Improved Respiratory Outcomes and Decrease in Pain Medication Dependence in a Patient with a Collapsed Diaphragm Using a Wearable Ventilator

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Introduction

Pneumococcal pneumonia, a serious infection of the lungs, affects an estimated 900,000 individuals in the US yearly with a 5-7 percent overall mortality rate.[1] Approximately 400,000 hospitalizations are caused each year in the US.[2] Pneumonia may be bacterial or viral in origin, with the majority of cases caused by bacterial infection. In these cases, antibiotics are typically used to treat the infection, with symptomatic improvement typically seen within 1-3 days. Though the condition is commonly eradicated quickly, certain cases require hospitalization and have long-term effects.

Patient Background

Erin, a 58-year-old female from the Northeastern United States was seen in November 2014 presenting with a paralyzed diaphragm stemming from a severe case of pneumonia 12 years prior. Initially, she received nocturnal Bi-level Positive Airway Pressure (Bi-level) treatment that was insufficient and resulted in headaches and marked shortness of breath. Bi-level therapy was augmented to a regimen of 18-20 hours per day. While she was able to ambulate for short periods of time, she was severely restricted in her movement and required daily naps of 2-3 hours and the use of a cane or wheelchair.

Erin was also affected by severe muscle spasms and chronic chest pain from overuse of intercostal and accessory muscles, and had become dependent on narcotic painkillers to manage her symptoms. In addition to pain and movement limitations, Erin was unable to generate sufficient airflow to enable phonation and had been almost completely without a voice for 13 years. At one point, her condition seriously deteriorated after developing influenza with pneumonia, and she became completely dependent on Bi-level therapy 24/7 for several months, only pausing treatment for long enough to eat. Following Erin's marked decline, the initial assessment was that she needed tracheostomy and invasive ventilation.

Treatment Recommendation

After conducting a more comprehensive health assessment, we recommended that Erin begin therapy with the Non-Invasive Open Ventilation (NIOV) System, developed by Breathe Technologies, Inc, prior to trying a more intrusive option. This FDA-cleared, one-pound, palm-sized wearable ventilator delivers a high mixture of oxygen and air through an unobtrusive nasal pillows interface, working to augment an individual's spontaneous breath. The NIOV System can be used by oxygen dependent patients and has also received FDA clearance for use with a compressed air supply for non-oxygen dependent patients with neuromuscular diseases.

The system also unloads respiratory muscles by providing positive pressure and augmenting patient's tidal volume.[3] Published data that support the efficacy of the Breathe NIOV System demonstrate that the device reduces dyspnea (shortness of breath), increases oxygenation, enhances exercise endurance, and unloads respiratory muscle activity.

Outcomes Following Discharge

Following the commencement of her treatment with NIOV, which she uses during the day, Erin has made remarkable improvements from her baseline evaluation. She is now able to walk 400 feet unassisted (compared to only 20 steps using her previous regimen). She has regained her ability to speak and has decreased her use of pain medicines by approximately 80 percent.

In addition to significant improvements in overall endurance and mobility, Erin was also able to resume driving, something she had not been able to do for approximately one year due to exhaustion and pain. She was able to also run routine errands, perform basic daily chores and participate more fully in everyday life.

Reflecting on how rapid the change has been, Erin remarked, "The most common comment I receive is not only how much better I look, but how I am more like my old self. I have a more normal life because I am able to go without needing assistance. NIOV, quite frankly, has been life changing."

With the approval of her doctor, in April 2015 Erin was able to travel with her husband to Florida to watch their daughter perform with her high school musical group at Disney World. She coordinated with a local Orlando-based scuba shop to get a supply of compressed air and her tanks were filled throughout her trip.

"We had the medical air tanks on the back of my wheelchair and I was able to go out every day at Disney, including to see my

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daughter perform, which brought me to tears. Before NIOV, there was no way I would have been able to go because I needed to be on the Bi-level for so many hours and could not travel due to pain. Now that I was being properly ventilated, we went full tilt! Seeing my daughter perform at Disney was a once in a lifetime experience."

References

1 Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine-Preventable Diseases. Atkinson W, Wolfe S, Hamborsky J, eds. 12th ed., second printing. Washington DC: Public Health Foundation, 2012.

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3 Porszasz J, et al. Physiologic effects of an ambulatory ventilation system in COPD. Am J Respir Crit Care Med Vol 188, Iss. 3, pp 334–342, Aug 1, 2013.