The flash glucose monitoring revolution: the Sat Nav journey

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I am setting readers a challenge (Figures 1 and 2). I would like you to drive to Park Row in Leeds, a place you have not visited before. To get there you can drive your car and use your satellite navigation (Sat Nav) system. However, you can only look at your Sat Nav system on four occasions during your whole journey. Are you feeling uncomfortable? No wonder. But this is essentially what we have been asking people with diabetes to do for decades when it comes to glucose monitoring. Asking people with diabetes to check their blood glucose only before meals and before bed provides very limited information about what is happening to glucose levels in between meals and overnight. What would be preferable, of course, is the ability to see the glucose data across the full day, on demand, to check how the journey is going and, most importantly, to arrive safely at the desired destination.

In 2014 the Abbott FreeStyle Libre device became available in the UK, allowing people with diabetes to monitor their glucose levels continuously. The Freestyle Libre flash glucose monitoring device is an arm-worn glucose sensor, the first two versions of which were the size of a £2 coin. The device reads glucose data every minute and transfers this information to a mobile phone app. The person with diabetes can then access their glucose data by scanning their phone over the sensor or, for those without a smartphone, there is a reader which can be used for scanning the sensor and doing glucose checks.

The Impact flash glucose monitoring randomised controlled trial in 2014 demonstrated that the use of flash glucose monitoring in people with well controlled T1DM resulted in a 38% reduction in hypoglycaemia.[1] Interestingly, this reduction in hypoglycaemia occurred after the first fortnight of use, even though the users had no instructions on how to respond to their glucose data. This may initially seem surprising but viewing the data from the device shown in figure 3 makes clear how intuitive it can be for people with diabetes to understand and respond to their glucose levels. For example, in the UK to be safe to drive a car in accordance with the DVLA regulations, your glucose must be above 5.0 mmol/L.[2] In the finger prick example in Figure 3 the glucose reading is 5.3mmol/L, implying that the individual would meet the criteria for safe driving. In the second example with a reading of 5.3mmol/L and a straight across arrow, indicating a steady glucose profile, again this would be reassuring for driving. In the third example with a reading of 5.3mmol/L and a downwards arrow indicating a rapidly reducing glucose level, it is clear that the person would need to take extra rescue carbohydrates to avert the risk of hypoglycaemia.

Figure 1. The challenge

Figure 2. The challenge: the desired option

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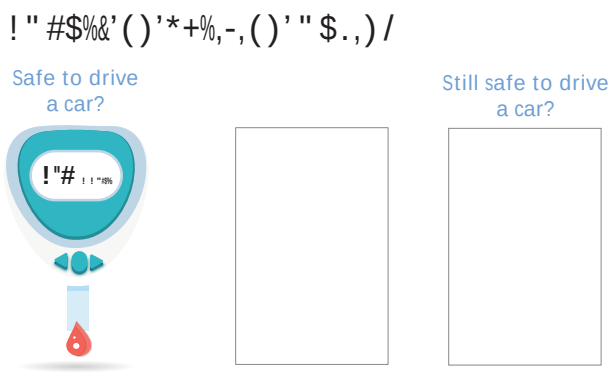
Figure 3. Glucose monitoring and the DVLA

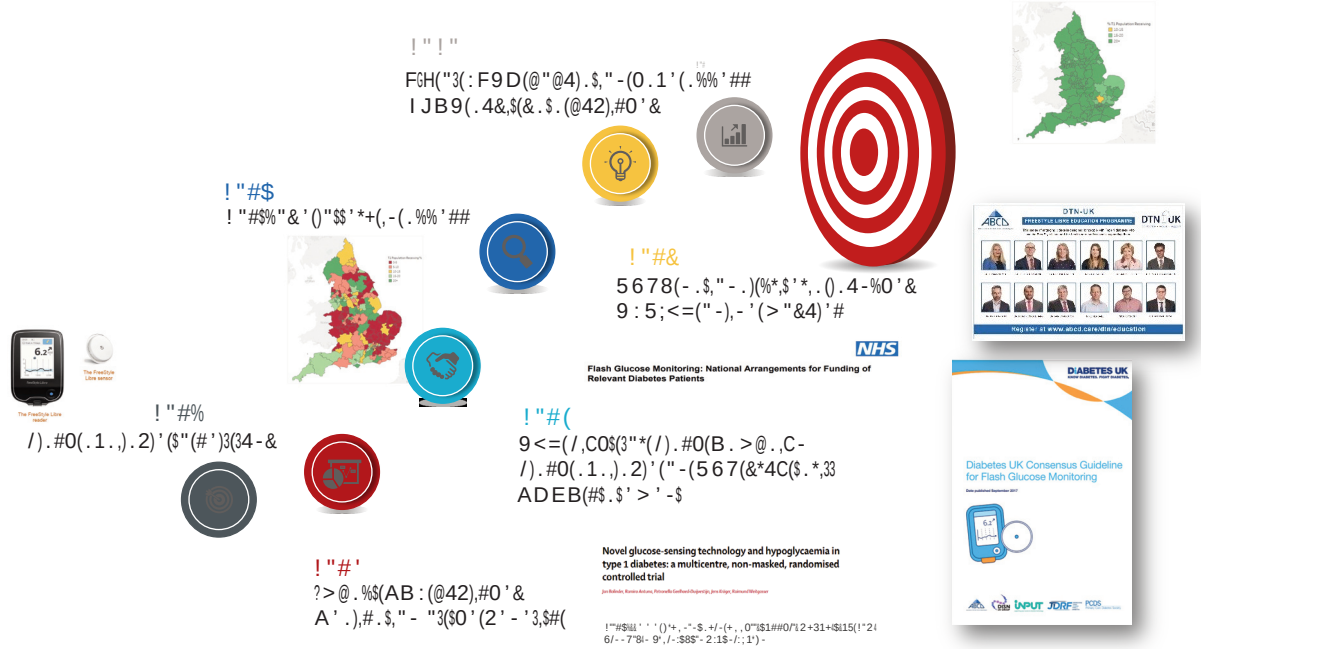


Over the past eight years we have seen a substantial increase in access to ash glucose monitoring. Figure 4 demonstrates the journey to improving access to ash glucose monitoring. This became available initially to self-fund in 2014, and people living with diabetes started to gain insight into the potential bene ts. Many were frustrated that such a life-changing device was not available on prescription. Diabetes UK responded on their behalf with their Fight for Flash campaign. Flash glucose monitoring became available on the NHS drug tariff in 2017 but access remained patchy, with the emergence of a post code lottery. In response, NHS England rolled out national access criteria associated with a national reimbursement policy. Interestingly, these criteria included indications such as psychosocial or occupational indications for ash glucose monitoring, opening the doors for wider access for those who were struggling with blood glucose monitoring. Since then, we have seen a substantial uptick in the levels of access. Towards the end of 2022, more than 70% of people living with T1DM have access to this technology, representing the most rapid increase in uptake of a new technology in the history of T1DM.

From 2017 ABCD undertook a national audit of ash glucose monitoring with the aim of understanding better the clinical outcomes associated with using the device. The data, published in Diabetes Care in 2020, demonstrated a - 5.2mmol/mol reduction in HbA_{1c}, with even greater reductions witnessed in those with higher baseline HbA_{1c} values.[3] The other striking nding was a signi cant reduction in admissions with diabetic ketoacidosis (DKA), hyperglycaemia, hypoglycaemia, paramedic call outs and severe hypoglycaemia. Importantly there was also an improvement in the Gold score (a marker of hypoglycaemia awareness): proportion of those with impaired awareness of hypoglycaemia at baseline reverted to normal hypoglycaemia awareness; reducing from 28% to 18%.[4]

A further concern which some may have when initiating ash glucose monitoring is whether structured education might be needed prior to starting the device. However, in contrast to the assumptions made, our work demonstrated that it did not matter whether somebody had attended structured education or not HbA_{1c} reduction was seen across the board independent of prior education status.[5] This nding is further supported by the real-world data which showed that during the pandemic lockdown, a period when people with diabetes had limited support from healthcare professionals, there was an improvement in time in range, re ecting improved self-management.[6] Finally, and possibly most importantly, the ABCD audit has also demonstrated that ash glu-

Figure 4. The ash glucose montoring journey in the UK



Key messages

- The uptake of flash glucose monitoring in the UK has increased exponentially in recent years, providing people with diabetes with a more detailed understanding of their glucose levels across the day.
- The use of flash glucose monitoring technology in people with type 1 diabetes is associated with improvements in HbA_{1c}, hypoglycaemia and acute admissions.
- From 2022 on, NICE recommends that we offer people living with Type 1 diabetes a choice of interstitial glucose monitoring devices, designed to meet their individual needs.

cose monitoring is associated with a significant reduction in diabetes-related distress (50% to 26%, p<0.001). (This is a measure of the degree to which people feel they are either failing with their diabetes or feeling overwhelmed by their diabetes.[7])

These data support the case for wider access to flash glucose monitoring in the UK. The most recent development in access was in March 2022, when NICE published their updated guidance on glucose monitoring.[8] It is now recommended that either flash or real-time continuous glucose monitoring should be made available to all people living with T1DM and that the choice of device should be guided by individual needs and the characteristics of the devices available. The challenge in delivering this will, of course, be the associated costs. These concerns will hopefully be offset by the results of Flash UK study, led by Dr Lala Leelarathna, which has recently demonstrated the effectiveness of the FreeStyle Libre device in a randomised controlled trial.[9,10]

The latest development in the flash glucose monitoring journey is the integration of smart pens in the Libreview platform. This will allow clinicians to visualise glucose data alongside insulin data, facilitating a more detailed interpretation and hopefully leading to better support for those using multiple daily injections and flash glucose monitoring. These data will also be available for real-time CGM users with connected pens in the Glooko platform. These latest developments in access to smart pens will finally help to bridge the gap between multiple daily injection users and insulin pump users, providing thorough glucose and insulin data regardless of the insulin delivery modality.

In the past decade we have witnessed a revolution in the access to flash glucose monitoring. The recent NICE update extends this revolution to real-time CGM also, providing choice and the ability to respond to individual needs when discussing glucose monitoring options in clinic. Never before has there been such a rapid increase in diabetes technology. As we move into the era of automated insulin delivery, the future is looking very bright indeed.

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