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## Evaluation of 2 Forehead Reflectance Oximeters in Pediatric Intraoperative Surgical Patients

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**Introduction:** Recent studies have evaluated the use of pulse oximetry and alternate monitoring sites such as the forehead. This study evaluates, in stable pediatric surgical patients, the accuracy and reliability of two new reflectance forehead sensors, the Nellcor MaxFast attached to the Nellcor N595 oximeter, and the Masimo TF-I attached to the Masimo SET Radical oximeter.

**Methods:** Twenty-four pediatric surgical patients were studied, after obtaining informed consent as per approved IRB protocol. These patients were monitored with the Nellcor N595 using the Max-P or Max-I sensor and the Masimo SET Radical using the LNOP Pdt or Inf-L sensor as controls. They were concurrently monitored with the Masimo SET Radical TF-I forehead sensor and the Nellcor N595 MaxFast forehead sensor. SpO<sub>2</sub> and pulse rate from all four sensors were continuously logged on computer throughout surgery. Error is defined as the difference between either of the forehead sensors and the mean of the two digit sensors during stable patient conditions. Data were analyzed using bias (mean error) and precision (standard deviation of error) for each patient, E-7 (percentage of time during which error was greater than 7% during stable conditions) and performance index (the percentage of time in which the SpO<sub>2</sub> reading is within 7% of control value). Data was compared using paired t-test with p<0.05 considered significant.

**Results:** The mean and standard deviation of the bias and precision of the digit sensors (24 patients) were - 0.2(± 0.9) and 0.3 (±0.3) respectively. The forehead sensors are presented in Table 1 below. In 33% of patients, the Nellcor MaxFast error was greater than 7% during more than 20% of the duration of the surgical procedure. **Discussion:** In this population of pediatric surgical patients we demonstrated statistically significant performance differences between the Nellcor and the Masimo forehead sensors. The small bias and precision between the 2 digit sensors indicates stable conditions during these cases. Because the Nellcor MaxFast sensor had significantly longer periods of time where SpO<sub>2</sub> reading was falsely low, it is unacceptable for use in the pediatric surgical patient. In contrast, the superior performance of the Masimo Radical TF-I forehead sensor produced superior results, evidenced by a small bias and precision.

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Data Mean (SD) for the Nellcor Max Fast and the Masimo TF-I forehead

	Nellcor Max Fast	Masimo TF-I	p value (between Max Fast and TF-I)
Bias (%)	-4.1±6.0	0.1±0.5	0.002
Precision (%)	2.7±3.4	0.5±0.6	0.006
E7 (%)	20.2±30.7	0.6±1.7	0.004
Performance Index	79.8%	99.4%	