

Evaluation of Point-of-Care Blood Glucose Measurements in Patients with Diabetic Ketoacidosis or Hyperglycemic Hyperosmolar Syndrome Admitted to a Critical Care Unit

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Abstract

Background:

Point-of-care (POC) blood glucose (BG) measurement is currently not recommended in the treatment of patients presenting with diabetic ketoacidosis (DKA) or hyperglycemic hyperosmolar syndrome (HHS).

Methods:

We prospectively evaluated and compared capillary and venous POC BG values with laboratory venous glucose in patients with DKA or HHS admitted to one critical care unit over 8 months.

Results:

Venous laboratory glucose was strongly correlated with venous ($r = 0.98$) and capillary ($r = 0.96$) POC glucose values, though POC glucose values were higher than venous laboratory values (venous POC 21 ± 3 mg/dL, capillary POC 30 ± 4 mg/dL; both $p < .001$). Increased plasma osmolality had no effect on glucose meter error, while acidemia ($\text{pH} < 7.3$) was associated with greater glucose meter error ($p = .04$) independent of glucose levels. Comparing hypothetical insulin infusion rates based on laboratory venous glucose to actual infusion rates based on POC glucose values showed that 33/61 insulin infusion rates would have been unchanged, while 28 out of 61 rates were on average $7\% \pm 2\%$ higher. There were no instances of hypoglycemia in any of the patients.

Conclusions:

Overall, both venous and capillary POC BG values were safe for the purpose of titrating insulin infusions in patients with severe hyperglycemia. Acidemia, but not hyperosmolality, increased POC BG value errors.

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Abbreviations: (BG) blood glucose, (DKA) diabetic ketoacidosis, (ED) emergency department, (FDA) Food and Drug Administration, (HHS) hyperglycemic hyperosmolar syndrome, (ICU) intensive care unit, (ISO) International Standards Organization, (MCICU) medical cardiac intensive care unit, (POC) point of care

Keywords: accuracy, blood glucose, hyperglycemic hyperosmolar syndrome, ketoacidosis, point of care

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