

Accuracy of Continuous Non-Invasive Hemoglobin Monitoring: A Systematic Review and Meta-Analysis

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Background

Non-invasive hemoglobin (Hb) monitoring devices are available in the clinical setting but their accuracy and precision against central laboratory Hb measurements have not been evaluated in a systematic review and meta-analysis.

Methods

We conducted a comprehensive search of the medical literature (2005 to August 2013) with PubMed, Web of Science and the Cochrane Library, reviewed references of retrieved articles, and contacted manufactures to identify studies assessing the accuracy of non-invasive Hb monitoring against central laboratory Hb measurements. Two independent reviewers assessed the quality of studies using recommendations for reporting guidelines and quality criteria for method comparison studies. Pooled bias and standard deviation (SD) (95% limits of agreement) across studies were calculated using the random-effects model. Heterogeneity was assessed using the I^2 statistic.

Results

A total of 32 studies (4,425 subjects, median sample size of 44, ranged from 10 to 569 patients per study) were included in this meta-analysis. The overall pooled random-effects bias (non-invasive – central laboratory) and SD were 0.10 ± 1.37 g/dl (-2.59 to 2.80 g/dl, $I^2=95.9\%$ for bias and 95.0% for SD). In subgroup analysis, pooled bias and SD were 0.39 ± 1.32 g/dl (-2.21 to 2.98 g/dl, $I^2=93.0\%$, 71.4%) in 13 studies conducted in the perioperative setting and were -0.51 ± 1.59 g/dl (-3.63 to 2.62 g/dl, $I^2=83.7\%$, 96.4%) in 5 studies performed in the intensive care unit setting.

Conclusions

Although the bias between non-invasive Hb and central laboratory measurements were small, the wide limits of agreement mean clinicians should be cautious when making clinical decisions based on these devices.