Journal of Diabetes Science and Technology
Volume 6, Issue 4, July 2012

ORIGINAL ARTICLE

Determinants of the Accuracy of Continuous Glucose Monitoring in Non-Critically Ill Patients with Heart Failure or Severe Hyperglycemia

Kathleen M. Dungan, M.D.,[1] Wen Han, M.D.,[1] Anthony Miele, B.S.,[2] Trisha Zeidan, M.D.,[1] and Karen Weiland, C.N.P., C.D.E.[1]

Abstract

Background:

The accuracy of continuous glucose monitoring (CGM) in non-critically ill hospitalized patients with heart failure or severe hyperglycemia (SH) is unknown.

Methods:

Hospitalized patients with congestive heart failure (CHF) exacerbation (receiving IV or subcutaneous insulin) or SH requiring insulin infusion were compared to outpatients referred for retrospective CGM.

Results:

Forty-three patients with CHF, 15 patients with SH, and 88 outpatients yielded 470, 164, and 2150 meter–sensor pairs, respectively. Admission glucose differed (188 versus 509 mg/dl in CHF and SH, $p < .001$) but not the first sensor glucose ($p = .35$). In continuous glucose error grid analysis, 67–78% of pairs during hypoglycemia were in zones A+B ($p = .63$), compared with 98–100% in euglycemia ($p < .001$) and 98%, 92%, and 99% ($p = .001$) during hyperglycemia for the CHF, SH, and outpatient groups, respectively. Mean absolute relative difference (MARD) was lower in the CHF versus the SH group in glucose strata above 100 mg/dl, but there was no difference between the CHF and outpatient groups. Linear regression models showed that CHF versus outpatient, SH versus CHF, and coefficient of variation were significant predictors of higher MARD. Among subjects with CHF, MARD was not associated with brain natriuretic peptide or change in plasma volume, but it was significantly higher in subjects randomized to IV insulin ($p = .04$).

Conclusions:

The results suggest that SH and glycemic variability are more important determinants of CGM accuracy than known CHF status alone in hospitalized patients.

J Diabetes Sci Technol 2012;6(4):884-891

Author Affiliations: [1]Division of Endocrinology, Diabetes, and Metabolism, Ohio State University, Columbus, Ohio; and [2]College of Medicine, Ohio State University, Columbus, Ohio

Abbreviations: (BG) blood glucose, (BNP) brain natriuretic peptide, (CG-EGA) continuous glucose error grid analysis, (CGM) continuous glucose monitoring, (CHF) congestive heart failure, (CV) coefficient of variation, (EGA) error grid analysis, (HbA1c) hemoglobin A1c, (ICU) intensive care unit, (IV) intravenous, (MAD) mean absolute difference, (MARD) mean absolute relative difference, (non-ICU) areas outside of ICU, (SH) severe hyperglycemia, (SQ) subcutaneous

Keywords: continuous glucose monitoring, heart failure, hospital

Corresponding Author: Kathleen Dungan, M.D., 4th Floor McCampbell Hall, 1581 Dodd Dr., Columbus, OH 43210; email address *kathleen.dungan@osumc.edu*