

Accuracy of Pulse Oximeters Intended for Hypoxemic Pediatric Patients.

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OBJECTIVES: Prior studies have shown inaccuracies in pulse oximetry readings at saturations less than 85%; however, no large studies have evaluated new sensors marketed for these low saturations. This study's purpose was to evaluate two sensors with claims of improved accuracy in children with saturations less than 85%.

DESIGN: Prospective observational study.

SETTING: Single institution; cardiac catheterization laboratory, and operating room.

PATIENTS: Fifty patients weighing 3-20 kg with baseline saturations less than 90% undergoing surgical or catheterization procedure.

MEASUREMENTS AND MAIN RESULTS: Data collected included demographics, diagnosis, continuous saturations from three different pulse oximeters (Masimo LNCS [Masimo, Irvine, CA], Masimo Blue [Masimo], and Nellcor Max-I [Medtronic, Dublin, Ireland]) and up to four blood samples for co-oximetry as the gold-standard arterial oxygen saturation. Analysis included scatter plots, smoothed regression estimates of mean continuous saturation levels plotted against corresponding arterial oxygen saturation values, and Bland-Altman plots. Bland-Altman analysis indicated increasing levels of bias and variability for decreasing arterial oxygen saturation levels for all three sensors, with a statistically significant increase in mean difference observed for decreasing arterial oxygen saturation level. The Masimo Blue sensor had the lowest mean difference, SD and Bland-Altman limits in patients with saturations less than or equal to 85%. At saturation range of less than or equal to 85% and greater than 75%, 14% of the samples obtained from Masimo Blue, 24% of the readings from the Nellcor, and 31% from the Masimo Standard sensors were greater than or equal to 5% points difference. All three sensors had a further increase in these differences for arterial oxygen saturation values less than 75%.

CONCLUSIONS: The Masimo Blue sensor has improved accuracy at saturations 75-85% versus the Nellcor and Masimo Standard sensors. The accuracy of peripheral capillary oxygen saturation of the Masimo Blue sensor was within 5% points of the arterial oxygen saturation the majority of the time. Currently, at saturations less than or equal to 85%, pulse oximetry alone should not be relied on in making clinical decisions.