Pulmonary Support for Neuromuscular Disease Patients During COVID19 Pandemic

(Michelle Cao1, Sherri Katz2, Ericka Simpson Greene3, Eric M. Davis4, Aparajitha Verma5, John W. Day1, Lisa Wolfe6)

BACKGROUND

1. Neuromuscular Disorders (NMD) can affect breathing function
   a. NMD do not in general damage lung tissue
      - Even NMD patients with weak muscles do not need supplemental oxygen when otherwise healthy
   b. Impaired breathing in NMD is due to weak diaphragm and other breathing muscles
      - Breathing is supported with advanced positive airway pressure (PAP) devices including home ventilators, commonly known as noninvasive ventilation (NIV), via a mask interface. These are often used at night. During the daytime, some individuals may receive ventilation via a mouthpiece (sip ventilation).
      - Tracheostomy and a home ventilator are used when breathing muscles are very weak.

2. COVID19 can affect breathing function in all individuals, even if their muscles are strong
   a. COVID19 does not directly affect breathing muscles, but inflames lung tissue
      - Oxygen has greater difficulty moving through the lung in COVID19
      - COVID19 patients with low oxygen benefit from supplemental oxygen

CONCERNS RAISED BY COVID19 REGARDING BREATHING SUPPORT IN NEUROMUSCULAR DISORDERS

1. NMD patients with COVID19 will require both PAP ventilation (NIV or intubation) AND supplemental oxygen

2. Typical NIV support in COVID19 can increase spread of viral particles to surroundings and infect others
   a. COVID19 is mainly spread through droplets produced by coughing or sneezing
   b. NIV and airway clearance devices (cough assist, nebulizer) can “aerosolize” the COVID19 virus – spreading it much more widely
   c. To reduce viral spread, most hospitals are discontinuing routine use of NIV and airway clearance devices
   d. Home mask interfaces are vented and can blow virus out of the CO2 exhalation ports, spreading the virus in the surrounding environment, as do masks with a high leak.

3. NIV devices for NMD patients with COVID19, can be modified to restrict viral spread, by:
   a. Removing the humidifier, and adding a combined bacterial/viral filter between a non-vented mask and the tubing.
   b. Switching to a dual-lumen hose and non-vented full-face mask with a compatible ventilator
      - Without venting, CO2 can dangerously build up in the lungs
      - A dual lumen hose allows CO2 to be removed and limits spread of the virus
      - Some new home ventilators (e.g. Philips EVO, ResMed Astral 150, VOCSN) have dual lumen capability
BREATHING SUPPORT OPTIONS FOR NEUROMUSCULAR DISEASE PATIENTS DURING COVID19 PANDEMIC

1. **At home**
   a. If there is no COVID19 exposure or infection
      - Continue usual breathing support and pulmonary care
      - Caregivers need to follow CDC guidelines closely: Wash hands, use ≥ 60% alcohol-based sanitizers, do not touch face, avoid contact with anyone possibly infected
   b. If there is evidence of COVID19 exposure or infection but breathing has not changed
      - Maintain close contact with providers to get detailed recommendations and updates to these guidelines
      - Institute changes to NIV outlined above, if possible
      - Increase protection of caregivers to reduce the risk of them being infected
      - Follow cleaning recommendations for equipment closely (also see ACCP guidelines)
      - Monitor oxygenation carefully, use home pulse oximeter if possible

2. **Emergency department or hospital pulmonary care, if there is suspicion of COVID19**
   a. NMD patients with COVID19 infection will require PAP support (NIV or intubation) and supplemental oxygen
   b. To decrease spread of COVID19 in the hospital, use of typical home PAP/NIV devices will not be allowed
   c. To avoid intubation, use a double-lumen compatible ventilator with an unvented, well-fitted full-face mask
   d. Severe pneumonia may necessitate intubation and ventilator support
   e. As hospital ventilators become scarce, specific home ventilators that are compatible with a dual-lumen hose (e.g. Trilogy 100, EVO, Astral 150, VOCSN) may be used, if hospital policy permits

For more details see [American College of Chest Physicians (ACCP) Care Recommendations for the Home-Based Ventilation Patient Undergoing Therapy for Known or Suspected Respiratory Viral Infection with COVID-19]


https://foundation.chestnet.org/patient-education-resources/

1 Division of Neuromuscular Medicine, Department of Neurology, Stanford University
2 Division of Pediatric Respirology, Department of Pediatrics, University of Ottawa
3 Department of Neurology, Houston Methodist Hospital
4 Division of Pulmonary and Critical Care, Department of Medicine, University of Virginia
5 UT Health Neurosciences, The University of Texas Health Science Center at Houston
6 Division of Pulmonary and Critical Care, Department of Medicine, Northwestern University