

## **A Preliminary Quality Investigation of Continuous Non-Invasive Hemoglobin Monitoring in Pediatric Patients Undergoing Cranial Vault Remodeling.**

Loveland-Baptist L., Staudt S.R., Hoffman G. *Proceedings of the 2011 Annual Meeting of the American Society of Anesthesiologists*. A050.

### **Background**

Continuous non-invasive hemoglobin (hgb) assessment has been validated in adults, but not in pediatric populations or clinical situations. We present a QI study of the use of continuous noninvasive hemoglobin (SpHb) assessment in pediatric patients undergoing cranial vault reconstruction. This population is an appropriate target due to the consistent large blood loss and frequent laboratory hgb assessment that is standard of care.

### **Methods**

Eleven patients were ages 5-25 months, 7-13kg and ASA II - III. Each patient had an arterial line and a Masimo hemoglobin sensor (rev E) probe applied. (Masimo Radical-7 Pulse CO-Oximeter, Masimo Corp, Irvine CA) Arterial blood gases with either a spun hematocrit (Hematostat II micro hct system; STI, inc.) or central laboratory hemoglobin (Cell-DYN Sapphire) were obtained periodically as indicated clinically. A simultaneous SpHb reading was recorded. Hemoglobin was estimated by dividing the hematocrit value by 3. . One additional data point was collected the following morning; a blood sample was drawn for laboratory hgb while the Masimo probe value was simultaneously measured in the awake child. IRB approval was obtained to present this QI data.

### **Results**

51 hgb data points were obtained. Hemoglobin values ranged from 7.0-16.0; average 11.6. Figure 1 illustrates SpHb monitoring in one typical case. The perfusion index demonstrated good signal and perfusion in the monitored digit. Figure 2 regression analysis demonstrates an equation fit of:  $Hb = 3.1 + 0.68 \times SpHb$ . The overall  $r^2 = 0.54$ ; the between subject  $r^2 = 0.47$ ; the within - subjects  $r^2 = 0.67$ ; demonstrating a good within patient relationship.

### **Discussion**

The Masimo Radical-7 provided accurate and timely continuous SpHb measurements compared with intermittent laboratory methods for pediatric patients undergoing cranial vault remodeling. The device performed better trending changes within a single subject vs. between subjects. We find this acceptable, as trends are more important clinically than an absolute hgb value. There were no technical difficulties in the application and use of the device. The sensor was used in some cases outside the suggested weight range. Positioning could not always be obtained per manufacturer recommendations. (middle or 4th digit). This study was conducted as a preliminary quality initiative evaluating feasibility of noninvasive hgb monitoring in our pediatric population. Limitations included hgb results from two different measurement devices, a small sample n, and a sensor probe that was difficult to place on recommended sites in the smallest pediatric digits. The results are encouraging, and a future study is planned using new pediatric probes and restricting comparison to a single laboratory device.

References: 1. Macknet et al. *Anesth Analg* 2010; 111:1424-6. 2. Jou et al.” Abstract presented at SPA Spring Annual Meeting, March 2011.

Pediatric Craniognostosis Case  
7 mo, 8.9 kg

