

New pulse oximeter measures methemoglobin levels in human volunteers

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Introduction: Conventional pulse oximeters cannot measure dyshemoglobins (e.g. MetHb, COHb), or even accurately determine SpO₂ in their presence. (1,2) Masimo has developed a new eight-wavelength pulse oximeter, the “Rainbow-SET Rad-57 Pulse CO-Oximeter,” which is designed to measure methemoglobin (MetHb) as well as the traditional SpO₂ value. This is the first study of the accuracy of this device in human volunteers.

Methods: Ten healthy volunteers participated, with informed consent and IRB approval. Each subject was monitored with six Rad-57 pulse oximeter sensors, on digits 2, 3, and 4 of each hand. A radial artery cannula was used to sample blood for analysis by three calibrated CO-oximeters. At ten minute intervals, data from all pulse oximeters were recorded and an arterial sample was analyzed for MetHb, COHb, O₂Hb, and total Hb. After recording baseline values, subjects were given sodium nitrite by i.v. infusion (4 mg/min), to a total dose of 300 mg. Subjects were observed for at least 60 minutes after the infusion was completed, to ensure that MetHb levels were decreasing.

Results: Subjects reached peak MetHb levels of 5% to 12.6%. None had any serious side effects, although one had a brief vagal episode during infusion. A pooled data scatterplot (pulse ox vs. CO-ox, 10 subjects) is shown in Figure 1. The bias (mean error) and precision (std dev of error) are 0.01% and 0.5%. The linear regression slope and intercept are 0.999 and -0.004. The standard error of the estimate (SEE) is 0.5%, and the correlation is 0.985.

Discussion: No previous pulse oximeter has been able to measure MetHb, or accurately estimate SaO₂ in its presence. High levels of MetHb tend to force conventional SpO₂ readings towards 85%. (2) The Masimo Rad-57 measured MetHb with an uncertainty of about 0.5% in our volunteer study. This new multi-wavelength pulse oximeter, which can also measure COHb levels, represents a significant advance in the monitoring of patient oxygenation.

REFERENCES

1. Barker SJ, Tremper KK: *Anesthesiology* 66:677-79, 1987.
2. Barker SJ, Tremper KK, Hyatt J: *Anesthesiology* 70:112-17, 1989.

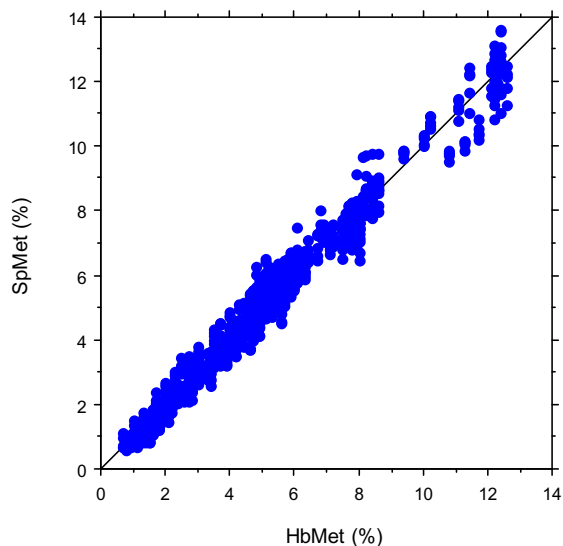


Figure 1. Pooled data scatterplot of SpMet from Rad-57 vs. MetHb from CO-oximeters.