

## **Can Short Physiological; Desaturations be Validated in the Neonate?**

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### **Introduction**

Neonates have frequent short intermittent desaturations. These increase the perception of inappropriate alarming. Alarm management technologies produce decreases in the depth and frequency of desaturation at the expense of real time monitoring. We sought to qualify short intermittent desaturations and characterize their presence according to a physiological model.

### **Methods**

Short desaturations were qualified by brief drops of oxygen saturation by more than 10% points from baseline for up to 4 seconds. >9000 minutes of continuous pulse oximetry were sampled from at risk neonates. A desaturation was qualified if present on the Masimo Radical Oximeter (v4.1) and validated by desaturation on 2 of 3 of the other oximeters on the other three extremities.

### **Results**

Analysis demonstrated desaturations of  $14.3 \pm 5.0\%$  (range 10.3-28.1%) over  $2.54 \pm 1.0$  seconds with an average decelerative velocity of  $6.7 \pm 3.6\%/second$  (2.7-14.4%/second) from baseline to nadir.

### **Conclusions**

Physiological considerations support rapid changes in the saturation dynamic occurring over a period of 2-4 seconds. *Clinical Implications:* Cardiac output in the neonatal period is between  $273 \pm 59$  and  $301 \pm 61$  ml/min/kg. (Hirsimaki H. et al. 1988) 37% of left ventricular output goes to the distribution of the SVC. Kluckow M. et al. 2000) 96 ml/min/kg is the expected output to the upper torso. 80% of this blood flows to the brain; 20%, to the upper extremities. Calculating, 9.6 ml/min/kg or 0.16 ml/second/kg flows to each arm. Total blood volume is 80 ml/kg for premature newborns. Instantaneous volumes follow output without circulatory delay. 29.6 ml/kg is the total blood volume in the distribution of the SVC. Single arm distribution should be 2.96 ml/kg (50% of the 20% remaining blood volume) Compensatory blood flow recovery can be up to 8 times that of resting values during recovery from ischemia (such as blood pressure cuff elevation). (Nioka, S et al. 2006) Maximum blood flows could approach 1.28 ml/kg/sec. In 2.3 seconds, the blood volume of an arm can be exchanged. Although the physiologic significance of the desaturation cannot be ascertained from the data, its validity can be demonstrated.