

D-Rev's Expiratory Safety for Non-Invasive Respiratory Support

Eliminating infectious expiratory aerosolization and reduce ventilator shortages

PROBLEM

Treatment for patients with acute respiratory distress syndrome (ARDS) due to COVID-19 can quickly escalate from supplemental oxygen to mechanical ventilation. As a result, policy makers and device makers have focused on increasing ventilator supply. While ventilator manufacturers have already boosted their production by 30-50%, they are unable to deliver the 500 or 1000% growth in production that analysts believe are required.¹

Data is now suggesting, however, that mechanical ventilation is not the best treatment for severely ill COVID patients. Sedating and intubating patients for ventilation reduces the body's ability to fight the virus and increases the risk of permanent lung damage, and early outcome data from China, New York, and the UK suggest extremely poor outcomes (66-80% mortality^{2,3}) for ventilated COVID patients. Medical experts believe that less invasive respiratory support which focus on oxygenation, such as high flow nasal cannula, continuous positive airway pressure (CPAP), and Bi-level Positive Airway Pressure (BiPAP), could significantly improve outcomes for many COVID-19 patients. These treatments are available and being used in some facilities, but are less desirable due to the aerosolization of the virus and requirement of full PPE for providers' protection and a negative pressure isolation room for each patient. There are typically only a few of these rooms per hospital. As a patient exhales, the expiratory air aerosolizes, releasing tiny, highly viral droplets with COVID RNA into the air and contaminating facilities. As a result, patients in patients with less respiratory distress and hypoxia must be must be treated with more invasive, potentially damaging forms of respiratory therapy, and life-saving ventilator supplies are even more strained.

D-REV'S SOLUTION

D-Rev is developing supplemental components, device add-ons, and systems to ensure nasal cannula, CPAP, and BiPAP treatments can be administered to patients without the danger of releasing contagious expiratory air. Our solutions will be for adults, children and neonates.

The benefits of this solution include:

- Greater flexibility for clinicians to treat patients with the most appropriate forms of respiratory support.
- Significantly improved outcomes for COVID-19 patients with respiratory distress who can be treated with less invasive respiratory supports before escalating to ventilation.
- Improved safety for healthcare workers who manage patients with COVID-19 and other infections that can be spread through aerosolized droplets.

¹ Netland, Torbjørn. [A better answer to the ventilator shortage as the pandemic rages on](#). World Economic Forum Global Agenda. 2020; (Published online April 3, 2020. Accessed April 20, 2020)

² Yang X, Yu Y, Xu J et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *Lancet Respir Med*. 2020; (published online Feb 21, 2020. Accessed April 20, 2020) [https://doi.org/10.1016/S2213-2600\(20\)30079-5](https://doi.org/10.1016/S2213-2600(20)30079-5)

³ Vaudya, Anuja. [66% of COVID-19 patients needing mechanical ventilation die, new study shows](#). Becker's Hospital Review; (Published online April 3, 2020. Accessed April 20, 2020)

- Reduced strain on ventilator supply, particularly in settings where demand is high or resources are very low.
- Reduced reliance on specialized medical professionals who are intubating a patient and managing their ventilator. This is a particularly acute problem in rural and low-income regions with few specialists.

This approach has already been successfully studied: a three-year randomized control trial of ARDS patients at the University of Chicago found that non-invasive ventilation via a helmet resulted in lower patient mortality, faster recovery time, and shortened ICU stay.⁴

We are taking two approaches to addressing the problem: (1) supporting regulatory clearance and/or the scale-up of the most promising solutions for immediate use, and (2) designing a user-centered solution that is applicable to low-income, as well as high-income markets. For (2), we are confident that a robust and highly-effective solution can be developed within a year, with the timeline accelerated with funding and strategic commercial partnerships. D-Rev is eager to partner with medical experts and other organizations with ideas, technical skills, and prototypes to accelerate the design and development process and ensure that a high-quality solution reaches patients at scale.

FEASIBILITY

Availability of safe, advanced respiratory therapy is a global need that D-Rev is uniquely situated to fill. With operations in the United States, India, Kenya, Uganda, Rwanda, and soon Thailand, D-Rev is a leader in medical device development and distribution for low- and middle-income markets, and has significant expertise in respiratory distress and CPAP development. We have two manufacturing partners in India, as well as global commercial distribution partners in India and Europe.

SUPPORT REQUEST

We seek philanthropic partners to seed the projects. Specifically, we require:

- \$200,000 to support the scale-up of the most promising existing solutions, and
- \$750,000 to seed the development of a user-centered interface for non-invasive respiratory support.

With your partnership, we can support physicians on the front lines of this pandemic and improve quality of care and outcomes for hundreds of thousands of patients requiring hospitalization.

If you are interested in supporting this project or you know an individual or foundation that is aligned with our work, please contact Shelly Helgeson, Senior Manager of Development & Partnerships, (+1)937-441-5471, shelgeson@d-rev.org

⁴ Patel BK, Wolfe KS, Pohlman AS, Hall JB, Kress JP. Effect of Noninvasive Ventilation Delivered by Helmet vs Face Mask on the Rate of Endotracheal Intubation in Patients With Acute Respiratory Distress Syndrome: A Randomized Clinical Trial. *JAMA*. 2016;315(22):2435–2441. doi:10.1001/jama.2016.6338