

Management of type 1 diabetes

Wonderful attempt to improve blood glucose management



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Forget DAFNE (Dose Adjustment For Normal Eating), I would like a 'Data Miner' to look after my diabetes (if I had it).

I have often fantasised about what it would be like if I developed type 1 diabetes.

Would I be obsessively in control, testing my blood glucose six times a day, weighing my branflakes and dutifully filling in my DAFNE diary every time food passed my lips? Or would I forget to eat all day (as now) and hope my peakless basal insulin really was peakless and pray that New Zealand Sauvignon Blanc had a neutral effect on my blood glucose?

It is not often that I read a paper and conclude that I have not understood a word of it, but the original article by Yamaguchi et al is the sort of paper that induces subarachnoid haemorrhages. The title is

the easy bit, but the paper itself is almost incomprehensible (though it probably reads better in Japanese). Nevertheless the ideas behind it are fantastic and a wonderful attempt to improve blood glucose management for the person with type 1 diabetes. Data such as the fasting blood glucose, the metabolic rate, calorie intake and a self-assessment of the person's 'physical condition' was collected over 120 days and then used to see if it was possible to predict the following day's fasting glucose.

The answer? Despite 2240 data items collected by four individuals, fasting blood glucose was not predictable and there was no correlation between this and any of the other variables measured. However it was mainly the participants' fault since they often forgot to measure fasting blood glucose and to record metabolic rate and food intake. I could have told them that . . .

MEDICAL AND BIOLOGICAL ENGINEERING AND COMPUTING

Predicting blood glucose levels using data mining and response surface methodology

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

1 The authors tried to improve the accuracy of predicting blood glucose levels in people with type 1 diabetes by using data mining (the process of searching large data sets for patterns) and response surface methodology (a system useful in building a model with non-linear characteristics).

2 Fasting blood glucose level, metabolic rate, food intake and physical condition were recorded in four patients over a 5-month period.

3 The data collected were subjected to data mining to estimate fasting blood glucose. The patient's self-assessed physical condition (on a scale of 1 to 5) was considered as an additional variable.

4 Response surface methodology was then employed to correlate an individual person's glucose metabolism with biological markers and physical condition.

5 Using the variables found to correlate with fasting blood glucose level, the accuracy of predicting fasting blood glucose improved.

6 The accuracy in predicting blood glucose levels in an individual was as high as 80% using this methodology. The authors suggest that this method could be used to reduce the incidence of hypoglycaemia.

Yamaguchi M, Kaseda C, Yamazaki K et al (2006) Prediction of blood glucose level of type 1 diabetics using response surface methodology and data mining. *Medical and Biological Engineering and Computing* **44**: 451-7

DIABETIC MEDICINE



Twice- rather than once-daily insulin glargine needed in some patients

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

1 Previous studies have shown that some patients experience hyperglycaemia before their next dose of insulin glargine when on a once-daily regimen.

2 This cross-over study compared HbA_{1c} and pre-breakfast blood glucose concentration in 20 people who received insulin glargine once (dinner-time) or twice a day (breakfast and dinner-time), in addition to meal-time insulin aspart. Each treatment period lasted for 4 weeks, and finished

with a 24-hour inpatient metabolic profile.

3 All patients had previous exposure to multiple insulin regimens for at least 1 year.

4 The mean 24-hour self-monitored blood glucose level was lower in patients receiving the twice-daily compared with the once-daily regimen (8.8 mmol/l versus 7.1 mmol/l; $P=0.031$). Within day variability was lower with twice-daily glargine (standard deviation 3.2 ± 0.2 vs 4.0 ± 0.3 mmol/l; $P=0.044$).

5 Towards the end of the afternoon, blood glucose concentrations were raised in some patients receiving the twice-daily regimen.

6 The authors concluded that the once-daily regimen may not be suitable for about 15% of patients, who could be given insulin glargine twice-daily instead.

Ashwell SG, Gebbie J, Home PD (2006) Twice-daily compared with once-daily insulin glargine in people with type 1 diabetes using meal-time insulin aspart. *Diabetic Medicine* **23**: 879-86

‘A web-based education programme was developed to provide information on diabetes suitable for people with differing literacy levels.’

DIABETES TECHNOLOGY AND THERAPEUTICS



Improving knowledge of diabetes using a web-based programme

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

1 A web-based education programme was developed to provide information on diabetes suitable for people with differing literacy levels. The programme, known as “Brainfood”, was developed by the Florida Initiative in Telemedicine and Education.

2 The programme consists of 19 different modules, 15 of which

include an assessment of user knowledge before and after undertaking the training.

3 People with diabetes, their carers and nurses were invited to use the website. Patients were advised about the programme by their healthcare professional and nurses were targeted by advertisements on a continuing education website.

4 Pre- and post- module tests were undertaken by 135 out of 389 non-nurses who accessed the site. Post-module tests improved significantly compared with pre-module tests for all modules ($P<0.001$).

5 Post-module scores were significantly better than pre-module scores for nurses in 13 of the modules ($P<0.05$). Nurses had a lower margin of improvement than patients.

Bell JA, Patel B, Malasanos T (2006) Knowledge improvement with web-based diabetes education program: brainfood. *Diabetes Technology and Therapeutics* **8**(4): 444–8

DIABETES, OBESITY AND METABOLISM



Causes of weight gain in type 1 diabetes

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

1 An open-label, prospective study (n=21) investigated the causes of weight gain in people with type 1 diabetes.

2 The authors found that the lipogenic effect of insulin may be the main cause of weight gain associated with insulin therapy and improved glycaemic control.

Jacob AN, Salinas K, Adams-Huet B et al (2006) Potential causes of weight gain in type 1 diabetes mellitus. *Diabetes, Obesity and Metabolism* **8**: 404–11

DIABETES/METABOLISM RESEARCH AND REVIEWS



Exercise capacity not influenced by hyperglycaemia

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

1 A link between high plasma glucose and increased exercise capacity had been proposed.

2 Exercise capacity was tested in eight males. The authors concluded that exercise capacity is not influenced by hyperglycaemia in people with type 1 diabetes.

Stettler C, Jenni S, Allemann S et al (2006) Exercise capacity in subjects with type 1 diabetes mellitus in eu- and hyperglycaemia. *Diabetes/Metabolism Research and Reviews* **22**: 300–6

DIABETIC MEDICINE



Insulin detemir lowers the risk of hypoglycaemia

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

1 The aim of this study was to evaluate whether the risk of hypoglycaemia was similar with insulin detemir and NPH insulin used in a basal–bolus regimen.

2 An open-label, crossover study was conducted in 130 people with type 1 diabetes. Patients received either insulin detemir or NPH insulin twice-daily, in combination with pre-meal insulin aspart. Patients received each treatment for 16 weeks.

3 Hypoglycaemia was assessed using self-measured plasma glucose and self-reported episodes of hypoglycaemia.

4 Incidence of nocturnal and overall hypoglycaemia was reduced by respectively 50 % and 18 % with insulin detemir compared with NPH insulin ($P < 0.001$). HbA_{1c} was reduced to a similar degree with both treatments. Within-person variation was greater with NPH insulin (standard deviation 3.33 versus 3.00 mmol/l, $P < 0.001$). There was no significant difference in the incidence of severe hypoglycaemia.

5 The authors concluded that insulin detemir provided more consistent plasma glucose levels than NPH insulin and reduced the risk of the patient experiencing hypoglycaemia.

Kolendorf K, Ross GP, Pavlic-Renar I et al (2006) Insulin detemir lowers the risk of hypoglycaemia and provides more consistent plasma glucose levels compared with NPH insulin in type 1 diabetes. *Diabetic Medicine* **23**: 729–35

‘The authors concluded that insulin detemir provided more consistent plasma glucose levels.’