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The Performance of Three Pulse Oximeters During Low Perfusion in Volunteers

Barker SJ, Novak S, Morgan S. *Anesthesiology* 1997;87(3A):A409


Introduction

“In a recent study, we compared the performance of three current pulse oximeters during controlled hand motion in volunteers. (The Effects of Motion on the Performance of Pulse Oximeters in Volunteers *Anesthesiology* 86:101-108, 1997). The performance of the Masimo SET prototype was superior to both the Nellcor N-200 and Nellcor N-3000 (OXISMART) in terms of bias, precision, dropout rate, and alarm specificity. The present study performs a similar comparison of the same instruments during low perfusion states induced by cold and arm elevation.”

Methods

Six healthy volunteers were studied to evaluate the effect of low perfusion on the readings of two conventional pulse oximeters (Nellcor N-200 and Nellcor N-3000) and the Masimo SET pulse oximeter. Low perfusion was induced to the test hands by wrapping the adjacent arms in a cooling blanket set at 5°C and elevating 75° above horizontal. Hypoxemia was induced to a SpO₂ of 80%. Sensors from all oximeters were placed on the test and control hands. Control hands were cannulated for an arterial line. Neither the test nor the control hands were subjected to motion. Data was evaluated for identification of desaturation events, drop out rate (display reading zero), error rate of the time for which difference between test instrument and control instrument was > 7%, and total error (drop out rate plus error time > 7%).

Results

	 Masimo SET	Nellcor OXISMART	Nellcor N-200
Drop Out Rate	0.8%	9.9%	17.8%
True Hypoxemias Missed	0%	33.3%	33.3%
Bias	1.0	1.8	1.0
Precision	2.6	2.2	1.7
Error Rate	1.5	0.7	1.8

Authors' Discussion and Conclusion

“Both the N-200 and N-3000 (OXISMART) failed to detect two of six hypoxemic events

Masimo detected all six ... In terms of drop out rate and total error, the Masimo SET oximeter performed significantly better than the N-3000 (OXISMART), which in turn performed better than the N-200. The N-3000 (OXISMART) exhibited the lowest value of E7 (error rate %), but had a much higher drop out rate than Masimo (9.9% versus 0.8%). These results for cold-induced low perfusion are consistent with our previous results for controlled hand motion.”