

## Clinical Update on Optimal Prandial Insulin Dosing Using a Refined Run-to-Run Control Algorithm

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### Abstract

#### Background:

This article provides a clinical update using a novel run-to-run algorithm to optimize prandial insulin dosing based on sparse glucose measurements from the previous day's meals. The objective was to use a refined run-to-run algorithm to calculate prandial insulin-to-carbohydrate ratios (I:CHO) for meals of variable carbohydrate content in subjects with type 1 diabetes (T1DM).

#### Method:

The open-labeled, nonrandomized study took place over a 6-week period in a nonprofit research center. Nine subjects with T1DM using continuous subcutaneous insulin infusion participated. Basal insulin rates were optimized using continuous glucose monitoring, with a target fasting blood glucose of 90 mg/dl. Subjects monitored blood glucose concentration at the beginning of the meal and at 60 and 120 minutes after the start of the meal. They were instructed to start meals with blood glucose levels between 70 and 130 mg/dl. Subjects were contacted daily to collect data for the previous 24-hour period and to give them the physician-approved, algorithm-derived I:CHO ratios for the next 24 hours. Subjects calculated the amount of the insulin bolus for each meal based on the corresponding I:CHO and their estimate of the meal's carbohydrate content. One- and 2-hour postprandial glucose concentrations served as the main outcome measures.

#### Results:

The mean 1-hour postprandial blood glucose level was  $104 \pm 19$  mg/dl. The 2-hour postprandial levels ( $96.5 \pm 18$  mg/dl) approached the preprandial levels ( $90.1 \pm 13$  mg/dl).

#### Conclusions:

Run-to-run algorithms are able to improve postprandial blood glucose levels in subjects with T1DM.

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**Abbreviations:** (BG) blood glucose, (I:CHO) insulin-to-carbohydrate ratio, (SD) standard deviation, (T1DM) type 1 diabetes mellitus

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