Application of the Breathe NIOV Device to Aid in Mobilization of the Patient on High Flow Nasal Cannula

Mike Bissonette RRT BA, Jim Chisholm RRT, Mary Dawson RRT MA, Liz Denton RRT

Background
The importance of mobilizing patients on mechanical ventilation has been successfully documented and many hospital ICUs generally support this program, but there is a gap when addressing patients on High Flow Nasal Cannula (HFNC). This patient population had not previously been mobilized regularly due to the limitation of the portability of the HFNC. The Respiratory Care Practitioners (RCP) in the Fletcher Allen Health Care FAHC's adult ICUs were becoming creative in attempting to solve this dilemma by strapping oxygen (O2) tanks on the base of the HFNC however, this was a safety concern. An additional issue was the rapid consumption of O2 on the HFNC which was a primary limiting factor to ambulation.

Our Respiratory Therapy department decided to trial the Breathe NIOV device to see if this was a solution for the patients on HFNC. The Breathe NIOV System is comprised of a one pound wearable device that uses a proprietary nasal pillow interface and requires an external source of compressed oxygen gas. The NIOV is a breath-actuated device that senses the patient's spontaneous breath through sense ports in the patient's nasal pillow interface. When the patient inhales, the device delivers a set volume of oxygen gas that is customized by the RCP. Volume delivery settings ranging from 50mL to 250mL are easily programmed to 3 levels of patient activity; low, medium and high. In addition to the volume of oxygen gas that is preset, ambient air is also entrained through two entrainment ports located on the interface. Delivering both ventilation and supplemental oxygen the NIOV System seems to effectively augment the patient's spontaneous breath and reduces the patient's work of breathing.

Often the patient was placed on a HFNC in an effort to avoid intubation or re-intubation. These patients were generally recovering from respiratory failure, in a weakened condition due to their disease process and at risk for further deconditioning.

Method
The ICU Physical Therapist (PT) would alert the RCP that there was a patient on HFNC that PT had been working with and was at a point that ambulation was a consideration. The RCP would titrate the volume settings on the Breathe NIOV to 3 activity settings. The augmentation volume are titrated to achieve the patients goal SpO2 and comfort levels. The low activity setting was titrated while the patient is in bed or doing any mild exertional activity. The medium activity setting is titrated to mild-moderate activity that may take place in and around the bed. The high activity volume is titrated during ambulation or during moderate-to-severe exertional activity. The RCP would remove the patient from the HFNC and place them on the Breathe device and allow the patient time to become accustomed to the different "feel" of the device. Oxygen saturation (SpO2), Heart Rate, Respiratory Rate, and work of breathing (WOB) were observed as well as patient's subjective statements. Due to the unique configuration of the NIOV System, we were initially a bit concerned that we could not manipulate the fraction of inspired oxygen (FiO2) on the Breathe, especially since we had these patients on high liter flow as well as high FiO2.

Case Study
52 year old male admitted with atypical pneumonia (PCP), HX AIDS/HIV, HEP C, recent diagnosis of COPD, former smoker and had quit 3 weeks prior to admission.

1st Day – Hypoxic adult ICU patient on Optiflow HFNC set at 40 lpm and 40% FiO2. Patient was titrated on the Breathe NIOV with augmentation volumes set at: low = 70 milliliter (ml), medium = 180 ml and high = 250 ml. Patients SpO2 remained stable around 90-93% during the entire duration of the trial. Patient walked approximately 60 feet in 2 tries with PT assistance. The patient noted that the shape and fit of the cannula was much more comfortable to wear than the previous cannulas. He stated that the HFNC was difficult to tolerate because of the constant flow and the NIOV felt more natural and was synchronized with his breathing. He also noted that the additional volume support he received during exertion helped his respiratory symptoms. He actually requested to remain on the Breathe device, however, he was returned to the HFNC at previous settings. Hours following this physical therapy session the patient’s oxygen saturation improved and he was successfully weaned down to 6 lpm via nasal cannula.

2nd Day – In effort to continue his rehabilitation the patient was reevaluated by PT the following day. We reinitiated the NIOV on the previous settings and reattempted to mobilize the patient. Saturations remained above 90% for approximately 30-40 feet. Patient paused during a desaturation to 86% and then turned around to return to his room. Saturation increased to 93% and was returned to the 6 liter per minute NC. Saturation remained 92-93%. Again this patient stated how much he preferred the Breathe device, noting the shape and fit of the cannula.
**Conclusion**

Although we recognize that we would need to select patients carefully to confirm that their current FiO2 needs were being met, we do find a unique application for patient use in the ICU to mobilize patients. This portable system provides an option to those patients that were previously limited by their equipment in an effort to ambulate and regain muscle condition.

**References**

5. Breathe Technologies—NIOV System Early Mobilization Protocol