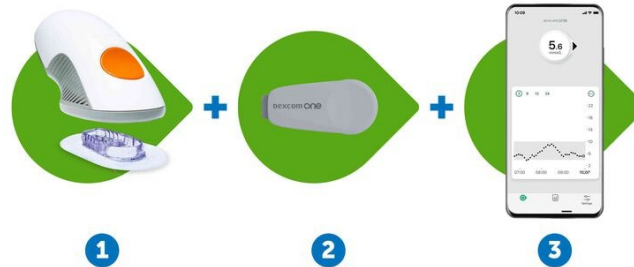


Diabetes technology for glucose monitoring in primary care – what do *we* need to know?



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Disclosures

- I have received honorarium for speaking or support for attending meetings from:

Abbott

Amarin

Astra Zeneca

Bayer

Boehringer Ingelheim

Dexcom

Lilly

Novo Nordisk

Roche

Learning objectives

- What are intermittent scanned and continuous glucose monitoring devices?
- Time in range vs HBA1c
- The basics of data interpretation
 - What do we actually need to know?
- Guidelines
 - Who is eligible?
- Practicalities of implementation in primary care
 - And possible pitfalls!
- Further education and support tools

Case study – Primary care

- 92 year old man
- Type 2 diabetes for 26 years
- On multiple daily injections of insulin
- Lives with his 90 year old wife, both fiercely independent, good QoL
- Family nearby
- Increasing anxiety around both hypo and hyperglycaemia
 - Often seeing practice nurse for reviews, reassurance
- Now finding SMBG increasingly tricky due to reduced dexterity leading to more anxiety

Case study – Primary care

- 56 year old lady
- Type 2 diabetes for 10 years
- On MDI insulin
- Can't get her head around her diabetes
 - Struggles with diet and weight
 - Not keen on injecting, been resistant to insulin for a long time due to needle phobia
 - Can't bear CBG testing more than once a day
 - HBA1c 86mmol/mol

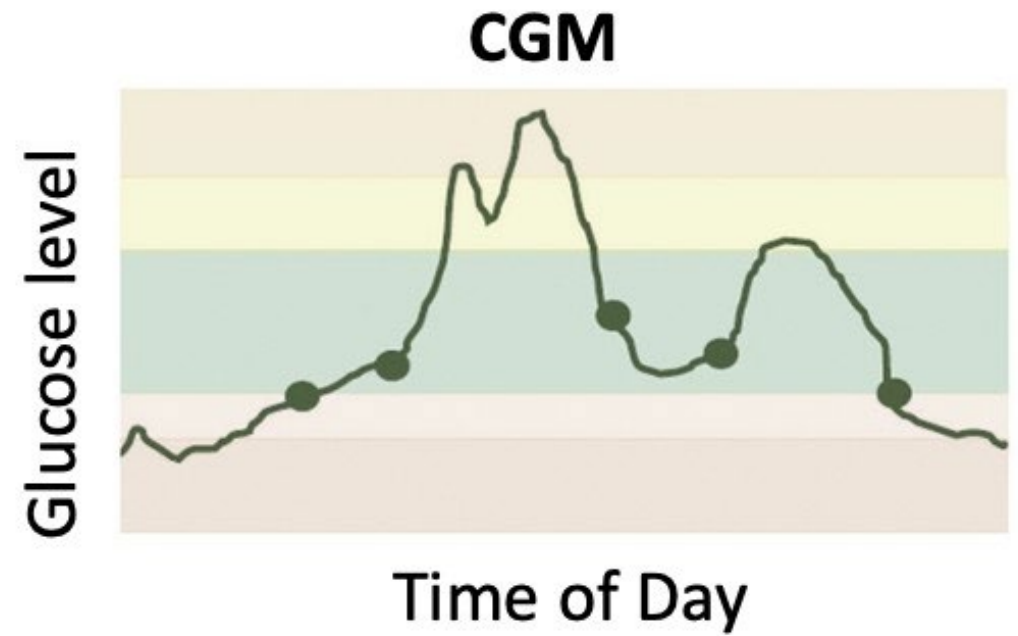
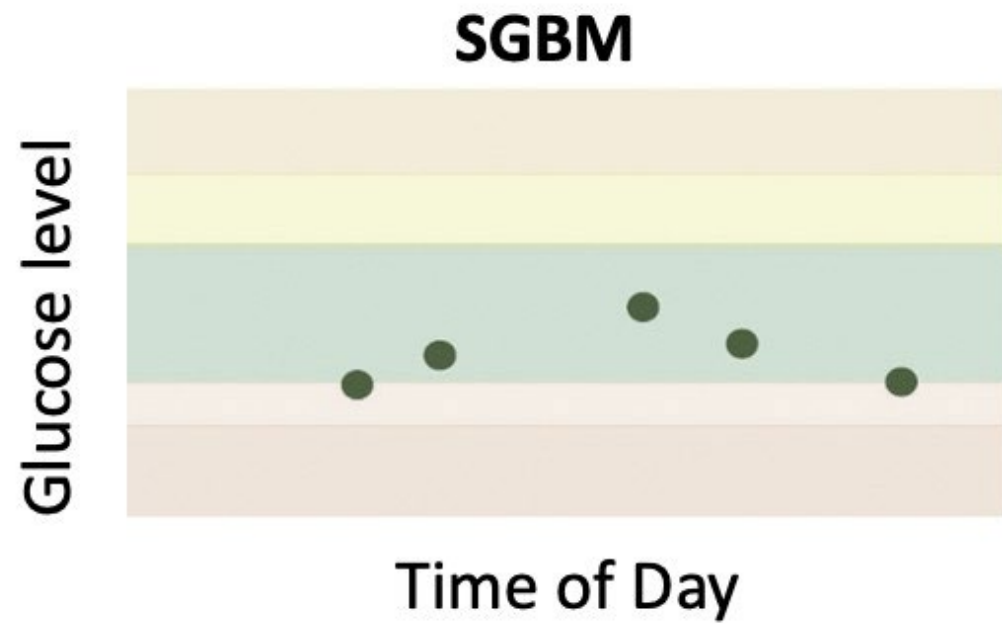
What is the new technology?

- We are all familiar with capillary blood glucose monitors
 - Finger prick testing
 - Snap shot of CBG at that moment and can assess patterns with multiple readings through the day
 - Invasive, fiddly, unpleasant for some, snapshot view
- Over the last few years, rapid development in new technologies
 - Until now predominantly used in secondary care clinics for people with type 1 diabetes, variability in access
 - Now change to guidelines, promoting increased access to new technologies to people with diabetes, including type 2 diabetes, hence the inclusion of primary care in roll out

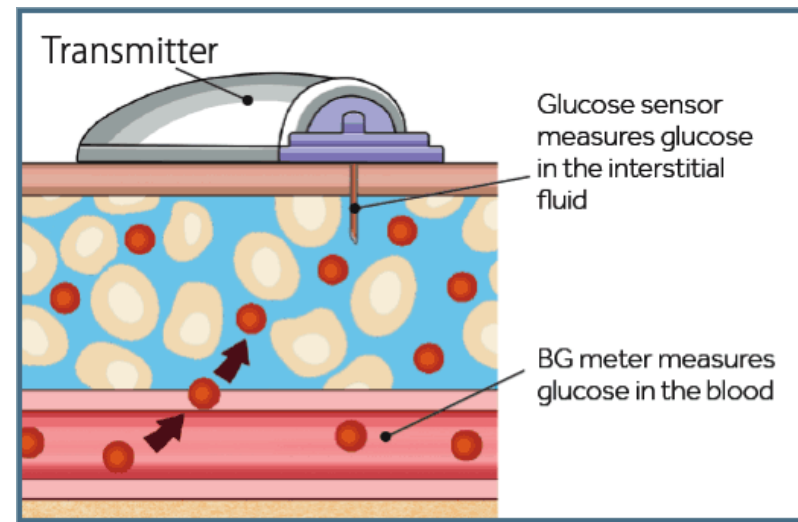


How do they work?

- Measure interstitial fluid glucose level using a small filament which is attached to a sensor on the skin
 - Each sensor lasts 10 or 14 days depending on device
- Two general types available:
 - **Intermittently** scanned or **Flash** CGM, when person scans the device with their smart phone or device reader
 - Real time **continuous** glucose monitor, readings automatically sent to device every 1-5 minutes, no need for scanning
- Person / carer can see current reading plus predicted trend by means of an arrow
 - Allows the person to adjust behaviours accordingly at that time
- Also allows to see accurate pattern throughout the day



Blood Glucose V Interstitial Fluid



- Blood glucose and sensor glucose levels (which measure interstitial glucose) are closely related but not identical.
- The interstitial fluid can lag behind a finger-prick blood glucose reading by 2.4 minutes in adults and 2.1 minutes in children.
- Therefore, in times of rapidly changing blood glucose levels (e.g. after eating or exercise), or when a person is experiencing hypoglycaemia or is symptomatic of hypoglycaemia, a finger-prick blood glucose measurement is indicated.
- It is important that the person with diabetes still has access to appropriate quantities of finger prick blood glucose equipment

Interstitial glucose monitoring and driving

Group 1

- **These systems may be used for monitoring glucose** at times relevant to driving Group 1 vehicles. Users of these systems **must carry finger prick capillary glucose testing equipment** for driving purposes as there are times when a confirmatory finger prick blood glucose level is required.
- If using an interstitial fluid continuous glucose monitoring system (FGM or RT-CGM), the blood glucose level must be confirmed with a finger prick blood glucose reading in the following circumstances:
 - when the glucose level is 4.0 mmol/L or below
 - when symptoms of hypoglycaemia are being experienced
 - when the glucose monitoring system gives a reading that is not consistent with the symptoms being experienced (e.g. symptoms of hypoglycaemia and the system reading does not indicate this)

Group 2

- There is a legal requirement for Group 2 drivers to monitor their blood glucose for the purpose of Group 2 driving.
- **FGM and RT-CGM interstitial fluid glucose monitoring systems are not permitted for the purposes of Group 2 driving and licensing.**
- Group 2 drivers who use these devices must continue to monitor finger prick capillary blood glucose levels with the regularity defined below.

FreeStyle Libre 2

Intermittently scanned Continuous Glucose Monitoring (isCGM) commonly known as Flash

Addition of 3 optional alarms;

- low glucose alarm
- high glucose alarm
- signal loss

- Scan using Freestyle Libre app on smart phone, or a reader device to get current reading, can be scanned up to every minute

- So long as the device is scanned at least once every 8 hours, can see continuous trend, as it stores a reading every 15 mins for up to 8 hours

- The sensor needs replacing every 14 days



The Freestyle LibreLink app is FREE to download from Apple App Store or Google Play





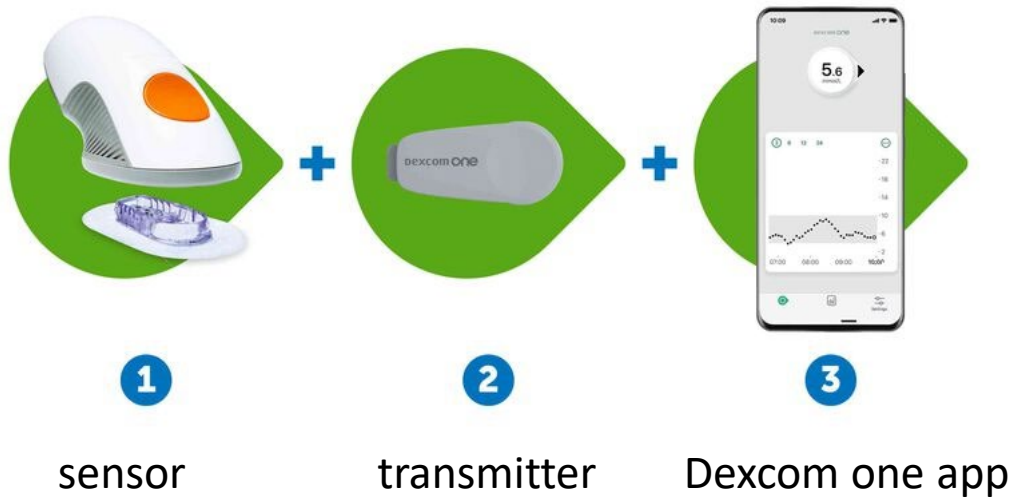


Dexcom One

Real time Continuous Glucose Monitoring (rtCGM)

Continually transmits glucose data without need for scanning device.

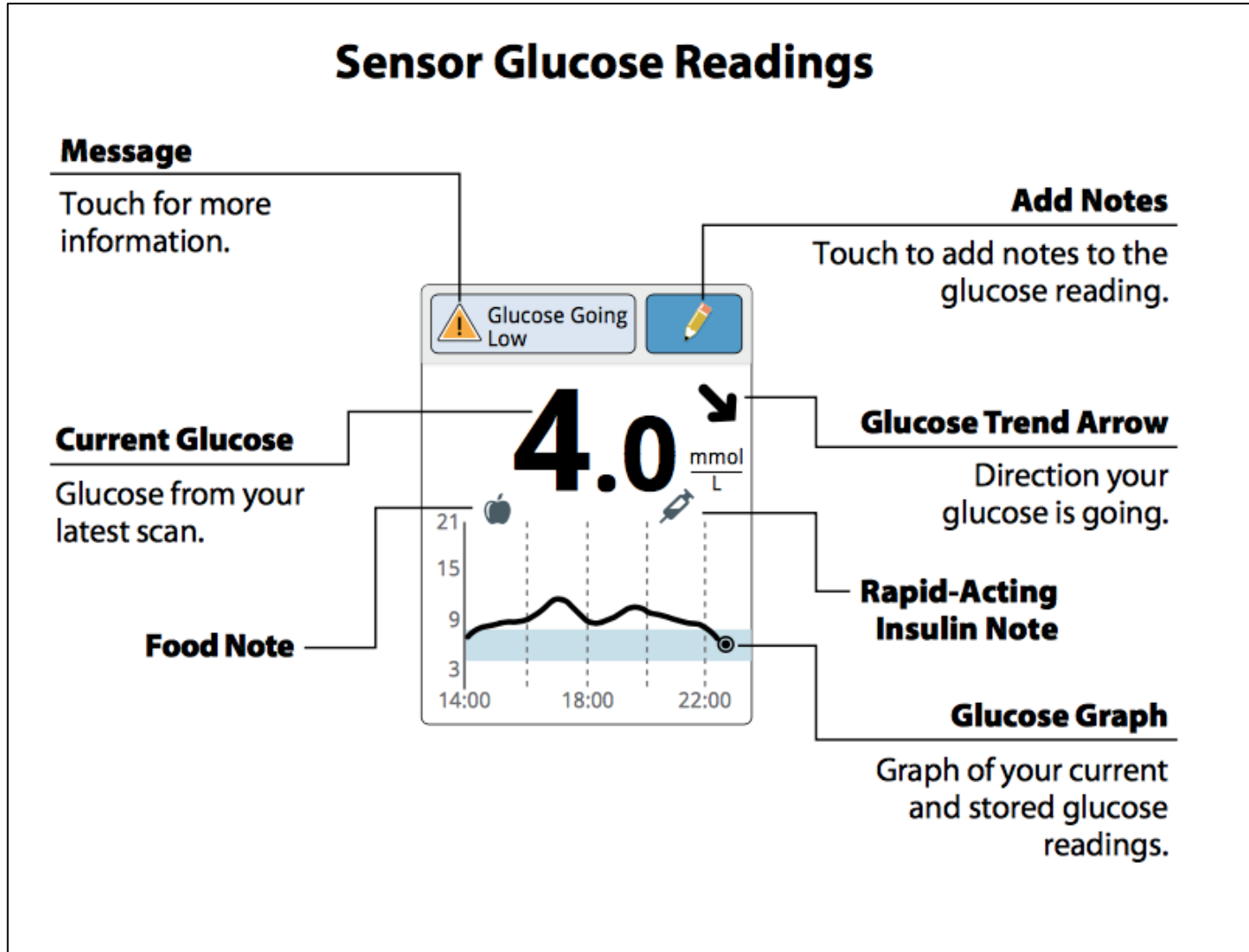
Takes a reading automatically every 5 minutes.



- Optional high and low glucose alerts
- Urgent “low soon” alarm

- Sensor needs replacing every 10 days, the transmitter every 90 days

What does the person see?



Why use it?

- Evidence has demonstrated that using IS or CGM devices improves glycaemic control, reduce hypoglycaemia events and improve QoL.
- Improve engagement, self management and a person's understanding of their diabetes, their diet, treatment and the effect of exercise and stress.
- What is the evidence of benefit?

Evidence of benefit in Type 2 diabetes

- REFER meta-analysis
 - European real world studies Germany, France and Austria
 - Effect of changing to flash glucose monitoring in people on MDI therapy, N= 363
 - Reduction in HbA1c by mean of 9.6mmol/mol after 3-6 months of device use
 - Greater reduction if higher baseline.
- REPLACE RCT
 - N= 224 T2DM on intensive insulin therapy
 - Randomised to SMBG or glucose sensing technology, 6m FU
 - Significant reduction in HbA1c in those < 65yrs on sensing technology vs SMBG
 - 43% reduction in time spent in hypoglycaemia (< 3.9mmol/l)
 - High level of utilization – 8.3 scans per day over 6/12
 - Significant improvement in treatment satisfaction using DTSQ scores

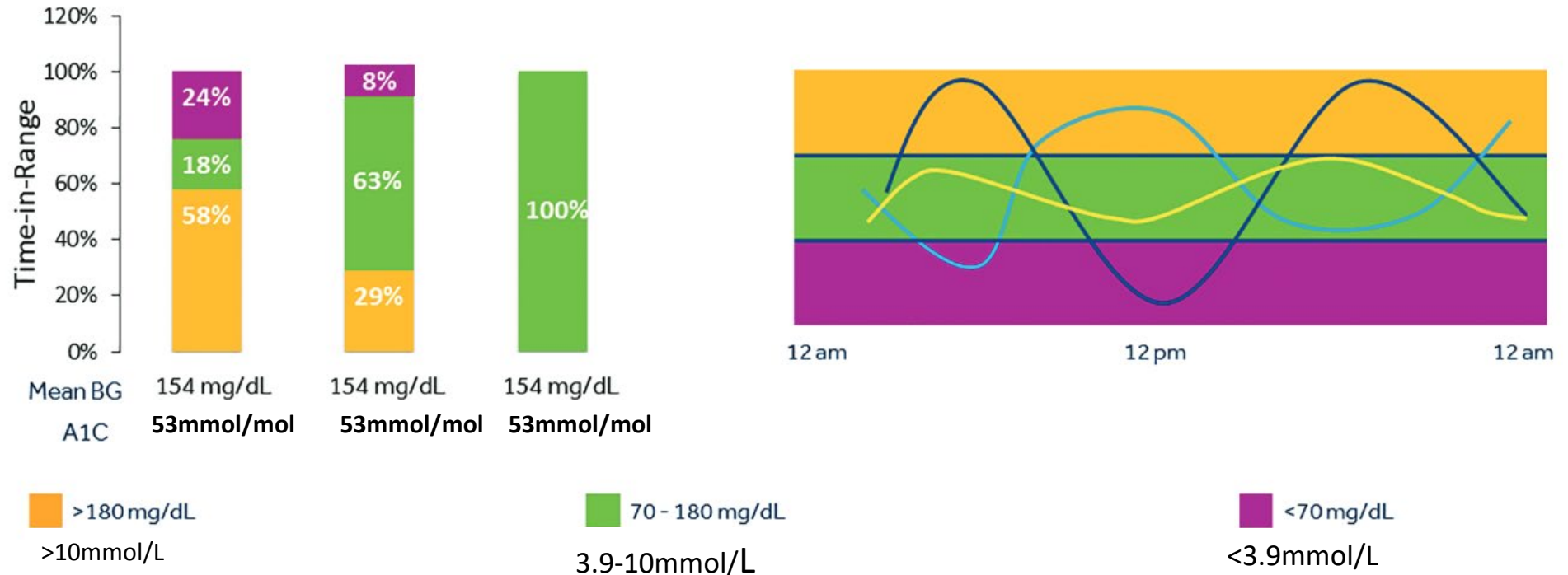
1. Kröger J et al. "Three European Retrospective Real-World Chart Review Studies to Determine the Effectiveness of Flash Glucose Monitoring on HbA1c in Adults with Type 2 Diabetes." *Diabetes Ther* 2020;11(1):279–91. doi: 10.1007/s13300-019-00741-9;

2. Haak T et al. "Flash Glucose-Sensing Technology as a Replacement for Blood Glucose Monitoring for the Management of Insulin-Treated Type 2 Diabetes: a Multicenter, Open-Label Randomized Controlled Trial." *Diabetes Ther* 2017;8(1):55–73. doi: 10.1007/s13300-016-0223-6;

Time in Range (TiR) vs HBA1c

- There is a move towards using time in range rather, or better, alongside HBA1c
- HBA1c gives an average blood glucose over the 3 month lifespan period of a red blood cell
- HBA1c is well validated to correlate closely to diabetes related complications, especially retinopathy
- However, it cannot give information about acute glycaemic excursions and the acute complications of hypo- and hyperglycaemia.
 - It also cannot identify the magnitude and frequency of intra- and interday glucose variation
- HBA1c can also be affected by a number of factors including anaemia, haemoglobinopathies
- With CGM, we are able to see how much time is being spent within a person's target range which give a much more accurate idea of what is **actually** going on.

Glycaemic variability & 'Time in Range'

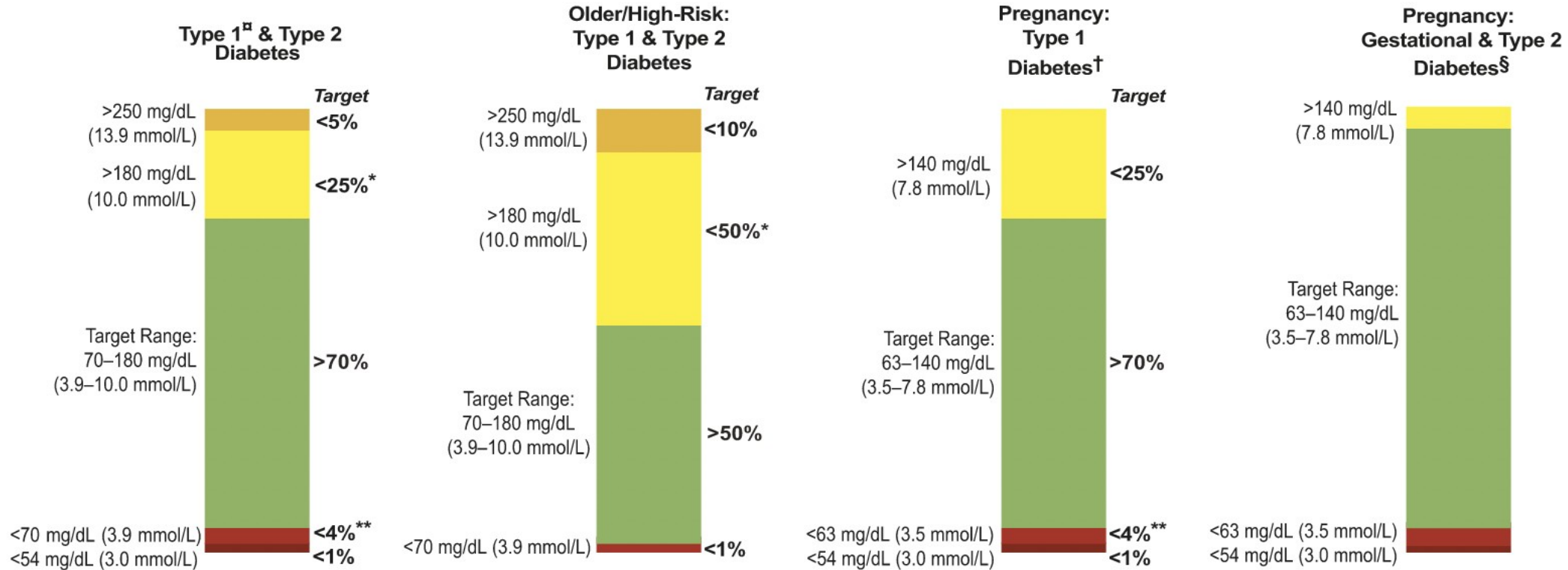


- Increasing acceptance of TIR as a clinically valuable marker of glycaemic control
- Simple definition of glycaemic variability = degree by which glucose levels fluctuate between high and low
 - Independent risk factor for diabetes complications and a predictor of hypoglycaemia

So what TiR is best?

- In 2019, an international Consensus on Time in Range targets was set
 - Commonly the glucose target range is set between 3.9 and 10 mmol/l.
 - Evidence shows that if 70% or more time is spent in this range, less than 4% below 3.9, and as little time as possible above 10mmol/l, diabetes-reduced complications are minimised.
- So in most people, aiming for 70% TIR is appropriate
- Flash or CGM apps can easily calculate a TIR from their data

CGM-based TIR targets for different diabetes populations.



□ For age <25 yr., if the A1C goal is 7.5%, then set TIR target to approximately 60%. (See *Clinical Applications of Time in Ranges* section in the text for additional information regarding target goal setting in pediatric management.)

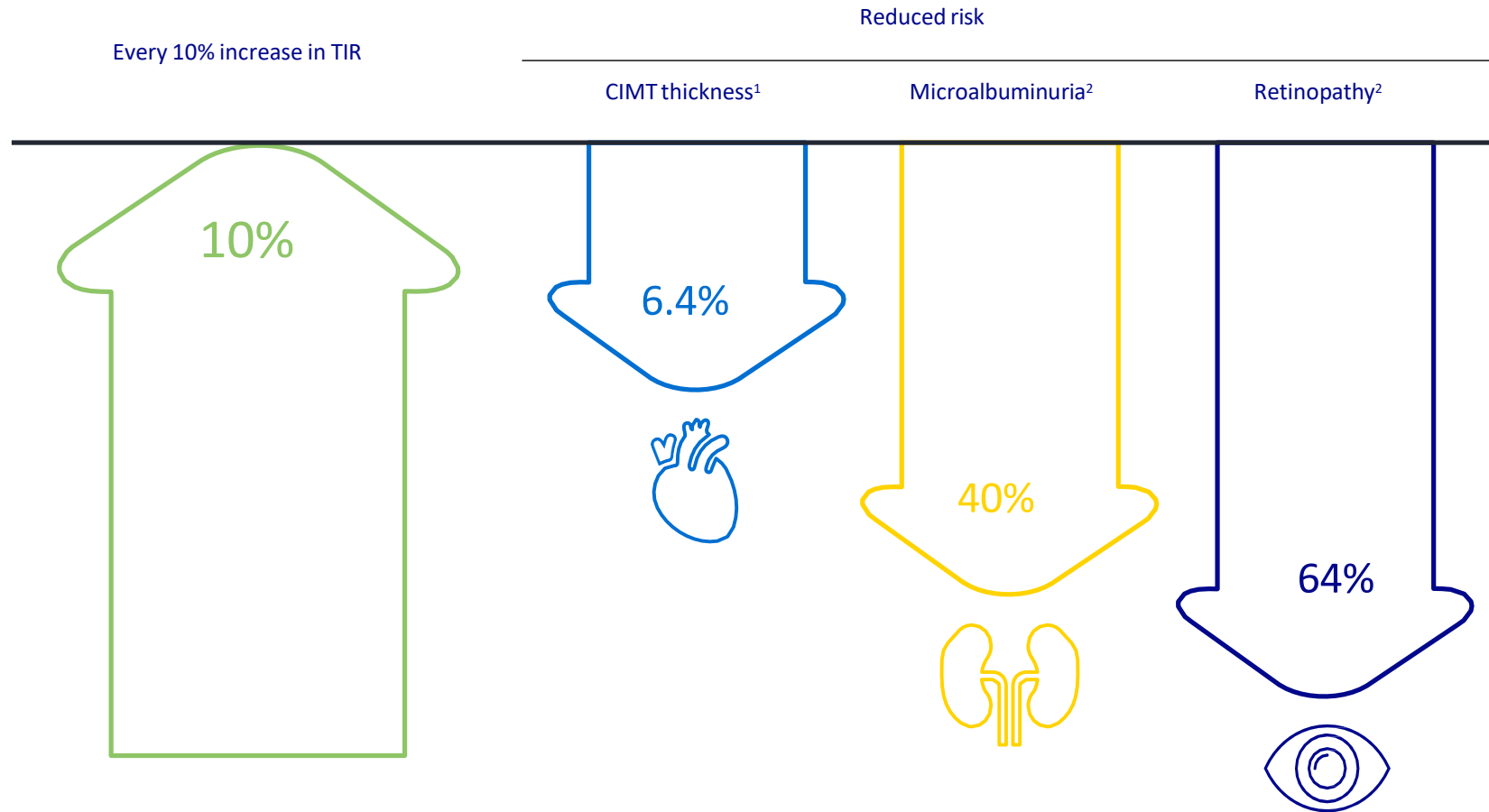
† Percentages of time in ranges are based on limited evidence. More research is needed.

§ Percentages of time in ranges have not been included because there is very limited evidence in this area. More research is needed. Please see *Pregnancy* section in text for more considerations on targets for these groups.

* Includes percentage of values >250 mg/dL (13.9 mmol/L).

** Includes percentage of values <54 mg/dL (3.0 mmol/L).

improved TIR is associated with reduced risk of long-term complications of diabetes



CIMT = carotid intima-media thickness; TIR = Time in Range.

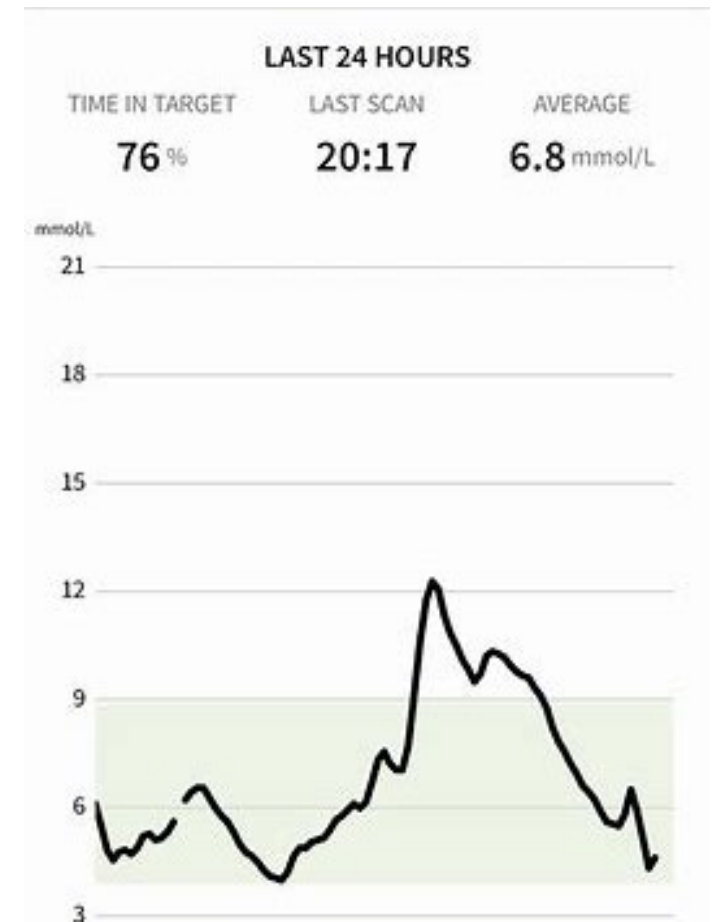
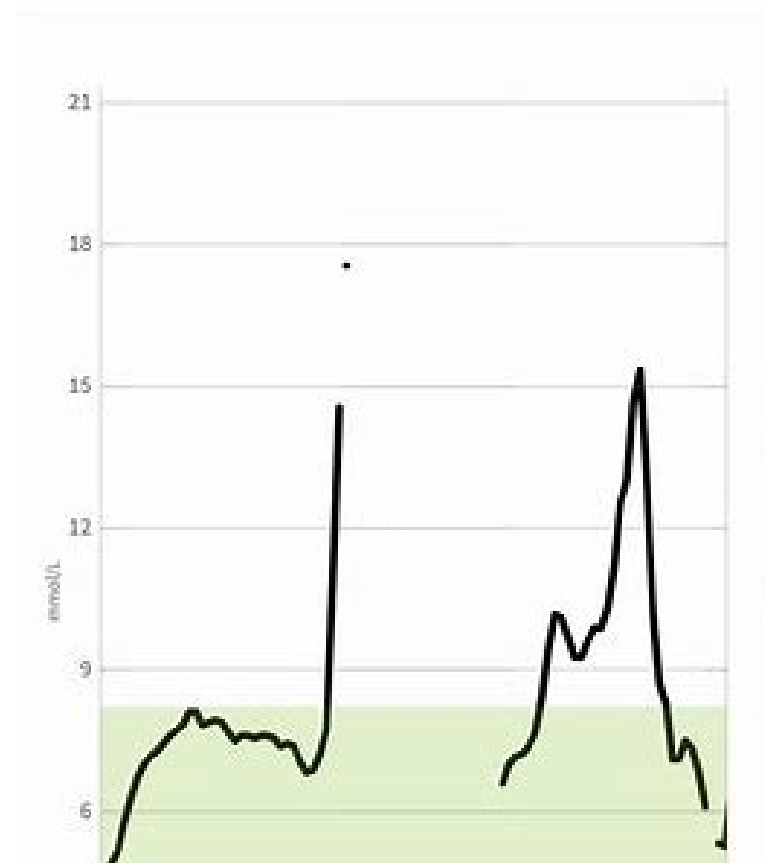
1. Lu J, et al. Diabetes Technol Ther. 2020 Feb;22:72-78. 2. Beck RW et al. Diabetes Care. 2019;42(3):400-405. 3. Lu J et al. Diabetes Care 2018;41:2370-2376. 4. Li F, et al. Diabetes Res Clin Pract. 2020 Aug;166:108289. doi: 10.1016/j.diabres.2020.108289.

Ok – so talk me through interpreting the data?

- Simplest option
 - Just look at the app or reader
 - **Daily graphs** – look at the patterns just as you would CBG readings
 - Note hypo and hyperglycaemia, note consistent patterns, post prandial excursions
 - Is the patient remembering to scan if using flash?
 - After a few days of use, the app for the device will also calculate the **Time in Range**
 - Remember aiming for >70%, more relaxed in frailty, high risk individuals. Set realistic targets to improve TIR.
 - You can also see an estimated HBA1c and amount of sensor usage
 - SIMPLE!



Daily graphs examples

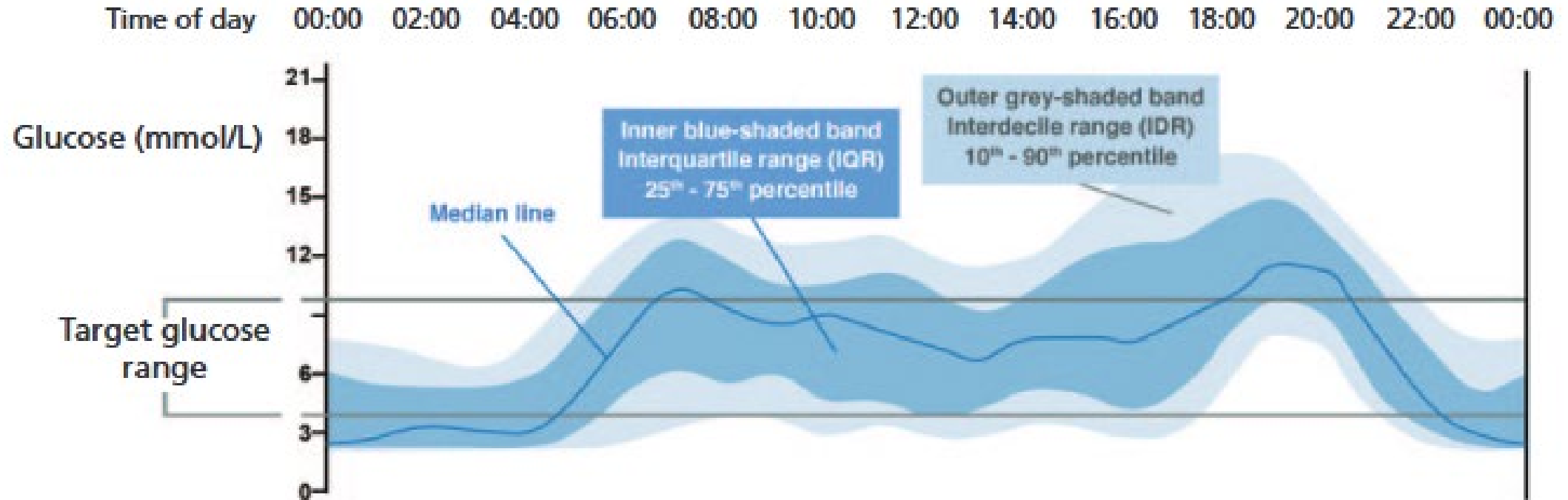


Next step in interpretation - the AGP – OPTIONAL!!

- After a few days the app will be able to sketch **Daily Patterns** or an Ambulatory Glucose Profile “AGP”
- Internationally agreed standard for summarising the wealth of data in a visually impactful format
- This demonstrates glucose variability vs target range
 - This allows a more detailed analysis of glucose variability and what might be impacting on this



Key visual features of a AGP



- Blue line = median
- Grey lines horizontal = target range
- Darker blue shading = 25th-75th percentile
 - This is where the glucose is 50% of the time. If this is very wide, there is a lot of day to day variability
- Lighter blue shading = 10-90th percentiles.
 - Shows less common departures from the daily average glucose

Using software platforms to look at data remotely

- As well as just looking at a persons app or reader, we also have the option to use cloud-based platforms to remotely look at data
 - Eg LibreView or Clarity
- Need to ensure that appropriate ***data sharing agreements*** in place
- Need to ensure that the person / carer understands that the data will not be accessed beyond the time of their review ie acting upon their glucose readings remains their own responsibility
- The advantage of these systems allows us to look at daily graphs and AGPs remotely and make plans prior to review or during a remote consultation - more efficient

NICE guideline update March 2022

Offer intermittently scanned continuous glucose monitoring (isCGM, commonly referred to as 'flash') to adults with type 2 diabetes on multiple daily insulin injections if any of the following apply:

- they have recurrent hypoglycaemia or severe hypoglycaemia
- they have impaired hypoglycaemia awareness
- they have a condition or disability (including a learning disability or cognitive impairment) that means they cannot self-monitor their blood glucose by capillary blood glucose monitoring but could use an isCGM device (or have it scanned for them)
- they would otherwise be advised to self-measure at least 8 times a day.

Offer isCGM to adults with insulin-treated type 2 diabetes who would otherwise need help from a care worker or healthcare professional to monitor their blood glucose.

Consider real-time continuous glucose monitoring (rtCGM) as an alternative to isCGM for adults with insulin-treated type 2 diabetes if it is available for the same or lower cost.

Health Technology Wales 2021

- The evidence supports the **routine adoption** of Freestyle Libre flash glucose monitoring to guide blood glucose regulation **in people with diabetes who require treatment with insulin.**
- The use of Freestyle Libre flash glucose monitoring in these people improves the proportion of time that the blood glucose is in target range and reduces time in hypo and hyperglycaemia.
- Health economic modelling indicates that the use of Freestyle Libre flash glucose monitoring is a cost effective intervention compared to finger-prick self monitoring of blood glucose with incremental cost effectiveness ratios (ICERs) of £4,706 and £13,137 per QALY for type 1 and type 2 diabetes, respectively.

Possible barriers or pitfalls to implementation in primary care

Training need

Work transfer?

Resource implications

Data sharing

Data ownership

Who is monitoring and how often?
Patient/ carer responsibly to act on readings

Cost

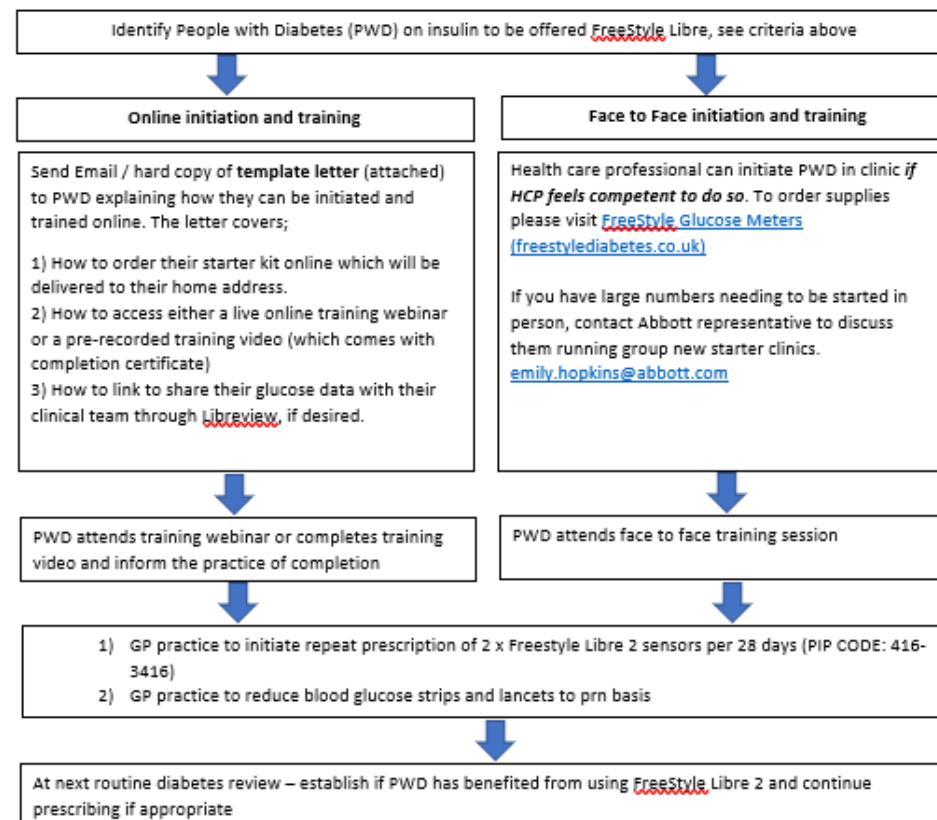
Prioritisation, patient identification – not suitable for all

Access

Avoid worsening health inequality

Local pathway example

Flash Glucose Monitoring (FreeStyle Libre 2) Primary care initiation pathway



Useful Resources for Health Care Professionals

- Please visit <https://pro.freestyle.abbott/uk-en/home/primary-care.html> to access primary care specific help and resources. This includes the ability to order a trial sensor for yourself, access HCP training videos/modules and a range of resources to make starting patients in primary care easy.
- **Abbott Customer Service** For any product related questions patients and HCPs can call, eg issue with sensor not working properly, need a replacement sensor:
- **General enquiries: 0800 170 1177** (Mon-Fri 8:00am – 8:00pm, Sat 9:00am – 5:00pm)
Digital Health Solutions (FreeStyle LibreLink, LibreLinkUp and LibreView): 0800 612 3006 (Mon-Fri 8:00am –

Template letter example

FreeStyle Libre 2 Invitation Letter

Dear Patient,

You have been identified to be initiated onto the FreeStyle Libre 2 flash glucose monitoring system in order to help self-manage your diabetes. Please follow the steps below to complete the training and initiation process.

Option A: Live interactive training webinar



Step 1. Register for a webinar and order your starter kit – Please scan the QR code or visit the following link whereby you will be asked to register for a live webinar.

<https://app.livestorm.co/abbott-uk-sales-team/freestyle-libre-2-training-west-region-please-pick-your-date-311?type=detailed>

Once registered, you will receive a confirmation email with instructions on how to order your free starter kit, download the FreeStyle LibreLink app to scan your sensor with and join the training session. (Please check your junk mailbox if you have not received it within a day.)

Step 2. Attend webinar – following webinar, please retain email confirmation of attendance and notify your health care professionals/GP practice so the FreeStyle Libre 2 sensors can be added to your repeat prescription.

Option B: On-demand training video



Step 1. Order your starter kit – Scan the QR code or visit the following link freestylediabetes.co.uk/starterclinic/starter-letter-order or access via the QR code to complete a sample request form, as well as download the FreeStyle LibreLink app to scan your sensor with. Once the sample request has been submitted, the FreeStyle Libre 2 system starter kit will be delivered to the address you specified (delivery may take up to 7 working days).



Step 2. Complete your training - Before applying your sensor for the first time, please click on the following link [FreeStyleDiabetes.co.uk/FSL2start](https://freestylediabetes.co.uk/FSL2start) or access via the QR code to watch the FreeStyle Libre 2 starter clinic training video and download completion certificate. After watching the training video, please contact your GP practice to process your prescription for the FreeStyle Libre 2 sensors.

Step 3 - Contact your GP practice to inform them you have completed the FreeStyle Libre 2 training so that they can add FreeStyle Libre 2 sensors to your repeat prescription.

Kind regards

(Insert GP Surgery name and contact telephone number)

For any extra assistance contact:

Abbott Customer Services – For any product related questions or issues eg sensors not working or fallen off:
General enquiries: 0800 170 1177 (Mon-Fri 8:00am – 8:00pm, Sat 9:00am – 5:00pm) Digital Health Solutions ([FreeStyle LibreLink](https://freestylediabetes.co.uk), [LibreLinkUp](https://freestylediabetes.co.uk) and [LibreView](https://freestylediabetes.co.uk)): 0800 612 3006 (Mon-Fri 8:00am – 5:30pm)

Nursing home settings

Draft Wales Guideline

Guidelines / Pathway for Flash Glucose Monitoring (isCGM) for individuals living in residential / nursing home or who require support with insulin administration.

Project roll Out

Phase 1	Phase 2
Two or more insulin injections a day	Daily insulin injection
More than 1 hypoglycaemic event in a 7-day period	

Diabetes
ON THE NET

Journal of
Diabetes Nursing

Embedding flash glucose monitoring technology within neighbourhood nursing teams



Competency framework and workbook Blood glucose monitoring and subcutaneous insulin administration

Version 2, November 2022

This framework and workbook are for use with health care workers, healthcare assistants, support workers, other non-regulated health and care roles, and allied health professionals.



Education and Support

[How to initiate and support continuous glucose monitoring - DiabetesontheNet](https://www.diabetesonthenet.com)

CONTINUOUS GLUCOSE MONITORING, DEVICES, EDITOR'S PICK, FLASH GLUCOSE MONITORING, FREESTYLE LIBRE, HOW TO... SERIES

How to initiate and support continuous glucose monitoring

Nicola Milne

12 Oct 2022 Vol:24 | No:05 Page: 139



What information/data does CGM provide?

- **Current interstitial glucose level (A).**
- **Trend arrows** show the direction glucose is heading and the rate of change (B).
- **Daily patterns (C).**
- **Low-glucose events (D).**
- **Time spent in the target glucose range: Time in Range (TIR)** – see [Box 2](#).⁵
 - Increasing TIR reduces the risk of microvascular complications.⁵
- The user can also add **notes on food, exercise and insulin doses (E).**
- **Ambulatory glucose profile (F).**
 - For more information, see [Quick guide: Interpreting CGM data](#)

A

B

Glucose trend arrow meanings

- ↑ Increasing quickly (>0.11 mmol/L/min)
- ↗ Increasing slowly (0.06–0.11 mmol/L/min)
- Stable (<0.06 mmol/L/min)
- ↘ Decreasing slowly (0.06–0.11 mmol/L/min)
- ↓ Decreasing quickly (>0.11 mmol/L/min)

Image source: FreeStyle Libre

C

Image source: FreeStyle LibreView

F

Image source: Dexcom Clarity

Box 2. Time in Range (TIR)

Overall goal (type 1 and 2 diabetes):
Aim for >70% of the day with
Time In Range (3.9–10.0 mmol/L)

Priority 1:
Minimise **Time Below Range (<3.9 mmol/L)**

Priority 2:
Then minimise **Time Above Range (>10.0 mmol/L)**

Blood glucose range:	Target (percentage of day):
>13.9 mmol/L	<5%
>10.0 mmol/L	<25%
3.9–10.0 mmol/L	>70%
<3.9 mmol/L	<4%
<3.0 mmol/L	<1%

Note: Other targets are recommended in cases of frailty or pregnancy

Data review: Top tips

- Respect the person's data and avoid negative language: see [How to find the ideal words in consultations](#)
- For data interpretation, see [Quick guide: Interpreting CGM data](#)
- Common areas causing variability and/or reduced TIR include:
 - Limited sensor glucose data (insufficient iCGM scanning).
 - Unsuitable TIR targets.
 - Inappropriate alarm/alert settings.
 - Incorrect timing of insulin.
 - Incorrect dose of insulin.
 - Under-reacting to glucose levels.
 - Over-reacting to glucose levels.
 - Overtreating hypoglycaemia.
 - Poor injection technique to include injecting into areas of lipohypertrophy.
- For information of appropriate insulin management, see [The Six Steps to Insulin Safety](#) e-Learning module.
- For information on appropriate injection technique, visit [Injection Technique Matters](#)

Resources

For healthcare professionals:	Manufacturers' resources:
● Diabetes technology Network	● Abbott FreeStyle Libre
● Leicester Diabetes Centre/ EDEN: Implementing Glucose Sensing in Primary Care e-Learning modules	● Dexcom ONE
	● GlucRx AiDEX
	● GlucoMen Day



Association of British Clinical Diabetologists

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DTN-UK Education

Providing education to health care professionals as well as people with diabetes to help them make the best use of diabetes technology

Healthcare Professional Education



The educational platform for diabetes technology, certified by the Association of British Clinical Diabetologists.

Educational Resources for people living with diabetes



The ABCD Diabetes Technology Network

eden Implementing Glucose Sensing in Primary Care

[Implementing Glucose Sensing in Primary Care \(glucose-sensing.com\)](https://www.edensensing.com)



Cambridge
Diabetes Education
Programme



Time: 1h 30m

Continuous Glucose Monitoring (CGM): the Basics

This topic is aimed at introducing healthcare staff to Continuous Glucose Monitoring (CGM), the different types of devices available and their use in people living with diabetes.

[Select Your Topic | Cambridge Diabetes Education Programme \(cdep.org.uk\)](https://cdep.org.uk)



*Get the most out of the systems**

FREESTYLE ACADEMY

The FreeStyle Academy is a unique resource committed to supporting you, to get the most from the FreeStyle Libre systems*.

START YOUR MODULES ›

For any device related issues with the Freestyle Libre sensor or reader contact Abbott customer service

- Customer service telephone - [0800 170 1177](tel:08001701177)
- Customer service E-mail - ADChelpuk@abbott.com

[FreeStyle Progress - Abbott \(freestylediabetes.co.uk\)](http://freestylediabetes.co.uk)

rt-CGM and Dexcom ONE

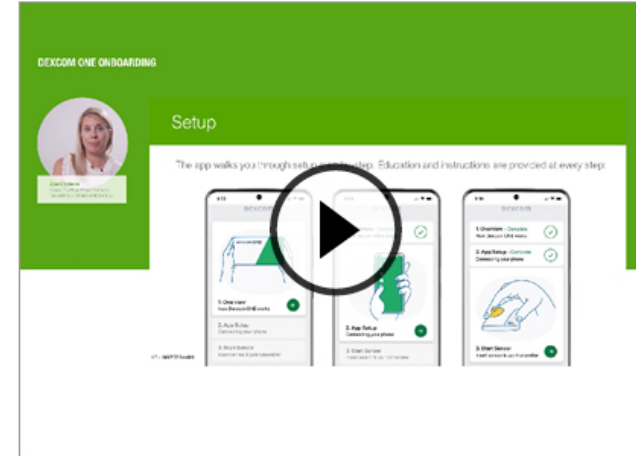
Introducing Dexcom ONE, best for people with T1 or T2 diabetes using insulin who are looking for an easy and accessible real-time CGM system available on prescription.



Dexcom ONE - Training for HCP's

Discover the benefits of real-time Continuous Glucose Monitoring (rt-CGM) and the Dexcom ONE system for people with diabetes.

[WATCH VIDEO](#)



Dexcom ONE – Getting patients started

How to get your patients started on Dexcom ONE and resources available for HCP's.

[WATCH VIDEO](#)

<https://uk.provider.dexcom.com/education-and-resources/rt-cgm-education>

Case study – Primary care

- 92 year old man
- Type 2 diabetes for 26 years
- On MDI insulin
- Lives with his 90 year old wife, both fiercely independent, good QoL
- Family nearby
- Increasing anxiety around both hypo and hyperglycaemia
 - Often seeing practice nurse for reviews, reassurance
- Now finding SMBG increasingly tricky due to reduced dexterity leading to more anxiety

- On Dexcom One
 - Anxiety massively reduced
 - Son fits the sensor
 - Patient now comes in the surgery brandishing his reader!
 - Identified some morning hypoglycaemia and afternoon hyperglycaemia
 - Adjusted accordingly

Case study – Primary care

- 56 year old lady
- Type 2 diabetes for 10 years
- On MDI insulin
- Can't get her head around her diabetes
 - Struggles with diet and weight
 - Not keen on injecting, been resistant to insulin for a long time due to needle phobia
 - Can't bear CBG testing more than once a day
 - HBA1c 86mmol/mol
- Started FreeStyle Libre 2
 - Feeling much more informed, self management and engagement increased
 - Altered diet and self titrating insulin
 - TIR was 40% initially, now increased to 62%
 - HBA1c improving

Conclusions

- Intermittently scanned (flash) and CGM is increasingly available to patients living with diabetes
 - New guidelines supports use in type 2 diabetes for some people treated with insulin
 - Evidence of improvements in glycaemic control, reduction in hypoglycaemia and increased QoL
 - Promote self management and engagement
 - Time in range is a useful measurement alongside HbA1c, gives an insight into glucose variability
 - Interpreting the data - equivalent of CBG readings, or more complex AGP
 - As always, training and resource implications which need to be considered and suitable pathways designed.
-
- Will fingerprick testing become a thing of the past?
 - Maybe eventually....





Thank you

Any questions?