Accuracy and trending of non-invasive hemoglobin measurement during different volume and perfusion statuses.

J Clin Monit Comput. 2018 Jan 15. doi: 10.1007/s10877-018-0101-z. Adel A, Awada W, Abdelhamid B, Omar H, Abd El Dayem O, Hasanin A, Rady A.

The evolution of non-invasive hemoglobin measuring technology would save time and improve transfusion practice. The validity of pulse co-oximetry hemoglobin (SpHb) measurement in the perioperative setting was previously evaluated; however, the accuracy of SpHb in different volume statuses as well as in different perfusion states was not well investigated. The aim of this work is to evaluate the accuracy and trending of SpHb in comparison to laboratory hemoglobin (Lab-Hb) during acute bleeding and after resuscitation. Seventy patients scheduled for major orthopedic procedures with anticipated major blood loss were included. Radical-7 device was used for continuous assessment of SpHb, volume status [via pleth variability index (PVI)] and perfusion status [via perfusion index (PI)]. Lab-Hb and SpHb were measured at three time-points, a baseline reading, after major bleeding, and after resuscitation. Samples were divided into fluid-responsive and fluid non-responsive samples, and were also divided into high-PI and low-PI samples. Accuracy of SpHb was determined using Bland-Altman analysis. Trending of SpHb was evaluated using polar plot analysis. We obtained 210 time-matched readings. Fluid non-responsive samples were 106 (50.5%) whereas fluid responsive samples were 104 (49.5%). Excellent correlation was reported between Lab-Hb and SpHb (r = 0.938). Excellent accuracy with moderate levels of agreement was also reported between both measures among all samples, fluid non-responsive samples, fluid-responsive samples, high-PI samples, and low-PI samples [Mean bias (limits of agreement): 0.01 (- 1.33 and 1.34) g/dL, - 0.08 (- 1.27 and 1.11) g/dL, 0.09 (- 1.36 and 1.54) g/dL, 0.01 (- 1.34 to 1.31) g/dL, and 0.04 (- 1.31 to 1.39) g/dL respectively]. Polar plot analysis showed good trending ability for SpHb as a follow up monitor. In conclusion, SpHb showed excellent correlation with Lab-Hb in fluid responders, fluid non-responders, low-PI, and high PI states. Despite a favorable mean bias of 0.01 g/dL for SpHb, the relatively wide levels of agreement (- 1.3 to 1.3 g/dL) might limit its accuracy. SpHb showed good performance as a trend monitor.