

**Evaluation of the
Venture HomeFill II Oxygen System
During Activities of Daily Living**

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Introduction

The use of Long Term Oxygen Therapy (LTOT) in the home has been increasing over the past several years due to an increase in the number of COPD patients requiring oxygen and the understanding of the value of early diagnosis and treatment. With this increase in the number of patients receiving oxygen therapy, there is an increase in the overall costs associated with LTOT. CMS (Medicare), being the largest payer for LTOT, has been evaluating and attempting to control this increase in costs with a decrease in payment. As reimbursement decreases, Home Medical Equipment (HME) suppliers are faced with the challenge of providing home oxygen therapy appropriately and cost effectively.

One of the new options for controlling costs associated with LTOT are oxygen-conserving devices (OCDs). OCDs used with packaged gases such as liquid oxygen (LOX) and compressed gases can reduce the number of systems required for service or can reduce the cost associated with refilling these systems as often as is necessary with continuous flow.

Another option that has become available to the market is a system that allows gas from an oxygen concentrator to fill a high-pressure cylinder. The Venture HomeFill II (Invacare Corp, Elyria OH) was recently introduced at a national trade show. The system includes a concentrator that is equipped to supply oxygen to a compressor unit. The compressor unit fills the cylinders from the concentrator's supply of oxygen. The specially designed cylinders connect to an OCD to extend the operating time of the small cylinders.

The purpose of this investigation was to determine if a cylinder filled from a concentrator with approximately 93% * oxygen, coupled to an OCD could maintain the same level of oxygenation as a cylinder using 99.6% USP oxygen with a patient performing activities of daily living.



* Oxygen output specification for the Homefill II is $93 \pm 3\%$

Case Summary

Patient Selection

A patient was selected that was active and using 4-6 M6 (180 liter) oxygen cylinders a week. This 68-year-old white female had been on 2-lpm oxygen for over four years. She had a history of smoking for over 30 years. The patient was interviewed to determine her interest in participating in the investigation, her activity level, and her ability to work with the equipment and to maintain a diary of activity. The patient was capable and agreeable to the study.

The study would monitor the patient on her existing oxygen system for 72 hours, then switch to the HomeFill II system for the next 72 hours. An oximeter would be worn for the entire period of the study and downloaded after each segment of the evaluation. A diary would be used by the patient to record daily activity and any unique episodes that might have an impact on oxygenation.

Method

The patients existing oxygen system was a Puritan Bennett 590 concentrator, a Puritan Bennett CR-50 OCD and M6 cylinders (Puritan Bennett is a division of TYCO, Pleasanton CA). The evaluation unit was a Venture HomeFill II concentrator and compressor unit, the Venture DODD conserving unit and HomeFill II M6 cylinders (Invacare, Elyra OH). Oxygen saturation was monitored with the PalmSat 2500 (Nonin, Plymouth MN) and analyzed with nVision software (Nonin). A patient activity log was created to record significant activity on an hourly basis during waking hours.

Results

Activity Log

The patient activity log indicated that there was no limit or change to activity with either system. The patient had a daily routine that was similar with both systems that included household chores and outside trips. One episode of desaturation was recorded in the activity log, on the existing system, when the patient returned from a shopping trip and became short of breath entering the house. The SpO₂ dropped to 85% and the heart rate was 107.

More activity related to the HomeFill II system was recorded due to the closer observance of a different system. Details related to the connection of the portable cylinders to the compressor were noted and the connecting of the supply tubing to the OCD. There was one episode of desaturation on the HomeFill II system related to walking approx. 40 feet inside the house. The SpO₂ dropped to 87% and the heart rate to 104. The OCD alarmed once when the tubing disconnected from the cylinder to the OCD. The patient appreciated this alarm since the NPB CR-50 does not have a disconnect alarm.

Oximeter Summary

The patient was very compliant with the use of the oximeter. Total hours recorded on the baseline test of the existing system was 71 hours. Hours recorded for the HomeFill II system was 72 hours.

The oximeter data indicated that there were fewer number of desaturation events with the baseline test, yet the total time in desaturation events was the same on either system. The average duration of an event was similar between both tests.

Average pulse rate and lowest pulse rates were the similar between both tests.



Oximeter Data

| Events | Current System PB 580 & CR 50 | | Evaluation System HomeFill II | |
|------------------------|----------------------------------|-------|----------------------------------|-------|
| | SP0 ₂ | Pulse | SP0 ₂ | Pulse |
| Total events | 55 | 24 | 75 | 13 |
| Time in Events (min) | 43 | 14 | 39 | 4.4 |
| Avg. Events Dur. (sec) | 47 | 35 | 31 | 20 |
| % Artifact | 6 | 6 | 5.7 | 5.7 |

| Measure | Current System PB 580 & CR 50 | Evaluation System HomeFill II |
|-------------------------|----------------------------------|----------------------------------|
| Base O ₂ (%) | 97.4 | 98.1 |
| Time (min) < 88% | 67.9 | 28.6 |
| Events < 88% | 20 | 11 |
| Min. O ₂ (%) | 59 | 60 |
| Avg. Pulse rate (bpm) | 78.9 | 76.3 |
| Low Pulse rate (bpm) | 24 | 24 |

Analysis Parameters

Desaturation Event: Drop in SpO₂ by at least 6% for a minimum duration of 8 seconds.

Pulse Event: Change in rate by at least 6 bpm for a minimum duration of 8 seconds.

Discussion

New technology is entering the home care market due to reimbursement changes and the development of innovative solutions to delivering therapy. Understanding the principles of operation of these new devices is necessary and the clinical implications understood before a clinician can appreciate the impact a device might have on a patient. Oxygen conserving devices are a recent addition to the LTOT market and research has documented the variability of individual products¹.

Oxygen concentrators have been clinically accepted and oxygen levels of 85% or greater are therapeutically equivalent to 100% oxygen according to the findings of the first Consensus Conference on Home Oxygen Therapy². The compounding of lower oxygen concentration, OCD use and an active patient could be a concern. This study was intended to determine if desaturation would occur with an active patient using the new HomeFill II system. The findings indicate that the patient did not have any adverse effects while using the new system.

This evaluation was conducted on one patient during a 3-day period. Numerous variables could have been monitored that might effect oxygenation and the findings, including activity level, activity time, cylinders used, etc. This study was intended to provide initial information on the subject of concern regarding the compounding of several variables related to patient oxygenation. There was no indication that the patient had any additional desaturation using the HomeFill II system compared to the system already being used.

Conclusion

In this single patient study, the data showed no adverse effects of using the HomeFill II system while performing activities of daily living. More studies, including a larger group of patients, are recommended to determine the value and applications of the HomeFill II oxygen system.

References

1. McCoy R. Oxygen Conserving Techniques and Devices. *Respir Care*. 2000;45:95-103
2. Problems in Prescribing and Supplying Oxygen for Medicare Patients. Summary of a Conference on Home Oxygen Therapy held in Denver, February 28 and March 1, 1986, *Am Rev Respir. Dis* 1986;134:340-341