

Glucometer Error in the Anemic Patient
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Problem

Traditional single-channel point-of-care (POC) glucometers overestimate true glucose values in anemic patients, creating a dilemma for providers who simultaneously implement tight glucose control and restrictive transfusion strategies^{1,2}.

Evidence

We previously demonstrated that a mathematical formula successfully corrects for the effect of hematocrit (HCT) alone, improving glycemic regulation³. Studies suggest multiple biologic parameters such as oxygen tension, acid base balance, and various pharmacological agents also affect the accuracy of handheld glucometers^{4,5}. A newly released 4-channel POC analyzer measures and eliminates the majority of these interfering substances.

Strategy

A 4-channel glucometer was compared to a single channel glucometer with mathematical hematocrit correction to determine which method provided a better approximation of laboratory glucose measurement.

Evaluation

Whole blood samples (n=99) were prospectively gathered from 42 critically ill patients in the surgical, trauma, medical and burn ICU. Samples were tested on the single-channel (SureStep Flexx™, LifeScan) and 4-channel (StatStrip™, Nova Biomedical) glucometers, and in the central chemistry laboratory (Vitros Fusion, Ortho Clinical Diagnostics). Error rates were calculated based on differences from laboratory reference values.

Results

Mean HCT for samples was 26.6% (SD 5.2%, range 18.5 – 43.1%). Mean error for uncorrected single channel glucose measurement was 22% (SD 9.4%, range -42.4 - 3.6%), decreasing to -4.36% (SD 5.6%, range -14.7 – 14.6%) after correction. Mean error for 4-channel measurement was -4.25% (SD 5.3%, range -30.3 – 7.2%). With a zone of indifference set for $\pm 5\%$, the difference between analyzers was -0.67% (CI: -1.79% to 0.45%), demonstrating non-inferiority between methods. Utilization of a 4-channel glucometer demonstrated clinically indistinguishable results compared with mathematical correction for hematocrit.

Practice Change

As a result of our study, our institution has initiated conversion of all POC glucometers to the 4-channel Nova, Biomedical glucometer.

Recommendations

Current single-channel glucometers do not accurately reflect serum glucose values in anemic patients. Either a 4-channel glucometer (Nova, Biomedical) or a mathematical correction factor for a single channel device should be used when hematocrit is <34%.

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