

A Comparison of Newer Generation Pulse Oximeters for Accuracy and Dropout Rate in Neonatal Intensive Care.

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Background

Accuracy, precision and dropout rates of newer generation pulse oximeters in neonatal care should be assessed. *Objective:* To establish accuracy and dropout rate for newer generation pulse oximeters for use in neonatal intensive care.

Methods

Pulse oximetry (SpO₂) was measured continuously for a four-hour target period using a Nellcor OxiMax N-600 (v1.1.2.0) and Masimo Radical SET (v4.3) monitor in 28 newborns with an existing umbilical arterial line. SpO₂ and pulse rate (PR) data was exported via serial connections to a lap-top computer at a sampling frequency of 1Hz. Sensors (LNOP Neo and Max-N) were systematically placed to either foot extremity and were optically shielded. Sensor site was rotated at the 2hr mark, to avoid site bias. Arterial oxygen saturation (SaO₂) measured by Co-oximetry were obtained and compared to simultaneously recorded SpO₂ values using Pearson correlation coefficients and using the method of Bland Altman to calculate bias and precision. Dropout rates were calculated by dividing the dropout time for both oximeters by the total monitoring time.

Results

A total of 54 arterial blood gas samples for paired comparisons were available for analysis. There were statistically significant correlations ($r^2=0.91$, CI= 0.85 to 0.95, $p=0.001$) found between the SpO₂ measured by both oximeters and SaO₂ but no significant differences between the performances of either oximeter (Nellcor $r^2 = 0.91$, CI= 0.85 to 0.95; and Masimo $r^2= 0.94$, CI = 0.90 to 0.97). The Nellcor dropout rate (0.003%) was statistically lower ($p=0.001$) than the Masimo (0.012%) over 7,447 minutes of total monitoring time. Bias + Precision for Nellcor was $1.63 \pm 2.32\%$ and $1.30 \pm 2.08\%$ for Masimo. Pulse rate was 149 ± 2.5 SEM for Nellcor and 149 ± 2.6 SEM for Masimo. Average gestational age was 32.9 ± 1.5 SEM weeks and average birth weight was 2065 ± 256.3 SEM g.

Conclusions

Results of this study demonstrate that both newer generation pulse oximeters have similar high accuracy and low bias differences compared to CO-oximetry and similar dropout rates, with the Nellcor device showing the lowest dropout rate.