

Glucometer Correction Factor for Hematocrit Effect in the ICU

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Problem: Hematocrit effect, the influence of non-optimal hematocrit on the accuracy of glucose analyzers, poses a patient safety risk when tight glucose control is desired. The combination of tight glucose management and restrictive blood transfusion policies has brought about a situation not anticipated when the widespread use of point-of-care glucose testing became the standard of care. Utilizing devices in the intensive care unit that were originally intended for home use by hyperglycemic diabetics with normal hematocrits has proved problematic.

Evidence: 211 paired blood samples were prospectively collected and simultaneously tested with bedside glucometers and the laboratory serum analyzer. Serum versus glucometer results were plotted and regression analysis used to develop a mathematical correction factor subsequently validated with an additional 527 prospectively collected samples time-matched with grey top (sodium fluoride) lab specimens. Glucometers over-estimated blood glucose levels by 30% ($\pm 14\%$); the average hematocrit (HCT) for the patients analyzed was 23% ($\pm 5\%$). The corrected glucometer values for the validation samples were on average within 2% ($\pm 6.5\%$) of reported lab values.

Strategy: The mathematical correction formula was entered into the computer charting system (ESSENTRIS) to automatically correct glucose values obtained from bedside glucometer measurement.

Practice Change: The correction factor has been subsequently refined and is now applied to all bedside glucose values for patients with HCT $<34\%$ on our ICU.

Evaluation: Data were analyzed to determine how many unrecognized glucose values less than 80 mg/dl would have occurred without application of mathematical correction.

Results: The number of glucose values less than 80mg/dl identified by the glucometer without correction was 4%; the number identified with correction was 21%; and matched serum glucose values were 29%.

Recommendations: There is a reliable and efficient glucose correction method appropriate for acute care settings utilizing bedside glucose measurement for patients with non-optimal hematocrits.