

Continuous glucose monitoring: Is it worth it?



Daniel Flanagan,
Consultant Physician,
Derriford Hospital,
Plymouth

Despite the development of insulin analogues and the use of insulin pump therapy, for a large number of people with type 1 diabetes, the goal of reaching their target HbA_{1c} level remains out of reach. We have now

been using continuous glucose monitoring in a variety of forms for some years. It would seem obvious that more information about daily fluctuations in glucose levels should improve overall glycaemic control. Instead of the snapshot of a single finger-prick glucose measurement, we have several days' worth of information available about the rise and fall of glucose values in response to meals, insulin, exercise, and so forth. The problem is that the small studies performed to date have not shown that this information translates into lower HbA_{1c} values. We have seen some evidence that the technology can help with reducing hypoglycaemia, but nothing to tell us that we are achieving improvements in glucose control.

It would appear, at first glance, that the Juvenile Diabetes Research Foundation Continuous Glucose Monitoring Study Group have performed a trial (summarised alongside) that answers this question. This was an expensive study, performed by experts in the field. The study used all the latest versions of

monitoring devices from the various competitors in the market. Individuals were randomised to either continuous monitoring or best-care based on capillary glucose values. Three groups were studied, with an emphasis on paediatric use of the equipment. The study headline is that significant improvements in glucose control were seen after 6 months, but only in the adult group (mean age approximately 40 years). There were only 50 subjects in each arm of this age group, studied for a relatively short period – suggesting that the effect on glucose control is relatively large.

The problem we have is trying to translate that result into clinical practice. The study design asked for each participant to wear a sensor device continuously for 6 months. Each sensor has to be replaced every 3 to 7 days. In addition, there is a sensor failure rate – meaning extra electrodes would be needed over the study period. In most clinical practice, the cost of the electrodes limits their use. The technology tends to be used for short periods of a few weeks and not indefinitely, as in this study. In addition, there is the psychological cost of wearing the monitor. In the younger groups studied, the devices were being worn 6 days per week by 50% or less of the participants by the end of the study period.

The results of this study are encouraging, but we need to look long and hard at the costs and benefits before using the technology in the way described.

NEJM

Continuous glucose monitoring may improve glycaemic control

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

1 This 26-week multicentre randomised controlled trial was conducted in order to evaluate the safety and efficacy of continuous glucose monitoring (CGM) in people of all ages with type 1 diabetes.

2 Inclusion criteria were: age >8 years with a minimum duration of diabetes of 1 year prior to randomisation; use of insulin pump or multiple daily injection therapy; an HbA_{1c} level of 7–10%; and no use of CGM in the previous 6 months.

3 Following a run-in period where a “blinded” continuous glucose monitor was used (the individual could not see the values being recorded), 322 people were randomised to CGM (n=165) or home monitoring using a blood glucose meter (control group, n=157).

4 The two groups were stratified by age: 8–14 years (n=114), 15–24 years (n=110), ≥25 years (n=98). The primary outcome was HbA_{1c} at 26 weeks.

5 In those ≥25 years of age, CGM yielded a significant improvement in HbA_{1c} compared with home blood glucose monitoring ($P<0.001$), but there was no difference between monitoring methods in those aged 15–24 years or 8–14 years ($P=0.52$; $P=0.29$, respectively).

6 Rates of severe hypoglycaemia were low in both monitoring groups, but no difference was seen between them.

7 The authors conclude that CGM can aid improvement in HbA_{1c} in adults, but further work is needed to elucidate the barriers seen in younger individuals.

Juvenile Diabetes Research Foundation Continuous Glucose Monitoring Study Group et al (2008) Continuous glucose monitoring and intensive treatment of type 1 diabetes. *NEJM* **359**: 1464–76

BMJ

Blood pressure predicts retinopathy in adolescents

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

1 The aim of this study was to elucidate the role of blood pressure on the development of retinopathy in adolescents with type 1 diabetes.

2 This Australian prospective cohort study enrolled 1869 individuals aged between 12 and 15.2 years of age, all

of whom had type 1 diabetes with an average duration of 4.9 years.

3 In a median 4.1 years of follow up, retinopathy developed in 673 individuals (36%).

4 In those who did not have retinopathy at baseline, after adjustment for HbA_{1c} and albumin excretion rate, systolic and diastolic blood pressure were predictors of the complication.

5 In young people with type 1 diabetes, blood pressure is a predictor of retinopathy, independent of incipient nephropathy.

Gallego PH, Craig ME, Hing S, Donaghue KC (2008) Role of blood pressure in development of early retinopathy in adolescents with type 1 diabetes: prospective cohort study. *BMJ* **337**: a918

“Scheduled text messaging is a useful and successful tool for engaging young people with diabetes in their care”

DIABETOLOGIA

Alcohol consumption lowers CV risk

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

1 This study was undertaken in order to assess the relationship between the risk of microvascular complications and alcohol consumption in people with type 1 diabetes.

2 The authors examined the records of 1857 individuals who had been part of the EURODIAB Prospective Complications Study. They documented

cases of proliferative retinopathy (n=304), neuropathy (n=660) and macroalbuminuria (n=157).

3 Comparing these data with reported levels of alcohol consumption produced a “U-shaped” curve, with those who consumed 30–70g of alcohol per week having a lower risk of microvascular complications. Consumption of alcohol was not associated with diabetic ketoacidosis or hypoglycaemic episodes.

4 It was concluded that moderate alcohol consumption decreases the risk of microvascular complications in people with type 1 diabetes.

Beulens JW, Kruidhof JS, Grobbee DE et al (2008) Alcohol consumption and risk of microvascular complications in type 1 diabetes patients: the EURODIAB Prospective Complications Study. *Diabetologia* **51**: 1631–8

DIABETES CARE

Mortality risk factors in type 1 diabetes

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

1 The authors of this study examined the EURODIAB Prospective Complications Study data to determine risk factors for mortality in type 1 diabetes.

2 Mortality data from the 7-year follow-up of 2787 individuals were analysed, with an annual mortality rate of 5 deaths per 1000 person-years (102 deaths in total).

3 The final model for analysis included the following risk factors for mortality: age at baseline (hazard ratio [HR]: 1.78), waist-to-hip ratio (HR: 1.32), pulse pressure (HR: 1.33), non-HDL cholesterol level (HR: 1.33), macroalbuminuria (HR: 2.39) and neuropathy (both peripheral [HR: 1.88] and autonomic [HR: 2.40]).

4 The authors found from the analysis that, when examining all-cause, non-CV, CV and unknown-cause mortality, the risk factors were similar. They conclude that complications due to macroalbuminuria and neuropathy are strong risk markers for future mortality.

Soedamah-Muthu SS, Chaturvedi N, Witte DR et al (2008) Relationship between risk factors and mortality in type 1 diabetic patients in Europe: the EURODIAB Prospective Complications Study (PCS). *Diabetes Care* **31**: 1360–6

DIABETES CARE

Lower BMD over time in women with type 1 diabetes

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

1 This paper reports the 2-year follow-up of a study that found women with type 1 diabetes (13–35 years of age) had a lower bone-mineral density (BMD) than matched individuals without the condition, to determine the natural history of BMD in this population.

2 Dual-energy X-ray absorptiometry was used to determine BMD in 63

women with type 1 diabetes and 85 controls without diabetes.

3 Following adjustment for BMI, oral contraceptive use and age, the authors found that, in women with type 1 diabetes, BMD continued to be lower in women ≥ 20 years of age compared with controls ($P < 0.03$).

4 In conclusion, persistent low BMD, and subsequent failure to accrue bone density after 20 years of age, may be a contributing factor to the increased incidence of hip fractures seen in postmenopausal women with type 1 diabetes.

Mastrandrea LD, Wactawski-Wende J, Donahue RP et al (2008) Young women with type 1 diabetes have lower bone mineral density that persists over time. *Diabetes Care* **31**: 1729–35

JOURNAL OF MEDICAL INTERNET RESEARCH

Sweet Talk successfully engages adolescents

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

1 The authors of this paper explored how young people with type 1 diabetes interacted with a text-messaging support system, “Sweet Talk”.

2 The participants (n=64) were recruited from the two intervention arms of the original three-arm Sweet Talk study (usual therapy, Sweet Talk plus conventional therapy, Sweet Talk plus intensive therapy).

3 Each participant received a pay-as-you-go mobile phone as part of the intervention, plus a £10 phone card. The authors recorded all text messages received by the Sweet Talk system during a 12-month period, and the message content and messaging patterns were analysed.

4 There were 1180 text messages sent during the study period (median 18.4 per person). Of these, five individuals contributed to 52% of all messages sent, and there was a wide variety in the number of messages sent by each participant (0–240).

5 Messages giving unsolicited blood glucose readings accounted for 35% of all text messages, while 40% were responses to requests about personal experiences or tips.

6 A key finding of the study was that, while girls sent significantly more messages than boys ($P = 0.002$), the clinical characteristics of each individual did not influence the use of Sweet Talk.

7 Scheduled text-messaging is a useful and successful tool for engaging young people with diabetes in their care.

Franklin VL, Greene A, Waller A et al (2008) Patients' engagement with “Sweet Talk” - a text messaging support system for young people with diabetes. *Journal of Medical Internet Research* **10**: e20