

**OXYGEN CONCENTRATIONS VIA NASAL CANNULA AT HIGH FLOWRATES.** – Tom Malinowski, RCP, RRT, FAARC, James Lamberti MD.

Inova Fairfax Hospital, Falls Church, VA. **BACKGROUND:** A new humidifier (Vapotherm™) design allows for the delivery of heated, humidified oxygen at higher levels of oxygen liter flow. We sought to determine the actual inspired oxygen concentrations being delivered via the Vapotherm™ nasal cannula at higher-than-average flowrates to a test model at varying tidal volumes and respiratory rates. **METHOD:** A modified, dual chambered test lung (VentAid™ Training Test Lung) connected to an adult CPR manikin and mechanical ventilator simulated a spontaneous breathing patient. When the ventilator cycled, side one of the test lung pressurized, simulating a spontaneous breath via the manikin. A Vapotherm adult cannula was placed into the nares of the model and oxygen flow adjusted accordingly. Model conducting deadspace volume (nasopharynx, trachea, conducting airways) was similar in size and volume to actual adult deadspace.

**Ventilator Settings** (Test lung compliance 0.05 L/cm H<sub>2</sub>O)

Frequency (bpm)	Vt (mL) ranges	Insp. Time %	Ve (L/min)
40	200, 300, 400, 500	35%	8.0 – 20.0
30	300, 400, 500, 600	35%	9.0 – 18.0
20	400, 500, 600, 700	35%	8.0 – 14.0

**RESULTS:**

Respiratory Rate	Vt (mL)	Observed oxygen concentration (%) at:		
		10LPM	15 LPM	25 LPM
20	400	.77	.77	.77
20	500	.75	.76	.78
20	600	.73	.76	.77
20	700	.71	.75	.77
30	300	.77	.77	.77
30	400	.76	.76	.78
30	500	.73	.76	.79
30	600	.71	.75	.82
40	200	.77	.77	.83
40	300	.75	.76	.84
40	400	.73	.76	.84
40	500	.70	.75	.83

Oxygen concentration as measured in the deadspace was consistently > 70%, regardless of tidal volume or ventilatory pattern. Higher flowrates resulted in higher inspired oxygen concentrations in some circumstances. **CONCLUSIONS:** Higher than typical flowrates via nasal cannula result in clinically significant elevations in oxygen concentration during a variety of ventilatory rates, inspiratory flowrates, and tidal volumes. Higher flows of nasal oxygen provide an alternative technique to simple or non-rebreathing masks for administering higher inspired oxygen concentrations.

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