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**Comparison of the gold standard of hemoglobin measurement with the clinical standard (BGA) and noninvasive hemoglobin measurement (SpHb) in small children: a prospective diagnostic observational study.**

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**INTRODUCTION:** Collecting a blood sample is usually necessary to measure hemoglobin levels in children. Especially in small children, noninvasively measuring the hemoglobin level could be extraordinarily helpful, but its precision and accuracy in the clinical environment remain unclear. In this study, noninvasive hemoglobin measurement and blood gas analysis were compared to hemoglobin measurement in a clinical laboratory.

**METHODS:** In 60 healthy preoperative children (0.2-7.6 years old), hemoglobin was measured using a noninvasive method (SpHb; Radical-7 Pulse Co-Oximeter), a blood gas analyzer (clinical standard, BGAHb; ABL 800 Flex), and a laboratory hematology analyzer (reference method, labHb; Siemens Advia). Agreement between the results was assessed by Bland-Altman analysis and by determining the percentage of outliers.

**RESULTS:** Sixty SpHb measurements, 60 labHb measurements, and 59 BGAHb measurements were evaluated. In 38% of the children, the location of the SpHb sensor had to be changed more than twice for the signal quality to be sufficient. The bias/limits of agreement between SpHb and labHb were -0.65/-3.4 to 2.1 g·dl<sup>-1</sup>. Forty-four percent of the SpHb values differed from the reference value by more than 1 g·dl<sup>-1</sup>. Age, difficulty of measurement, and the perfusion index (PI) had no influence on the accuracy of SpHb. The bias/limits of agreement between BGAHb and labHb were 1.14/-1.6 to 3.9 g·dl<sup>-1</sup>. Furthermore, 66% of the BGAHb values differed from the reference values by more than 1 g·dl<sup>-1</sup>. The absolute mean difference between SpHb and labHb (1.1 g·dl<sup>-1</sup>) was smaller than the absolute mean difference between BGAHb and labHb (1.5 g·dl<sup>-1</sup>) /P = 0.024).

**CONCLUSION:** Noninvasive measurement of hemoglobin agrees more with the reference method than the measurement of hemoglobin using a blood gas analyzer. However, both methods can show clinically relevant differences from the reference method (ClinicalTrials.gov: NCT01693016).