Pulse Oximetry in Children with Congenital Heart Disease: Effects Of Cardiopulmonary Bypass And Cyanosis.

Torres A. Jr., Skender K.M., Wohrley J.D., Aldag J.C., Raff G.W., Bysani G.K., Geiss D.M. *J Intensive Care* 2004 Jul-Aug;19(4):229-34.

Introduction

The objective of this prospective, observational study with consecutive sampling was to assess the reliability, bias, and precision of Nellcor N-395 (N) and Masimo SET Radical (M) pulse oximeters in children with cyanotic congenital heart disease and children with congenital heart disease recovering from cardiopulmonary bypass-assisted surgery admitted to a cardiovascular operating suite and pediatric intensive care unit at a tertiary care community hospital.

Methods

Forty-six children with congenital heart disease were studied in 1 of 2 groups: (1) those recovering from cardiopulmonary bypass with a serum lactic acid > 2 mmol/L, and (2) those with co-oximetry measured saturations (SaO2) < 90% and no evidence of shock. Measurements of SaO2 of whole blood were compared to simultaneous pulse oximetry saturations (SpO2). Data were analyzed to detect significant differences in SpO2 readout failures between oximeters and average SpO2 - SaO2 +/- 1 SD for each oximeter.

Results

A total of 122 SaO2 measurements were recorded; the median SaO2 was 83% (57 - 100%). SpO2 failures after cardiopulmonary bypass were 41% (25/61) for N versus 10% (6/61) for M ($P < .001$). There was a significant difference in bias (ie, average SpO2 - SaO2) and precision (+/- 1 SD) between oximeters (N, 1.1 +/- 3.3 vs M, -0.2 +/- 4.1; $P < .001$) in the postcardiopulmonary bypass group but no significant difference in bias and precision between oximeters in the cyanotic congenital heart disease group (N, 2.9 +/- 4.6 vs M, 2.8 +/- 6.2; $P = .848$).

Conclusions

The Nellcor N-395 pulse oximeter failed more often immediately after cardiopulmonary bypass than did the Masimo SET Radical pulse oximeter. SpO2 measured with both oximeters overestimated SaO2 in the presence of persistent hypoxemia.