**Pulse Oximetry during Hypothermia in Neonates: Conventional Versus Signal Extraction Technology.**

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## Background

Pulse oximetry is widely used in neonates. However, conventional pulse oximetry instrumentation to date has had difficulty in producing accurate and reliable measurements of oxygen saturation (SpO2) during low perfusion states.

## Objective

The aim of the study was to compare the accuracy and precision of measurements of SpO2 and pulse rate (PR) made with Masimo (MAS) signal extraction technology (SET), with the same measurements made with conventional pulse oximetry using Nellcor N-200 (NEL) during low perfusion state induced by hypothermia.

## Methods

Continuous pulse oximetry and heart rate monitoring were performed in 4 term infants (mean birth weight 3403 g) undergoing brain cooling for the treatment of perinatal hypoxic-ischemic encephalopathy, using MAS and NEL pulse oximeters and a standard heart rate monitor (Hewlett Packard 3680). Pulse oximeter probes were placed on the ear lobes. Simultaneous continuous temperature recordings were made from anterior fontanel (AF), nasopharyngeal (NP) and rectal (REC) probes using Olympic Medical Cool Care System. The head cooling cap temperature was adjusted to maintain the rectal temperatures at 34.5 ± 0.5 °C. For each infant, data was collected for 3 hours and average values for SpO2, PR, HR and various temperatures were computed. SpO2 and PR data from MAS and NEL were compared and the oximeter pulse rates were related to the reference HR.

## Results

During brain cooling with AF, NP and REC temperatures of 30.5, 33.6, and 34.2 °C respectively, SpO2 and PR signals from MAS when compared to NEL, were systematically higher (SpO2: 94.7 vs. 76.4%, $p<0.01$; PR 109.5 vs. 68.0 bpm, $p<0.02$) and less variable, as shown in the table below. Also, the MAS-PR signal more accurately predicted the HP-HR, with lower residual error.

## Conclusions

Our data suggest that Masimo SET may offer superior pulse oximetry performance during low perfusion state induced by hypothermia.