

CASE STUDY

Strengthening health systems' capacities to operate and manage medical oxygen generation, storage and supply equipment

Lessons from the Indian state of Maharashtra

Scaling Up Access to Oxygen

The state of Maharashtra in western India experienced the worst of the second wave of the COVID-19 pandemic, accounting for nearly one of every five of the 32 million cases and around one of every three of the 430,000 COVID-19 related deaths in the country by mid-August 2021. Given the unprecedented scale of the pandemic during the second wave, the state's efforts were inadequate to rapidly scale up its oxygen supplies to meet the spike in demand for medical oxygen in many of its public health facilities.

As part of its preparations for the third wave for COVID-19, the Maharashtra state government has identified that augmenting access to oxygen as one of the most effective and critical actions to improve health outcomes and save lives. The state is installing various oxygen systems – liquid medical oxygen (LMO), pressure swing adsorption (PSA) plants and oxygen concentrators – across government health facilities, in addition to improving availability of oxygen supply systems through medical gas pipeline systems (MGPS), manifold systems and oxygen cylinders.

Emerging need for trained human resources for managing oxygen systems

Although oxygen therapy is a very old treatment modality, yet various oxygen systems are fairly new to the public health systems, which, except for large teaching hospitals and tertiary healthcare facilities, had historically relied on oxygen cylinders to meet its medical oxygen demands. As a result, there are very few trained persons in the public health system, especially at district and sub-district level facilities, who understand the complexity of integration and maintenance of these newly deployed oxygen systems and know how to manage them.

Training biomedical engineers managing vaccine cold chain to manage oxygen systems

To address this gap, the state government decided to strengthen capacities of the biomedical engineers (BMEs) working with the Health Equipment Maintenance and Repair (HEMR) division of the state's health department. The BMEs and other technicians of the HEMR Division in the state have been involved in managing, operating and maintaining the Vaccine Cold Chain management systems. Engaging BMEs who manage vaccine cold chains to manage oxygen systems is an approach that had never been attempted before in the country – this was the first such initiative of its kind!



Participants of the training conducted on oxygen management system

The Public Health Department in collaboration with Deputy Director, Health Services (Transport division), Pune and PATH organized a training on oxygen management system for the Biomedical Engineers and Technicians of the HEMR Division between 28 June 2021 and 06 July 2021. Thirty-three (33) BMEs were trained in three batches at the National Cold Chain Resource Centre Training Center in Pune, Maharashtra on –

- Various aspects of oxygen ecosystem and operations and maintenance of oxygen
- systems including MGPS,
- Trouble shooting, safety and security of various oxygen sources in the government hospitals in the state,
- Inventory management and oxygen audit for optimizing the available oxygen resources at the facility, and
- Orienting and training facility level staff on day-to-day operations and maintenance of oxygen systems in public health facilities.



Dr. Satish Tajne, PATH, along with Dr. Sanjay Deshmukh, Assistant Director - Medical, Pune circle, orienting the BMEs on oxygen inventory management

Transferring knowledge and strengthening capacities at the public health facilities

Following their trainings, the state allocated districts to groups of trained BMEs. The BMEs of the HEMR division are functioning as master trainers and mentors to the district staff of their allocated districts, who will further train the identified medical, paramedical and non-medical staff at the health facilities on oxygen systems.

The training design and approaches used by the state government to train the BMEs are being replicated for training the district trainers. The BMEs have also been mandated to visit all the health facilities in their allocated districts after completing the training of district trainers to provide supportive supervision to facility-specific trainings and mentor the district trainers.

As an outcome of this training at state level master trainers and district trainers visited 120 facilities within 2 months and trained a total of 1676 trainees on medical oxygen management systems at facility level.



The expert trainer explaining about different components of a PSA oxygen generation plant in the hospital premises to the BME trainees

PATH supported the state government in identifying subject matter expert from the public systems and the industries to facilitate the training. They shared their field experience and built technical knowledge and operational capacities through classroom learning and practical demonstration on the live systems in nearby hospitals. The training covered technical specifications, installation, commissioning, operation, maintenance, safety of the oxygen equipment and oxygen audit, related to the oxygen ecosystem components on LMO, PSA oxygen generation plants, oxygen concentrators, oxygen cylinders, MGPS and manifold systems. The BMEs also received orientation on basic fire.

Encouraged by the early response to this approach, the state government of Maharashtra is in process of developing a state strategy for strengthening human resources of oxygen systems, which will include developing a cadre of BMEs as trainers and building facility level capacity to maintain and repair the oxygen equipment.

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