

Reliability of Conventional and New Pulse Oximetry in Neonatal Patients.

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Introduction

Pulse oximetry is widely used in the NICU, but clinicians often distrust the displayed values during patient motion, i.e., questionable oxygen saturation (SpO_2) and pulse rate (PR) values. Masimo Corporation (Irvine, CA) has developed pulse oximetry with claims of resistance to sources of interference. To test this premise, we compared the performance of the Masimo SET pulse oximeter to a conventional device, Nellcor N-200, and then with three other new-generation pulse oximeters, Nellcor N-395, Novametrix MARS, and Philips Viridia 24C.

Methods

We studied 26 nonsedated NICU infants who were on supplemental oxygen and/or mechanical ventilation. ECG heart rate (HR) from a bedside monitor and SpO_2 and PR from the two pulse oximeters were captured by a PC for a total of 156 hours. The ECG HR and pulse oximeter spectral waveform were analyzed at alarms for hypoxemia ($\text{SpO}_2 < \text{or} = 85\%$) and/or bradycardia ($\text{HR} < \text{or} = 80 \text{ bpm}$). We then compared the performance of the Masimo SET to three other new-generation pulse oximeters, Agilent Viridia 24C, Nellcor N-395, and Novametrix MARS, in a similar population of seven infants for a total of 28 hours. We added to the test criteria the ability of the various pulse oximeters to track acute changes in HR.

Results

Compared with Nellcor, Masimo SET had 86% fewer false alarms, which also were shorter in duration, resulting in 92% less total alarm time. Masimo SET also identified nearly all bradycardias versus 14% for the Nellcor. Compared with the new-generation pulse oximeters, false desaturations, data drop-outs, and false bradycardias were lowest for Masimo SET, as was the capture of true desaturations and bradycardias. Notably, the new-generation devices differed greatly in their ability to detect changes in HR (i.e., the frequency of frozen PR during times of ECG HR change was 0, 6, 11, and 46 for Masimo, Nellcor, Philips, and Novametrix, respectively).

Conclusions

Masimo SET pulse oximetry recorded markedly fewer false SpO_2 and PR alarms and identified more true hypoxic and bradycardic events than either conventional or other new-generation pulse oximeters. Masimo SET also most closely reflected the ECG rate irrespective of accelerations or decelerations in HR. Routine use of Masimo SET pulse oximetry in the NICU could improve clinician confidence in the parameter leading to more judicious titration of oxygen with possible reductions in hypoxic (e.g., pulmonary hypertension) and hyperoxic (e.g., retinopathy of prematurity) pathology. Additionally, a more trustworthy technology should equate with fewer confirmatory arterial blood gas analyses (less blood loss), and faster weaning from the mechanical ventilation (less chronic lung disease).