Telemonitoring in Patients on Home Mechanical Ventilation

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Introduction. The rising prevalence of chronic respiratory failure has increased the demand for home mechanical ventilation (HMV), straining hospital resources. Telemonitoring has emerged as a pivotal innovation in managing patients on HMV, offering scalable solutions to address rising demand for chronic respiratory care amid global healthcare workforce shortages and resource constraints.

Methods. This abstract synthesizes recent advancements, challenges, and future directions, emphasizing telemonitoring's potential to enhance clinical outcomes and operational efficiency while aligning with themes of technological integration highlighted at the Critical Care.

Findings. For HMV initiation, telemonitoring is noninferior to in-hospital initiation, achieving comparable clinical outcomes with lower direct costs. In long-term follow-up, telemonitoring reduces hospitalizations by up to 36% in COPD patients and 54% in neuromuscular disease (NMD) cohorts, alongside fewer urgent clinic visits and emergency room admissions. A 2022 study of 34 patients reported a 60% reduction in extra clinical visits and optimized ventilator settings in 50% of cases, improving sleep quality and safety. Telemonitoring enhances patient management by facilitating early detection of issues like leaks, asynchronies, or exacerbations, with predictive capabilities for respiratory deterioration. Cost savings are notable, particularly in NMD, were remote monitoring reduced healthcare utilization. Patients report high satisfaction, with 75–80% willing to continue telemonitoring, valuing increased support and home comfort.

Discussion. Despite its promise, telemonitoring faces significant barriers. Current algorithms for detecting suboptimal ventilation exhibit poor diagnostic performance, with sensitivity and specificity rates as low as 78% and 40%, respectively, due to inconsistent expert-defined thresholds. This variability leads to frequent false alerts, increased clinician workload, and higher costs without proven improvements in patient-centered outcomes such as survival or quality of life 13. Furthermore, the lack of standardized protocols for data interpretation and intervention limits its clinical relevance across diverse healthcare systems.

integrating AI to analyze high-resolution ventilator data and wearable sensors could enhance early prediction of respiratory decompensation. Collaborative initiatives like the European Respiratory Society's IMPORTANCE project aim to harmonize data collection and validate cost-effective strategies globally. Additionally, multimodal systems combining camera-based monitoring (e.g., real-time ventilator screen analysis) with cloud-based data platforms may reduce blind spots and improve remote diagnostics, as demonstrated in ICU settings during the COVID-19 pandemic.

Conclusion. Telemonitoring holds transformative potential for HMV, improving access, efficiency, and patient-centered outcomes. By addressing technological and systemic barriers, it could redefine chronic respiratory care, aligning with the evolving needs of patients and healthcare systems.

Keywords: Telemonitoring, Home Mechanical Ventilation,