

Accuracy of Noninvasive Hemoglobin Monitoring in Intensive Care Unit Patients with Very Low Hemoglobin. Juhl A., Naqvi S., Aregbeyen O., Demir S. *Crit Care Med* 2010; 38 (12):215.

Introduction

The introduction of the non-invasive continuous hemoglobin monitor, Rainbow SET Pulse CO-Oximeter (Masimo Corporation, Irvine, CA) allows for immediate and continuous reporting of hemoglobin level. The device is FDA cleared for clinical use, but limited data exist on its performance in severely anemic patients. Hypothesis: Hemoglobin levels obtained from SpHb monitoring are comparable with measurements made using a reference method in patients with critically low hemoglobin levels.

Method

After IRB approval, consenting ICU patients with hemoglobin levels less than 8g/dl, wore Rainbow Resposable finger sensors connected to Masimo Radical-7 Pulse CO-Oximeters for the continuous noninvasive recording of hemoglobin (SpHb). Venous blood samples were obtained on a daily basis and analyzed by a COULTER analyzer LH 780 (Beckman Coulter, Inc, Miami, FL) to obtain the reference hemoglobin levels. Bias and precision of the SpHb values reported from the Radical-7 at the time of blood draw compared with the invasive reference values were calculated.

Results

Nine ICU patients with a median length of stay of 3 days (range 1-12 days) were included in the study. Hemoglobin values ranged from 2.9-9.6 g/dL from Pulse CO-Oximetry and 4.3-8.6 g/dL from the reference device. Despite very low hemoglobin levels, no patient expired. A total of 19 paired samples were collected from the patients. The mean bias and precision of SpHb values compared with laboratory reference values were 0.70 g/dL and 1.05 g/dL, respectively. Evaluation of the Bland-Altman plot of the bias versus mean measurements of 19 comparative samples indicated that bias was distributed uniformly across the range of the measurements with no specific trend spotted. The limits of agreement between the two methods were calculated to be 2.76 and -1.36 g/dL.

Conclusions

The Radical-7 Pulse CO-Oximeter provided clinically acceptable agreement with laboratory reference values in ICU patients with critically low hemoglobin. The ability to measure hemoglobin noninvasively and continuously has the potential to facilitate the timely detection of changes in hemoglobin and thus improve patient blood management decisions in patients with critically low hemoglobin.