

Low-Cost Lung Support Models for Newborns

Health need

Each year, millions of preterm infants are born with immature lungs, often leading to respiratory distress syndrome, a major cause of illness and death. Although mechanical ventilators and continuous positive airway pressure (CPAP) therapy are routinely used in high-income settings to keep these infants alive, high costs and lack of infrastructure often put these tools out of reach for patients who need them in low-resource settings.

Technology solution

PATH has been investigating models and options for low-cost lung support devices that would be appropriate in low-resource settings. We assisted Seattle Children's Research Institute in defining a strategy for developing, certifying, and commercializing a low-cost, high-amplitude bubble (bCPAP) device and ventilator that is under development. We investigated the business model used by the East Meets West Foundation's Breath of Life program (BOL). The BOL program partners with a Vietnamese manufacturer of respiratory support equipment for use in neonatal intensive care units (NICUs). Together, the partners provide low-cost equipment, training, and maintenance to hospitals throughout Cambodia, Laos, Myanmar, and Vietnam. This model has allowed for expanded and better equipped NICUs throughout the Southeast Asia region. Our team learned of an innovative low-cost approach to providing respiratory support to newborns during a visit to Hindu Rao Hospital in Bangalore, India. The doctor in charge of the hospital's NICU assembled an improvised bCPAP device with commonly sourced, inexpensive supplies at the hospital. This alternative means of meeting clinical needs for neonatal respirator support does not require electricity to operate; this innovation allows the hospital to provide lifesaving care for newborns.

Current status and results

PATH's aim is to advance Hindu Rao Hospital's system. We refined and tested an improvised bCPAP device in a kit format. Components for the kit were procured and evaluated to determine their availability in low-resource settings and suitability for use. Various kit configurations were evaluated and tested prior to a human factors evaluation with health care workers in a Delhi hospital. In conjunction with the kit, PATH is also developing an inexpensive, robust oxygen blender for use where no source of pressurized air is available. This blender has been designed to provide a stable flow of blended gas that is suitable for use with any bCPAP system where pressurized oxygen is available. The bCPAP kit requires the use of the blender in order to provide a safe blend of gas to the neonate and will be included in the package. We are working to further refine the oxygen blender for compatibility with low-pressure oxygen sources, such as oxygen concentrators, and to develop preassembled bCPAP kits, reducing time required for setup of the kit at the point of care. In addition, we are developing a commercialization and distribution plan in preparation for manufacture and distribution in targeted countries.



An improvised bubble, continuous positive airway pressure device.

Practical methods for respiratory support of prematurely born infants could save hundreds of thousands of newborn lives each year.

Availability

For more information regarding this project, contact Darin Zehrung at dzehrung@path.org.

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