

## Bolus Guide: A Novel Insulin Bolus Dosing Decision Support Tool Based on Selection of Carbohydrate Ranges

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### Abstract

#### Background:

Optimal continuous subcutaneous insulin infusion (CSII) therapy emphasizes the relationship between insulin dose and carbohydrate consumption. One widely used tool (bolus calculator) requires the user to enter discrete carbohydrate values; however, many patients might not estimate carbohydrates accurately. This study assessed carbohydrate estimation accuracy in type 1 diabetes CSII users and compared simulated blood glucose (BG) outcomes using the bolus calculator and the “bolus guide,” an alternative system based on ranges of carbohydrate load.

#### Methods:

Patients ( $n = 60$ ) estimated the carbohydrate load of a representative sample of meals of known carbohydrate value. The estimated error distribution [coefficient of variation (CV)] was the basis for a computer simulation ( $n = 1.6$  million observations) of insulin recommendations for the bolus guide and bolus calculator, translated into outcome blood glucose (OBG) ranges ( $\leq 60$ , 61–200,  $>201$  mg/dl). Patients ( $n = 30$ ) completed questionnaires assessing satisfaction with the bolus guide.

#### Results:

The CV of typical meals ranged from 27.9% to 44.5%. The percentage of simulated OBG for the calculator and the bolus guide in the  $<60$  mg/dl range were 20.8% and 17.2%, respectively, and 13.8% and 15.8%, respectively, in the  $>200$  mg/dl range. The mean and median scores of all bolus guide satisfaction items and ease of learning and use were 4.17 and 4.2, respectively (of 5.0).

#### Conclusion:

The bolus guide recommendation based on carbohydrate range selection is substantially similar to the calculator based on carbohydrate point estimation and appears to be highly accepted by type 1 diabetes insulin pump users.

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**Abbreviations:** (BG) blood glucose, (BOB) bolus on board, (CBG) current blood glucose, (CSII) continuous subcutaneous insulin infusion, (CV) coefficient of variation, (DCCT) Diabetes Control and Complications Trial, (DID) diabetes interactive diary, (HbA1c) hemoglobin A1c, (ISF) insulin sensitivity factor, (ITC) insulin-to-carbohydrate ratio, (MDI) multiple daily injection, (OBG) outcome blood glucose, (PC) personal computer, (TBG) target blood glucose, (TC) true carbohydrate

**Keywords:** bolus, bolus calculator, bolus guide, carbohydrates, glycemic control, range

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