

CO-Oximetry Validation of a New Pulse Oximeter in Sick Newborns.

Holmes M., Thomas A., BSN, Vogt J., Gangitano E., Stephenson C., Liberman R. *Respir Care*. 1998;43(10):860.

Background

Pulse oximetry (SpO₂) has been used for over a decade as a indicator of the percent oxygen saturation of arterial blood. A new pulse oximeter has been introduced which uses a novel approach for determination of the SpO₂. Using the patented Discrete Saturation Transform (DST), Masimo SET pulse oximetry (Masimo Corp., Irvine, CA) works despite low perfusion and patient motion (prior studies).

Method

A prototype Masimo SET pulse oximeter and a Nellcor N-200 oximeter (Nellcor Puritan Bennett, Pleasanton, CA) were attached to opposing feet and covered to prevent LED cross-talk. Data (ECG heart rate, SpO₂ and pulse rate) were collected every second (1 Hz) by a system composed of a laptop computer, 8-channel multiplexer, and data acquisition software. Sixty-eight samples of arterial blood were analyzed from 18 sick newborns. Demographics were: gestational ages of 26 to 41 weeks and weights of 825 to 4055 gms. All infants were intubated and on various forms of continuous mechanical ventilation: 8 IMV, 6 SIMV, and 4 HFOV. An AVL OMNI blood analyzer (AVL List GmbH Medizintechnik, Graz, Austria) was used for analysis of pH, PCO₂, PO₂, %COHb, %MetHb, total Hb, and functional %SaO₂. The AVL OMNI uses an array of 66 wavelengths to determine its oximetry calculations.

Results

The bias and precision for each manufacturer versus the measured functional blood oxygen saturation was 0.9 and 2.4 for Masimo and 1.0 and 5.1 for Nellcor respectively. The Nellcor findings included a spurious point of 63% (97% SaO₂ and 99% SpO₂ Masimo) where the Nellcor pulse rate matched the ECG. Three N-200 zero-outs were ignored in the calculations where low perfusion adversely affected the Nellcor even though Masimo read through these events without any problem (97/97/97% SaO₂ and 99/100/99% SpO₂ Masimo). All Masimo data points were included. Blood gas values were either non-significant (e.g., %COHb and %MetHb within normal limits) or revealed a diversely ill population (e.g., pH of 7.19 to 7.57, PCO₂ of 25.5 to 69.1, PO₂ of 46.5 to 505.3, and total Hb of 9.4 to 17.3).

Conclusions

We have used Masimo SET for 16 months and have published on the dramatic improvement in continuous measurement and reduced false alarms compared to conventional pulse oximeters. However, accuracy has not been reported in sick infants. Masimo SET accurately reflects the SaO₂ in sick infants. Our prior findings of reduced false alarms and continuous operation during motion and low perfusion compared to a conventional pulse oximeter occurs without a loss in accuracy of the SpO₂ displayed.