

Performance Evaluation of a Continuous Glucose Monitoring System under Conditions Similar to Daily Life

Stefan Pleus, M.S.,¹ Christina Schmid, Ph.D.,¹ Manuela Link, M.E.,¹ Eva Zschornack, M.D.,¹
Hans-Martin Klötzer, Ph.D.,² Cornelia Haug, M.D.,¹ and Guido Freckmann, M.D.¹

Abstract

Background:

This study aimed at evaluating and comparing the performance of a new generation of continuous glucose monitoring (CGM) system versus other CGM systems, under daily lifelike conditions.

Methods:

A total of 10 subjects (7 female) were enrolled in this study. Each subject wore two Dexcom G4™ CGM systems in parallel for the sensor lifetime specified by the manufacturer (7 days) to allow assessment of sensor-to-sensor precision. Capillary blood glucose (BG) measurements were performed at least once per hour during daytime and once at night. Glucose excursions were induced on two occasions. Performance was assessed by calculating the mean absolute relative difference (MARD) between CGM readings and paired capillary BG readings and precision absolute relative difference (PAR), i.e., differences between paired CGM readings.

Results:

Overall aggregate MARD was 11.0% ($n = 2392$). Aggregate MARD for BG <70 mg/dl was 13.7%; for BG between 70 and 180 mg/dl, MARD was 11.4%; and for BG >180 mg/dl, MARD was 8.5%. Aggregate PAR was 7.3%, improving from 11.6% on day 1 to 5.2% on day 7.

Conclusions:

The Dexcom G4 CGM system showed good overall MARD compared with results reported for other commercially available CGM systems. In the hypoglycemic range, where CGM performance is often reported to be low, the Dexcom G4 CGM system achieved better MARD than that reported for other CGM systems in the hypoglycemic range. In the hyperglycemic range, the MARD was comparable to that reported for other CGM systems, whereas during induced glucose excursions, the MARD was similar or slightly worse than that reported for other CGM systems. Overall PAR was 7.3%, improving markedly with sensor life time.

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Author Affiliations: ¹Institut für Diabetes-Technologie Forschungs- und Entwicklungsgesellschaft mbH an der Universität Ulm, Ulm, Germany; and ²HMKQ Quantitative Analytik - Chemometrie, Weinheim, Germany

Abbreviations: (BG) blood glucose, (CGM) continuous glucose monitoring, (EGA) error grid analysis, (MARD) mean absolute relative difference, (PAR) precision absolute relative difference, (SMBG) self-monitoring of blood glucose

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Corresponding Author: Stefan Pleus, M.S., Institut für Diabetes-Technologie Forschungs- und Entwicklungsgesellschaft mbH an der Universität Ulm, Helmholtzstrasse 20, 89081 Ulm, Germany; email address stefan.pleus@uni-ulm.de