

BLOOD GLUCOSE MEASUREMENTS IN NEONATES: THE IMPORTANCE OF GETTING IT RIGHT

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BACKGROUND: Neonates are at significant risk of hypoglycemia and accurate and reliable glucose measurements are required to ensure safe management of neonates. Point of Care (POC) meters have the advantage of delivering immediate results on very small whole blood specimens. However neonatal whole blood can have varying levels of endogenous substances known to impact on the accuracy of glucose meters including lipids, bilirubin and hematocrit, and non glucose sugars. In particular haematocrit levels can exceed the functional ranges often reported in the instructions for use for POC glucose methods. The aim of this study was to evaluate four POC methods for the effect of haematocrit on glucose measurement

METHODS: The effect of varying haematocrit (HCT) levels was assessed in two whole blood specimens with low (hypoglycemic), and high (hyperglycemic) glucose concentrations. Hematocrit levels were adjusted to 24%, 45% and 59% according to CLSI protocol. The whole blood specimens were analysed on three POC glucose meters (Optium Xceed Abbott), StatStrip Glucose (Nova Biomedical) and HemoCue 201 (HemoCue) and an ABL 825 blood gas analyser (Radiometer). After testing the plasma was immediately separated and tested using the laboratory DxC800 analyser as a reference method (Beckman).

RESULTS: The influence of hematocrit on the accuracy of results varied according to the POC method used. The accuracy of StatStrip Glucose results was unaffected across the range of hematocrit and glucose levels tested. For the low level glucose sample the accuracy of both the HemoCue and Optium POC glucose results was affected with a 0.8mmol/L difference compared to the laboratory result at a haematocrit level of 59%. The accuracy of the ABL 825 blood gas analyser was not affected at a low glucose concentrations but was affected at high glucose concentrations with a 15% difference at 59% hematocrit level compared to 45% hematocrit level. At the high glucose concentration the most significant influence was seen with Optium with a difference of 25% in glucose values between hematocrit levels of 24% and 59%.

CONCLUSIONS: Hematocrit levels in neonates can vary significantly and frequently can be high. The accuracy of POC glucose methods used for managing both hypoglycemia and hyperglycemia can be influenced by varying hematocrit levels. The degree of influence seen in this study exceeds the performance criteria in new guidelines for glucose meters (ISO 15197 2013 and CLSI POCT 12 A3) and as such POC glucose methods influenced by hematocrit can increase the risk of an adverse management decision. Of the POC methods evaluated StatStrip Glucose provided the most accurate glucose measurements.