

Continuous Glucose Monitoring Accuracy Results Vary between Assessment at Home and Assessment at the Clinical Research Center

Yoeri M. Luijf, M.D., M.Sc.,¹ Angelo Avogaro, M.D., Ph.D.,² Carsten Benesch, Ph.D.,³ Daniela Bruttomesso, M.D., Ph.D.,² Claudio Cobelli, Ph.D.,² Martin Ellmerer, M.Sc., Ph.D.,⁴ Lutz Heinemann, M.D., Ph.D.,³ Julia K. Mader, M.D.,⁴ and J. Hans DeVries, M.D., Ph.D.,¹ on behalf of the AP@home consortium

Abstract

Background:

Continuous glucose monitoring system (CGMS) accuracy is of critical importance both in delivering therapeutic value and as a component of a closed-loop system. This study aims at assessing the differences between accuracy assessments of CGMS at home and at the clinical research center (CRC).

Methods:

Twelve patients with type 1 diabetes used the Dexcom® SEVEN® PLUS (DexCom, Inc.) CGMS for 7 days. Patients performed ≥ 6 finger pricks [self-measurement of blood glucose (SMBG)] per day while at home. Reference blood glucose measurements were taken during a 24 h CRC admission (YSI 2300 STAT Plus™). Continuous glucose monitoring system data were compared with YSI and SMBG values. Outcome measures included mean absolute relative difference (MARD) and Clarke error grid analysis (CEGA).

Results:

During CRC admission, the MARD of CGMS vs YSI glucose values was 19.2% ($n = 509$)—significantly higher than 16.8% at home ($n = 611$) ($p = .004$). In the hypoglycemic range, MARD was 23.9% at CRC ($n = 26$)—not significantly different from 41.6% at home ($n = 39$) ($p = .269$). In the hyperglycemic range, CRC MARD at 20.3% ($n = 115$) was significantly higher than home MARD at 11.2% ($n = 118$) ($p = .001$). Clarke error grid analysis showed no significant difference in distribution of data pairs (overall $p = .317$).

Conclusions:

This study illustrates the importance of the setting used when assessing CGMS accuracy. Continuous glucose monitoring system accuracy at home appeared better than at the CRC. This is probably due to the higher sampling rate of reference measurements, feasible only in the CRC. Testing CGMS accuracy in the CRC provides valuable information over and above home testing.

J Diabetes Sci Technol 2012;6(5):1103-1106

Author Affiliations: ¹Internal Medicine, Academic Medical Center, Amsterdam, The Netherlands; ²Department of Clinical and Experimental Medicine, University of Padova, Padova, Italy; ³Profil Institut für Stoffwechselforschung GmbH, Neuss, Germany; and ⁴Department of Internal Medicine, Medical University Graz, Graz, Austria

Abbreviations: (CEGA) Clarke error grid analysis, (CGMS) continuous glucose monitoring system, (CRC) clinical research center, (MARD) mean absolute relative difference, (SMBG) self-measurement of blood glucose

Keywords: accuracy, continuous glucose monitoring, diabetes, sensors, type 1 diabetes

Corresponding Author: Yoeri M. Luijf, M.D., M.Sc., Academic Medical Center, Department of Internal Medicine, Room F4-215, PO Box 22660, 1100DD, Amsterdam, The Netherlands; email address y.m.luijf@amc.nl