

Anesth Analg. 2014 Sep 3.

A Comparison of Hemoglobin Measured by Co-Oximetry and Central Laboratory During Major Spine Fusion Surgery.

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BACKGROUND: Many factors affect the accuracy of hemoglobin concentration values. In this study, we evaluated whether the hemoglobin concentration obtained by means of arterial blood gas (ABG) co-oximetry and complete blood count (CBC) central laboratory techniques clinically correlate when using simultaneous measurements of hemoglobin concentration obtained during complex spine fusion surgery.

METHODS: Three hundred forty-eight patients who underwent spinal fusion of >3 bony levels between September 2006 and September 2010, with concurrent ABG and CBC samples, were identified. The mean difference between pairs of measured hemoglobin values was determined using limits of agreement analysis. Error grid analysis was used to delineate correlation of samples in relation to hemoglobin values within the range considered for transfusion.

RESULTS: The median difference (ABG-CBC) between the measured hemoglobin values was 0.4 g/dL (95% confidence interval [CI], 0.35-0.40 g/dL; $P < 0.0001$). Limits of agreement analysis correcting for repeated observations in multiple patients demonstrated that the mean difference between measured hemoglobin values (i.e., bias) was 0.4 g/dL (95% CI, 0.36-0.41 g/dL), and the 95% limits of agreement of the difference between paired measurements were -0.70 to 1.47 g/dL. The magnitude of the difference between the measured hemoglobin values was >0.5 g/dL in 44.5% of patients (95% CI, 42.2%-46.8%); however, 6.8% (95% CI, 5.8%-8.1%) of paired measurements had a difference of >1.0 g/dL. There was only fair-to-moderate agreement between the CBC and ABG values within the clinically significant range of hemoglobin values of 7 to 10 g/dL (Cohen $\kappa = 0.39$; 95% CI, 0.33-0.45).

CONCLUSIONS: The hemoglobin values obtained from ABG and CBC cannot be used interchangeably when verifying accuracy of novel point-of-care hemoglobin measurement modalities or when managing a patient with critical blood loss.