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Does a non-invasive hemoglobin monitor correlate with a venous blood sample in the acutely ill?

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Non-invasive hemoglobin measuring technology has potential for rapid, portable, and accurate way of providing identification of blood loss or anemia. Our objective is to determine if this technology is reliable in critically ill patients presenting to the Emergency Department.

Prospective cross-sectional observational study was done at an urban level-one trauma center, 135 subjects were conveniently sampled, suspected of having active bleeding, sepsis, or other critically ill condition. Non-invasive measurements with Masimo (Irvine, CA, USA) Radical-7 and Rad-57 hemoglobin monitors were compared with the Beckman-Coulter LH-550 (Brea, CA, USA) clinical laboratory blood cell analyzer. The primary outcome was the relationship of the non-invasive device to the clinical laboratory results. Secondary evaluations included the effect of pulse rate, systolic BP, respiratory rate, temperature, capillary refill, skin color, nail condition, extremity movement.

The Radical-7 was able to capture reading in 78 % (88/113) of subjects, and the Rad-57 in 65 % (71/110) of subjects. The correlation (R(2)) of the device Hb was 0.69 and 0.67 ($p < 00.01$) for the Radical-7 and Rad-57, respectively. The coefficient of variation for the Radical-7 was 18 %, and for the Rad57 it was 13 %. Univariate analysis shows none of the observed factors is associated with the difference values between the device Hb and laboratory Hb. Our results show that Radical-7 and Rad-57 devices do not report readings in 29 % of patients and accuracy is significantly lower than reported by the manufacturer with over 50 % of readings falling outside of ± 1 g/dL.

We determined that none of the several potential factors examined are associated with the degree of device accuracy.