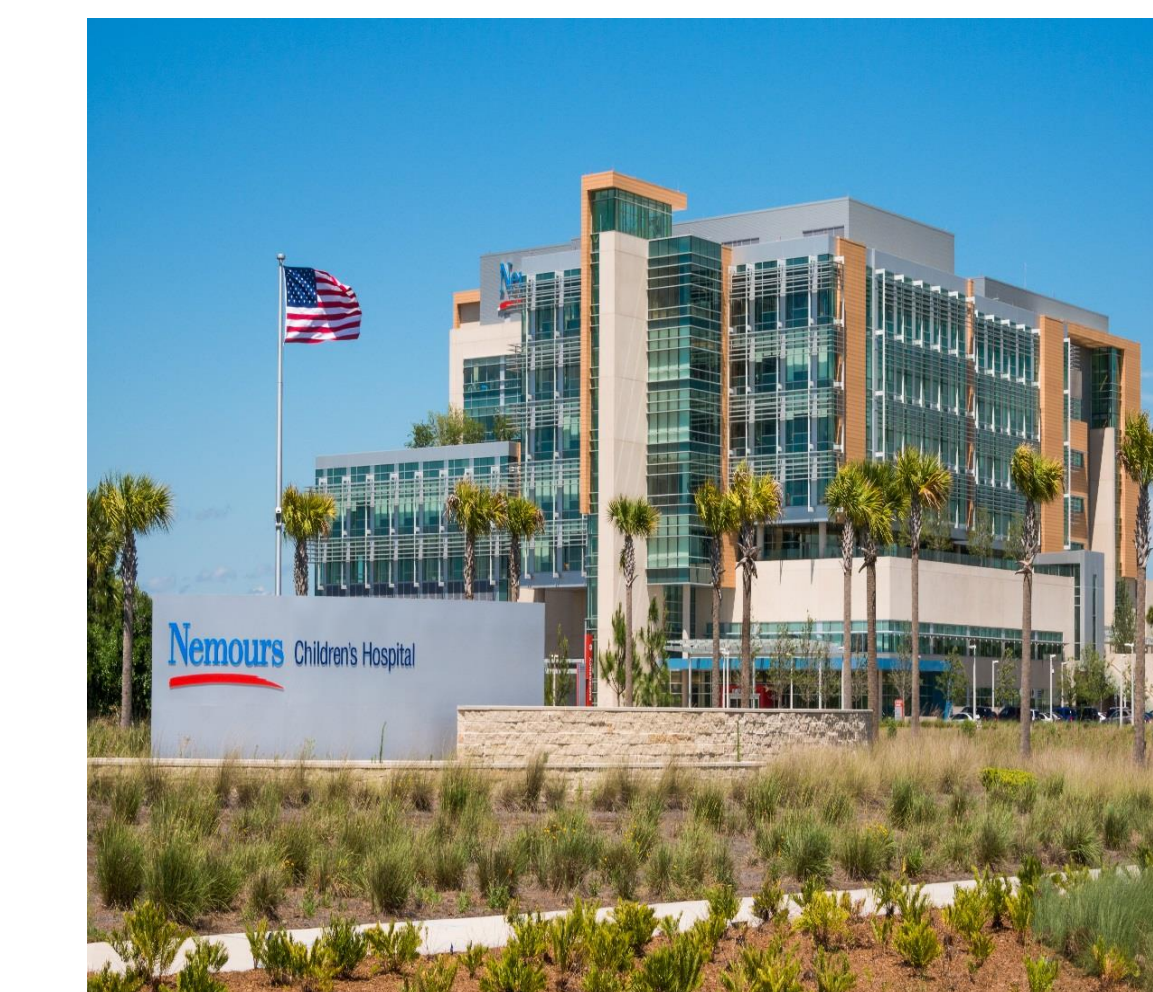


NEMOURS CHILDREN'S HEALTH



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A BENCH EVALUATION OF VENTILATOR MODE CHANGES DURING HIGH FREQUENCY JET VENTILATION AND INHALED NITRIC OXIDE

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Disclosures: Ms. Burr has a relationship with Hill-Rom, as a patient contract trainer, no other authors have relationships to report.

Original Abstract

A BENCH EVALUATION OF VENTILATOR MODE CHANGES DURING HIGH FREQUENCY JET VENTILATION AND INHALED NITRIC OXIDE

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Background: High Frequency Jet Ventilation (HFJV), conventional ventilation (CV), and inhaled Nitric Oxide (iNO) are therapies that are often used simultaneously. In our Level IV NICU, we noticed a discrepancy between CV set PEEP (actual PEEP), Pmin and measured PEEP on HFJV when CV modes were changed. We aimed to evaluate the effect of this discrepancy on the delivery of iNO.

Method: A Drager® Babylog equipped with a F&P™ Evaqua 2 circuit interfaced a Bunnell® LifePulse HFJV, iNO was placed in-line (between gas outlet and heater) on the HFJV from a Mallinckrodt® INOmax DSIR system to a Drager® neonate test lung. Two models were evaluated, Model 1 included CV-PC CMV, PIP 25, Ti 0.35, RR 5, PEEP 6, HFJV- PIP 30, RR 420, Ti 0.02 and iNO at 20ppm (sampling post ETT and within the test lung). Model 2 included CV- SPN CPAP, PEEP 6, PS 6, with the HFJV and iNO unchanged. Variables for analysis included; CV measured PEEP/Pmin, HFJV measured PEEP/ΔP and iNO sampling on DSIR. Due to observed decrease in PEEP and increase in ΔP on the HFJV when switching between models slightly larger VTs would be expected. iNO sampling was obtained from within the test lung to evaluate iNO delivery and values were obtained three times in each model after stabilization and averaged. Student's t-test was used to determine statistical significance.

Results: Average values in CMV PC mode: CV PEEP 6.2, Pmin 5.9, HFJV PEEP 6.1, HFJV ΔP 23.9, iNO 19ppm. Average values in SPN CPAP mode: CV PEEP 5.8, Pmin 5.2, HFJV PEEP 5.3, HFJV ΔP 24.7, iNO 19ppm. Pmin/HFJV PEEP is decreased and HFJV ΔP is increased when CV mode is changed from CMV PC to SPN CPAP. As PEEP decreases and ΔP increases, larger VTs are expected. All reported pressure fluctuations were determined not significant (Table 1) and fall within manufacture specifications. iNO delivery was not affected when CV mode changes were made when used in conjunction with HFJV.

Conclusion: Despite variability in CV Set PEEP, Pmin, and measured PEEP between CV and HFOV, when CV modes were changed iNO delivery remained stable in our bench model. Further research must be done to evaluate expected volume increases and the potential impact to neonatal patients on these therapies.

BACKGROUND: High Frequency Jet Ventilation (HFJV), conventional ventilation (CV), and inhaled Nitric Oxide (iNO) are therapies that are often used simultaneously. In our Level IV NICU, we noticed a discrepancy between Conventional Ventilation set PEEP (actual PEEP), Pmin and measured PEEP on High Frequency Jet Ventilation when Conventional Ventilator modes were changed. We aimed to evaluate the effect of this discrepancy on the delivery of inhaled Nitric Oxide.

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CONCLUSIONS: Despite variability in CV Set PEEP, Pmin, and measured PEEP between CV and HFOV, when CV modes were changed iNO delivery remained stable in our bench model. Further research must be done to evaluate expected volume increases and the potential impact to neonatal patients on these therapies.

Evaluated Equipment



F&P™ Evaqua 2 circuit



Drager® Neonatal Test Lung



Bunnell® LifePulse HFJV



Mallinckrodt® INOmax DSIR



Drager® Babylog

Table 1

Mode of CV	CV PEEP	CV PEEP Avg.	Pmin	Pmin Avg	HFJV PEEP	HFJV PEEP Avg	HFJV ΔP	HFJV ΔP Avg	Average iNO Measured in Test Lung (ppm)
CMV PC	6.0/6.4/6.1	6.2	5.9/5.9/5.8	5.9	6.1/6.0/6.1	6.1	23.9/24.1/23.7	23.9	19
SPN CPAP	5.3/5.8/5.8	5.8	5.4/5.2/5.1	5.2	5.4/5.2/5.2	5.3	24.6/24.6/24.9	24.7	19.7
		P > 0.05		P > 0.05		P > 0.05		P > 0.05	P > 0.05

Table 1: Average measured values from conventional ventilation, high frequency jet ventilation, and inhaled nitric oxide over three trials in two bench models.