A CLINICAL COMPARISON OF PORTABLE OXYGEN SYSTEMS: CONTINUOUS FLOW COMPRESSED GAS VS. OXYGEN CONCENTRATOR GAS DELIVERED WITH AN OXYGEN CONSERVING DEVICE

J. Lewarski BS RRT[1], G. Mikus RRT[1], G. Andrews BS RRT[1], R. Chatburn BS RRT FAARC[2]

[1]Hytech Homecare, Mentor OH; [2]University Hospitals of Cleveland, Cleveland OH

Background: Declining home oxygen reimbursement along with growing demand for small ambulatory oxygen (O_2) systems has encouraged the development of new ambulatory O_2 technologies. Recently, O_2 concentrators capable of filling small compressed gas cylinders have entered the market. Although it is well established in literature that O_2 produced from concentrators at >88% delivered in continuous flow is clinically equivalent to 99.6% USP gas (traditional compressed oxygen), there are no data evaluating concentrator gas delivered via an oxygen-conserving device (OCD). To test the hypotheses of equivalent benefit, we compared patient responses and tolerance of continuous flow (CF) USP O_2 versus compressed concentrator gas delivered via OCD in current home oxygen users.

Methods: We selected the Homefill® II oxygen concentrator and transfill system (Invacare, Elyria, Ohio), which includes a proprietary ML6 cylinder configured with a pneumatic OCD (EasyPulse®, Precision Medical, Northhampton PA). We used 9 patients in a prospective, randomized, crossover design. Patients were selected from a pool of existing home O_2 users from one home medical equipment provider. All patients were previously diagnosed with uncomplicated COPD and regularly using an ambulatory O_2 system. Additional selection criteria included: stable condition, O_2 prescription of 3 LPM or less and ability to carry portable. Physician orders were obtained for each patient. Patients were randomly assigned one of the following delivery systems: CF 99.6% O_2, or 93% O_2 concentrator gas via the ML6 with the OCD. Liter flow and settings for O_2 were consistent with their current prescription. On different days, each patient underwent 1 of the 2 test walks with the selected delivery system. A standard 6-min walk protocol was used while S_PO_2 and heart rate were continuously monitored and recorded. Objective measures of S_PO_2, HR, and distance walked along with subjective determination of breathlessness using a *Borg Scale* were used to evaluate the patient condition before and after each walk. Physiologic data were compared via *2-way ANOVA.* The *Borg Scale* data was analyzed via *Wilcoxon Rank Sum Test*. A power analysis was performed for an effect size of 10% change in S_PO_2 and 15 beats/min for HR.

Results: All patients tolerated the test. The table shows mean (standard deviation):

Device	SpO_2		Heart Rate		Borg Score	
	Before	After	Before	After	Before	After
99.6% O_2 constant flow	97% (1)	90% (7)	81 (13)	112 (15)	85 (1)	111 (2)
93% O_2 with conserver	96% (1)	88% (11)	83 (11)	115 (10)	85 (1)	111 (1)

There was no effect of device on either SpO_2 or heart rate (p=0.792). Statistical power was 0.90. There was no difference in *Borg* score (p = 0.63).

Conclusions: These results suggest that the lower percentage O_2 output by the concentrator system does not adversely affect clinical outcomes when using an O_2-conserving device. O_2 derived from a concentrator at 93% O_2 and delivered in conjunction with a pneumatic O_2-conserving device provides the same clinical benefit as the standard 99.6% O_2 continuous flow device. Practical benefits of a transfilling oxygen concentrator system include patient freedom to refill their compressed gas cylinders at their own schedule, leading to improved portability. Providers should experience a

Original Publication
Respiratory Care ● November 2003 Vol 48, No 11; 1115

substantial decrease in the high and recurring operational costs associated with the provision of ambulatory O_2 systems.

Original Publication
Respiratory Care ● November 2003 Vol 48, No 11; 1115