

Keeping Patients Active — a one-year follow-up

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In the Oct/Nov 2012 issue of *Respiratory Therapy*, we presented a case report about Mr Dana Jones, an Alpha-1 patient, who was struggling to maintain his Activities of Daily Living (ADLs). The report highlighted the impact of Alpha-1 on Mr Jones' life and how a new medical device has helped him regain his independence and ability to participate in activities he enjoys. Mr Jones was introduced to the Non Invasive Open Ventilation (NIOV) System (Breathe Technologies, Inc) while participating in a clinical research study at the Rehabilitation Clinical Trials Center, Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center in Torrance, CA. The NIOV System is a palm-size, volume assist system that provides pressure and volume via a proprietary nasal pillows interface. Clinical study data has demonstrated the clinical benefits of the NIOV System, including improvements in exercise endurance, oxygen saturation (SpO₂) levels and a reduction in dyspnea.¹

Alpha-1 Antitrypsin (AAT) deficiency is a genetic disorder affecting approximately 3.4 million individuals worldwide.² This inherited disorder results in COPD, liver disease, and several other conditions. The deficiency of the protein, alpha-1 antitrypsin, can lead to emphysema and presents with respiratory symptoms including shortness of breath, decreased exercise tolerance, and frequent lower respiratory tract infections. Therefore, the general management of AAT deficiency as recommended by the ATS/ERS is similar to that of COPD.³ Several of the interventions recommended by ATS/ERS include supplemental oxygen, pulmonary rehabilitation, and consideration for lung transplant.

Since the publication of the case study in 2012, Mr Jones has incorporated the NIOV System into his daily activities and has seen a marked improvement in his ability to complete activities of daily living (ADLs). He attributes the positive changes in his lifestyle to the benefits of using the NIOV system to reduce his work of breathing and alleviate the symptoms of dyspnea. The NIOV System allows Mr Jones to tolerate increased activity necessary and to accomplish his daily routines. Mr Jones has been an outspoken advocate of the benefits of maintaining activity even with diminished lung capacity and is working to increase awareness of new technologies in the Alpha-1, COPD, and medical communities.

He and his medical team had specific goals in mind for the use of NIOV System. The first goal was to reduce his dyspnea and to increase his exercise endurance allowing him to complete ADLs as well as return to his work and hobbies. By participating in a 4 hours per week pulmonary rehabilitation program, Mr Jones has seen a significant reduction in his dyspnea and a dramatic

increase in his exercise endurance. Prior to the intervention with the NIOV System, he was using a pulsed dose oxygen system at a setting of 4. His ability to exercise with that system was limited to 20 minutes of treadmill time at a speed of 1.5 miles per hour. His Borg score was reported at 6-7 during exercise. Using the NIOV System, he is now able to exercise for approximately 30 minutes while on a treadmill reaching speeds of up to 2.2 miles per hour with a reported Borg score of 3-4. Also, using the NIOV System has made it possible for him to initiate and adhere to a resistance training regimen – lifting weights of up to 25 lbs with multiple repetitions – which is important factor in maintaining skeletal muscle function in AAT deficient patients.

The second goal in using the NIOV System was to prepare Mr Jones for lung transplant by participating in a pulmonary rehabilitation program. Maintaining pre-transplant health status is an important predictor of morbidity and mortality in lung transplant patients.⁴ Augmented ventilation provided by the NIOV System has allowed Mr Jones to actively participate in his pulmonary rehabilitation program and he has reported no exacerbations or hospital admissions over the past 12 months. He has now been added to the national lung transplant list and is looking forward to a successful surgery and recovery.

Exacerbations are a common occurrence for anyone with a chronic lung condition. Mr Jones has been on oxygen therapy for 3 years with the first two years receiving low flow traditional oxygen therapy. He has indicated that in the first two years he needed to be hospitalized twice to treat an episode of respiratory insufficiency. After the initiation of the NIOV System, he reports that there have been at least two occasions where he was able to use his NIOV System to cope with severe dyspnea that in the past would have resulted in 911 calls and emergency room admissions.

The progress in Mr Jones' pulmonary rehabilitation program has been a major factor in regaining his independence. The NIOV System provides the respiratory support he needs, going beyond basic oxygen therapy to allow for showering, shaving, lifting objects, walking up stairs, and bending down or rising from a seated position. These basic activities are now all possible for him whereas before using the NIOV System all seemed daunting and out of reach.

People living with respiratory insufficiencies face many challenges in their daily lives. Oxygen therapy can address perfusion issues and pharmacologic options can dilate airways, reduce swelling, and address bacterial infections. Ventilation has not been practical in the past due to technology limitations. The NIOV System provides an option for ambulatory patients that

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included in the study, 7 females and 1 male of which 5 were Hispanic, and 3 Caucasian. The average age of the subjects was 60, ranging from 50 to 71 years of age. All 8 subjects completed the PR training program in regard to fulfilling their specific goals, but only 7 completed the post program evaluation. This individual's post results have been eliminated from the statistical analysis.

Recruitment and Consent Procedures

Subjects were not actively recruited or consented for this study as this was a retrospective review of patient medical records who had previously participated in the department's outpatient comprehensive pulmonary rehabilitation program and who met all established inclusion criteria for this study.

Results

Descriptive statistics (Table 1) demonstrate improvement in all three outcome measures post comprehensive outpatient pulmonary rehabilitation. Wilcoxon signed ranked analysis determined that these improvements were significantly significant with $p < 0.05$ (Table 2). A previous study published in 2006 demonstrated a treatment-related increase in walking distance of 96 meters in patients with pulmonary hypertension who had completed exercise and respiratory training very comparable to the 85 meter increase in the 6MWD found in this study 9. Changes related to (Table 2) are pre and post pulmonary rehabilitation: 6MWD ($p = 0.018$), Borg Scale ($p = 0.017$) and SF-36 Quality of Life ($p = 0.028$).

Conclusion

A comprehensive pulmonary rehabilitation program can be a valuable adjunct to treatment for patients with pulmonary hypertension. The interdisciplinary nature of the program yielded greater activity tolerance and subsequent improved community mobility and subjective quality of life in patients who participated. Although limited by sample size, this study should inform future investigations into potential candidates for pulmonary rehabilitation, outside of the traditional and dominant COPD patient population.

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require mechanical support for their breathing. The NIOV System can easily be incorporated into any in-patient, out-patient, or at home pulmonary rehabilitation program to significantly reduce dyspnea, improve oxygenation, offload respiratory muscle effort, and improve exercise endurance.

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