

# Simple Algorithm Method for Insulin Dosing Safe, Effective

The traditional method of counting carbohydrates to determine mealtime insulin dosing can be complicated and intimidating.

BY CONNI BERGMANN KOURY, EDITOR-IN-CHIEF

For many patients with type 2 diabetes, adjusting mealtime insulin glulisine (Apidra; Sanofi-Aventis, Paris) using a simple algorithm based on preprandial glucose is as safe and effective as using the traditional insulin-to-carbohydrate ratio.

According to a poster presented at the American Diabetes Association's 66th Scientific Sessions in Washington, DC, the new algorithm may provide patients with an easier alternative to the more complicated carbohydrate counting method. Lead investigator Richard Bergenstal, MD, executive director of the International Diabetes Center in Minneapolis said the insulin-to-carbohydrate ratio is currently considered the gold standard, but it is a lot of work for the patient. "Some people get intimidated by [the counting carbohydrate method] and do not use it," he said in an interview with *DIABETIC MICROVASCULAR COMPLICATIONS TODAY*.

The open-label, multicenter, randomized trial evaluated starting patients on a fixed-dose of mealtime glulisine and using an algorithm to adjust the glulisine to target based on preprandial glucose patterns, compared with starting and adjusting glulisine to target using the insulin-to-carbohydrate ratio. In the 24-week study, 136 patients were assigned to the simple algorithm group and 137 were assigned to the insulin-to-carbohydrate group.

## UNCONTROLLED DIABETES

All study patients had uncontrolled type 2 diabetes with two or more insulin injections. The mean age of the patients was 55.1 years, mean body mass index was 36.7 kg/m<sup>2</sup> and the mean baseline HbA1c was 8.2%.

Patients were switched to basal:bolus therapy with daily glargine (Lantus; Sanofi-Aventis) titrated to achieve fasting plasma glucose <95 mg/dL and glulisine before meals with targets of <100 mg/dL before lunch and dinner and <130

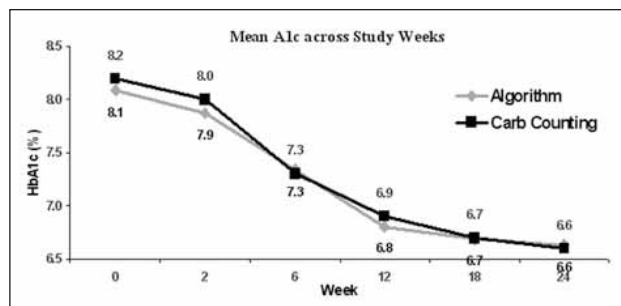


Figure 1. After 24 weeks, patients using both methods of dosing were able to achieve mean HbA1c levels of 6.6%.

mg/dL at bedtime (with or without metformin).

Dr. Bergenstal said premeal glulisine was adjusted weekly. The algorithm group added 1, 2 or 3 U/kg based on premeal patterns and the carbohydrate count group adjusted the insulin-to-carbohydrate ratio.

## PATIENTS REACHED GOAL

After 24 weeks, patients using both methods of dosing were able to achieve mean HbA1c levels of 6.6% (Figure 1). There was no difference between the algorithm and the insulin-to-carbohydrate groups with regard to HbA1c decrease (-1.46% vs -1.59%,  $P=.24$ ), the proportion of patients achieving HbA1c <7% (73.0% vs 69.2%,  $P=.7$ ) and weight gain (3.7 kg vs 2.4 kg,  $P=.06$ ).

Patients in the algorithm group had higher doses of glulisine (110.2 U vs 94.3 U,  $P=.04$ ) and glargine (103.4 U vs 87 U,  $P<.0001$ ) and less symptomatic hypoglycemia <50 mg/dL (4.9 vs 8.0 events/patients yr,  $P=.02$ ) compared with the insulin-to-carbohydrate group.

Both groups ended with a basal:bolus ratio of 50:50 and used 1.8 to 2 U/kg of insulin per day.

## INVESTIGATIONAL CONTINUOUS GLUCOSE MONITOR STABLE, ACCURATE

The Freestyle Navigator (Abbott Diabetes Care, Alameda, Calif) continuous glucose monitoring system demonstrated safety and efficacy in the home use environment over 5 days of wear in patients with type 1 and type 2 diabetes.

According to a news release, the accuracy of the device was assessed in 58 patients ranging in age from 18 to 64 years. Comparison of the system measurements (n=20,362) with a laboratory reference method (YSI) gave a mean absolute relative difference of 12.8% and a median absolute relative difference of 9.3%. The study results were discussed by William L. Clarke, MD, professor of pediatrics at the University of Virginia Health System, in a presentation at the American Diabetes Association's 66th Scientific Sessions in Washington, DC.

On the Clarke Error Grid (CEG), 81.7% (n=16,627) of measurements were in zone A, and 16.7% (n=3,398) were in zone B (as compared to YSI). The CEG compares readings from a lab reference to a reading from a glucose monitoring device at a specific point in time. The variance between the two readings is placed on a grid within clinical categories or zones. Each zone is labeled A, B, C, D or E. Points in the A zone are clinically accurate and most consistent with the lab reference value. B zone readings are clinically acceptable. Points in the C, D, and E zones are progressively less accurate.

The study met its primary endpoint of demonstrated accuracy and stability over 5 days of wear. The Freestyle Navigator is an investigational device under review by the US Food and Drug Administration. The system includes a 5-day



**Figure 1. In clinical trials, the Freestyle Navigator system set a new threshold for point glucose accuracy in a continuous glucose monitoring system, researchers said.**

sensor, a transmitter and a wireless receiver with a built-in blood glucose monitoring system. The system is designed to provide glucose readings once per minute, high and low glucose alarms and projected glucose alarms.

"Frequent and accurate glucose monitoring is an essential element of achieving tight glycemic control. The accuracy, particularly in the A zone, of continuous glucose monitoring sensors is critical to assessing the benefits that patients can derive from the technology," said Dr. Clarke. "In clinical studies ... the Freestyle Navigator system, under development, has set a new threshold for point glucose accuracy in a continuous glucose monitoring system." ■

Bode B, Bergenstal R, Weinstein R, et al. Performance of the Freestyle Navigator continuous glucose monitoring system during home use. Poster #2-LB. Presented at the American Diabetes Association's 66th Annual Scientific Sessions. June 9-13, 2006. Washington, DC.

"We found that physicians really need to keep an open mind and do what is best for the patient," Dr. Bergenstal said. "If patients want to do the insulin-to-carbohydrate ratio, that's fine, but if they want something simple with pattern control, that can work, too. The key thing is to have a target goal, do the blood sugars and adjust by either method."

The researchers concluded that this simple approach may help patients learn to initiate and adjust bolus insulin, thereby improving the transition to basal-bolus regimens and their effectiveness. This may also encourage physicians to initiate insulin earlier in patients with type 2 diabetes who fail oral agents.

"This new dosing approach relies on a simple algorithm that allows patients to start with a fixed dose of mealtime glulisine and then adjust to target based on premeal glucose patterns," Dr. Bergenstal emphasized. "This is an easy way to dose and adjust mealtime insulin that should meet the needs of many patients who are not prepared to

undertake the equally effective but more complex carbohydrate counting method. Also, the HbA1c reductions seen in this study help further demonstrate that good glycemic control is possible and often associated with basal:bolus regimens." ■

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Bergenstal R, Johnson M, Powers M, Wynne A, et al. Using a simple algorithm to adjust mealtime glulisine based on preprandial glucose patterns is a safe and effective alternative to carbohydrate counting. Presented at the American Diabetes Association's 66th Scientific Sessions. June 9-13, 2006. Washington, DC.