

Impact of Glucose Measurement Processing Delays on Clinical Accuracy and Relevance

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Abstract

Background:

In a hospital setting, glucose is often measured from venous blood in the clinical laboratory. However, laboratory glucose measurements are typically not available in real time. In practice, turn-around times for laboratory measurements can be minutes to hours. This analysis assesses the impact of turn-around time on the effective clinical accuracy of laboratory measurements.

Methods:

Data obtained from an earlier study with 58 subjects with type 1 diabetes mellitus (T1DM) were used for this analysis. In the study, glucose measurements using a YSI glucose analyzer were obtained from venous blood samples every 15 min while the subjects were at the health care facility. To simulate delayed laboratory results, each YSI glucose value from a subject was paired with one from a later time point (from the same subject) separated by 15, 30, 45, and 60 min. To assess the clinical accuracy of a delayed YSI result relative to a real-time result, the percentage of YSI pairs that meet the International Organization for Standardization (ISO) 15197:2003(E) standard for glucose measurement accuracy (± 15 mg/dl for blood glucose < 75 mg/dl, $\pm 20\%$ for blood glucose ≥ 75 mg/dl) was calculated.

Results:

It was observed that delays of 15 min or more reduce clinical accuracy below the ISO 15197:2003(E) recommendation of 95%. The accuracy was less than 65% for delays of 60 min.

Conclusion:

This analysis suggests that processing delays in glucose measurements reduce the clinical relevance of results in patients with T1DM and may similarly degrade the clinical value of measurements in other patient populations.

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Abbreviations: (ISO) International Organization for Standardization, (MARD) mean absolute relative difference, (POC) point of care, (T1DM) type 1 diabetes mellitus

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