

## **An Improved Sensor for Monitoring Respiration in Pediatric Patients.**

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### **Introduction**

Monitoring respiration of spontaneously breathing patients is a concern in the operating room, post anesthesia care unit (PACU), and on general care wards. Present technology has focused on capnometry attached to the patient's airway via a nasal cannula as the best method of providing this monitoring.<sup>1</sup> There are multiple problems with this method of monitoring respiration. The cannula is frequently dislodged, partially dislodged, or occluded with nasal secretions leading to inaccurate data or complete loss of monitoring.<sup>2</sup> A novel bioacoustic sensor for monitoring respiration has been developed. We evaluated patients' tolerance for the capnometer cannula system and the new bioacoustic sensor.

### **Methods**

Following institutional IRB approval, informed consent was obtained prior to enrollment. Pediatric patients, upon arrival to the PACU, were monitored in the standard fashion. In addition, a nasal cannula was placed, secured with tape, and connected to a BCI capnometer. An adhesive bioacoustic sensor connected to a breathing frequency monitor prototype (Masimo Corp, Irvine CA) was applied to the patient's neck just lateral to the cricoid cartilage. Both the capnometer and the bioacoustic monitor were connected to a computer for continuous data recording. When either signal was lost, the appropriate sensor was checked for proper positioning and attachment. Time was noted when either sensor was dislodged resulting in loss of data. Data was compared using paired t-test or Chi square where appropriate, with  $p < 0.05$  considered significant. No restraints were applied to the patients to prevent dislodgment of the sensors.

### **Results**

All data is expressed as mean + SD. Fifteen pediatric patients (age =  $6.6 \pm 3.6$  years, weight =  $36.6 \pm 26.2$  kg) were enrolled. Duration of monitoring time in PACU was  $58.7 \pm 39.6$  minutes. Premature cannula dislodgement occurred in 14 patients. Loss of signal due to dislodgement of the capnometer occurred after  $15.2 \pm 19.4$  minutes. In no patient was the bioacoustic sensor dislodged before the end of stay in PACU ( $p < 0.001$ )

### **Discussion**

This data shows the relative ease and high incidence of capnometer cannula dislodgement compared to the new bioacoustic sensor. In clinical settings where continuous and reliable monitoring of spontaneous respiration is important the new bioacoustic sensor provides significantly greater patient connection time, which should lead to significantly more reliable monitoring of respiration rate.

References: 1) *Pediatrics* 2006;117;1170-1178; 2) *Medical and Biological Engineering and Computing* 2003;41;377-383