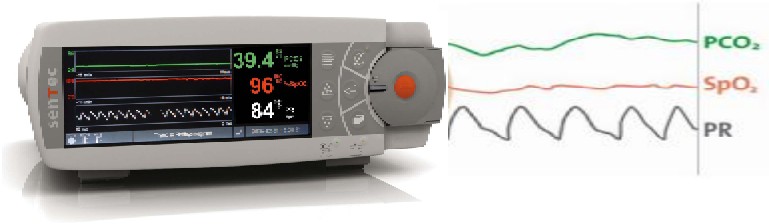
EVALUATION OF A DIGITAL TRANSCUTANEOUS PCO_2 SENSOR AND ITS CORRELATION TO ARTERIAL BLOOD GAS PCO_2 MEASUREMENTS DURING NEONATAL HIGH FREQUENCY OSCILLATORY VENTILATION

Daniel D. Rowley, RRT-NPS, RPFT, Janet Glass, RRT, Timothy Hicks, RRT, Tamara Wheeler, RRT, Frank Caruso, RRT
Pulmonary Diagnostics & Respiratory Therapy Services
University of Virginia Medical Center
Charlottesville, Virginia, U.S.A.

BACKGROUND: Obtaining arterial blood gases (ABGs) for measuring P_aCO_2 can be painful to patients and time consuming and hazardous for healthcare providers. In an attempt to reduce risks associated with ABG draws, as well as to provide a method by which clinicians may monitor PCO_2 objectively and non-invasively, we evaluated the SenTec Digital Monitoring System for clinical accuracy during neonatal High Frequency Oscillatory Ventilation (HFOV).



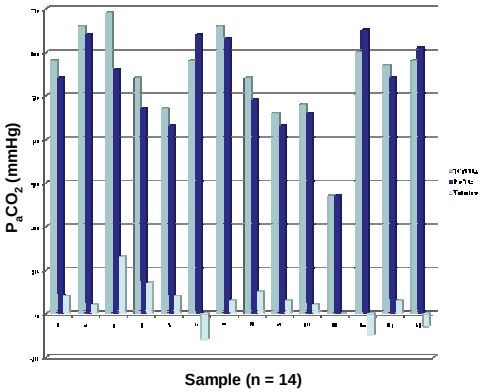
METHOD: Neonatal patients on HFOV requiring an ABG for clinical indications unrelated to the SenTec monitor's evaluation were identified prospectively. Patient demographic and selective clinical data was obtained and recorded while the SenTec sensor self-calibrated. Refer to table:

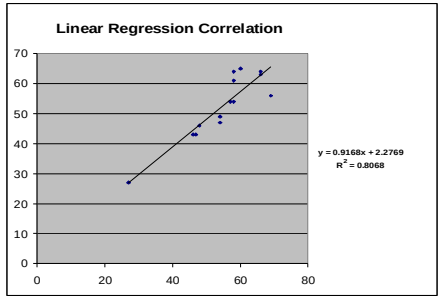
Patient Data

Sample	GA / AA	Primary Dx	Sen Loc	Body T°	BP	Pressor? (Dose)
1	39/39	CDH	L Chest	36.7	57/33	Dopa 18 mcg/kg
2	23/26	VLBW	Liver	36.6	38/27	Dopa 12 mcg/kg
3	39/39	CDH	L Chest	36.7	51/32	Dopa 18 mcg/kg
4	26/30	VLBW	Liver	36.7	50/27	Dopa 2 mcg/kg
5	23/26	VLBW	Liver	36.5	33/28	None
6	23/27	VLBW	Liver	36.7	37/23	Dopa 2 mcg/kg
7	23/26	VLBW	R Chest	36.4	42/19	None
8	25/25	VLBW	Liver	36	35/20	Dopa 19mcg/kg
9	39/39	Hypoxia	R Chest	36.7	57/35	None
10	39/40	Hypoxia	R Chest	37.4	60/37	None
11	25/28	VLBW	L Chest	37.3	32/21	Dopa 3mcg/kg
12	23/27/	VLBW	Liver	37	33/23	None
13	39/40	CDH	R Chest	37.1	57/40	Dopa 1mcg/kg
14	23/26	VLBW	R Chest	36.8	41/18	Dopa 2 mcg/kg

Following successful sensor calibration, the digital sensor was applied to each patient using a skin sensitive multi-site attachment ring per manufacturer guidelines. Fifteen minutes following sensor application, an ABG was obtained and the concurrently displayed $_{TC}PCO_2$ measurement on the SenTec monitor was recorded. The ABG sample was subsequently analyzed using a Siemens Rapidpoint 405 analyzer and the measured P_aCO_2 value was recorded next to the corresponding

RESULTS: 64% of our samples were obtained from very low birth weight neonates who required vasopressors at the time of sample measurement. We found clinically acceptable correlation between the $_{TC}PCO_2$ and P_aCO_2 measurements. R^2= 0.807; p= < 0.001. Refer to graphs:





CONCLUSION: The SenTec Digital Monitor yielded an excellent correlation when compared to ABG P_aCO_2 measurements and it may be used as a surrogate for ABG P_aCO_2 determination during neonatal HFOV. The difference between our sampled CO_2 measurements may be related to the standard deviation of the compared measurement devices, pre-existing medical conditions, pharmacologic agents that are known to cause vasoconstriction, and user sampling error.

CONTINUING EVALUATION: Future clinical evaluation of $_{TC}PCO_2$ monitoring should be designed to evaluate the efficacy of this technology for objective determination of initial and adjustable amplitude (ΔP) settings during neonatal, pediatric, and adult HFOV. Real time measurement of $_{TC}CO_2$ may also minimize sequela (i.e., intraventricular hemorrhage) resulting from wide P_aCO_2 swings in very low birth weight infants.

UNIVERSITY of VIRGINIA