Editorial

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Diabetes in the UK – Luddite or technophile?

Is type 1 diabetes care in the UK ready for prime time or does it run the risk of turning into a third-world service? Recent newspaper headlines suggest that all is not well in Blighty, with stories of diabetes potentially bankrupting the NHS. Even more worrying, outcomes for young people with type 1 diabetes fare poorly compared with European counterparts (*Express*, 2015; *International Business Times*, 2015). In comparison, in the United States, the Affordable Care Act has allowed more people with diabetes to access care than before although there remains significant problems with their system of health provision. The US federal government is also putting its research money where its mouth is with a recent announcement of $300 million for type 1 diabetes research (*Diabetes Times*, 2015). One high-profile focus of research and development is for the creation of an artificial pancreas (AP) – a fully automated, 24-hour closed-loop system with minimal or no input by the user.

The concept of the AP is based on taking an "off-the-shelf" insulin pump and a continuous glucose-sensor device and creating feedback-controlled algorithms that automatically adjust the rate of insulin delivery by the insulin pump based on the real-time continuous glucose monitoring (CGM) data. Other variations on the system include whether or not the AP system needs to have meals or exercise "announced" (i.e. the user has to inform the system), whether AP needs to be developed for overnight closed-loop control or for 24-hour control, or whether it is fully automated, requiring almost no input from the user except from having to wear the devices. Until recently, most studies of the AP have been performed in controlled situations, but recently AP research has been moved out of the laboratory and into "free living" situations (Barnard et al, 2015).

Continuing with the goal of advancing this technology for full outpatient use, current trials are moving away from using frequent assessments of blood glucose with intravenous blood measurements or fingerstick checks, and towards using CGM as the sole measurement of glucose levels. Smartphone technology has also reached a point where these consumer devices can host the AP "brain", as well as allowing for remote monitoring by professionals and family members. More likely, the AP algorithms will be embedded in the insulin pump to reduce the number of devices associated with this technology. At the present time, results from clinical trials of AP systems show that they are able to maintain glucose levels between 4 and 10 mmol/L around 70% of the time (Doyle et al, 2014).

There are limitations to using consumer off-the-shelf technologies in a system that was not initially designed to be integrated. First, not all insulin pumps can be programmed with a background default basal rate if the system loses connection; some pumps just stop giving insulin when signals are not received. Similarly, most trials to date have participants wearing two glucose sensors in case one fails. This is not feasible for real-life use, as today, less than 10% of people with type 1 diabetes wear even a single sensor at all. Remote monitoring is also an issue – do physicians want to be alerted in real time every time a signal is lost between devices or a low blood glucose occurs? There is also much-needed research to determine the psychosocial aspects of what living with an AP would be like day in and day out, and the basic elephant-in-the-room question of the cost of such a system.

Nevertheless, in the US and across Europe and Israel, AP research is progressing. For the UK, access to technology for diabetes is still a desert, with only an occasional oasis, as evidenced by the continued low levels of insulin pump therapy use and a lack of funding for glucose sensors. Moreover, much of type 1 diabetes care is delivered by clinicians lacking specialist training in this complex condition. If AP becomes available and unless things change, access to this potentially life-changing technology will be based more on where an individual lives and the level of enthusiasm and expertise of local clinicians, rather than the efficacy of the system. That is not good ethical medicine. ■

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