



Reliable Pulse Oximetry During Exercise Testing

Harrington S, Henderson D, Burton GG. *Respiratory Care* 1999;44(10):1226

Introduction


The authors studied the Masimo SET system's ability to accurately measure SpO₂ and pulse rate while titrating patients' oxygen levels during treadmill exercise. They wanted to see if Masimo SET had fewer “dropouts” and fewer erroneous numbers that plague conventional pulse oximeters during this type of exercise trial. The authors hypothesis is that more accurate SpO₂ data may dramatically alter the amount of oxygen prescribed for the patient during ambulation.

Methods

Adhesive sensors from Masimo SET and Nellcor N-200 pulse oximeters were attached to different fingers of the same hand on 5 adult volunteers with known lung disease. Each sensor was shielded to prevent optical cross talk. The subjects were exercised on a treadmill ergometer for efficiency testing of various oxygen conservation devices. ECG heart rate, pulse rate (PR) and SpO₂ were collected by a computerized data acquisition (DAQ) system. The DAQ file for each test was analyzed after the study for data discrepancies. When either pulse oximeter displayed SpO₂ values > 5% from the other, raw waveform analysis was performed to calculate the correct SpO₂. This post-processing technique uses time and frequency domain information to calculate the correct SpO₂ from the detected red and infrared light signals (Comp. Bio. Med. 26:143-159, 1996) during non-motion periods. Also compared for differences was the pulse oximeter's specification for PR and the ECG monitor heart rate (\pm 3 bpm for both devices).

Results

The 5 subjects were 62 ± 10 years of age and all had utilized oxygen because of chronic pulmonary disease. A total of 13 separate trials were performed for a total of 134 minutes of total treadmill ergometry (mean duration of 10.2 ± 1.3 minutes). There were 22 “zero outs” (21 with Nellcor and 1 with Masimo) which were excluded from the calculations. The ECG heart rate range from 83-131 bpm.

	 Masimo SET	Nellcor N-200
Accuracy (minutes)	129/133	101/133
Zero Outs	1	21
Range of SpO ₂ (%)	87-98	73-97
Range of Pulse Rate (bpm)	80-144	40-210

Authors' Discussion and Conclusions

“Use of conventional pulse oximetry during exercise testing is problematic. Motion and monitoring site hypoperfusion adversely affects conventional pulse oximetry performance. 25% of the time data from the N-200 pulse oximeter was erroneous. **Our findings demonstrate that the Masimo SET pulse oximeter accurately reflects SaO₂ and ECG heart rate during exercise testing of adults with lung disease. Reliable pulse oximetry during stress testing can be achieved with Masimo SET.**”