

Management of type 1 diabetes

Hub-and-spoke: The future of type 1 diabetes care?



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If you are a person with type 1 or type 2 diabetes, you need to understand the effect that diet and lifestyle will have on your condition. The information you need to absorb is complicated and not always immediately obvious. The situation for people with type 1 diabetes is further complicated by the need to understand how their particular insulin regimen will impact on their blood glucose.

It seems so obvious that this education needs to be part of the care that we provide for individuals with diabetes but, in fact, it has only been part of routine care for a very short period.

The work from Düsseldorf, that has since been translated as DAFNE (Dose Adjustment For Normal Eating; DAFNE Study Group, 2003), and a number of other similar courses in the UK, has been successful in improving quality-of-life and reducing hypoglycaemia rates and improving glycaemic control for large numbers of people with diabetes. It is clearly the responsibility of diabetes specialist teams to become experts in education both for people with diabetes and for the primary care teams looking after the majority of them.

The established model of diabetes care has secondary care services based in large hospitals providing care for type 1 diabetes at a central site. This view is now being challenged. People with diabetes want and need diabetes care provided close to home. Diabetes has enough of an impact on everyday life without

adding a 3-, 6- or 12-monthly journey of perhaps an hour or more to a large hospital to spend a further hour in the car park and 40 minutes in a waiting room. The challenge is how to provide this care to a high level outside of the hospital with limited specialist resource.

The DAFNE group have been very protective of their structured education package up to this point. To prove that the intervention works and is cost-effective they have very tightly controlled the course's structure and content.

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This is expensive but has been shown to work. The argument has been won and structured education is an established part of treatment. The article by Rogers et al (2009; summarised alongside) is an obvious first step, but one that has to be taken. The authors describe a hub-and-spoke model with the full 5-day course being delivered at a single, central point with follow-up at local centres that were unable to deliver the full course. The results were comparable with the standard course.

This may seem a rather small step forward, but it must be remembered that DAFNE is a research project and, to prove benefit, needs to be very tightly controlled. The principle demonstrated can, however, be built upon by other centres delivering locally defined structured education with primary care providing the spokes. This must surely be the final aim.

DAFNE Study Group (2003) Training in flexible, intensive insulin management to enable dietary freedom in people with Type 1 diabetes: dose adjustment for normal eating (DAFNE) randomized controlled trial. *Diabet Med* 20(Suppl 3): 4–5

DIABETIC MEDICINE



“Hub and spoke” education method beneficial in T1D

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

1 Structured education programmes in type 1 diabetes have been shown to improve glycaemic control and quality-of-life. Although resource-intensive, they can be cost-effective.

2 This study explored the feasibility of delivering an evidence-based 5-day programme in diabetes centres too small to deliver them themselves.

3 A “hub and spoke” method was used, whereby specialist staff from three district general hospitals (spokes) were trained in all aspects of the programme by a larger centre (the hub), which delivered the 5-day programme.

4 Glycaemic control and quality-of-life were assessed at 1 year post-course in 63 people with follow-up data.

5 HbA_{1c} decreased by $0.42 \pm 1.0\%$ ($P=0.001$), with a greater fall in those with high HbA_{1c} levels at baseline, and no mean weight gain.

6 The number of emergency call-outs for severe hypoglycaemia dropped from 10 episodes in seven people the year before, to one episode in one person ($P=0.03$).

7 Quality-of-life measures also improved, with reduced negative impact of diabetes on diabetes-related quality-of-life ($P<0.00004$) and “present quality-of-life” improving ($P<0.001$).

8 The authors concluded that by using a “hub and spoke” methodology, the benefits of a 5-day structured education programme can be provided to people with type 1 diabetes attending centres without the resources to provide the course themselves.

Rogers H, Turner E, Thompson G et al (2009) Hub-and-spoke model for a 5-day structured patient education programme for people with Type 1 diabetes. *Diabet Med* 26: 915–20

DIABETES CARE

Glucose variability does not predict microvascular complications

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

1 Data from the EDIC (Epidemiology of Diabetes Interventions and Complications) study were analysed to establish whether longer-term follow-up of participants from the DCCT (Diabetes Control and Complications Trial) showed an association between glycaemic variability and the development of microvascular complications.

2 The authors used datasets relating to both the DCCT and the first 4 years of the EDIC study.

3 Mean area under the curve glucose and the within-day glucose variability (standard deviation [SD] and mean amplitude of glycaemic excursions [MAGE]) during the DCCT were analysed to see whether they contributed to the risk of retinopathy and nephropathy by year 4 of the EDIC study.

4 Mean glucose levels during the DCCT and mean HbA_{1c} levels during the EDIC study were independently predictive of retinopathy ($P<0.001$) as well as HbA_{1c} during the EDIC study of nephropathy ($P=0.001$) development by year 4 of the EDIC study; glucose variability did not increase this (all $P>0.25$ using SD or MAGE).

5 Limitations comprised the lack of glucose profiling during EDIC and the inability to precisely evaluate diurnal glycaemic variation from quarterly seven-point glucose profiles.

6 The data suggest that glucose variability in the DCCT did not predict the development of either retinopathy or nephropathy by year 4 of the EDIC study.

Kilpatrick ES, Rigby AS, Atkin SL (2009) Effect of glucose variability on the long-term risk of microvascular complications in type 1 diabetes. *Diabetes Care* **32**: 1901–3

DIABETIC MEDICINE

Exercise in T1D: Comparison of three basal insulins

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

1 This randomised trial compared the effect of exercise on plasma glucose when using either insulin detemir, insulin glargine or NPH insulin.

2 People with T1D ($n=51$) on basal-bolus insulin regimens, exercised for 30 minutes, 5 hours after their last mealtime and basal insulin injection.

3 No significant differences in plasma glucose excursions were observed during or for 150 minutes after exercise.

4 From start to 150 minutes post-exercise, 10 (21%) people on insulin detemir experienced minor hypoglycaemia compared with 13 (27%) for NPH and 27 (57%) for insulin glargine ($P<0.001$ insulin glargine vs. insulin detemir and NPH).

5 The results showed that insulin detemir was associated with less hypoglycaemia than insulin glargine, but not NPH insulin, in people with T1D during and post-exercise.

Arutchev V, Heise T, Dellweg S et al (2009) Plasma glucose and hypoglycaemia following exercise in people with Type 1 diabetes: a comparison of three basal insulins. *Diabet Med* **26**: 1027–32

DIABETES CARE

Predicting use and benefit of CGM in T1D

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

1 The authors explored the factors related to successful use of CGM in people with intensively treated T1D.

2 People ($n=232$) randomly assigned to the CGM group were asked to use CGM daily (165 with baseline HbA_{1c} $\geq 7.0\%$ [≥ 53 mmol/mol] and 67 with HbA_{1c} $< 7.0\%$ [< 53 mmol/mol]).

3 Links between baseline factors and CGM use at 6-month follow-up were evaluated.

4 Age (≥ 25 years) and more frequent self-reported pre-study blood glucose meter measurements per day (both $P<0.001$) were associated with greater CGM use in month 6.

5 Frequency of blood glucose meter monitoring and initial CGM use may help predict the likelihood of long-term CGM benefit in intensively treated people with T1D of all ages.

Juvenile Diabetes Research Foundation Continuous Glucose Monitoring Study Group (2009) Factors predictive of use and of benefit from continuous glucose monitoring in type 1 diabetes. *Diabetes Care* **32**: 1947–53

DIABETES CARE

Adverse outcomes in T1D pregnancies

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

1 The authors compared obstetric and perinatal outcomes between pregnancies of women with T1D and the general obstetric population in Sweden between 1991 and 2003.

2 Included in the analysis were 5089 T1D and 1 260 207 control pregnancies. Pre-eclampsia and Caesarean sections, respectively, were more frequent (odds ratio [OR] 4.47

[3.77–5.31], 5.31 [4.97–5.69]) than in the general population.

3 Stillbirth (3.34 [2.46–4.55]), perinatal mortality (3.29 [2.50–4.33]) and major malformations (2.50 [2.13–2.94]) were more common in T1D than in control pregnancies. The incidence of fetal macrosomia was increased in T1D (11.45 [10.61–12.36]).

4 T1D in pregnancy is still associated with increased rates of adverse obstetric and perinatal outcomes. The authors commented that the eight-fold increased risk for fetal macrosomia in T1D pregnancies is unexpected and warrants further investigation.

Persson M, Norman M, Hanson U (2009) Obstetric and perinatal outcomes in type 1 diabetic pregnancies: A large, population-based study. *Diabetes Care* **32**: 2005–9

“The eight-fold increased risk for fetal macrosomia in type 1 diabetes pregnancies is unexpected and warrants further investigation.”