

## **Improved Accuracy of Methemoglobin Detection by Pulse CO-Oximetry during Hypoxia.**

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### **Introduction**

Methemoglobin in the blood cannot be detected by conventional pulse oximetry and may bias the oximeter's estimate (SpO<sub>2</sub>) of the true arterial functional oxygen saturation (SaO<sub>2</sub>). A recently introduced "Pulse CO-Oximeter" (Masimo Rainbow SET® Radical-7) that measures SpMet, a noninvasive measurement of the percentage of methemoglobin in arterial blood (%MetHb), was shown to read spuriously high values during hypoxia. In this study we sought to determine whether the manufacturer's modifications have improved the device's ability to detect and accurately measure methemoglobin and deoxyhemoglobin simultaneously.

### **Methods**

Twelve healthy adult volunteer subjects were fitted with sensors on the middle finger of each hand, and a radial arterial catheter was placed for blood sampling. Intravenous administration of ~300 mg of sodium nitrite elevated subjects' methemoglobin levels to a 7% to 11% target level, and hypoxia was induced to different levels of SaO<sub>2</sub> (70% to 100%) by varying fractional inspired oxygen. Pulse CO-Oximeter readings were compared with arterial blood values measured with a Radiometer ABL800 FLEX multi-wavelength oximeter. Pulse CO-Oximeter methemoglobin reading performance was analyzed by the bias (SpMet-%MetHb), and by observing the incidence of meaningful reading errors and predictive value at the various hypoxia levels. SpO<sub>2</sub> bias (SpO<sub>2</sub>--SaO<sub>2</sub>), precision, and root-mean-square error were evaluated during conditions of elevated methemoglobin.

### **Results**

Observations spanned 74% to 100% SaO<sub>2</sub> and 0.4% to 14.4% methemoglobin with 307 blood draws and 602 values from the 2 oximeters. Masimo methemoglobin reading bias and precision over the full SaO<sub>2</sub> span was 0.16% and 0.83%, respectively, and was similar across the span. Masimo SpO<sub>2</sub> readings were biased -1.93% across the 70% to 100% SaO<sub>2</sub> range.

### **Conclusions**

The Rainbow's methemoglobin readings are acceptably accurate over an oxygen saturation range of 74%-100% and a methemoglobin range of 0%-14%.