Technology

DIABETES TECHNOLOGY & THERAPEUTICS

CGM reduced fear of hypos and improved quality of life

Readability	✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 The authors of this study aimed to identify whether continuous glucose monitoring (CGM) among people with T1D would reduce fear of hypoglycaemia, which would, in turn, improve quality of life (QoL).

2 A questionnaire assessing educational experiences with CGM, QoL issues related to the fear of hypoglycaemia, incidence of severe hypoglycaemia before and while using CGM and the impact of CGM on QoL.

3 A total of 150 questionnaires were sent to people with T1D on the practice register of the Rocky Mountain Diabetes and Osteoporosis Center in Idaho Falls, USA.

4 The first part of the questionnaire assessed the demographics of the population: 54 (36%) responses were submitted. The second part looked at the impact of CGM on QoL and hypoglycaemia: 58 (39%) were submitted.

5 The responses from the questionnaires suggest significantly fewer severe hypoglycaemic events (P=0.0006), less fear of hypoglycaemia and increased empowerment with CGM.

6 A reduced incidence of acute complications was also noted as a result of having fewer episodes of severe hypoglycaemia.

7 Using CGM as part of diabetes self-management may significantly improve user outcomes such as QoL, reduction of fear of hypoglycaemia and a sense of empowerment.

Halford J, Harris C (2010) Determining clinical and psychological benefits and barriers with continuous glucose monitoring therapy. *Diabetes Technol Ther* **12**: 201–5

What do people with diabetes think of continuous glucose monitoring?

Peter Hammond, Consultant in General Medicine, Harrogate

The benefits of advances in technology for people with diabetes are usually measured in terms of improvements in HbA_{1c} and reduction in hypoglycaemia. During insulin pump therapy in particular, users report significant gains in terms of quality of life (QoL), which they often place greater emphasis on than the improvement in biochemical markers that healthcare professionals look for.

Continuous glucose monitoring (CGM) is a relatively new technology and there has yet been little information published regarding what CGM users feel about this technology and, indeed, whether they regard it in a positive light. Given that some reports of user satisfaction with self-monitoring of blood glucose have shown increased levels of anxiety and depression in those who are monitoring compared with those who are not, especially in people with type 2 diabetes not on insulin, the latter is a pertinent consideration (O'Kane et al, 2008).

Two articles have recently been published that looked at user evaluation of CGM. Halford and Harris (2010; summarised alongside) considered the impact of CGM on QoL, concerns around glycaemic control and managing diabetes. Fritschi et al (2010; summarised on page 152) asked women with type 2 diabetes who had used CGM how it had changed their perceptions about their glycaemic control and what they could do to improve it themselves.

The use of CGM in type 2 diabetes has been rarely reported. However, the limited evidence suggests that it has an impact in altering eating and exercise behaviour and is associated with improvements in glycaemic control (Harman-Boehm, 2008). In the study by Fritschi et al (2010) the women used retrospective CGM that required them to check capillary blood glucose levels at least four times daily. Most of the women found this to be positive, emphasising to them the importance of regular blood glucose monitoring. From the regular checks of capillary glucose levels they identified changes they could make to their lifestyle, but this was more often a consequence of the output from the CGM. Most of the women were surprised by the evidence from CGM, particularly the high blood glucose levels caused by certain foods. At the end of the study most women wanted to make changes to their diet and exercise, while a minority were determined to increase the frequency of blood glucose monitoring.

In contrast, the main benefit reported by Halford and Harris (2010) among CGM users with type 1 diabetes was a decrease in the fear of hypoglycaemia, which was more marked in those who continued using CGM. This was supported by a reduction in episodes of severe hypoglycaemia. However, interestingly, use of CGM was associated with an increase in levels of stress around diabetes management. This was most obvious in those who stopped using CGM, suggesting that stress levels decline with continued use.

It is encouraging that these studies found that both people with type 1 diabetes, and people with type 2, were positive about using CGM and identified benefits in terms of improvement in parameters of glycaemic control, a better understanding of the effect of lifestyle issues on blood glucose levels and reduced anxiety about hypoglycaemia. However, we should be aware of the possibility of increased stress associated with CGM use. If this stress is indeed attenuated in those who continue to use CGM, we need to have a clearer understanding of who will benefit from CGM and be prepared to embrace the technology, continuing to use it long term. The glycaemic benefits of CGM appear to be restricted to those who persist with using it, and this may also extend to the QoL benefits.

Harman-Boehm I (2008) Continuous glucose monitoring in type 2 diabetes. *Diabetes Res Clin Pract* **82**(Suppl 2): S118–21

O'Kane MJ, Bunting B, Copeland M et al (2008) Efficacy of self monitoring of blood glucose in patients with newly diagnosed type 2 diabetes (ESMON study): randomised controlled trial. *BMJ* **336**: 1174–7

"Most participants said they would like to change their diabetes self-care behaviour, particularly food and exercise, after reviewing their continuous glucose monitoring results."

DIABETES TECHNOLOGY & THERAPEUTICS

Fasting during Ramadan with an insulin pump

Readability	✓✓✓
Applicability to practice	✓✓✓
WOW! factor	✓✓✓

1 This report looked at Muslim people with T1D treated with an insulin pump during Ramadan (29 days) in 2008.

2 A total of 63 people were evaluated, 14 of whom did not fast.

3 Outcomes were number of days fasted, frequency of hypoglycaemia, unusual hyperglycaemia and number of hospital visits.

4 Of those who fasted, 30 fasted for the whole 29 days with no adverse events. Fasting was broken on 55 out of a potential 1450 fasting days and no severe episodes of hypoglycaemia were reported.

5 Ramadan fasting is feasible for people with T1D on an insulin pump accompanied by adequate support.

Benbarka MM, Khalil AB, Beshyah SA et al (2010) Insulin pump therapy in Moslem patients with type 1 diabetes during Ramadan fasting: an observational report. *Diabetes Technol Ther* **12**: 287–90

JOURNAL OF DIABETES AND ITS COMPLICATIONS

Not changing the insulin infusion line negatively affected glycaemic control

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓✓

1 This double-blind, randomised, cross-over trial investigated the consequences of not changing the insulin pump infusion line as often as is recommended.

2 A total of 20 people with T1D were analysed using retrospective CGM during 100 hours of insulin pump therapy without a line change.

3 From day 2 to day 5 the daily average glucose level increased from 6.8 to 9.1 mmol/L ($P<0.05$) and total daily insulin dose increased from 48.5±11.8 to 55.3±17.9 U ($P=0.05$).

4 Not changing the insulin infusion line resulted in worse glycaemic control. The infusion line should be changed every 48 hours to avoid this effect.

Thethi TK, Rao A, Kawji H et al (2009) Consequences of delayed pump infusion line change in patients with type 1 diabetes mellitus treated with continuous subcutaneous insulin infusion. *J Diabetes Complications* **24**: 73–8

DIABETES CARE

Low HbA_{1c} associated with nocturnal hypos

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓

1 The amount of nocturnal hypoglycaemia (NH) in people with T1D and the factors associated with it using continuous glucose monitoring (CGM) were assessed for 36 467 nights in 176 participants with T1D.

2 Hypoglycaemic events occurred for 8.5% of nights. The median percentage of nights each participant experienced hypoglycaemia was 7.4%.

3 On the nights with hypoglycaemia, its duration was ≥2 hours for 23% of the time.

4 A higher incidence of NH was associated with a lower baseline HbA_{1c} level ($P<0.001$) and the occurrence of NH on one or more nights during blinded CGM ($P<0.001$).

5 NH occured frequently in adults and children with T1D. The authors suggest that 1 week of blinded CGM may be used to identify those at risk of nocturnal hypoglycaemia.

Juvenile Diabetes Research Foundation Continuous Glucose Monitoring Study Group (2010) Prolonged nocturnal hypoglycemia is common during 12 months of continuous glucose monitoring in children and adults with type 1 diabetes. *Diabetes Care* **33**: 1004–8

THE DIABETES EDUCATOR

Use of CGM in women with T2D helped to stimulate lifestyle change

Readability	✓✓✓✓
Applicability to practice	✓✓✓✓
WOW! factor	✓✓✓

1 The experiences of wearing a continuous glucose monitor (CGM) were documented in this descriptive study of women with T2D.

2 A total of 35 women from Chicago, USA with T2D wore a CGM for 3 days. Inclusion criteria were age 40–65 years, time since diagnosis >6 months and treatment with any diabetes medication.

3 Participants wore the Medtronic MiniMed CGMS Gold sensor and were educated on how to use and calibrate it. Interviews were conducted after the 3-day period of CGM use.

4 Participants were asked three questions during the interview: (i) How was the experience of wearing the CGM?; (ii) Were you surprised by any of the numbers?; (iii) Do you want to change any aspect of your diabetes care as a result of wearing the CGM?

5 Most participants were surprised by the number and magnitude of glucose excursions and began to self-assess the causes of the excursion, by looking back at previous meals, exercise or stressful situations.

6 Most participants said they would like to change their diabetes self-care behaviour, particularly food and exercise, after reviewing their CGM results.

7 CGM was acceptable to this group and the authors suggested that this technology is an alternative to self-monitoring of blood glucose for the assessment of the effect of real-life events on glycaemic control in T2D.

Fritschi C, Quinn L, Penckofer S et al (2010) Continuous glucose monitoring: the experience of women with type 2 diabetes. *Diabetes Educ* **36**: 250–7