

# Medical Device Maintenance Strategy for Post Pandemic: Case on Ventilators

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## Abstract

Equipment-demand of healthcare providing institutions increased drastically during the Covid-19 pandemic. While majority of the demand (also the most publicized) has been occurring for disposable products such as masks, gloves, gowns, sterilizers, and test kits; the demand for electronic devices also increased during the initial waves of the pandemic but dropped afterwards as it was satisfied by the manufacturers. Since devices like vital monitors, dialysis systems, and ventilators are not single use products, handling of such systems after acquisition has become an issue of operations management for healthcare professionals. Utilization of such devices seem to have a cyclic behavior correlated with pandemic waves (as the hospitalizations peak so the usage and vice versa) and tend to have a long-term decreasing trend as the Covid-19 pandemic transforms to epidemic. Ventilators have found extensive usage in the treatment of Covid-19 related patients for ICU and emergency admissions. Medical ventilator device provides mechanically simulated air into the lungs of patients who are completely unable to breathe by themselves or breathes but insufficient to carry the necessary oxygen. So, the total functionality is crucial and service readiness is imminent. Number of active ventilators in Turkey increased to 22.000 units by the first year of the pandemic. However, utilization ratio of ventilators dropped to 29.6% (as of March 17, 2022) from the heights of 55% observed in the winter of 2021. Because of such decline, devices have become idle or operational times have dropped significantly. Health institution under investigation is a full-service government hospital operating in the city of Istanbul, Turkey. There are currently 142 ventilators in the hospital with less than 35% utilization. Maintenance task is only carried out by manufacturer approved service providers and parts are supplied from abroad. Since the operator of devices is a non-profit government hospital, maintenance outsourcing is done by bidding with strict budget and usually under the pressure of currency exchange rates even after the maintenance contract is signed. Failure analyses indicate mean time to failure of devices has not changed significantly with respect to pre-pandemic operation. Periodic maintenance strategy that has long been adopted for such devices has been modified to consider cyclic operation, extended standby durations, and lead time of spare parts. Further proposals are under consideration for group maintenance involving multiple healthcare institutions.

## Keywords

Maintenance, Healthcare, Covid-19, Pandemic, Institutions.

## Biography

**Çağlar S. Aksezer** is Professor of Industrial Engineering at FMV Işık University, Istanbul, Turkey. He received his Ph.D. and M.S. degrees in Industrial Engineering from Northeastern University, USA and B.S. degree in Applied Mathematics from Yıldız Technical University, Turkey. He has been teaching at the undergraduate and graduate level since 2004 as well as lecturing professionals on service systems engineering and lean techniques. He is involved in various projects for industries such as healthcare, energy, automotive, and retail; through which he has published several research papers and technical reports. His research interests include warranty modeling, performance assessment, and service systems.