

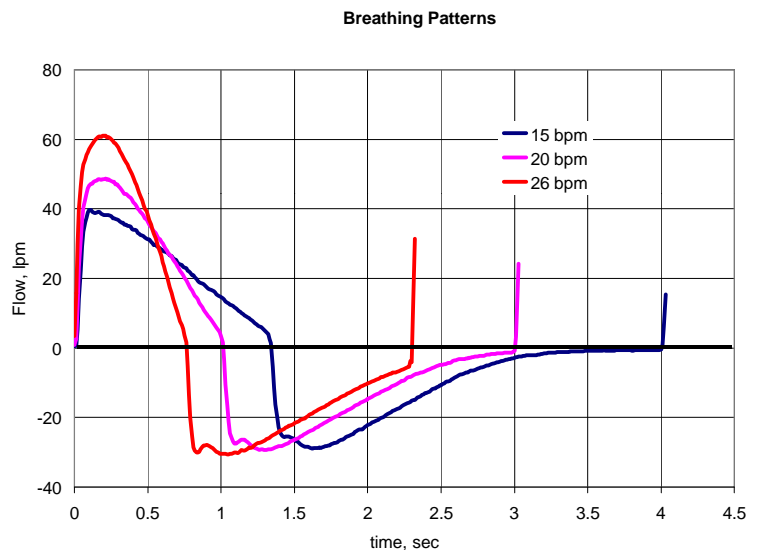
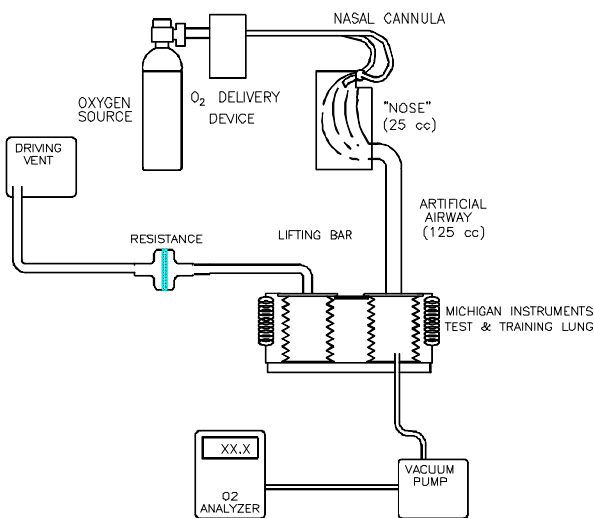
PERFORMANCE OF NEW DEMAND OXYGEN DELIVERY SYSTEMS IN A SIMULATION OF LOW FLOW OXYGEN USE

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Background: Demand oxygen delivery systems (DODS) are in widespread use in conjunction with oxygen cylinders or liquid oxygen portable devices via nasal cannula. DODS are designed to deliver oxygen during all or portions of inspiration to provide a comparable FIO₂ to continuous flow oxygen (CFO) and to conserve oxygen. Each model of device delivers oxygen in a different manner. We evaluated the FIO₂ delivery capabilities and oxygen conservation of new DODS compared to continuous flow oxygen and one previously available model.

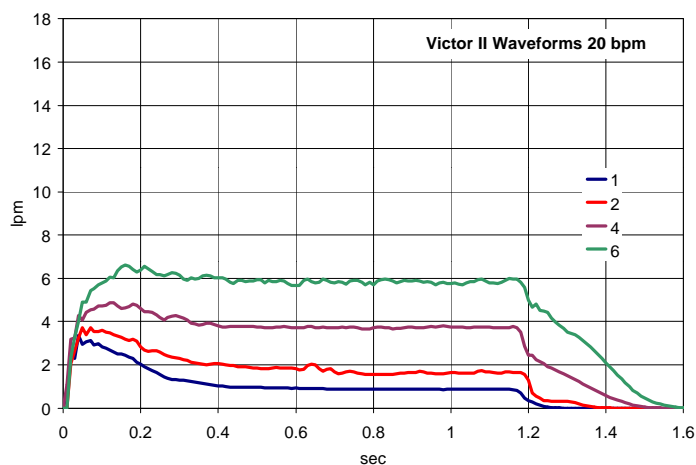
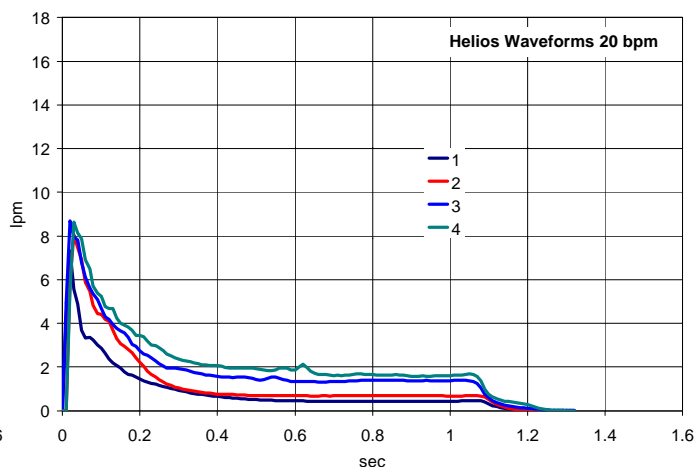
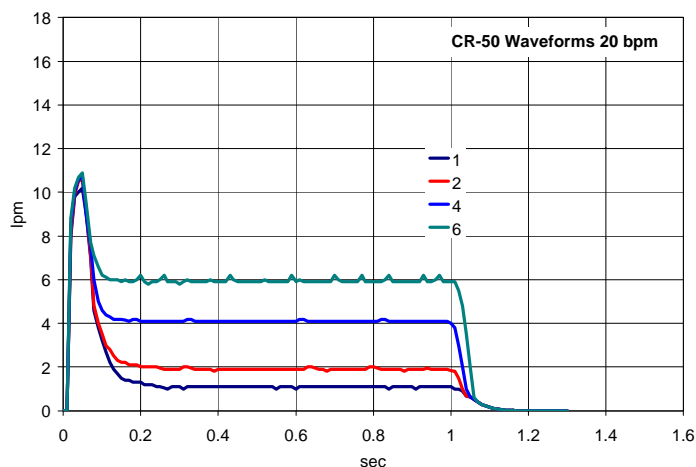
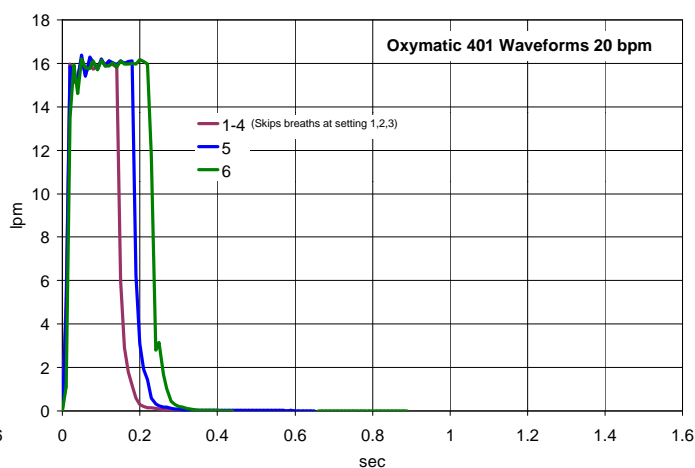
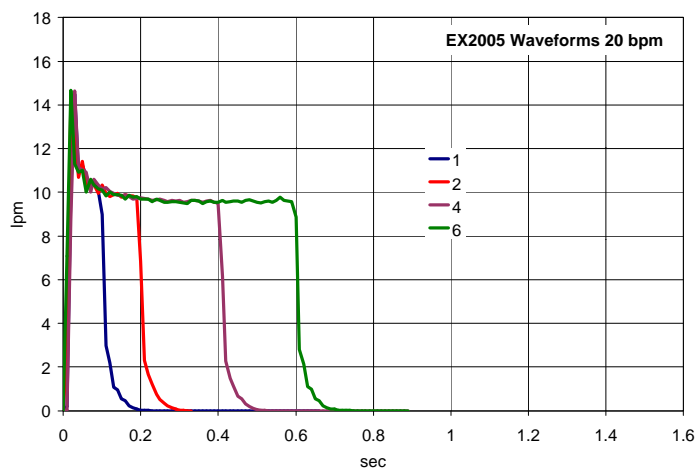
Methods: An apparatus was constructed to simulate the nares, conducting airways and an alveolar chamber with a machined ‘nose’, flex tube (150 ml of deadspace) and one limb of a mechanical test lung (TTL-Michigan Instruments). Three respiratory patterns (VT=520 ml, f=15,20,26/min, I:E=1:2, decelerating flow wave) were generated in the "respiring" limb of the test lung as driven by a linked ventilator (7200 – Puritan Bennett). The FIO₂ delivery to the alveolar chamber was measured at 1, 2, 4 and 6 L/min settings by a Ceramtec model OM-25A oxygen analyzer. Oxygen pulses from the DODS were measured by a mass flowmeter (Model 4040 - TSI). The ratio of oxygen delivery (increase over 21%) to CFO was calculated for each device. "Real Savings Ratio" was calculated by dividing continuous flow oxygen usage by individual device usage with each device set to achieve the same FiO₂ as continuous flow at 2 L/min, using the 20 bpm breathing pattern.

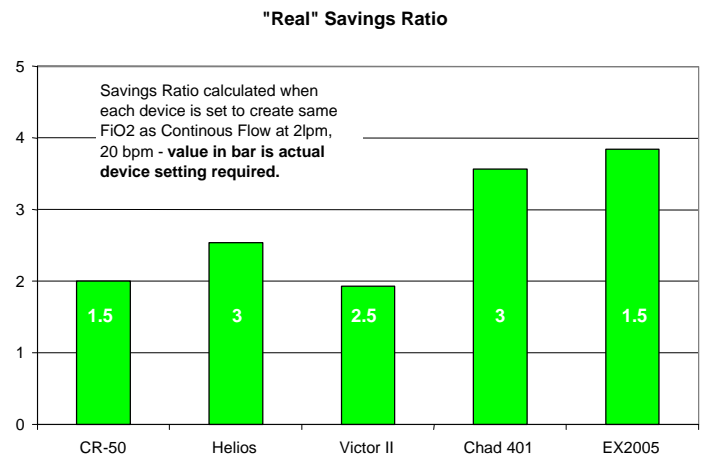
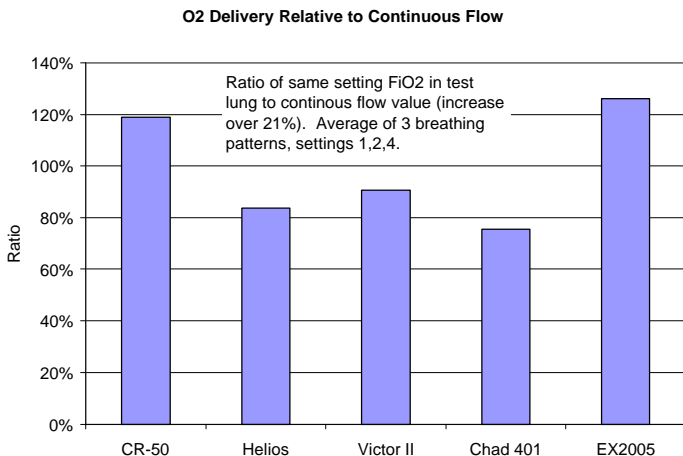
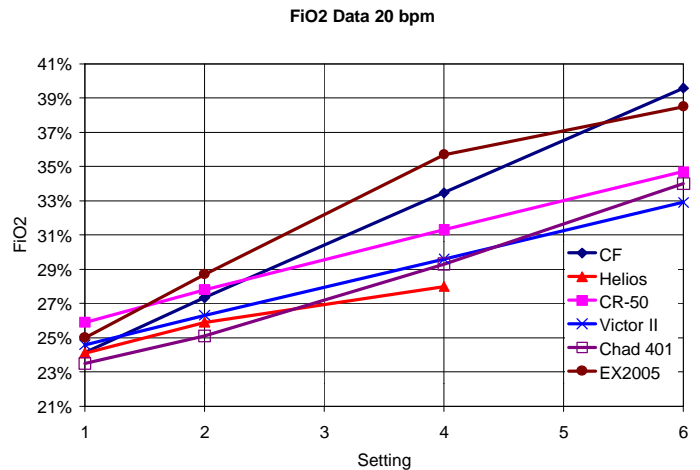
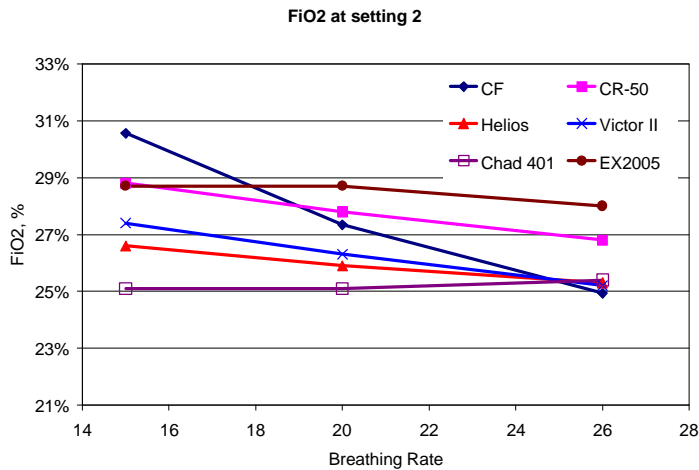


Units Tested

Oxymatic 401	Chad Therapeutics	Chatsworth, CA
CR-50	Mallinckrodt, Inc.	St. Louis, MO
HELiOS	Mallinckrodt, Inc.	St. Louis, MO
EX 2005	Sunrise Medical	Somerset, PA
O ₂ N Demand II	Victor Medical	St. Louis, MO

Results: All DODS triggered their oxygen delivery as anticipated. There is variability in FIO₂ between devices at each setting and with each respiratory pattern. There is a difference of +26% to -24% in the amount of oxygen entering the lung, relative to CFO (mean value for each device).





Conclusion:

DODS settings must be made to meet therapeutic goals rather than expected comparisons between devices or to continuous O₂ use.

In addition to the variability discovered in this study, other factors may affect patient's therapy, such as individual breathing patterns and the triggering sensitivity of each device.

Patients should be titrated at rest and activity levels on the specific device they will use.

Manufacturers and Clinicians should work together to establish a standard for the labeling of DODS, to replace the 'equivalence' comparison to continuous flow oxygen.