

Heart Rate Variability Detection and the Newer Motion Resistance Pulse Oximeters.

Goldstein M.R., Pernia M.L., Lawas-Alejo P., Furman G.I., Sindel B.D., Yang L.L., Ochikubo C.G., Martin G.I. *Proceeding of the American Thoracic Society International Conference*, 2004; A50.

ECG monitoring has traditionally been the source of heart rate variability (HRV) measurement. This assessment is routine in the care of acutely ill neonates. Erroneous SpO₂ and PR values in conventional pulse oximeter (PO) results in frequent false alarms. Although the newer generation PO has fewer issues, the subject of fidelity of the HRV capture is open to question. PR performance of the newer generation PO technologies in neonates with clinical indication for pulse oximetry was studied.

30 neonates were monitored with 4 newer generation PO technologies simultaneously; the Philips Viridia (24C Rev C1), Masimo Radical (Rev V4), Nellcor N-395 (Rev 1.6.2.0) and the Nellcor N-595 (Rev 2.4.6.0). The PR was compared to the HR from the ECG channel of the Philips Viridia. The PR and HR were collected via a computer at 1 Hz. Missed HRV was defined if displayed PR remaining constant (Δ 1 BPM for >20 sec) while the ECG tracing measured an acute change \geq 25 BPM. A severe missed HRV event was quantified by Δ 1 BPM for >20 sec) while the ECG tracing measured an acute change of \geq 60 BPM.

Episodes of acute HRV were monitored in 179 hours of data collection. There was a significant difference in the 4 tested ($P < 0.001$). The Masimo Radical tracked HRV most closely with 8 missed episodes for a total of 326 seconds, followed by the Philips Viridia with 47 missed episodes for 712 seconds, Nellcor N-595 with 59 episodes for 2163 seconds, the Nellcor N-395 with 61 episodes for 1710 seconds. Masimo SET has no severe missed events while the N-595 had 3 episodes for 29 seconds, the N-395 had 1 for 5 seconds and the Philips Viridia had 11 for 385 seconds.

Qualification of neonatal HRV is vital in the management of at risk infants. Of the newer generation pulse oximeters, only the Masimo Radical reliably tracked acute HRV. The other pulse oximeters missed significant HRV and failed to indicate changes \geq 60 BPM.