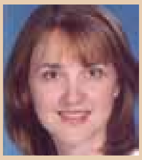
Paediatrics

Sensor-augmented insulin pump therapy in children and young people: The tech-savvy generation?



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Technology has become an integral part of life in the 21st century and it is likely to be the young who are most technology savvy. The use of technology in managing type 1 diabetes is increasing with the aim of improving both short- and long-term glycaemic control.

Data suggest that technology such as insulin pump therapy and continuous glucose monitoring (CGM) can be beneficial in diabetes care, yet the data also suggest that it is adults and not young people who seem to use the technology the most. The Juvenile Diabetes Research Foundation Continuous Glucose Monitoring Study Group (2008) examined the benefit of wearing continuous monitors continuously in people with type 1 diabetes (children and adults) who were on intensive insulin regimens (at least three injections per day). The study showed an improvement in HbA_{1c} levels in adults over the age of 25 years but not in children and young people, which was felt to be related to a lower rate of continuous use of the glucose sensor: CGM use for ≥6 days per week was 83% in those over 25 years of age, 30% in those aged 15–24 years and 50% in those aged 8–14 years.

In the study from Kordonouri et al (2010; summarised alongside), a combination of insulin pump therapy and CGM at onset of type 1 diabetes was evaluated in a randomised controlled trial. One hundred and sixty children and young people aged 1–16 years took part over a 12-month period. At the end of this period the authors found that there was no significant difference in HbA_{1c} level, fasting C-peptide or change in C-peptide (i.e. preservation of beta-cell function) between the intervention and control groups. An assessment of quality of life was made using standardised questionnaires – again, no difference was observed between the two groups.

Data for sensor use were only available for 55 participants. Sensor use was significantly higher at 6 weeks (2.1±0.9 sensors per week) compared with 52 weeks (1.1±0.7 sensors per week; $P<0.001$). There were no significant differences in sensor use between age groups but this may have been due to the small number of people in this analysis. Participants with sensor-augmented pump therapy performed fewer capillary blood glucose tests than those without CGM (5.2±2.0 vs 6.5±2.1, respectively; $P<0.001$).

The overall mean HbA_{1c} level for the total study cohort was very good at 7.5±1.1% (58±12 mmol/mol) but the addition of CGM did not improve this. It is difficult to know from this study whether combined insulin pump and CGM may have been beneficial as, from the small number of participants from whom data were collected on sensor use, the use of the CGM was very low. No formal assessment has been made as to why continuous glucose monitors were not worn, although one could speculate that treatment burden is likely to be increased or the monitors may not be comfortable.

Overall this study does not suggest that CGM would *not* be beneficial for the paediatric population but it is another study which suggests that it is CGM per se that is not acceptable on a day-to-day basis. We need to work with children and young people to see what the barriers may be to adequate implementation of this technology to further explore if the beneficial effects of CGM seen in adults can be provided to children and young people.

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

DIABETOLOGIA

Sensor-augmented pump therapy from diagnosis: Of benefit to children with T1D?

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

1 The authors of this randomised controlled trial examined the benefits of using sensor-augmented insulin pump therapy, from diagnosis of T1D in children, with an emphasis on glycaemic control and beta-cell function.

2 One hundred and sixty children (age range, 1–16 years; mean age, 8.7 years; 47.5% girls) were randomised to receive insulin pump therapy plus (i) CGM or (ii) self-monitoring of blood glucose (SMBG).

3 The primary outcome was HbA_{1c} level after 12 months. Secondary outcomes comprised fasting C-peptide, glycaemic variability, adverse events, sensor usage, health-related quality of life and parent's wellbeing.

4 At 12 months, no significant difference in mean HbA_{1c} level was observed between the two groups, although participants with regular sensor use had lower values than those with no or low sensor usage (7.1% [54 mmol/mol] vs 7.6% [60 mmol/mol], respectively; $P=0.032$).

5 Glycaemic variability was lower in the CGM group ($P=0.037$) and C-peptide concentrations were higher in those aged 12–16 years in the CGM group ($P=0.033$) compared with the insulin pump group using SMBG.

6 The authors concluded that children and young people with T1D can benefit from sensor-augmented insulin pump therapy initiated at diagnosis of the condition, both in terms of achieving good glycaemic control and reduced glycaemic variability.

Kordonouri O, Pankowska E, Rami B et al (2010) Sensor-augmented pump therapy from the diagnosis of childhood type 1 diabetes: results of the Paediatric Onset Study (ONSET) after 12 months of treatment. *Diabetologia* **53**: 2487–95

DIABETES

Metformin reduces body weight in obese children

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

1 In this randomised, double-blind, placebo-controlled trial, the authors aimed to determine whether metformin causes weight loss and improves obesity-related comorbidities in obese, insulin-resistant children.

2 One hundred severely obese (mean BMI 34.6±6.6 kg/m^2), insulin-resistant children aged 6–12 years were randomised to either 1000 mg metformin therapy (*n*=53) or placebo (*n*=47) twice-daily for 6 months.

3 The primary study endpoint was change in BMI standard deviation score (BMI *Z*-score) at 6 months. Secondary endpoints were changes in BMI, body weight and fat mass.

4 Eight-five per cent of participants completed the 6-month randomisation phase. In children prescribed metformin, a significantly greater decrease was observed in BMI (difference –1.09 kg/m^2; 95% confidence interval [CI], –1.87 to –0.31; *P*=0.006), body weight (difference –3.38 kg; 95% CI, –5.2 to –1.57; *P*<0.001), BMI *Z*-score (difference –0.07; 95% CI, –0.12 to –0.01; *P*=0.02) and fat mass (difference –1.40 kg; 95% CI, –2.74 to –0.06; *P*=0.04).

5 Significant improvements were also seen in the metformin group regarding fasting plasma glucose (*P*=0.007) and homeostasis model assessment insulin resistance model (*P*=0.04).

6 Metformin was found to have modest but favourable effects on body weight, body composition and glucose homeostasis in obese, insulin-resistant children.

Yanovski JA, Krakoff J, Salaita CG et al (2011) Effects of metformin on body weight and body composition in obese insulin-resistant children: a randomized clinical trial. *Diabetes* **60**: 477–85

JOURNAL OF PEDIATRICS

Rapid decline in glycaemic control in children with T2D

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

1 To determine the rate of glycaemic decline in children from diagnosis of T2D, participants were split into two groups: non-acidotic (NA; *n*=46; mean age at diagnosis, 14.7 years); diabetic ketoacidosis (DKA; *n*=13; mean age at diagnosis, 13.3 years).

2 HbA_{1c} levels, insulin dose and markers of insulin reserve were measured every 6 months for 4 years.

3 At baseline, the DKA group had higher HbA_{1c} levels (*P*=0.002), required more insulin (*P*=0.036) and had lower C-peptide (*P*=0.003) than the NA group.

4 In both groups, HbA_{1c} levels began to rise after 1.5 years and insulin requirements began to rise after 2 years.

5 Children with T2D required increasing insulin doses over a 4-year period and DKA at diagnosis predicted greater beta-cell decline.

Levitt Katz LE, Magge SN, Hernandez ML et al (2011) Glycemic control in youth with type 2 diabetes declines as early as two years after diagnosis. *J Pediatr* **158**: 106–11

JOURNAL OF PEDIATRICS

Coeliac autoimmunity in children with T1D

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

1 This study aimed to evaluate screening for coeliac autoimmunity with immunoglobulin A transglutaminase autoantibodies (TG) in children with T1D.

2 Seventy-nine TG+ and 56 TG– children were followed for 2 years to assess growth, nutritional status, bone mineral density and glycaemic control; the TG+ group self-selected to either a gluten-free or gluten-containing diet.

3 At 2 years, participants in the TG+ group had consistently lower weight *Z*-scores and higher urine N-telopeptides than the TG– group.

4 TG+ children on gluten-containing diets had lower insulin-like growth factor binding protein-3 *Z*-scores than TG+ children on gluten-free diets.

5 No significant adverse events were observed in TG+ children who delayed therapy with a gluten-free diet for 2 years.

Simmons JH, Klingensmith GJ, McFann K et al (2011) Celiac autoimmunity in children with type 1 diabetes: a two-year follow-up. *J Pediatr* **158**: 276–81

DIABETES CARE

Exercise, birth weight and metabolic risk

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

1 The authors examined whether physical activity and aerobic activity modifies the link between birth weight and metabolic risk.

2 Using data from the European Youth Heart Study of 9- and 15-year-olds (*n*=1254), fat mass index (FMI; kg/height^2) was calculated from skin-fold thickness and insulin levels were measured using fasting blood samples; physical activity was measured using a hip-worn accelerometer for over 600 min/day for ≥3 days, and aerobic activity was measured using a maximal cycle ergometry test.

3 After adjustments, higher birth weight was associated with higher FMI (*P*=0.001) and greater waist circumference (*P*<0.001); lower birth weight was associated with higher fasting insulin levels (*P*=0.016).

4 The authors concluded that there was no evidence that physical activity or aerobic fitness modifies the association between birth weight and metabolic risk.

Ridgway CL, Brage S, Anderssen SA et al (2011) Do physical activity and aerobic fitness moderate the association between birth weight and metabolic risk in youth?: the European Youth Heart Study. *Diabetes Care* **34**: 187–92

"Metformin was found to have modest but favourable effects on body weight, body composition and glucose homeostasis in obese, insulin-resistant children."