Learning to juggle: Advances in diabetes technologies and beta-cell preservation

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I have written in previous issues that, for all but a few young people and adults with type 1 diabetes, the demand to balance food and unpredictable physical activity with sufficient insulin to prevent long-term harm is an almost impossible juggling act. I have argued for either better technology to support people in achieving good glycaemic control, or interventions to prevent autoimmune destruction of beta-cells. In this issue of *Diabetes Digest* we see articles that report advancements on both of these fronts.

Charpentier and colleagues (2011; summarised alongside) found that the use of decision support software (DSS) used on a smartphone resulted in better glycaemic control than was achieved with conventional paper-based recording and calculation. Combining this sophisticated technology with frequent remote contact from a diabetes healthcare professional is better still and saves the person with diabetes time spent at clinic appointments.

While DSS technology is becoming increasingly easy to incorporate into blood glucose meters and smartphones, evidence that improvements in glycaemic control can be achieved using these systems has been slower to appear. Political and epidemiological pressure for most people with diabetes to be managed in primary care is growing, but good evidence is needed to show that new, time- and manpower-saving technologies are safe and effective before being widely implemented – and Charpentier et al's (2011) article goes some way towards achieving that.

> ***"... pressure for most people with diabetes to be managed in primary care is growing, but good evidence is needed to show that ... time-saving technologies are safe and effective ..."***

Another exciting article reports the follow-up data on the continuing – though small – benefits of glutamic acid decarboxylase 65 (GAD-alum) therapy in the preservation of residual insulin secretion in children newly diagnosed with type 1 diabetes (Ludvigsson et al, 2011; summarised below). If the results produced by Ludvigsson and colleagues in their Swedish population can be confirmed in other studies, it is likely that GAD-alum will join the armoury of therapies to prolong insulin secretion and so improve glycaemic control.

DIABETOLOGIA

GAD-alum effective longer-term in T1D

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

1 The authors investigated the safety and efficacy of long-term alum formulated glutamic acid decarboxylase GAD (65; GAD-alum) therapy.

2 Having completed a double-blind clinical trial in which they were randomised to GAD-alum (20 µg) injection or placebo, participants (n=70; aged 10–18 years) were followed-up.

3 Decline in fasting C-peptide levels between day 1 and month 1 was smaller – but not significantly so – in the GAD-alum group than the placebo group; however, among those treated within 6 months of T1D diagnosis, fasting C-peptide decreased significantly less in the GAD-alum group than in the placebo group at 4 years' follow-up.

4 Young people in the present study with recent-onset T1D showed no adverse events and a clinically relevant preservation of C-peptide at 4 years.

Ludvigsson J, Hjorth M, Chéramy M et al (2011) Extended evaluation of the safety and efficacy of GAD treatment of children and adolescents with recent-onset type 1 diabetes: a randomised controlled trial. *Diabetologia* **54**: 634–40

DIABETES CARE

Smartphone software improves glycaemic control

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

1 In a 6-month, open-label, parallel-group, multicenter study, the authors sought to demonstrate the ability of Diabeo software to enable individualised insulin-dose adjustments – with and without telemedicine support – and whether this technology could significantly improve HbA_{1c} levels in people with T1D.

2 Adults (n=180) with T1D (duration >1 year; basal–bolus insulin regimen >6 months; HbA_{1c} >8% [>64 mmol/mol]) were randomised to: usual quarterly follow-up (G1); use of a smartphone recommending insulin doses with quarterly visits (G2); or use of the smartphone with short teleconsultations fortnightly, but no visit until study end (G3).

3 Six-month mean HbA_{1c} was significantly lower in G3 (8.4% [68 mmol/mol]) than in G1 (9.1% [76 mmol/mol]; P=0.0019); G2 achieved intermediate results (8.6% [70 mmol/mol]).

4 No significant difference was reported in the frequency of hypoglycemic events or in time spent in hospital or telephone medical consultations; however, those in G1 and G2 spent nearly 5 hours more in hospital visits than those randomised to G3.

5 The authors concluded that the Diabeo system significantly improved glycaemic control in this population with poorly controlled T1D, without requiring more medical time.

Charpentier G, Benhamou PY, Dardari D et al (2011) The Diabeo software enabling individualized insulin dose adjustments combined with telemedicine support improves HbA_{1c} in poorly controlled type 1 diabetic patients: a 6-month, randomized, open-label, parallel-group, multicenter trial (TeleDiab 1 Study). *Diabetes Care* **34**: 533–9

DIABETES CARE

Cost-utility analysis of genetic testing in neonatal diabetes

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

1 Neonatal diabetes (ND) is rare, but almost half of those with permanent ND have mutations in the genes for the ATP-sensitive potassium channel that allow switching from insulin to sulfonylurea therapy. Although treatment conversion has dramatic benefits, the cost-effectiveness of routine genetic testing for this condition is unknown.

2 A cost-utility analysis comparing routine genetic testing with no testing among children with permanent ND was undertaken; the outcome of interest was the incremental cost-effectiveness ratio (ICER; $USD/quality-adjusted life-year [QALY] gained) over 30 years.

3 Genetic testing remained cost-saving as long as the prevalence of the ND genetic defects remained >3.0%; ICER was <$200 000/QALY at prevalences between 0.7 and 3.0%.

4 The authors concluded that genetic testing for ND improves quality of life and lowers costs.

Greeley SA, John PM, Winn AN et al (2011) The cost-effectiveness of personalized genetic medicine: the case of genetic testing in neonatal diabetes. *Diabetes Care* **34**: 622–7

DIABETOLOGIA

TRIGR: First ever trial for the primary prevention of T1D

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

1 The TRIGR (Trial to Reduce IDDM in the Genetically at Risk) study was designed to establish whether weaning babies to a highly hydrolysed formula (based on hydrolysed casein and cow's milk) reduces the risk of T1D.

2 Participants comprised newborns with first-degree relatives with T1D living in 15 countries. Mothers were encouraged to breastfeed. The intervention was double blinded and lasted for 6–8 months. The blind will be dropped when the last recruited child turns 10 years of age in 2017.

3 Of the infants enrolled (n=2160), 80% were exposed to the study formula. The overall retention rate over the first 5 years is 87%, with protocol compliance at 94%.

4 It was concluded that the TRIGR demonstrates the feasibility and successful implementation of an international dietary intervention study.

TRIGR Study Group, Akerblom HK, Krischer J et al (2011) The Trial to Reduce IDDM in the Genetically at Risk (TRIGR) study: recruitment, intervention and follow-up. *Diabetologia* **54**: 627–33

DIABETES CARE

Insulin requirements during high-altitude exercise in T1D

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

1 The authors investigated insulin requirements, energy expenditure, and glucose levels at very high altitude during exercise in relation to acute mountain sickness (AMS) symptoms in eight people with T1D.

2 During 14-day expeditions to Mount Meru (4562 m) and Mount Kilimanjaro (5895 m; both in Tanzania), positive relationships between AMS symptoms and both insulin requirements (P=0.041) and blood glucose levels (P=0.014) were found.

3 The authors concluded that insulin requirements in T1D increase at altitudes >5000 m, despite high energy expenditure, and AMS may be implicated in this change.

de Mol P, de Vries ST, de Koning EJ et al (2011) Increased insulin requirements during exercise at very high altitude in type 1 diabetes. *Diabetes Care* **34**: 591–5