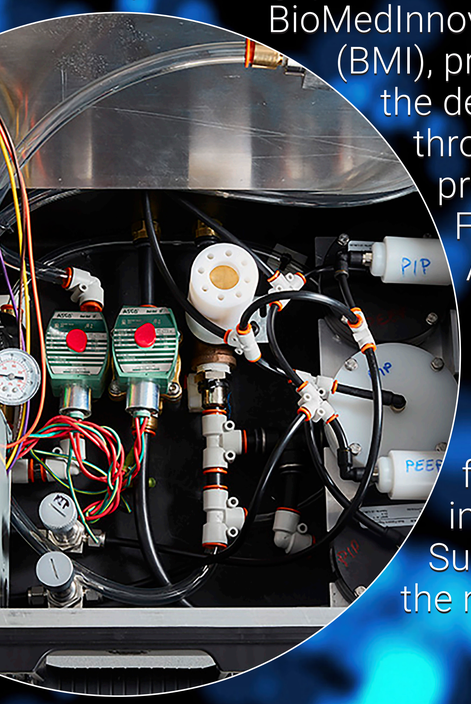
In response to a nationwide ventilator shortage, Lawrence Livermore National Laboratory (LLNL) designed a portable mechanical ventilator—using readily available parts—to help fill the gap. LLNL and partner BioMedInnovations, LLC (BMI), propelled the design through testing, production, and Food and Drug Administration (FDA) approval, ultimately aligning with manufacturing facilities to introduce SuppleVent™ to the marketplace.



SuppleVent™

TECHNOLOGY TRANSFER STORY

LLNL and BMI met a shared goal to address the critical and growing need for life-saving equipment for patients experiencing Acute Respiratory Distress Syndrome (ARDS) caused by COVID-19 and other serious conditions. In just over three months, LLNL and BMI designed, produced, and tested an easily reproducible prototype for a portable, life-saving ventilator, which achieved quick FDA authorization for emergency use. BMI, a North Carolina-based medical device startup that makes precision air and fluid flow devices, and its partner company, Equilibar, LLC, developed a pressure regulator used in the SuppleVent™ prototype. By refining the LLNL design, BMI made SuppleVent™ ready for widespread production at a reasonable cost.

SuppleVent™ is in use at a leading U. S. research hospital while in development for application in organ transplantation, a need likely to grow significantly as an outcome of the COVID-19 pandemic. BMI is poised and ready for production of the device to meet small or large demand. The LLNL/BMI collaboration was largely done remotely, with scientists, engineers, and medical experts contributing virtually during the shelter-in-place. The collaborative initiative exhibited by the team demonstrates how national laboratories and industry partners can work together to improve our nation and the world.

LLNL DESIGN TEAM

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Controls Team Lead

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TECHNOLOGY & PRODUCT

SuppleVent™ offers the cost, size, and ease of use to be an important tool in the nation's and globe's arsenals to fight a resurgence of COVID-19 cases and to support ARDS and other breathing difficulties, particularly in rural or underdeveloped areas where ventilators are in short supply. The suitcase-sized ventilation unit is readily deployed in hospitals or medical transport. Its pelican-style case quickly converts into a support stand in clinical use and, when closed, is easily stacked for storage.

SuppleVent™ features an easy-to-use interface, a large LCD display, and highly-accurate pressure regulators. Alarms alert medical professionals if pressure or desired gas-volume delivery falls out of range or if the system, gas, or electrical supplies fail. Based on clinical demand, the device operates in continuous ventilation mode for late-stage COVID-19 patients or adapts to patients who eventually breathe independently while being treated.

The decision to use minimal, select components avoided conflict with challenged supply chains and enabled SuppleVent™ to be available to meet the pandemic demand with little lead time. The design does not incorporate compressors or blowers, further adding to the device's portability and keeping power consumption low. The low cost design means SuppleVent™ can be sold for a small fraction of the price of conventional, commercial machines, supplying vital reserve hardware in the United States and primary hardware in the undeveloped world.

PEOPLE

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Lawrence Livermore National Laboratory

SUPPLEVENT™ BY BMI

U.S. DEPARTMENT OF ENERGY

Lawrence Livermore National Laboratory is operated by Lawrence Livermore National Security, LLC, for the U.S. Department of Energy, National Nuclear Security Administration under Contract DE-AC52-07NA27344. TID 61216