PERFORMANCE EVALUATION OF THREE DISPOSABLE CPAP/BI-LEVEL CIRCUITS

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Background: A large percentage of healthcare facilities utilize disposable CPAP/Bi-level circuits to deliver non-invasive therapy to their patients. Advantages of using disposable circuits include decreased infection risk and elimination of expenses associated with cleaning / processing of reusable circuits. We assessed the performance of three marketed disposable circuits in regards to flow rate, pressure , and noise level generated by the exhalation port assembly.

Items tested: Respironics® BiPAP® Circuit (# 312107, smooth bore), Pulmodyne™ BiTrac™ NIV Circuit (#313-9075, smooth ID) and Pulmodyne ValueTrac™ NIV Circuit (313-9078, corrugated).

Testing: A Respironics BiPAP Vision® unit was connected to the gas inlet of an RT-200 Calibration Analyzer (Timeter® Instrument Corp.) via a 12" low compliance tube. The test circuit was connected to the outlet port of the RT-200. The exhalation port end of the test circuit was connected to a small full face mask fastened to a mannequin head fixture. Prior to testing each circuit, the exhalation port test was initiated on the Vision unit. Flow rate and pressure were measured by the RT-200 equipment. Pressure was measured at the face mask via the auxiliary port. Noise level was measured at approximately 5 - 6 inches from the exhalation port assembly at the location of the mannequin's right ear lobe. An Extech® Instruments Sound Level Meter was used to monitor noise levels. Four different levels of CPAP (5, 10, 15, & 20cmH_2O) were generated and data was collected at each level after approximately 5 minutes. Both Pulmodyne circuits come with an attached bacteria filter and the filter was left in place for testing. Since the Respironics circuit is not packaged with an attached filter, an identical Pulmodyne filter was added to the circuitry to maintain similar testing configuration.

Results:

CPAP Level - 5cmH_2O

	Flow (lpm)	Pressure (cmH_2O)	Noise Level - db(A)
Pulmodyne BiTrac NIV Circuit	22.2	4.50	58.1
Pulmodyne ValueTrac NIV Circuit	24.3	4.40	58.2
Respironics BIPAP Circuit	18.6	3.90	58.9

CPAP Level - 10cmH_2O

	Flow (lpm)	Pressure (cmH_2O)	Noise Level - db(A)
Pulmodyne BiTrac NIV Circuit	32.3	8.90	60.4
Pulmodyne ValueTrac NIV Circuit	37.5	8.90	60.7
Respironics BIPAP Circuit	28.5	7.70	61.9

CPAP Level - 15cmH_2O

	Flow (lpm)	Pressure (cmH_2O)	Noise Level - db(A)
Pulmodyne BiTrac NIV Circuit	42.9	13.60	61.6
Pulmodyne ValueTrac NIV Circuit	45.5	13.60	61.2
Respironics BIPAP Circuit	36.1	11.90	62.8

CPAP Level - 20cmH_2O

	Flow (lpm)	Pressure (cmH_2O)	Noise Level - db(A)
Pulmodyne BiTrac NIV Circuit	50.8	18.40	63.3
Pulmodyne ValueTrac NIV Circuit	57.6	18.10	64.2
Respironics BIPAP Circuit	40.0	16.30	64.9

Conclusion: All circuits tested demonstrated similar characteristics in regards to flow rate, pressure, and noise level generation with no apparent effects on the Vision's functionality.