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Accuracy of noninvasive hemoglobin monitoring in patients at risk for hemorrhage.

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BACKGROUND: Monitoring for acute blood loss is critical in surgical patients, and delays in identifying hemorrhage can result in poor outcomes. The current standard of care for monitoring patients at risk for bleeding is serial measurement of hemoglobin (Hgb) by standard laboratory complete blood count (CBC). Point-of-care testing (i.e., iSTAT) can be a rapid method of evaluating Hgb, and spectrophotometry-based devices (i.e., Radical-7) offer the advantages of being continuous and noninvasive. We sought to evaluate the accuracy of Radical-7 and iSTAT in measuring Hgb and assessing for blood loss when compared with the criterion standard CBC.
METHODS: Adult patients at risk for hemorrhage admitted to the surgical intensive care unit of a tertiary referral, Level I trauma center were eligible for this study. Serial CBC Hgb measurements were drawn as clinically indicated. The Radical-7 device was placed on the patient for noninvasive Hgb measurements (SpHb), and at each CBC measurement, concurrent iSTAT Hgb measurements were obtained. Bland-Altman analysis was used to compare the three methods of measuring Hgb with accuracy defined as measurements within 1.0-g/dL CBC Hgb. Concordance measurements were also performed to compare trends between values.
RESULTS: Eighty-eight patients were enrolled and underwent 572 CBC measurements. Bland-Altman analysis of SpHb versus CBC resulted in an estimated bias of 1.49 g/dL, with 95% limits of agreement of -2.2 g/dL to 5.0 g/dL. iSTAT versus CBC resulted in an estimated bias of -0.63 g/dL, with 95% limits of agreement of -3.4 g/dL to 2.2 g/dL. Changes in SpHb had concordance with CBC Hgb 60% of the time, compared with 76% for iSTAT versus CBC
CONCLUSION: Radical-7 SpHb was inaccurate
when compared with CBC Hgb levels, and serial SpHb achieved concordance with CBC Hgb 60% of the time. As such, the clinical utility of Radical-7 as a rapid, noninvasive predictor of acute hemorrhage may be limited.
LEVEL OF EVIDENCE: Diagnostic study, level II; care management, level III.