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SYMPOSIUM

Predicted Blood Glucose from Insulin Administration Based on Values from Miscoded Glucose Meters

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Abstract

Objectives:

The proper use of many types of self-monitored blood glucose (SMBG) meters requires calibration to match strip code. Studies have demonstrated the occurrence and impact on insulin dose of coding errors with SMBG meters. This paper reflects additional analyses performed with data from Raine *et al.* (JDST, 2:205-210, 2007). It attempts to relate potential insulin dose errors to possible adverse blood glucose outcomes when glucose meters are miscoded.

Methods:

Five sets of glucose meters were used. Two sets of meters were autocoded and therefore could not be miscoded, and three sets required manual coding. Two of each set of manually coded meters were deliberately miscoded, and one from each set was properly coded. Subjects (n = 116) had finger stick blood glucose obtained at fasting, as well as at 1 and 2 hours after a fixed meal (Boost®; Novartis Medical Nutrition U.S., Basel, Switzerland). Deviations of meter blood glucose results from the reference method (YSI) were used to predict insulin dose errors and resultant blood glucose outcomes based on these deviations.

Results:

Using insulin sensitivity data, it was determined that, given an actual blood glucose of 150–400 mg/dl, an error greater than +40 mg/dl would be required to calculate an insulin dose sufficient to produce a blood glucose of less than 70 mg/dl. Conversely, an error less than or equal to -70 mg/dl would be required to derive an insulin dose insufficient to correct an elevated blood glucose to less than 180 mg/dl.

For miscoded meters, the estimated probability to produce a blood glucose reduction to less than or equal to 70 mg/dl was 10.40%. The corresponding probabilities for autocoded and correctly coded manual meters were 2.52% ($p < 0.0001$) and 1.46% ($p < 0.0001$), respectively.

Furthermore, the errors from miscoded meters were large enough to produce a calculated blood glucose outcome less than or equal to 50 mg/dl in 42 of 833 instances. Autocoded meters produced zero (0) outcomes less than or equal to 50 mg/dl out of 279 instances, and correctly coded manual meters produced 1 of 416.

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Abbreviations: (A1c) glycosylated hemoglobin, (BG) blood glucose, (CGM) continuous glucose monitoring, (DCCT) The Diabetes Control and Complications Trial, (SD) standard deviation, (SMBG) self-monitored blood glucose, (UKPDS) UK Prospective Diabetes Study

Keywords: autocoded meter, blood glucose meter, manually coded meters, miscoded meter, user error

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Abstract *(continued)*

Conclusions:
Improperly coded blood glucose meters present the potential for insulin dose errors and resultant clinically significant hypoglycemia or hyperglycemia. Patients should be instructed and periodically reinstructed in the proper use of blood glucose meters, particularly for meters that require coding.

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