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Home Mechanical Ventilation

A Fast-Growing Treatment Option in Chronic Respiratory Failure



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Home mechanical ventilation (HMV) can be delivered either noninvasively or via a tracheostomy and is the most effective treatment for patients with chronic hypercapnic respiratory failure. HMV has been shown to improve clinical symptoms, health status, and survival in patients with restrictive pulmonary disorders, such as neuromuscular diseases, thoracic deformities, and obesity-hypoventilation syndrome.¹ In contrast, for a long time, this was not so evident in patients with COPD, and we had to wait for the so-called high-intensity HMV to see that benefits also could be achieved in these patients.² Especially the landmark trials of Köhnlein et al³ and Murphy et al⁴ showed that if high-intensity HMV is being used, survival benefits and hospitalization/exacerbation frequency reduction can be obtained both in stable hypercapnic patients and in patients who started HMV after acute respiratory failure. The study of Cantero et al⁵ published in this issue of *CHEST* adds new and interesting data in the field of HMV. In addition to providing information about the

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current situation, it also showed that the prevalence of HMV increased from 15.1 in 100,000 in 2000 to 37.9 in 100,000 in 2019. One might argue that the Cantero et al⁵ study is from a very select area; however, comparable figures have been reported by the national registries of Norway (47 in 100,000), Sweden (33 in 100,000), and Finland (39 in 100,000). The paper from Cantero et al⁵ shows that COPD is by far the largest group on HMV, representing 39% of the patients, compared with 27% in 2000. This is understandable, because there is currently more evidence for HMV in COPD, and recommendations when HMV should be applied have recently been published.⁶ As mentioned by Cantero et al,⁵ it is interesting to see that inspiratory pressures are considerably lower compared with the German High Intensity. However, three remarks are to be made. First, the effect of noninvasive ventilation on PaCO₂ is unclear as no baseline values are provided. Second, the COPD group in the report of Cantero et al⁵ is phenotypically different compared with the patients in the COPD trials published.^{3,4,7,8} Thirty-eight percent of the “pure” COPD patients were obese (BMI > 30 kg/m²), and especially in the overlap group, patients did not have severe obstructive lung disease (FEV₁/FVC ratio mean 76% of predicted). This emphasizes that in Cantero et al’s⁵ COPD group, obesity might be a prominent contributor to respiratory failure, and thus the treatment response might be different compared with “pure” COPD patients. Finally, the compliance in the Cantero et al⁵ study was high, 7.6 vs 5.9 hours per night, and patients used the ventilator for a prolonged period, suggesting that (cumulative) number of hours of ventilator use are important as well reducing the PaCO₂, as shown previously by Struik et al.⁹

Patients with obesity hypoventilation syndrome are the second largest group, which can be explained by the increasing number of obese patients. However, it is also stated in the discussion that some of them had not used CPAP before. Although we do not know whether these patients could have been treated effectively by CPAP, we know now from several studies that at least some obesity hypoventilation syndrome patients with concomitant OSA can equally benefit from CPAP compared with BiPAP and thus can start with CPAP instead of BiPAP or even switch after clinical stabilisation.¹⁰

One of the most remarkable outcomes of this update is that only 16% of the patients had a neuromuscular disease. We know from the paper of Lloyd-Owen et al¹¹ that there is a big diversity between countries when we look at patient groups being on HMV. In some countries, the percentage of patients with a neuromuscular disease on HMV was very high; for example, in Denmark it was approximately 80%, whereas in other countries it was approximately 20%. An interesting study in this respect was published in 2001 by Gibson¹² showing that 25% of physicians did not discuss HMV with all of their Duchenne muscular dystrophy patients; the reason for advising against HMV was poor patient quality of life (52.6%).¹² Although we do not know from the Cantero et al⁵ paper what the reason for the low number of neuromuscular patients was, we do know that attitudes and beliefs of doctors, patients, and caregivers have an huge impact on the decision of whether to start HMV in these severely disabled patients.

Another important point of the paper is that most HMV was initiated in the hospital in most of the patients and that 45% of them started after an acute event. This is a large number, and it raises the question of how these patients were monitored before they were admitted. Regular follow-up in patients might give the opportunity to start HMV electively in an earlier phase. The remainder of patients, mainly having their follow-up by a pulmonologist working in a private practice, had an outpatient start. Two Dutch studies recently investigated the start of HMV at home.^{8,13} They showed that, in patients with COPD and neuromuscular disease, starting noninvasive ventilation at home is non-inferior compared with an inpatient start, and it reduces the costs by over 50%. Although starting at home might not be feasible in all patients, and its feasibility also depends on the local facilities and reimbursement issues, it seems to be an attractive alternative for both the health care system and our often very disabled patients.

In summary, the paper by Cantero et al⁵ shows an enormous growth in the number of patients on HMV in the Geneva lake area. Because COPD is probably a fast-growing indication, we need to carefully characterize this population, because obese COPD patients or COPD patients with concomitant OSA might be a different group compared with the pure lean COPD patients, with respect to both treatment settings and expected benefits. Further research is needed to better characterize COPD

patients and to investigate how these different phenotypes could be treated best with optimal response. Moreover, currently the primary focus of HMV in COPD is to reduce CO₂, but the question is whether this is the only goal to provide an effective HMV. Finally, because an inpatient start of HMV is far too expensive for all of the patients needing HMV, alternative pathways such as starting at home have to be explored.

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