

Dexcom G4AP: An Advanced Continuous Glucose Monitor for the Artificial Pancreas

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Abstract

Input from continuous glucose monitors (CGMs) is a critical component of artificial pancreas (AP) systems, but CGM performance issues continue to limit progress in AP research. While G4 PLATINUM has been integrated into AP systems around the world and used in many successful AP controller feasibility studies, this system was designed to address the needs of ambulatory CGM users as an adjunctive use system. Dexcom and the University of Padova have developed an advanced CGM, called G4AP, to specifically address the heightened performance requirements for future AP studies. The G4AP employs the same sensor and transmitter as the G4 PLATINUM but contains updated denoising and calibration algorithms for improved accuracy and reliability. These algorithms were applied to raw data from an existing G4 PLATINUM clinical study using a simulated prospective procedure. The results show that mean absolute relative difference (MARD) compared with venous plasma glucose was improved from 13.2% with the G4 PLATINUM to 11.7% with the G4AP. Accuracy improvements were seen over all days of sensor wear and across the plasma glucose range (40–400 mg/dl). The greatest improvements occurred in the low glucose range (40–80 mg/dl), in euglycemia (80–120 mg/dl), and on the first day of sensor use. The percentage of sensors with a MARD <15% increased from 69% to 80%. Metrics proposed by the AP research community for addressing specific AP requirements were also computed. The G4AP consistently exhibited improved sensor performance compared with the G4 PLATINUM. These improvements are expected to enable further advances in AP research.

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Abbreviations: (%20/20) percentage of points within 20 mg/dl below 80 mg/dl and within 20% above 80 mg/dl, (AD) absolute difference, (AP) artificial pancreas, (ARD) absolute relative difference, (CGM) continuous glucose monitor, (FDA) Food and Drug Administration, (MAD) mean absolute difference, (MARD) mean absolute relative difference, (SD) standard deviation, (SMBG) self-monitoring of blood glucose

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