

TAGA MEDICAL TECHNOLOGIES

A BENCH COMPARISON OF FOUR NASAL CPAP PASSOVER HUMIDIFIERS

J. Lewarski, BS, RRT, G. Austin, Eng., TAGA Medical, Inc., Ohio.

Background: Nasal continuous positive airway pressure (CPAP) is an accepted treatment for individuals with moderate to severe obstructive sleep apnea. Previous studies show that patient compliance with CPAP treatment can be as low as 45%. The studies suggest there are a number of primary contributors to low patient compliance, including oro-nasopharynx drying. Providing humidity in-line to the CPAP delivery system is the standard treatment. Although a number of CPAP humidifiers are available, there is limited information regarding performance. The purpose of this study was to compare the humidity outputs of 3 commercial and one prototype CPAP humidity systems.

Methods: We studied 3 commercial non-heated passover style humidifiers and one manufacturer's molded prototype (TAGA Velocity®). Using a Respironics Bi-PAP® S/T as the flow generator, standard 18 inch and 6 foot smooth bore tubing, a flow resistor with a leak placed distal to the flow generator, mimicking mask CPAP, and a calibrated hygrometer, we measured relative humidity (RH) levels at the patient interface. Ambient temperature and humidity levels were recorded prior to the start of each phase of the testing. CPAP generator output humidity measurements without a humidifier in-line acted as the baseline for each test. A 5-minute stabilization period was maintained before sampling output humidity. Pressure and flow settings were selected to represent a typical range of CPAP pressures used in clinical practice. Pressure and flow was verified using a Timeter analyzer, model RT-200. The increase in mean output RH over ambient was compared using repeated measures ANOVA. Pairwise multiple comparisons were performed with Tukey test.

Results: Data represent the mean of 3 complete measurements/unit.

CPAP Pressure & Flow Rate	Humidifier	Ambient Temp. °F	Ambient R.H.	Output R.H.	Increase in R.H. Over Ambient
10 cmH2O ~90L/min	TAGA Velocity®	70.9	47.4	75.8	60.1%
	Respironics Oasis® 532053	69.9	47.1	72.5	54.1%
	ResMed 18815/1	70.7	48.4	73.9	52.6%
	Nellcor Puritan Bennett S-616386-00-A	71.0	47.9	63.6	33.0%
15 cmH2O ~130L/min	TAGA Velocity	73.3	40.3	73.7	83.1%
	Respironics Oasis® 532053	71.5	42.8	70.6	65.9%
	ResMed 18815/1	72.7	41.5	67.6	63.3%
	Nellcor Puritan Bennett S-616386-00-A	72.5	41.2	58.03	40.6%

The TAGA unit demonstrated a significantly higher humidity gain compared to all other units ($p < 0.004$). The Respironics unit had a higher gain than the ResMed and Nellcor units ($p < 0.05$). Pressures/flows measured at patient interface were consistent to those measured at the outlet of the CPAP generator, showing that the humidifiers created little back-pressure.

Conclusions: All devices tested increased the output humidity levels. Units with a baffling system (TAGA & Respironics) consistently performed better than non-baffled units. Further research is needed to established standards for CPAP humidification testing and to determine the effects of humidity use on patient complaints and overall nasal CPAP compliance.

Original Publication

Respiratory Care

October 2001, Vol. 46, No. 10