Assessment of 2 New Generation Pulse Oximeters during Low Perfusion in Children.
Torres A., Skender K., Wohrley J., Aldag J., Raff G., Geiss D. *Crit Care Med.* 2002;29(12):A117.

Introduction
The Nellcor 395 (N) and Masimo Radical (R), pulse oximeters designed to perform under conditions of low perfusion, have not been clinically tested in children with this condition. *Hypothesis:* Pulse oximeter saturations (SpO_2) obtained with the N and R are neither accurate nor precise when compared to co-oximetry-measured oxygen saturations (SaO_2) of the whole blood of children with low perfusion.

Methods
N and R pulse oximeter probes were applied to the same distal extremity of children undergoing cardiopulmonary bypass (CPB) to repair congenital heart defects. Simultaneously obtained SaO_2 and SpO_2 were recorded in the OR post-CPB when serum lactic acid was ≥ 2 mmol/L. Chi square test was used to detect a significant difference in percentage of SpO_2 failures. Wilcoxon signed ranks test was used to detect for differences between SpO_2 and SaO_2 (i.e., accuracy $\pm$ precision), pulse oximeter heart rate (HR) and cardiac monitor HR, and the absolute differences between SpO_2 and SaO_2 for $SaO_2 < 90\%$ vs. $\geq 90\%$ for each pulse oximeter.

Results
25 children, with median (range) ages of 5 mo (0 – 95) had a total of 61 SaO_2 recorded. Core temps were 36.2º C (33.1 – 38.9). The median SaO_2 was 98% (62 – 100), with 17/61 (28%) being < 90%. SpO2 failures were 40% (25/61) for the N vs. 10% (6/61) for the R (p < .001). See table.

Variable (mean $\pm$ 1 sd)	N	p value	R	p value
$SpO_2 - SaO_2$*	1.1 ± 3.3	.09	-0.2 ± 3.3	.89
Oximeter HR – monitor HR	0.6 ± 6.6	.29	-2.3 ± 13.1	.04
Absolute $SpO_2 - SaO_2$				
when $SaO_2 < 90\%$ vs.	4.9 ± 4.7		4.1 ± 2.9	
when $SaO_2 \geq 90\%$	1.4 ± 1.6	.02	1.3 ± 1.6	< .001

*p = .99 when comparing absolute N $SpO_2 - SaO_2$ vs. R $SpO_2 - SaO_2$

Conclusions
There was no significant difference in SpO2 – SaO2 for either oximeter but the N failed significantly more often than the R in children with low perfusion. The R HR was significantly lower than the monitor HR was. The absolute difference between SaO2 and SpO2 was significantly greater for both pulse oximeters when SaO2 was < 90% compared to SaO2 of > 90%.