Teaching patients with type 1 diabetes to count their carbohydrates can help them to manage their insulin dose adjustment better and improve their quality of life.

Carbohydrate counting in diabetes

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Abstract

Carbohydrate counting is an effective tool to aid the management of blood glucose control in type 1 diabetes. All those with this condition should be offered the opportunity to learn about carbohydrate counting at diagnosis and have access to structured education programmes such as Dose Adjustment for Normal Eating (DAFNE).

Over two decades ago, carbohydrate counting for people with diabetes went out of favour in the UK and was replaced with education that focused on qualitative methods of advising on food intake, such as the glycaemic index and healthy eating. However, this was not the case in Germany and other parts of Europe, where a novel approach to managing type 1 diabetes was producing good-quality published evidence on the use of carbohydrate counting within structured education programmes.

The approach also involved using a specific set of algorithms to guide people with type 1 diabetes to adjust their insulin successfully (Bott et al, 1997; Pieber et al, 1995; Muhlhauser et al, 1987). These programmes showed this approach could dramatically improve HbA1c without an increase in severe hypoglycaemia.

In 2003, the Dose Adjustment for Normal Eating (DAFNE) study group showed this programme could be reproduced in the UK, not only improving biomedical outcomes but also bringing other benefits such as a better quality of life.

The economic evaluation of DAFNE showed reduced complication rates expected of the observed improved diabetic control, which meant the intervention would pay for itself within five years (Shearer, 2004).

Audit data demonstrates that following their DAFNE course, patients have lower levels of emotional distress and are less likely to be admitted to hospital with diabetic ketoacidosis or severe hypoglycaemia (Lawrence et al, 2008).

As a result of this wealth of evidence, carbohydrate counting is now considered a normal aspect of the education and skills required to manage type 1 diabetes, and structured education has now become a core component of “normal” care in quality diabetes services.

5 key points

1 Carbohydrate counting is effective in type 1 diabetes, but has no proven effect in type 2 diabetes, even for patients on insulin

2 It estimates the total carbohydrate in food, allowing people with type 1 to assess more accurately the impact of what they eat and drink on their glucose control

3 There is a variety of tools to help people to carbohydrate count

4 Dietitians who specialise in diabetes have specialist training in teaching carbohydrate counting skills

5 Dose Adjustment for Normal Eating (DAFNE) teaches people with type 1 diabetes the skills of carbohydrate counting and insulin dose adjustment
Researchers have tested this approach in type 2 diabetes where it was met with less success. In 2008, Bergenstal et al compared a control group that received general information on dose adjustment with a group that was taught carbohydrate counting. The intervention group experienced no additional benefit from carbohydrate management, so using a carbohydrate counting system cannot be recommended as a standard approach in type 2 diabetes. This is most likely to be because of the essential differences in the nature of type 1 and type 2 diabetes. In type 1 diabetes, carbohydrate is the only nutrient that directly affects blood glucose levels but this is not the case in type 2 diabetes, where weight management and therefore calorie control will be much more significant (Ulhanannan et al, 2007).

Teaching carbohydrate counting in practice
Specialist diabetes dietitians have access to a range of materials to teach patients how to count carbohydrate. This will normally include personalised education tailored to the individual patient’s abilities. The education will include the following.

Identifying carbohydrate foods
Patients should be taught to identify which foods and drinks contain carbohydrate and so will have an effect on their blood glucose levels.

For example, an omelette and salad contain no carbohydrate and have no effect on glucose levels. However, a bowl of pasta with garlic bread could easily contain in excess of 100g of carbohydrate and will cause blood glucose levels to rise by 20-30 mmol/L if no insulin is administered to counteract the impact of the carbohydrate in the meal.

Types of carbohydrate
The glycaemic index is a scientific system for classifying how quickly food increases blood glucose levels after a standard amount of carbohydrate has been consumed. It has many limitations, but in practice the index is useful to dispel myths about many carbohydrate foods, their impact on blood glucose and how they can be recommended in the food choices of people with type 1 diabetes.

For example, cake and chocolate are not rapid-acting carbohydrates and can easily be incorporated into food choices. Fibre, in most instances, has little or no effect on how rapidly glucose levels rise after a meal so it should not be recommended to people on the basis that it will improve their glucose profile.

Additionally, the glycaemic index provides us with a scientific basis to recommend rapid treatment of hypoglycaemia, which identifies glucose-based sweets and drinks as “best practice” options. Previous recommendations were to take the slow-acting carbohydrate of milk with sugar or biscuits, which can delay the treatment of hypoglycaemia.

The quantity of carbohydrate
This is the most important aspect of teaching about food and type 1 diabetes. The UK’s most recent nutritional guidelines (Diabetes UK, 2003) stated: “The amount of carbohydrate in meals or snacks has much greater influence than the source or type.”

This means that people with type 1 diabetes will need access to reliable carbohydrate portion guides, and practical education on the estimation of commonly eaten foods, interpretation of carbohydrate values on food packets and calculation of carbohydrate in recipes.

For those on twice-daily mixed insulin regimens, carbohydrate counting will aid meal planning that aims to ensure a consistent intake of carbohydrate at meals and snacks. For those on flexible insulin regimens, it will determine the quantity of “quick-acting” insulin required to “neutralise” the effect of the carbohydrate in any meal or snack. In the UK, the Diabetes Education Network (www.diabetes-education.net) has opted to use the term carbohydrate portion, which refers to an amount of food containing 10g of carbohydrate.

For example:

» Breakfast 1: 50g bowl of cornflakes with 200ml of milk and a large banana = 70g of carbohydrate = seven carbohydrate portions.

» Breakfast 2: two sweet waffles with two teaspoons of honey = 60g of carbohydrates = six carbohydrate portions.

» Breakfast 3: 200g portion of fruit salad with 150g fruit yoghurt = 40g of carbohydrate.
carbohydrate = four carbohydrate portions.

» Breakfast 4: scrambled egg, mushrooms, bacon and sausage with one piece of medium bread = 15g of carbohydrate = one and a half carbohydrate portions.

All the above breakfasts contain different quantities of carbohydrate and would have different effects on blood glucose levels in proportion to their carbohydrate value and, unless an adjustment is made in insulin dose, could lead to hypo- or hyperglycaemia.

There are a number of tools available to support people with diabetes in carbohydrate counting. Some suggestions include:

» Carbs and Cals: a Visual Guide to Carbohydrate and Calorie Counting for People with Diabetes, by Chris Cheyette and Yello Balolia;

» The DAFNE website;

» Diabetes UK website.

Most people find that a referral to a specialist dietitian or a structured education programme is the most comprehensive method of acquiring skills in carbohydrate counting.

DAFNE

The DAFNE programme meets Department of Health criteria for structured education in diabetes (DH and Diabetes UK, 2005). It is the only programme for type 1 diabetes named by the National Institute for Health and Clinical Excellence (2003) as an example of high-quality structured education. The programme was also cited as an example of best evidence as part of the Quality and Productivity Challenge (NHS Confederation, 2009).

Over the five-day programme, people are taught to carbohydrate count and adjust insulin to accommodate a range of everyday scenarios, which include eating out, managing snacks, alcohol, illness management, physical activity and hypoglycaemia.

Most people with type 1 diabetes will benefit from carbohydrate counting and a DAFNE programme in particular. It assists those who have:

» Problems with hypoglycaemia and poor awareness;

» Raised HbA1c who are actively interested in improving control;

» Erratic blood glucose control, particularly where insulin regimens do not match lifestyles;

» Not been taught to carbohydrate count so cannot predict the effect of food on blood glucose control;

» Excellent glucose control but find this places a good deal of restriction on their daily living and affects their quality of life, treatment satisfaction and mood. NYT

References


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