NIV at Home: Resource Implications

The NHS Modernisation Agency’s critical care programme report “Weaning and long term ventilation” recommends that long term non-invasive ventilation (NIV) should be available “according to need” and that this service should increase in line with demand. This need has not been well described. The Nottingham Assisted Ventilation Group (NAV) provides home NIV for a well defined population of approximately two million. We have looked at the number of patients using NIV at the end of each year between 1991 and 2002 and compared the aetiology of respiratory failure in these patients at the beginning and end of this period.

All patients used pressure controlled ventilation with NIPPV or BREATs machines. Most patients had chronic ventilatory failure with daytime hypercapnia, but a small number of patients with neuromuscular disease had symptomatic nocturnal hypoventilation with normal daytime arterial blood gases. Patients with obstructive sleep apnoea treated with continuous positive airway pressure (CPAP) were not included in this analysis.

The mean increase in the number of patients on home NIV was 8.8 per year (fig 1). The mean (SD) age of the patients in 2002 was 54.6 (17.1) years and the male:female ratio was 1:1.7. At the end of 1991 all patients on home NIV had poliomyelitis, scoliosis, or old tuberculosis. In 2002 these diagnoses together accounted for only 26% of patients, with 28% having other neuromuscular diseases and 31% obesity/hypoventilation. Airway diseases (chronic obstructive pulmonary disease (COPD), bronchiectasis and bronchiolitis) accounted for only 13% of patients.

The number of patients requiring home NIV is rising progressively. We do not think the increase reflects a change in our indications for NIV, which are in line with published recommendations1 and have not changed significantly over this time period. Most of the increase is for patients with neuromuscular diseases and obesity/hypoventilation syndrome. Although evidence from randomised controlled trials is lacking, observational data strongly suggest a beneficial effect of NIV on survival in Duchenne muscular dystrophy1 and in more slowly progressive neuromuscular conditions the 5 year survival on NIV is over 80%.2 In the absence of good epidemiological data on the prevalence of neuromuscular conditions in which NIV is likely to be indicated, it is impossible to predict the demand for this group. However, increasing awareness of the benefits of NIV by these patients and their doctors is likely to lead to more referrals for consideration of NIV. Doctors have become more aware of the obstructive sleep apnoea/hypopnoea syndrome over the last decade, and this may have resulted in more patients with obesity being referred to hospital and coming to the attention of those providing home NIV. The average weight of the UK population is increasing, and an obesity epidemic is likely to mean that patients with obesity/hypoventilation syndrome will be prominent consumers of home NIV services in the future.3 In many countries patients with COPD account for a large proportion of those on home NIV. Trial data are scanty and suggest that the beneficial effects are probably small.4 The numbers of patients with COPD using our service remain small but, if evidence emerges of a long term survival benefit with NIV, this would have large resource implications.5

We have calculated the equipment costs of the service on the assumptions that each ventilator costs £3000, has a life span of 7 years, and that every patient requires two new circuits, masks, and sets of headgear per year at a cost of £250 per patient. To start an average of 8.8 patients on home NIV, in the first year the equipment costs of setting up a home NIV service would be £26 400 for ventilators and £2200 for masks/circuits. After 5 years the new ventilator costs are unchanged, but £11 000 would be required for masks/circuits for the 44 patients at home. After 10 years the ventilator costs double because of the need to replace ventilators over 7 years old, and with 88 patients at home the total cost becomes £74 800.

The equipment costs for a home NIV service are thus substantial. We have not attempted to quantify personnel costs, which are likely to be highly variable between centres, but these will also increase if the Modernisation Agency’s recommendation that this service should be available as an outreach to all hospitals is implemented. In assessing the funding needs of a home NIV service, it should be assumed that the rate of increase in demand is likely to continue, at least in the short term.

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References

Objective: To determine whether GM-CSF can improve the clinical course of PMEM.

Methods: We performed a prospective, open-label, single-arm study of patients with PMEM refractory to corticosteroids and other immunosuppressants. The GM-CSF dose was 250 μg/m² twice daily for 3 months, followed by monthly injections for 6 months. We evaluated clinical and radiological outcomes.

Results: Of 12 patients, 11 completed the study. The mean disease duration from symptom onset to diagnosis was 3.8 ± 1.9 years. Before GM-CSF treatment, patients had a mean annual exacerbation frequency of 2.6 ± 1.4. During GM-CSF treatment, the annual exacerbation frequency was 0.4 ± 0.4 (p < 0.001). Following GM-CSF withdrawal, the annual exacerbation frequency was 1.8 ± 1.2 (p = 0.03). The mean time to relapse after GM-CSF withdrawal was 6.2 ± 3.1 months. During GM-CSF treatment, no patients developed anti-GM-CSF antibodies, and no patient developed GM-CSF-induced side effects.

Conclusions: GM-CSF treatment improved the clinical course of PMEM, and the effects were sustained after withdrawal of the treatment.


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References


Our concerns with this study are twofold. The first is the finding that unexplained recurrent pneumonia is uncommon (seven cases over a 5 year period) whereas insensitivity to tussive stimuli is relatively common in normal healthy volunteers. Indeed, it has been a sufficiently regular occurrence that the majority of cough challenges developed have had to incorporate an in-built method of assigning a theoretical cough threshold to non-coughers. This is usually taken as either the greatest concentration inhaled or the next incremental concentration which would have been inhaled if the test had continued. The proportion of subjects who do not cough will obviously vary between different cough challenge methodologies. In a recent as yet unpublished study the proportion of non-coughing healthy volunteers in our laboratory was approximately 10% with a median of 15.6 µM. Only one subject had a C5 titre of 1000 µM. We are therefore convinced that, when the 15 second tidal breathing method is used, “healthy” subjects rarely fail to respond to the highest concentrations of capsaicin. The different prevalence of non-responders in our laboratory from that of Doherty et al., who also used capsaicin, may be because they adopted a single breath method using a dosimeter. However, a study in 100 healthy volunteers using capsaicin and a dosimeter showed a distribution of C5 similar to ours. We would like to emphasise that, when the results of cough sensitivity tests are analysed, they should be cautiously compared with the results from appropriate controls obtained using exactly the same method, preferably in the same laboratory.

We did not exclude functional immunoglobulin deficiencies which might have been present in our patients. If this had been the case, however, impairment of the cough reflex might have played an additional role in the development of recurrent pneumonia.

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References
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