

## **Non-Invasive Measurements of Carboxyhemoglobin and Methemoglobin in Pediatric Patients with Sickle Cell Disease.**

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### **Introduction**

Assessment of oxyhemoglobin saturation in patients with sickle cell disease (SCD) is vital for prompt recognition of hypoxemia. The accuracy of pulse oximeters to assess oxygenation in SCD patients is variable due to carboxyhemoglobin (COHb) and methemoglobin (MetHb) which decrease oxygen saturation. This study evaluates the reliability of a non-invasive pulse CO-Oximeter, Masimo Radical-7, in measuring COHb and MetHb percentages (SpCO and SpMet) in pediatric patients with SCD.

### **Methods**

Ten asymptomatic pediatric SCD (Hb SS) patients,  $13 \pm 4$  years old, underwent simultaneous non-invasive and arterial blood CO-Oximetry while breathing room air. SpCO and SpMet were compared to arterial COHb and MetHb concentrations.

### **Results**

Average arterial fractional oxyhemoglobin saturation by CO-Oximetry was  $92.7\% \pm 3.7\%$ . Bland and Altman analysis was used to assess agreement between measurement techniques. The Radical-7 bias was  $-0.34\%$  for COHb and  $-0.03\%$  for MetHb. The precision, an indicator of measurement uncertainty, was  $1.30\%$  for COHb and  $0.48\%$  for MetHb. Differences in measurements between the two techniques were all within the 95% confidence interval of the bias,  $-2.9\%$  to  $2.2\%$  for COHb and  $-0.96\%$  to  $0.90\%$  for MetHb, and within the published uncertainty of the Radical-7 (COHb:  $\pm 3\%$  and MetHb:  $\pm 1\%$ ).

n =10	SpCO (%)	COHb(%)	SpMet(%)	MetHb(%)
Median (range)	2.45 (0–3.8)	2.55 (1.1–3.4)	0.30 (0.2–1.3)	0.45 (0.1–1.1)
Mean $\pm$ SD	$2.05 \pm 1.33$	$2.39 \pm 0.66$	$0.50 \pm 0.41$	$0.53 \pm 0.33$

### **Conclusions**

These results demonstrate that a non-invasive CO-Oximeter is useful in measuring COHb and MetHb levels in pediatric patients with SCD. Although the non-invasive slightly underestimated the invasive technique, there was close agreement between the two.