

INTRODUCTION

Neonates on respiratory support often experience rapid changes in their carbon dioxide (CO₂). These fluctuations in CO₂ concentrations can alter cerebral blood flow and increase the risk of intraventricular hemorrhage.

Frequent blood sampling to monitor CO₂:

- Disrupts sleep - wake cycle
- Is painful; associated with chronic pain
- Associated with poor developmental outcomes

Transcutaneous carbon dioxide monitors (TCOMs) allow for measurement of the partial pressure of carbon dioxide (pCO₂). This technology utilizes the diffusion properties of CO₂ through tissues and skin, allowing for sensor readings at the skin surface. Using this technology available, newborns in the NICU will not have to endure as many blood draws and will lower risks of complications.



HYPOTHESIS

Babies on TCOMs will have less frequent blood draws compared to babies without TCOMs.

METHODS

Study Type: retrospective cohort

Patient population: Newborn in respiratory distress requiring positive pressure ventilation over 48 hour period

Study period: September 2018 to January 2020

Data Collection: Type of blood gas (arterial [ABG], venous [VBG] or capillary [CBG]); Timing and frequency of blood sampling, TCOM measurement, patient characteristics (birthweight, gestational age, sex)

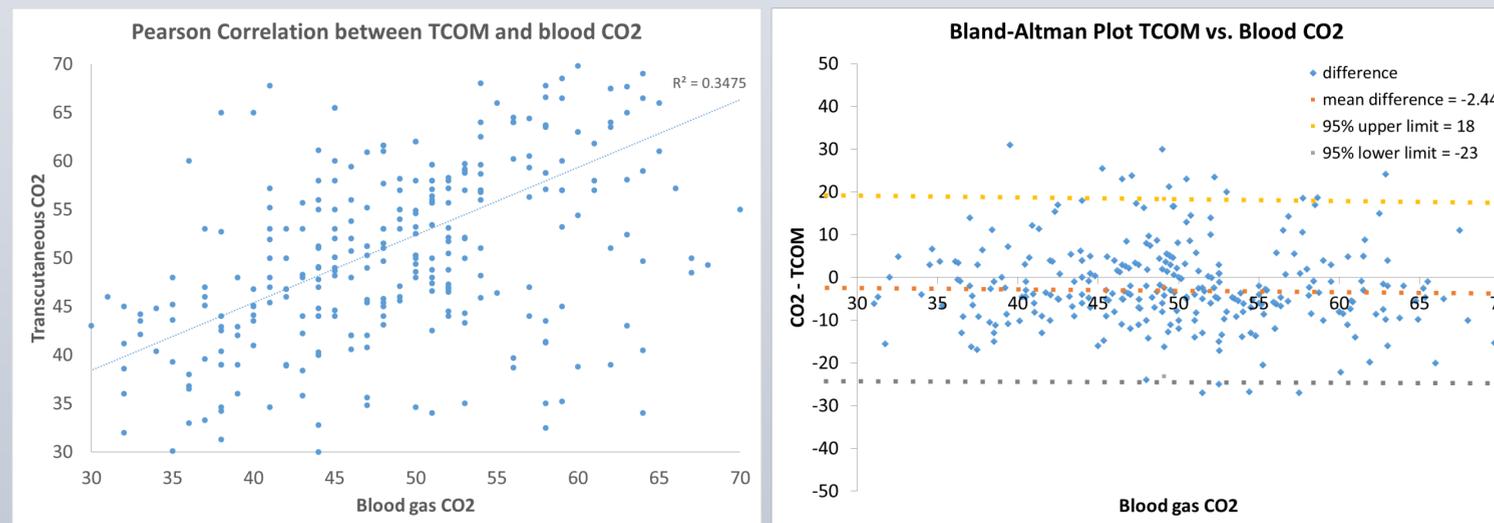
Analysis: Correlation and agreement between TCOM and pCO₂ values will be analyzed by Pearson correlation and Bland-Altman plot.

Differences in blood draw between groups will be calculated using unpaired student t-test.

RESULTS

121 ventilated patients were identified: 58 patients had TCOM measurements with 327 paired blood gases

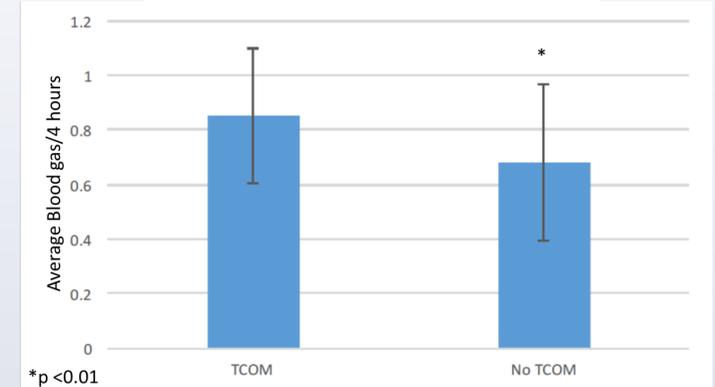
There was no significant difference in weight, sex or gestational age between patients who had a TCOM and those who did not.



There is a good correlation between TCOM and blood gas CO₂ with a Pearson correlation of r = 0.59

The Bland-Altman analysis revealed a mean difference (95% agreement) of -2.44 (-23 to 18).

Blood Gas Analysis TCOM Vs No TCOM



CONCLUSIONS

The data demonstrates that babies with TCOM measurements had more blood draws in the first 48h of ventilation

There was a good correlation between TCOM and blood CO₂. However, there was a large variation of agreement between -18 to 23 mm Hg between TCOM and blood CO₂

The patients with TCOMs could have had more blood draws because:

- Preference of TCOM was given to the sickest babies in the NICU who required more ventilator support.
- High TCOM values and inexperience with introduction of new technology may have prompted more frequent blood draws to confirm TCOM values.

REFERENCES

1. Janailac M, Labarinas S, Pfister RE, Karam O. Accuracy of Transcutaneous Carbon Dioxide Measurement in Premature Infants. Crit Care Res Pract. 2016;2016:8041967.
2. Aly S, El-Dib M, Mohamed M, Aly H. Transcutaneous Carbon Dioxide Monitoring with Reduced Temperature Probes in Very Low Birth Weight Infants. Am J pPerinatol. 2017;34(5):480-5.

ACKNOWLEDGEMENTS

Funding By Children's Miracle Network S-CMNPV18
Thank you to Anu Varsheneya for her immense help.