Novel Pulse Oximetry Technology Capable of Reliable Bradycardia Monitoring in the Neonate.
Barnum P.T, Taschuk R.D., Goldstein M.R., Vogt J.F., Gangitano E.S., Stephenson C.G., Liberman R.L.
Respir Care. 1997;42(11):1072.

Introduction
Pulse oximetry determines oxygen saturation by comparing the absorbance of light at two wavelengths during pulsatile blood flow. In addition, pulse rate is calculated from the resultant photoplethymosgraphic waveforms. Pulse oximetry is widely used in the Neonatal Intensive Care Unit (NICU). However, its use is greatly affected by motion artifact and low perfusion. Clinicians are often confronted with numerous false alarms and have become accustomed to "verifying" SpO2 values by correlating the pulse oximeter's pulse rate to the ECG heart rate. The Masimo Corp. (Irvine, CA) has developed Signal Extraction Technology (SET) that calculates a noise reference and uses adaptive filters to cancel interfering artifact. This eliminates interference in the signal and, therefore, is designed to provide a more accurate SpO2 and pulse rate measurement. This study evaluates Masimo SET's capability of monitoring pulse rate in the NICU.

Methods
Ten neonates (1,620 to 3,384 grams) were enrolled in the study. Masimo and Nellcor sensors were placed on either foot. The Masimo sensor was attached to a Masimo engineering prototype pulse oximeter, and the Nellcor sensor attached to a Nellcor N-200. Each infant was monitored for 3 to 4 hours; then the sensors were switched to the opposite foot and monitored for the same amount of time. ECG information was interfaced from the SpaceLabs central monitor. All data was collected via serial connection to a laptop computer and operated by a trained observer. Infant motion, physician, nursing and/or therapist interventions, parental care, and low ECG heart rate value during true bradycardias(HR < 100 bpm) were identified.

Results
A total of 65.3 hours of monitoring time was accumulated and examined for true and false bradycardic events (bradys).

	N-200	Masimo SET
# of true bradys caught (%)	9(68%)	16(100%)
# of false bradys (min)	96 (86.4 min)	5 (0.7 min)
# of "zero outs" (min)	190 (97.3 min)	4 (1.1 min)
total false alarms (min	286 (183.7 min)	9 (1.8 min)

* alarm time is defined as the amount of time the pulse oximeter would have been alarming falsely if not silenced by a clinician.

Conclusions
The frequency and duration of the low pulse rate false alarming of the Nellcor N-200 was more than 30 times greater than the Masimo SET unit. The data suggests that the Masimo SET pulse rate algorithm minimizes false alarms seen in the NICU and captures more true bradycardic events when compared to a conventional pulse oximeter. This supports the utilization of pulse oximeters incorporating Masimo SET in the NICU setting and potentially transport, as well Step Down units or home care settings where oxygenation and pulse rate monitoring are needed and more sophisticated central monitoring is not available.