Available at a flash – a new way to check glucose level

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Type 1 diabetes is a chronic autoimmune condition accounting for 5-10% of diabetes cases diagnosed worldwide[1]. Hypoglycaemia is common, limiting efforts to achieve tight glucose control, and linked to lower quality of life[2] and increased mortality[3]. Insulin analogues, structured education, insulin pump therapy and continuous glucose monitoring have helped to decrease the burden of hypoglycaemia[4,5] which is still considerable.

Flash glucose monitoring, as reported by Bolinder *et al* in this issue of the Lancet[6], is a novel unconventional glucose monitoring tool. Build on well-tested wired-enzyme glucose-oxidase sensing approach originally developed for continuous glucose monitoring, utilising tight quality-control manufacturing processes and underpinned by physiological research[7], flash glucose monitoring offers a two-week, externally-worn glucose sensor displaying present, 8-hour historic, and trend glucose data when *scanned* by the user using a near-field scanner[8] in a similar fashion as when using a contactless payment card. The device does not provide low or high glucose alarms but this reduction in functionality has surprisingly little effect on user acceptability. The unique benefit is that the sensor is factory calibrated; no calibrations are needed and the sensor provides glucose values for non-adjunctive diabetes treatment decisions. In a randomised controlled parallel design multicentre multinational study, well-controlled type 1 diabetes adults with mean HbA1c 6.7% used flash glucose monitoring over 6 months with a key finding of reduced time spent hypoglycaemic below 3.9mmol/l by mean 38% compared to conventional self-monitoring of blood glucose. Applying flash glucose monitoring, capillary glucose monitoring frequency dropped to mean one every two days. Time spent hyperglycaemic above 13.3mmol/l was reduced, mean glucose and HbA1c were unchanged, glycaemic variability was reduced and diabetes-related quality of life improved as well as user reported treatment satisfaction.

What could explain the benefits reported? Flash glucose monitoring, in the same manner as continuous glucose monitoring, is a behavioural modification tool. Users need to respond to glucose measurements by adjusting insulin delivery, modifying eating habits and exercise management. Such a behaviour adaptation occurred within 10 days of starting to use flash glucose monitoring, as hypoglycaemia was reduced and remained stable throughout. The number of scans started at mean 18 per day and reduced slightly to mean 15 per day 3 months later. This frequency was much higher compared to mean 6 capillary glucose measurements applied in the comparator self-blood glucose monitoring group. The convenience of inspecting glucose levels in a “flash”, on average once an hour during the daytime, appears key but indicates unrelenting round-the-clock attention to diabetes self-care to limit hypoglycaemia. Visualisation of historical glucose data may have enhanced aspects of care and support provided by educators. The authors do not report on details of behavioural adaptations and therapy optimisations.

How do these findings impact clinical practice? Hypoglycaemia reduction was observed in both multiple daily injections and insulin pump users, suggesting that benefits can be accrued irrespective of insulin delivery methods used. Interestingly this reduction was comparable to studies using low glucose suspend insulin pump therapy[9]. The exclusion of sub-optimally controlled and hypoglycaemia unaware users limits the generalisability to wider populations of people with type 1 diabetes including youth. Adherence to flash glucose monitoring was high, which may be related to the convenience associated with its use. This is line with our own personal experience in clinical practice, and many users appear willing to self-fund this technology. The non-adjunctive use to guide treatment decisions and insulin dosing is an important benefit, however training of users and healthcare providers is still needed to review and interpret sensor glucose values and trends appropriately.

Flash glucose monitoring has the potential to enhance the management paradigm of type 1 diabetes care, empowering users' informed decision-making whilst reducing burden associated with self-blood glucose monitoring. Amongst commonly reported barriers to wider adoption of continuous glucose monitoring are the need for calibrations, alarm fatigue, frequent sensor changes and cost[10] which may be alleviated by flash glucose monitoring. Well-conducted studies in more generalizable clinical population in which aspects of behaviour modification induced by use of this technology can be ascertained are needed to provide further guidance to health-care providers and funders, as well as comparisons with emerging automated insulin delivery systems[11].

Author Disclosure Statement

R.H. reports having received speaker honoraria from Eli Lilly and Novo Nordisk, serving on advisory panel for Eli Lilly and Novo Nordisk; receiving license fees from BBraun and Medtronic; having served as a consultant to BBraun, and patents and patent applications related to closed-loop insulin delivery. L.B. and H.T. declare no competing financial interests exist.

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Author contributions

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