The Ambulatory Glucose Profile (AGP) graph, provides you with a visual reference for changing glucose levels over time. Sensor glucose data of 5 days or more are combined and plotted into a single 24-hr chart. By plotting data this way, you can see patterns of variability that may be common to a specific time of day.

Limitations of Flash GS

- It is important to check a blood glucose where you feel the results do not make sense
- As there is a 5-10 minute 'lag' between any change (up or down) in your blood glucose and Flash GM result, it is advisable to confirm any insulin dosing on a capillary blood glucose result.
- Taking some medication may falsely raise sensor glucose readings. Taking salicylic acid (used in some pain relievers such as aspirin and some skin care products) may slightly lower Sensor glucose readings. The level of inaccuracy depends on the amount of the interfering substance active in the body (Abbott, 2018)

School and nursery

It is our expectation and guidance that school's, pre school & out of school clubs will continue to use the Child's bolus advisor (bolus wizard or smart meter) to obtain insulin dose advice at lunchtime as staff are unable able to interpret trend arrow information and act on it or make any judgment out with agreed protocols.

Older children for whom it has been agreed can self manage their diabetes independently can of course continue to do so .

Some schools may have rules around pupils using mobiles in class and this may have to be clarified .

Top tips and practicalities for Flash GS

- Consider waiting for 24hrs after inserting your new sensor before activating., or be aware that it may over report lows while it 'acclimatizes '. This may improve the sensor's accuracy.
- If you feel hypo take action, **check blood glucose**
- The accuracy of your Flash GM device may be limited during low or higher readings, it is therefore advised (Essential for schools) that you perform a capillary test if your reading is less than 4 or higher than 14mmol/L., or if it is falling or rising rapidly ↓↑
- Log what were you doing at the time of scanning. Is there anything you can identify to help you avoid your sugar swinging next time? Is it possible to avoid or change this or take other action?
- Lying on the sensor at night can cause a false reading / flat line.
- **Don't correct blood glucose in the first 2 hours after eating** – It can be scary to see how much your sugar swings but the sensor sometimes overreacts and your pre meal insulin sometimes takes a while to work.
- Both the reader and the sensor should be stored between 4°C and 30°C
- The oldest glucose readings will be lost if the reader is not scanned at least once during an 8 hour period. For example, if you scan the reader over the sensor at 1:00pm and again at 10:00pm, then you will lose glucose data from 1:00-2:00pm
- If you wish to use both the reader and your smart phone to monitor your blood glucose you must first scan with the reader then your phone in the initial 60 minute set up period.(due to change spring 2019, please refer to Abbot for updates.
- Sensor must be at least 1 inch (2.5 cm) from any injections sites
- The sensor should not be submerged in water for more than 30 minutes.
- Finger prick testing is still required for driving (please ask if applicable).
- Technical help or sensor failure call **Abbott customer service on: 0800 1701177**

ACDC guidance for bolus adjustment: Direct Net method 1

Do usual calculation of the amount of insulin needed to cover the carbohydrates in the meal and make a correction for high glucose. Look at the arrow and make the following adjustments:

Arrow trend before meal time bolus	Description	10-15min timing	Action needed
↑	Glucose is rising quickly (more than 0.1 mmol/L per minute)	1-1.5mmol/L in 10-15 mins	Add 20% of meal time dose as extra
↗	Glucose is rising (between 0.06 - 0.1 mmol/L per minute)	0.6-0.9 mmol/l in 10-15 mins	Add 10% of meal time dose as extra
→	Glucose is changing slowly (less than 0.06/L per minute)	Stable	Give usual meal time dose
↘	Glucose is falling (between 0,06 - 0.1 mmol/L per minute)	0.6-0.9 mmol/l in 10-15 mins	Take 10% off meal time dose
↓	Glucose is falling quickly (more than 0.1 mmol/L per minute)	1-1.5 mmol/L in 10-15 mins	Take 20% off meal time dose

‘Ready Reckoner’ to work out % adjustment over and above bolus advisor dose estimate

Meter dose	Dose to give based on trend arrows			
	↑	↗	↘	↓
3	3.5	-	-	2.5
3.5	4	-	-	3
4	5	4.5	3.5	3
4.5	5.5	5	4	3.5
5	6	5.5	4.5	4
5.5	6.5	6	5	4.5
6	7	6.5	5.5	5
6.5	7.5	7	6	5.5
7	8.5	7.5	6.5	5.5
7.5	9	8	7	6
8	9.5	9	7	6.5
8.5	10	9.5	7.5	7
9	11	10	8	7
9.5	11.5	10.5	8.5	7.5
10	12	11	9	8
10.5	12.5	11.5	9.5	8.5
11	13	12	10	9
11.5	13.5	12.5	10.5	9.5

Meter dose	Dose to give based on trend arrows			
Bolus dose (units)	↑	↗	↘	↓
12	14.5	13	11	9.5
12.5	15	13.5	11.5	10
13	15.5	14	12	10.5
13.5	16	14.5	12.5	11
14	17	15.5	12.5	11
14.5	17.5	16	13	11.5
15	18	16.5	13.5	12
15.5	18.5	17	14	12.5
16	19	17.5	14.5	13
16.5	19.5	18	15	13.5
17	20.5	18.5	15.5	13.5
17.5	21	19	16	14
18	21.5	20	16	14.5
18.5	22	20.5	16.5	15
19	23	21	17	15
19.5	23.5	21.5	17.5	15.5
20	24	22	18	16

References

- Abbott (2018) *How Does The Freestyle Libre Measure My Blood Glucose.* Available at: https://freestylediabetes.co.uk/freestyle-thinking/post/FreeStyle-Libre-system-measure (Accessed 12th July 2018).
- Healthcare Improvement Scotland (2018) *Scottish Health Technologies Group*. Available at : http://www.healthcareimprovementscotland.org/our_work/technologies_and_medicines/shtg.aspx (Accessed: 17th July 2018).
- FreeStyle Libre Indications and Important Safety Information Availa ble at https://www.freestylelibre.us/safety-information.html (Accessed 27th Sept 2018)
- Freestyle Libre User Manual available at https://freestylediabetes.co.uk/images/uploads/documents/FreeStyle_Libre_Manual.pdf (Accessed 27th Sept 2018)

Useful Links

- NHS Tayside's Diabetes Managed Clinical Network (MCN) -http://www.diabeteshealthnet.ac.uk/
- https://www.nhstayside.scot.nhs.uk/OurServicesA-Z/DiabetesOutThereDOTTayside/PROD_295143/index.htm
- www.sugarsurfing.com
- http://www.a-c-d-c.org/wp-content/uploads/2012/08/CGM-FGS-Practical-Approach-ACDC-Guideline-Oct-2018.pdf
- Diasend- https://diasend.com//uk
- MyDiabetesMyWay- https://mydiabetesmyway.scot.nhs.uk/
- Abbott (2018) *How Does The Freestyle Libre Measure My Blood Glucose.* Available at: https://freestylediabetes.co.uk/freestyle-thinking/post/FreeStyle-Libre-system-measure (Accessed 12th July 2018).

Acknowledgments

We would like to thanks the Diabetes Team at NHS Forth Valley and also to Dr Fraser Gibb of the **Edinburgh Centre for Endocrinology and Diabetes** for their permission to allow us to base our information on their work.

We would also like to acknowledge Abbott for allowing us to use some of their images.