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The benefits of a home non-invasive ventilation retrieval service: Improved effectiveness and environmental sustainability in challenging times

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Abstract

In the last 6 months, home non-invasive ventilation (NIV) services have faced several unanticipated challenges to their effectiveness and delivery as the result of a 'perfect storm' of the COVID-19 pandemic demands. We developed and delivered an innovative follow-up service, to support home NIV delivery, and improve cost-effectiveness and sustainability during COVID-19. Between Feb-2019 and Nov-2020, 92 post-acute patients were issued with home NIV; 25 (27%) out of the 92 patients had unused NIV machines successfully retrieved. The median (IQR) days of home NIV usage were 207 (98) for patients who had their machines returned. All the unused NIV machines retrieved were within the 5-year working life guaranteed by the manufacturer and were all redeployed after appropriate reconditioning and infection control measures. Without the home-visiting and recycling pilot, we would have relied on patients and families to return the unused machines. Given the expected disruption to NIV machine supply for at least the foreseeable 12–18 months, we feel it is important to get this important message out to other home NIV services urgently. Wider implementation of this novel approach could increase the availability of this vital resource and help meet the current demand on home NIV services.

Keywords

Non-invasive ventilation, COVID-19, respiratory medicine, COPD, sustainability

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Dear editor,

In the last 6 months, home non-invasive ventilation (NIV) services have faced several unanticipated challenges to their effectiveness and delivery as the result of a 'perfect storm' of the COVID-19 pandemic demands, the insulating foam contamination crisis,[1,2] international supply chain restrictions and the global shortage of microchips. This disruption to supply is of course all against a background of increased utilisation of NIV for acute hypercapnic respiratory failure (AHRF) over the past two decades, which has led to increased demands for post-acute admission home NIV (i.e. the cohort of home NIV recipients who have their long-term ventilation commenced upon discharge or within 4 weeks of a hospital admission with AHRF, distinct from elective commencement of home NIV through following up patients

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with ventilatory insufficiency), especially in obesity-related respiratory failure and chronic obstructive pulmonary disease (COPD). The overall effect of these pressures is a temporary relative shortage of NIV devices for home usage against this increasing demand for the service. Developing ways to recycle NIV machines could help to improve the availability of this resource, whilst improving their environmental sustainability by reducing the build and transport of new devices and providing economic advantages of sparing the raw materials to produce ventilator parts.

We know that the clinical effectiveness of long-term home NIV outside of neuromuscular respiratory failure is variable and problems around adherence/compliance have been reported.[3] Furthermore, current cost-effectiveness estimates assume each NIV machine is for individual patient use, that is, a single machine spending its entire working life with one patient without being recycled. Therefore, recycling of NIV machines has a potential to improve cost-effectiveness. Additionally, in view of the current supply challenges, it was beneficial to appropriately recycle the machines to increase machine availability for more patients, which could facilitate earlier discharge from hospital and prevent readmissions.

We established and trialled an innovative home NIV follow-up service to improve effectiveness and sustainability of home NIV by improving the safe retrieval and recycling of home ventilators. The service was initiated during the COVID-19 pandemic in Sep-2020, principally to reduce footfall to outpatients and prevent hospital admissions, and it enabled the home NIV team to proactively review every post-acute NIV machine and recycle the unused ones. Each post-acute home NIV machine issued between Feb-2019 and Nov-2020 from our acute NIV unit was reviewed between Dec-2020 and May-2021. Furthermore, remote monitoring of patient compliance and efficacy was instituted where they had home Wi-Fi facilities and patients consented (over 70% of patients), via the ResMed AirView™ platform. Patients received up to two home visits from a specialist physiotherapist together with a variable number of telephone calls (2–6), prompted by telemonitoring in most cases to enhance compliance.

Between Feb-2019 and Nov-2020, 92 post-acute patients were issued with home NIV; 25 (27%) out of the 92 patients had unused NIV machines successfully retrieved. The aetiology of respiratory insufficiency in these 92 patients was about equally divided between COPD and Obesity (BMI> 35kg/m^2). The entire cohort were admitted with AHRF, due to COPD or obesity, and were difficult to wean with persistent hypercapnia. The median (IQR) days of home NIV usage were 207 (98) for patients whose machines were returned. The 25 NIV machines were not used for the following reasons: nine were not compliant (despite home visits), three remained eucapnic (capillary blood partial pressure of carbon dioxide < 6 kPa; despite not using NIV), one was not suitable (locomotor disability) and 12 patients had died. All the unused NIV machines retrieved were within the 5-year working life guaranteed by the manufacturer and were all redeployed after appropriate reconditioning and infection control measures. Prior to this home-visiting and recycling pilot, the service entirely relied on patients to attend clinics for troubleshooting with the machine with no telemonitoring, and their families/carers to return their ventilators if they were deceased or unable to use the ventilator. Snapshot historic data from Apr 2011 to Mar 2013 showed that there were 54 post-acute home NIV machines issued (fewer than the period included in the pilot). Furthermore, in the subsequent 2-year period (by Mar 2015), only seven NIV machines were returned.

This pilot has demonstrated that a recycling service may be beneficial in successfully returning and reusing used NIV machines. Given the expected disruption to NIV machine supply for at least the foreseeable 12–18 months, we feel it is important to get this important message out to other home NIV services urgently. Further rigorous longitudinal evaluations are planned to assess the cost-utility of this service and precisely quantify its contribution to cost-effectiveness of home NIV and environmental sustainability by reducing wastage of non-renewable resources. Wider implementation of this novel approach facilitated by telemonitoring could increase the availability of this vital resource and help meet the current demand on home NIV services.

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