Accuracy of a Novel Bioacoustic Sensor in Adult Postoperative Patients.
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Introduction
Monitoring respiration of spontaneously breathing patients is a concern in a variety of clinical areas including the operating room, post anesthesia care unit (PACU), and on the general care wards. Most current devices are limited because they require either a cannula system positioned in line with airflow to detect respiration or impedance pneumography which is prone to missing obstructive apnea.[1] A novel bioacoustic sensor for continuously monitoring respiration has been developed. We evaluated the accuracy of the prototype sensor in adult postoperative patients in the post anesthesia care unit.

Methods
Following institutional IRB approval and informed consent, 10 postoperative 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 (SIMS, Waukesha WI). 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 and subsequent data analysis. The accuracy of the new acoustic sensor and the capnometer were compared to a reference respiratory rate from a manual scoring system. Bias, precision and A_{RMS} were calculated in the usual fashion, as either bioacoustic sensor – reference or capnometer - reference.

Results
All data is expressed as mean + standard deviation. 10 patients (age = 57.8 + 25.4 years, weight = 76.3 + 23.6 kg) were enrolled. Duration of monitoring time in PACU was 55.2 + 38.9 min. Respiratory rate varied 3 to 28 bpm during this time. The resultant bias, precision and A_{RMS} for the capnometer compared to the reference value was -0.53, 2.11, and 2.23 respectively. The bias, precision and A_{RMS} for the bioacoustic sensor compared to the reference sensor was -0.15, 2.23, and 2.36 respectively.

Conclusion
The new prototype bioacoustic respiratory sensor demonstrates accuracy for respiratory rate monitoring as good as capnometry, in this population of patients in the PACU. This data suggests the new bioacoustic sensor may provide a system at least as accurate as capnometry for monitoring respiration in spontaneously breathing patients. This device offers multiple benefits over existing devices and has a potential to improve monitoring in a general care setting.

References:
1) Medical and Biological Engineering and Computing 2003;41;377-383