



## Robust Respiratory Rate Detection Using Alar Photoplethysmography and a Thermistor

Cohen SF, Melker RJ, Stahl MW. *American Society of Anesthesiologists*. Oct 2013 (abstract).

### Introduction

The nasal ala is a unique site for monitoring respiratory rate (RR), oxygen saturation ( $SpO_2$ ), and heart rate (HR) using photoplethysmography (aPPG) derived parameters and nasal airway flow (NAF). The ala has a rich polygonal blood supply and little to no sympathetic innervation, yielding higher signal-to-noise ratio than traditional measurement sites such as the fingertips. Changes in intrathoracic pressure are reflected in the aPPG signal due to the lack of venous valves in vessels superior to the chest.

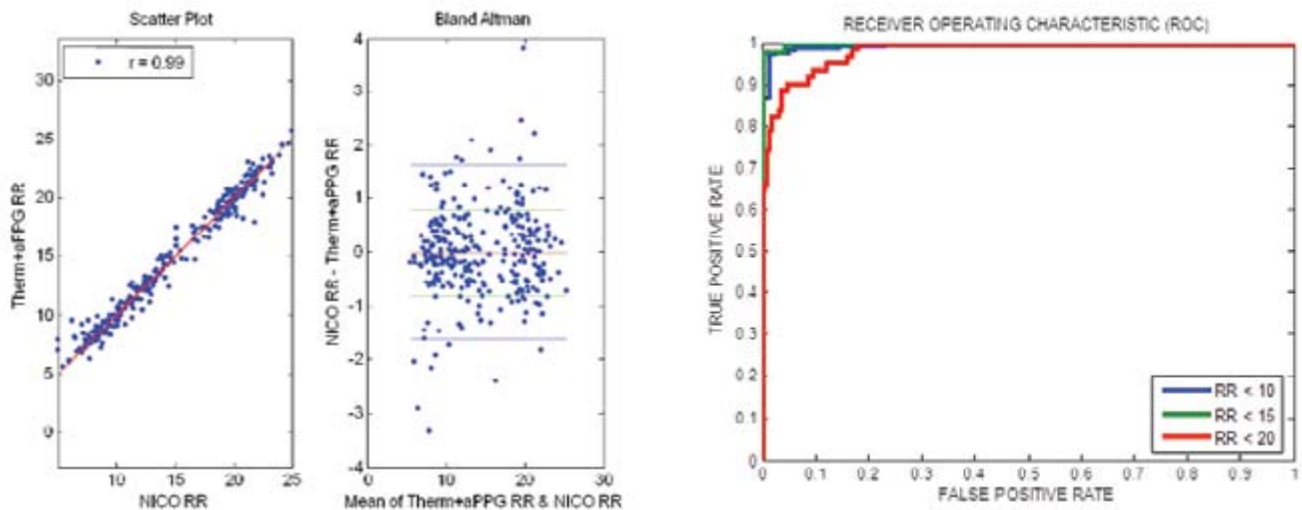
### Methods

The study included 5 subjects, 3 male and 2 female, ages 22-28, and was performed in a research laboratory. Assurance® Alar Sensors (Xhale Assurance, Inc., Glastonbury, CT) were placed on either ala and aPPG and thermistor-derived flow data were collected. For capturing respiratory parameters, a NICO Cardiopulmonary Management System (Philips/Respironics, Murrysville, PA) was connected to a full face mask (ResMed, San Diego, CA).

A proprietary algorithm calculated RR from the thermistor signal and three aPPG parameters. Specificity and sensitivity were calculated comparing the algorithm-derived parameters to volume data from the NICO.

### Results and Conclusions

RR calculated from the aPPG and thermistor flow data ( $r=0.99$ ) provide a reliable, non-invasive means to monitor patients. An alar sensor allows the monitoring of two physiological signals (aPPG and flow) with a single integrated sensor that provides robust RR determination.



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