



**David Kerr**  
Editor-in-Chief

## David Kerr

Director of Research and Innovation at the William Sansum Diabetes Center in Santa Barbara, California ([www.sansum.org](http://www.sansum.org)) and Founder of [www.DiabetesTravel.org](http://www.DiabetesTravel.org) and [www.Excarbs.com](http://www.Excarbs.com)

## References

- Klonoff DC, Blonde L, Cembrowski G et al (2011) Consensus report: the current role of self-monitoring of blood glucose in non-insulin-treated type 2 diabetes. *J Diabetes Sci Technol* **5**: 1529–48
- Stein J (2015) *The Emergence of the 'Internet Of Medical Things'*. Huffington Post, New York, NY, USA. Available at <http://huff.to/1Br11OZ> (accessed 23.11.15)
- Tattersall R (2009) *Diabetes: The Biography*. Oxford University Press, Oxford.

## The NHS is #stillwaiting

**“By the pricking of my thumbs, something wicked this way comes.”**

**Macbeth, William Shakespeare**

Self-monitoring of blood glucose (SMBG) is an established and repetitive aspect of diabetes self-management. However, back in the 1950s, when the concept of people with diabetes testing their own blood glucose levels was first suggested, it was met with laughter and incredulity by professionals (Tattersall, 2009). Subsequently, SMBG has become a multi-million dollar industry and the picture of a drop of blood dripping from a finger onto a test strip has become established as a defining image of diabetes care. Over recent years, controversy has developed as to the role of SMBG among non-insulin-treated individuals, with some clinicians advocating rationing or a return to urine testing. To me this makes no sense, especially given the evidence showing that structured (as opposed to episodic haphazard finger pricking) SMBG is useful; however, the question remains as to how often structured testing is offered, especially by primary care (Klonoff et al, 2011).

The alternative to painful and messy blood testing is interstitial glucose monitoring, which can be used either as a “one-off” to help solve clinical problems such as the detection of unrecognised hypoglycaemia or continuously to support day-to-day self-management. For traditional continuous glucose monitoring (CGM) systems, technological advances continue to improve accuracy characterised by the mean absolute relative difference (MARD) compared to a gold-standard glucose measuring system. The currently available market leaders are now close to or below the magical MARD value of 10%, which is probably good enough for safe and effective insulin dosing without the need for an additional SMBG test. Interestingly, at the recent Diabetes Technology Society meeting in Maryland, USA, at least one company was about to launch (in Europe) an implantable sensor with a MARD of around 11% over 90 days. Recently, Dexcom, Inc. also launched the latest version of its CGM system. With wireless Bluetooth® technology built into the device transmitter, the G5™ Mobile CGM sends glucose data directly to a smartphone (compatible with iOS devices, Android compatibility to follow), freeing users from the need to carry a separate receiver. Users can also select up to five designated recipients, or “followers.” These followers can remotely monitor glucose information and receive alert notifications from almost anywhere.

The options for this latter type of testing have recently been extended with the Abbott Freestyle Libre system providing real-time glucose values together with trend information and a performance similar to established CGM systems (but without the need for calibration). Importantly for those who pay the bills, this latter approach is less costly and is likely to prove popular with insulin users who test their blood glucose frequently and want more actionable information than SMBG data alone can provide. One key point of difference from traditional CGM systems is that the Libre system does not have high or low alarms, meaning it may not be ideal for those with a high incidence of hypoglycaemia or hypoglycaemia unawareness.

One Holy Grail of diabetes care is for a completely non-invasive approach to glucose monitoring, thus avoiding the need for insertion of needles or cannula. As far as I am aware, at least 70 companies have already crashed and burned in this space! There are a number of methods that have been applied including optical coherence tomography and polarimetric, Raman, fluorescence and near-infrared spectroscopy. None of these approaches have achieved the desired accuracy, especially close to the hypoglycaemia detection range, to allow for commercial success but the search continues.

Overall, glucose monitoring technology continues to make significant progress, and we are beginning to see the availability of hybrid “closed-loop” insulin delivery systems incorporating an insulin pump and CGM system, with the latter detecting the onset of hypoglycaemia or with the latest version applying an algorithm which can predict a low glucose level allowing the insulin delivery to be discontinued.

This is very exciting and the conversations on social media suggest that increasing numbers of people with diabetes want to have access to these advanced self-monitoring systems now (Twitter users can follow this story for the type 1 diabetes population with the hashtag #wearenotwaiting). While the NHS continues to grapple with the question of funding technologies such as CGM systems, there is another revolution about to happen which could directly benefit people with diabetes involving mobile health, wearable devices (including CGM systems) and the “Internet of Medical Things” (Stein, 2015). The question is whether UK diabetes services are ready for this? I fear not...! ■