

# Digital Diabetes – The Future Is Now

“It has significantly changed my life for the better” is what the final patient of my diabetes clinic said to me last week, when I asked her about her new continuous glucose monitor (CGM).

We are experiencing a Cambrian explosion of digital health tools in medicine and diabetes care is a great example of their impact. This is thanks to Moore’s Law, which states that the transistor density of integrated circuits doubles approximately every two years. This corresponds to smaller, more powerful computer chips which continuously push the boundaries of what’s possible with technology. We see this in our shops with better phones and TVs and now in our clinics with better patient outcomes.

In a very short period of time, primarily since the release of the iPhone (2007), we have seen the emergence of the Internet of Things (IoT) and personal health sensor ecosystems that can be harvested by a smartphone, analysed in the cloud and make suggestions to improve your health (e.g. step-counts, glucose etc.). Furthermore COVID19 has resulted in 10 years of digital transformation in medicine happening in one year (e.g. video consults, remote monitoring etc.)

Diabetes is a global health emergency affecting approximately 10% of the planet’s population. It is a chronic metabolic disease which results in glucose dysregulation and its management is multifaceted involving diet, exercise and usually medications (pills and insulin therapy). Several studies have shown that keeping blood glucose levels in the normal range reduces medical complications (e.g. nerve, eye, kidney and cardiovascular disease). It requires multidisciplinary team input (e.g. physicians, nurses, dieticians, podiatrists, psychologists, ophthalmologists etc.) and its ongoing management can often be burdensome for patients. Indeed my patients have described the extra mental load, as trying to live your life like everyone else but also having to be constantly tapping to keep a balloon in the air (like the party game). This is because so many things can affect your blood sugar levels from day to day including diet, exercise, stress,

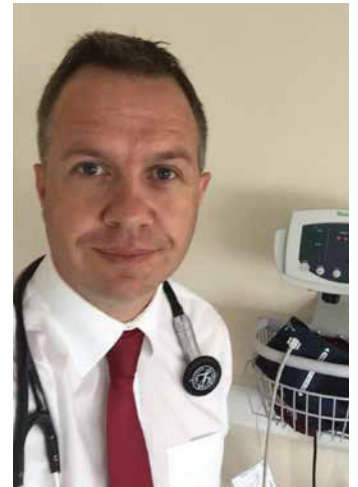
illness etc. Technology offers tools to help lighten the load by providing the patient with the right information at the right time, such as smartphone apps to calculate the carbohydrate content of different meals. Indeed for people with diabetes, having to calculate the required insulin doses based on the current blood sugar, the macronutrients of the meal to be eaten in addition to the above mentioned variables is like a math Olympiad several times a day. This in addition to physically having prick your finger, draw blood and measure with a glucometer four times a day, forever.

In the real world, patients will never get their insulin / glucose matched 100% all of the time and can feel upset by this but I reassure them using a golf analogy, that it’s impossible to get a hole in one every time. Using traditional methods, they might get on the fairway but by using diabetes technology, the results will get them on the putting green, every time.

Therefore technology such as intermittently scanned continuous glucose monitors can help remove some of this management burden by simply wearing a 2 euro sized device on your upper arm (e.g. Abbott Libre) for 2 weeks and not having to prick your fingers. Instead the glucose data is sampled every 5 minutes and stored on the device which can be read by waving your mobile phone over the sensor, every 8 hours. This data is then stored on the cloud for review by you and your clinician to see your unique glucose variation and to then make more informed management decisions to improve this. If more nuance is needed then matchbox sized real time continuous glucose monitors can be worn on the abdomen (e.g. Dexcom G6) and then not only can glucose data be seen instantly on your smartphone (and stored in cloud) but also alarms can be set to alert you when you are going low/high. On the software side, clinicians now use Ambulatory Glucose Profiles (AGP) reports to analyse this new glucose big data in a structured way.

Another important technology to improve glucose Time in Range (TIR) is an insulin pump (which is often paired with a CGM).

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These pager sized devices allow very flexible, micro dosing of insulin throughout the day, so that a tailored programme can be developed for each specific patient. Next generation diabetes technology research is exploring the use of artificial intelligence algorithms coupled with glucose big data to predict when patients will have sentinel events (e.g. hypoglycaemia) many hours ahead of what we can do now. In addition the closed loop insulin pumps will soon be a full artificial (bionic) pancreas, meaning it will

be able to match insulin/glucose requirements in real time day and night, taking into account all the variables to ensure normal glucose patterns at all times.

Of course the rapidly changing landscape of diabetes technology requires clinicians to stay up to date and so NUI Galway is now offering a stand-alone diabetes module, as well as a diploma and masters in Diabetes.

<http://www.nuigalway.ie/courses/taught-postgraduate-courses/diabetes-medicine-msc-pdip.html>

