

Noninvasive Hemoglobin Monitoring: A Rapid, Reliable, and Cost-Effective Method Following Total Joint Replacement.

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BACKGROUND: Noninvasive hemoglobin (nHgb) monitoring was initially introduced in the intensive care setting as a means of rapidly assessing Hgb values without performing a blood draw. We conducted a prospective analysis to compare reliability, cost, and patient preference between nHgb monitoring and invasive Hgb (iHgb) monitoring performed via a traditional blood draw.

METHODS: We enrolled 100 consecutive patients undergoing primary or revision total hip or total knee arthroplasty. On postoperative day 1, nHgb and iHgb values were obtained within thirty minutes of one another. iHgb and nHgb values, cost, patient satisfaction, and the duration of time required to obtain each reading were recorded. The concordance correlation coefficient (CCC) was utilized to evaluate the agreement of the two Hgb measurement methods. Paired t tests and Wilcoxon signed-rank tests were utilized to compare mean Hgb values, time, and pain for all readings.

RESULTS: The mean Hgb values did not differ significantly between the two measurement methods: the mean iHgb value (and standard deviation) was 11.3 ± 1.4 g/dL (range, 8.2 to 14.3 g/dL), and the mean nHgb value was 11.5 ± 1.8 g/dL (range, 7.0 to 16.0 g/dL) ($p = 0.11$). The CCC between the two Hgb methods was 0.69. One hundred percent of the patients with an nHgb value of ≥ 10.5 g/dL had an iHgb value of >8.0 g/dL. The mean time to obtain an Hgb value was 0.9 minute for the nHgb method and 51.1 minutes for the iHgb method ($p < 0.001$). At our institution, the cost of iHgb monitoring is approximately \$28 per blood draw compared with \$2 for each nHgb measurement, resulting in a savings of \$26 per Hgb assessment when the noninvasive method is used.

CONCLUSIONS: Noninvasive Hgb monitoring was found to be more efficient, less expensive, and preferred by patients compared with iHgb monitoring. Providers could consider screening total joint arthroplasty patients with nHgb monitoring and only order iHgb measurement if the nHgb value is <10.5 g/dL. If this protocol had been applied to the first blood draw in our 100 patients, approximately \$2000 would have been saved. Extrapolated to the U.S. total joint arthroplasty practice, approximately \$20 million could be saved annually.