The role of technology in the future of diabetes management

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What is the reality of the quest for a cure? Well, we are certainly much further forward than we were 15 years ago. We know the ‘recipe’ to make beta cells from stem cells, and can even get a reasonable amount of glucose responsiveness from them. However, even assuming we can make enough cells to be useful to a human, we need to test the short- and long-term safety of these cells to make sure they don’t ‘go rogue’, ie start making insulin, even when it’s not needed. The current thinking seems to be that we need to develop devices that can be implanted into patients, which will provide a safe haven for these cells from the body’s immune system, but also allow replacement or replenishment of cells if needed. Assuming the regulatory and technical hurdles of this can be met, we come to the question of cost and cost-effectiveness, and we have no idea if these ‘cures’ for diabetes will work and, if so, for how long. So, without wanting to sound pessimistic, I can see light at the end of the tunnel, but it looks like a pretty long tunnel to me.

The next few years
So what else can we do while we are in the ‘tunnel’? Well, the landscape for artificial pancreas or closed-loop systems is exciting. Medtronic has already launched their latest hybrid closed-loop system in the US, and that should be coming to the UK by next year. Similarly, collaborations between Dexcom, Cellnovo and Omnipod should provide commercial closed-loop systems by the end of 2018. It will then be up to the companies to prove the benefit is cost-effective for clinicians like me to be able to provide our patients with these tools. They will come with a whole new need for education too, because managing the transition from closed loop to open loop, when the sensor runs out, or the pump needs changing, or the Bluetooth stops talking, will become important safety issues.

The biggest change that may come around over the next few years is the increasing use of technology for patient education and support. Now that blood glucose meters can speak to the internet, we have the capability to follow patients electronically, and identify problems early. ‘Cloud-based care’ has already been trialled, and shown to make more efficient use of scarce healthcare professional resources, and direct them to those in most need.

So, the near future may involve some real changes in the way people with diabetes and healthcare professionals interact, with use of newer technology. So, although I don’t see a ‘cure’ in the next few years, I do see technology making life with diabetes a little bit easier.

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he need for multiple fingerstick glucose tests and multiple injections of insulin for survival, impose a heavy burden on people living with Type 1 diabetes. While some cope with these additional demands well, many others struggle, leading to reduced quality of life, suboptimal glucose levels and, ultimately, long-term complications and reduced life expectancy. Hypoglycaemia is a constant threat and stops many people from achieving near-normal glucose control. Almost everything we do in life affects Type 1 diabetes and, even more frustratingly, often no cause can be found for unexpected glucose behaviours.

People living with Type 1 diabetes need to learn and refine many skills. Although high-quality structured education courses, such as DAFNE (Dose Adjustment for Normal Eating), improve diabetes control and reduce hypoglycaemia, and are of fundamental importance, only a very small proportion of people who have completed these courses meet current treatment goals (HbA1c < 53mmol/mol), and a proportion continue to have problematic hypoglycaemia.

**Technology developments**

Continuous subcutaneous insulin infusion (CSII) has various benefits – reducing the burden of hypoglycaemia and improving both HbA1c and quality of life. Indeed, it can be life changing for some. Evidence from a Swedish registry suggests patients enjoy a lower total and cardiovascular mortality with CSII. However, to harness the full benefits of CSII, appropriate education, training and support for both the user and the healthcare professional is required. Overall, access to CSII remains disappointingly low in the UK (<10 per cent) compared with countries such as the US, France and Germany, and regional variations of access here are common.

More advanced pump features, such as predictive or threshold low-glucose suspend of sensor-augmented pumps, can further reduce biochemical and severe hypoglycaemia. The current NICE threshold for CSII of HbA1c >69mmol/mol may be too high bar, especially in the context of new NICE target HbA1c of 47mmol/mol. There is a need for further studies to assess the benefits of CSII in terms of HbA1c reduction for those with baseline HbA1c between 58 and 69mmol/mol after optimised multiple daily injection (MDI) treatment.

We have seen major developments in the field of glucose monitoring. For the first time, we now have devices that can provide glucose data without the need for burdensome fingerpricking. There is little doubt that, if provided with a choice, a clear majority of people living with diabetes would prefer not to do regular fingerpricks. Use of the Abbott Freestyle Libre device, that can replace fingersticks, has shown reduction in hypoglycaemia and improved quality of life, but randomised controlled clinical trial data is lacking about use of this device in suboptimally controlled Type 1 diabetes. Some European countries (eg France, Belgium and Austria) have initiated national reimbursement of the Libre device, but no firm decision has yet been reached in the UK.

Two recent large multicentre randomised trials, (the DIAMOND and GOLD studies), have shown significant improvements in HbA1c with the use of real-time continuous glucose monitoring (CGM) in adults with suboptimally controlled Type diabetes (HbA1c >58mmol/mol) on MDI therapy and may offer a new treatment paradigm – to consider CGM before, or as an alternative to, CSII for those not achieving current targets. Even though NICE recommends CGM for those with problematic hypoglycaemia, access to this form of treatment is also disappointingly low, with regional variation.

A new faster-acting insulin analogue (fast-acting insulin aspart) is now available in Europe. Published data shows improvements in HbA1c and post-prandial glucose control with faster-acting aspart compared with current insulin aspart in Type 1 diabetes with MDI therapy. Preliminary data also show benefit with CSII, with a larger trial ongoing. I suspect some will find this new insulin to be very useful, especially those with higher time to peak insulin action leading to high post-prandial glucose levels.

**Improve early access**

Healthcare resources are limited and cost-effectiveness needs to be demonstrated for funding new treatments. Currently we spend around 80 per cent of the diabetes budget on treating avoidable complications of the condition, such as lower-limb amputation. It therefore makes sense to provide treatments with proven benefit early, to avoid complications and offset short-term costs with long-term savings.

Continuation of expensive treatments can be linked to demonstration of ongoing benefits. We need to avoid regional variations and have local policies replaced with clear national policies. Compared with other western countries, the UK has much poorer diabetes control, and there is an urgent need to improve access for both high-quality structured education and diabetes technology, without regional variations.

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