



June 22, 2020

Tara Hall
MEDCAC Coordinator
Centers for Medicare and Medicaid Services
7500 Security Boulevard
Baltimore, MD 21244

RE: Comments on CMS-3395-N, Medicare Program; Virtual Meeting of the Medicare Evidence Development and Coverage Advisory Committee – July 22, 2020

Dear Ms. Hall:

ResMed appreciates the opportunity to provide comments in response to the Medicare Evidence Development and Coverage Advisory Committee (MEDCAC) meeting focusing on the state of evidence on the home use of noninvasive positive pressure ventilation (NIPPV) in patients with chronic respiratory failure (CRF) consequent to chronic obstructive pulmonary disease (COPD). We appreciate the Centers for Medicare and Medicaid Services (CMS) convening this committee meeting to develop a comprehensive understanding of the best available clinical evidence to guide prescribing and usage of these life-enhancing devices for Medicare beneficiaries. Our comments are intended to support CMS' efforts by emphasizing the importance of the clinical relationship between the range of ventilation technology that provide NIPPV therapy.

ResMed is a global leader in connected care, delivering innovative technology to improve quality of care, promote therapy adherence, and decrease health care costs. ResMed manufactures cloud-connected durable medical equipment (DME) used to diagnose and treat sleep apnea, COPD, and other chronic diseases. More than 11 million patients worldwide are remotely monitored at home with ResMed cloud-connected devices and more than 2 million patients use myAir™, a ResMed patient engagement mobile application.

ResMed makes the following general recommendations regarding the process: [1] CMS should ask MEDCAC to consider the full spectrum of devices and clinical indications and adopt appropriate policy to address both, and [2] CMS should allow for submission of additional comments beyond the June 22 deadline from the respiratory community so that all clinical considerations are reviewed.

In addition, ResMed makes the following specific recommendations for MEDCAC consideration: [1] The selection criteria needs to address all patient types and all device types to develop a comprehensive and clinically appropriate coverage policy, [2] Recent evidence and guidelines, particularly recommendations from the GOLD 2020 report¹ and the 2019 ERS guidelines² should be considered as state of the art in clinical practice, [3] The technology innovations incorporating remote monitoring capabilities, combined with physician oversight should be considered in MEDCAC's discussion, and [4] Patient usage criteria should not be included in recommendations for NIPPV coverage policy.

¹ Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease.

² Ergon, Begum, et al. "European Respiratory Society Guidelines on Long-Term Home Non-Invasive Ventilation for Management of COPD." *European Respiratory Journal*, vol. 54, no. 3, 2019, p. 1901003., doi:10.1183/13993003.01003-2019.

I. Recommendation: MEDCAC Should Consider the Full Spectrum of Technology Solutions Available for a Broad Range of Clinical Scenarios

Medicare policy currently covers ventilators, both positive and negative pressure types, for the treatment of neuromuscular diseases, thoracic restrictive diseases, and chronic respiratory failure consequent to COPD. The relationship between bi-level devices (identified as Respiratory Assist Devices (RADs) by CMS) for treatment of respiratory insufficiency and home mechanical ventilators for treatment of chronic respiratory failure are inextricably linked. Comprehensive national coverage policy should address all devices (bi-level devices and home mechanical ventilators) that provide NIPPV therapy and include coverage guidelines for therapy use for the range of relevant clinical conditions (e.g. neuromuscular disease, restrictive thoracic disorder, COPD, obesity hypoventilation).

Medicare beneficiaries may need a home mechanical ventilator without any previous use of a bi-level device; likewise, some Medicare beneficiaries may never require full home mechanical ventilation and a bi-level device is sufficient. There is also a portion of the Medicare population that experiences a shift in the level of mechanical support needed as their illness(es) progress. This is a complicated area of medical practice and therefore, the broad range of clinical scenarios and coverage policies must be considered in totality to ensure patients have access to the right device at the right time as determined clinically appropriate by the physician.

The types of NIPPV devices noted below vary in terms of technical features and settings, clinical oversight required by the treating physician, support services that include monitoring of settings and safety alarms, and service and preventive maintenance necessary to ensure proper function. Approved clinical indications differ between these device types, with home mechanical ventilators (HMs) indicated for patients with respiratory failure, bi-level positive airway pressure (BPAP) indicated for respiratory insufficiency, and continuous positive airway pressure (CPAP) indicated for OSA. Patients with progressive respiratory disorders require advanced ventilatory capabilities as their disease progresses. Selection and administration of NIPPV devices in an efficient, evidence-based manner—as directed by clinicians—is important in striking an optimal balance between quality and effectiveness of care and cost.

As a leading manufacturer of innovative NIPPV technology, we respectfully provide clarifying points (as sub-bullets) to the definitions provided by CMS to MEDCAC in the panel voting questions as they do not take into account nuances we believe are material in reviewing the use of NIPPV in different patient populations.

a. HMV: *A machine capable of delivering pressure targeted, volume targeted, and/or volume preset ventilation outside of the hospital setting. HMs are usually the machine of choice for patients with tracheostomy, but may also be used in patients via a noninvasive interface such as a facemask. Compared to BPAP machines, HMs typically have additional monitoring, ventilator control, safety, and backup power features.*

- A machine capable of delivering pressure or volume ventilation and, in some cases, dual modes of therapy like pressure targeted, volume guarantee modes of ventilation. HMs are capable of both invasive and non-invasive ventilation and typically have additional monitoring, safety alarms, backup power features and capabilities. HMs promote effective gas exchange in the lungs of patients who are unable to maintain ventilation spontaneously. These devices are generally utilized in patients with respiratory failure and patients may be

fully dependent on therapy as a means to sustain life. Patients with chronic respiratory failure experience significant quality of life improvements as these devices have the life-giving effect of “freeing” patients from their hospital beds and returning home, avoiding health risks associated with institutional settings, and allowing patients to make end of life decisions at home. These devices require regular maintenance and servicing. In accordance with section 1834 of the Social Security Act, ventilators are classified as a device requiring “frequent and substantial servicing” in order to avoid risk to the patients’ health.³ Unlike other categories of DME, separate payment for essential clinical services, service and maintenance of the device, and supplies is not available. Clinical services required to support these patients are provided by licensed or registered respiratory therapists who provide in-home care to set-up the patient on the device and educate both the patient and caregiver on the use of the device. The respiratory therapist will also visit the patient at home to adjust the device settings as the condition evolves and at the direction of a physician, and perform routine check-ins to reduce risk of exacerbation.

- b. BPAP:** *A device that delivers two levels of positive airway pressure. On inspiration, the machine delivers an inspiratory positive airway pressure (IPAP). On expiration, the machine delivers an expiratory positive airway pressure (EPAP).*
 - Bi-level devices without a backup rate deliver adjustable, variable levels of positive pressure via tubing and a noninvasive interface. Bi-level devices with backup include a timed backup feature to deliver air pressure when sufficient spontaneous inspiratory efforts fail. These devices will often have limited alarms, monitoring and safety features and are intended for non-dependent, spontaneously breathing patients. Leading manufacturers, including ResMed, offer remote monitoring technology that enable the care provider and physician to monitor the patient’s condition and remotely adjust settings as necessary to provide robust clinical support.
- c. CPAP:** *A machine that delivers a single level of positive airway pressure throughout the entire respiratory cycle (inspiration and expiration).*
 - CPAP devices provide a constant airway pressure intended to splint the upper airway. These devices are the standard of care for treatment of OSA patients to maintain airway patency and improve sleep-related symptoms and quality of life.⁴ CPAP devices generally have limited backup power options, limited monitoring and limited safety features as they are intended for treatment of OSA only. CPAP patients are non-dependent, spontaneously breathing patients. Leading manufacturers, including ResMed, offer remote monitoring technology that enable the care provider and physician to monitor the patient’s condition and remotely adjust settings as necessary to provide robust clinical support.

It is important for the MEDCAC’s analysis to recognize that ventilation therapy is used to treat a spectrum of patients including those with neuromuscular diseases, COPD, and other hypoventilatory syndromes that show progressive impact on the patient, thus requiring the clinician to anticipate respiratory failure in each patient. Additionally, the respiratory support needs of these patients may vary depending on environmental factors, activity levels, comorbidities and progression of disease. Chronic respiratory failure, as defined and documented, occurs across different Medicare populations at different rates and access to different types of equipment specific to the patient is medically reasonable and

³ Paragraph 3 of Section 1834 of the Social Security Act https://www.ssa.gov/OP_Home/ssact/title18/1834.htm

⁴ Patil SP, Ayappa IA, Caples SM, Kimoff RJ, Patel SR, Harrod CG. Treatment of adult obstructive sleep apnea with positive airway pressure: an American Academy of Sleep Medicine clinical practice guideline. *J Clin Sleep Med*. 2019;15(2):335–343.

necessary.⁵ In the past, many patients may have been treated with artificial airways but today the standard of care is to treat with noninvasive ventilation allowing for greater independence, mobility, and care in the home. HMV devices have the unique advantage of having additional modes of ventilation and settings – in particular, additional alarms that can alert care providers in the home – allowing the care provider to apply safe and targeted care for the patient.

While the descriptions for HMV, BPAP, and CPAP provided for the MEDCAC discussion highlight the general differences between these device types, there can be considerable variability in clinical application and support features (e.g. supplemental oxygen compatibility, telemonitoring capabilities, and etc.). Some patients may warrant a HMV without any previous use of a bi-level device; and likewise, some may never warrant genuine home mechanical ventilation. There is also a portion of the Medicare population that experiences a shift in need for the level of mechanical support as their illnesses progress. The higher acuity HMV devices have the advantage of being a therapy that can provide ongoing care to patients whose disease progresses. If this type of patient, for example with neuromuscular disease or severe COPD, is required to start on a PAP device, then later must transition to HMV, this transition is not only cumbersome for the continuum of care, but burdens the system with two costs versus one if the clinician is not allowed to initiate treatment on the HMV. These differences inevitably affect a clinician's management approach and overall healthcare costs to the system and outcomes of the patient. As a result, we believe that adopting a step therapy (or “try and fail”) treatment approach as a prerequisite for the use of NIPPV will harm Medicare beneficiaries by interfering with the physician-patient decision-making process.

Further, the value of telemonitoring, in particular, has been made apparent during the current COVID-19 pandemic, and could be important going forward in caring for vulnerable patient populations at risk of rapid deterioration, such as those living with CRF and COPD. With remote monitoring, clinicians and care providers can remotely monitor their patients' respiratory rate and SpO₂,¹ or blood oxygen saturation, two key indicators that should be monitored daily to track changes in a respiratory patient's condition. Amidst the COVID-19 crisis, there are many other patients who rely on ResMed ventilators every day to assist their breathing. A large number of these patients require regular check-ups and support from hospitals, physicians, and homecare providers. To protect patients and medical staff as well as increase the capacity of the health system, innovations such as telehealth and telemonitoring have become critical services that are being embraced by patients, caregivers and clinicians.

This Committee discussion is a significant step towards development of policies that will inevitably affect the quality of care for respiratory patients and lower overall healthcare costs. Although the MEDCAC has been directed to focus on a narrow population that require ventilator support for CRF secondary to COPD, there are varying clinical scenarios that play an important role in the discussion and will inevitably impact a range of other Medicare policies, including the qualification criteria of local coverage determinations (LCDs) for RADs to treat COPD, that will need to be addressed. *CMS should consider expansion of this MEDCAC discussion to include all technology solutions and the impact on all types of patients across clinical settings.*

⁵ National Association of Respiratory Medical Direction of Respiratory Care, CHEST/American College of Chest Physicians and the American Association of Respiratory Care. (2016). A Formal Request for NCD Reconsideration for Home Mechanical Ventilators, including Bi-level Devices.

II. Recommendation: MEDCAC Should Strongly Consider Recent Evidence and Guidelines

Recent scientific knowledge, clinical experience and technological innovations have substantially advanced our understanding of the role of NIPPV in the management of COPD for patients with CRF. The AHRQ technology assessment⁶ and subsequent meta-analysis^{Error! Bookmark not defined.} published in the Journal of the American Medical Association (JAMA) demonstrated improved outcomes for patients with CRF and COPD with NIPPV use, but stated that it remains unclear which PaCO₂ threshold should be used to initiate NIPPV. *We are concerned that the conclusion on the lack of clarity on PaCO₂ threshold for initiation of NIPPV may be due to the equal consideration given to older studies that used different therapy titration strategies and definitions for persistent hypercapnia.* These older studies were generated prior to the pivotal Home Oxygen Therapy (HOT)-Home Mechanical Ventilation (HMV trial),^{7,8} which is the most robust evidence to date on home NIPPV treatment.

COPD causes the progressive deterioration of respiratory function and often leads to intermittent severe exacerbations as the disease advances. The multi-center, open label, parallel-group, randomized controlled HOT-HMV¹⁹ trial investigated the effect of home NIV and oxygen on time to readmission or death in patients with persistent hypercapnia after an acute COPD exacerbation (AECOPD) requiring acute NIV. The trial used bi-level devices with a back-up rate; utilizing a back-up rate can be advantageous to these patients, as it can help alleviate burden on diaphragm muscles and fatigue. It aimed to identify whether this treatment strategy could improve outcomes for this patient group. The study recruited severe COPD patients who had been hospitalized for acute decompensated hypercapnic exacerbation of COPD requiring NIV.

The trial enrolled a total of 64 patients who completed the 12-month study period (28 in the HOT group, 36 in the HOT-HMV group). Both groups received the same standard of care regimen, including number of healthcare touchpoints. Therefore, the only differentiating factor between the two randomized groups was the addition of HMV. Significant effects were seen at six weeks and three months follow-up (which may have been due to 18 patients that crossed over from control group to HOT-HMV group during the study). Over the study period, the adherence to therapy was a positive average of 7.6 hours. There was a 51% reduction in the risk of hospital readmission or death in the arm given NIPPV and oxygen compared to the control arm of oxygen alone over the 12-month follow up period. Median admission-free survival time was 4.3 months in the NIPPV arm compared to 1.4 months for those in the control group of oxygen alone. This translates to an increase of over 90 days in the median time to first event for the NIPPV arm.

The HOT-HMV study should prompt changes in the clinical management of severe COPD patients with chronic respiratory failure following a life-threatening exacerbation. This severely ill patient group currently has few treatment options. The results confirm the value of offering home NIPPV therapy to these patients, a practice already adopted by many expert ventilation centers. They also support the conclusion that home NIPPV should be adopted more widely as part of the therapy strategy for severe hypercapnic COPD patients after hospitalization for AECOPD.

⁶ Agency for Healthcare Research and Quality. Noninvasive Positive Pressure Ventilation in the Home – Final Technology Assessment. 2/4/2020.

⁷ Murphy P et al. Effect of Home Noninvasive Ventilation With Oxygen Therapy vs Oxygen Therapy Alone on Hospital Readmission or Death After an Acute COPD Exacerbation. A Randomized Clinical Trial, JAMA. Published online May 21, 2017. doi:10.1001/jama.2017.4451.

⁸ ResMed supported this trial with devices and a grant. The devices supplied by ResMed were VPAP III STA.

⁹ P. Murphy et al., Effect of Home Noninvasive Ventilation With Oxygen Therapy vs Oxygen Therapy Alone on Hospital Readmission or Death After an Acute COPD Exacerbation. A Randomized Clinical Trial, JAMA. Published online May 21, 2017. doi:10.1001/jama.2017.4451.

Clinical insights generally improve over time through analysis of further studies and their results. Earlier studies did not yet appreciate the importance of vetting this heterogeneous population further to apply NIPPV to those with chronic hypercapnia (and thus, those that would most benefit from NIPPV that supports gas exchange). All-comers in the studies diluted the results, as some patients with acute hypercapnia can recover on their own (no need for long term home NIPPV). The HOT-HMV study explicitly accounted for this in their inclusion criteria. Later studies further define the most appropriate patient population to apply the intervention (for example, COPD with chronic hypercapnia rather than all COPD patients), better define the most appropriate implementation of that intervention (for example, NIPPV using greater levels of pressure support with back-up rate settings rather than low pressure and no back-up rate as well as titrating settings to lower carbon dioxide levels rather than to patient tolerance), and are designed as RCTs rather than earlier observational, more exploratory studies. The MEDCAC should consider results from current studies using current devices in current settings, not outdated data from older studies using older standards of care.

We thus recommend that the MEDCAC discussion place a greater weight on more recent evidence and guidelines, particularly recommendations from the Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2020 report¹⁰ and the 2019 European Respiratory Society (ERS) guidelines¹¹ on long-term home noninvasive ventilation for management of COPD.

III. Recommendation: MEDCAC Should Avoid Recommendations Which Result in Time-Based Criteria

Clinical stakeholders have uniformly criticized length of usage as a criterion in the past because it is too vague and subjective to implement and document. Relying upon it would place beneficiary access at risk. There are patients in disease categories like neuromuscular disease that are dependent on the HMV when asleep and need some of the safety functionality only available on a HMV. There are also patients that need other functionality of the HMV like mouth piece ventilation that is not used when the patient is asleep. For COPD patients after an AECOPD, pulmonary rehabilitation is commonly used and NIPPV can be part of that rehabilitation to help improve their exercise capacity through supporting their ventilation. The evidence is overwhelming that time based criteria do not work for patients. Patient usage criteria should not be included in recommendations for NIPPV coverage policy.

IV. Specific Comments on Questions and Recommendations

As stated above, beyond CRF in COPD, NIPPV is critical in the treatment of thoracic restrictive diseases, neuromuscular diseases, and obesity hypoventilation. All patient populations and corresponding clinical evidence should be strongly considered in this discussion; however, our comments hereinafter pertain only to the use of NIPPV for COPD and should not be extrapolated to the use of NIPPV for other indications.

¹⁰ Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease.

¹¹ Ergon, Begum, et al. "European Respiratory Society Guidelines on Long-Term Home Non-Invasive Ventilation for Management of COPD." *European Respiratory Journal* 1, vol. 54, no. 3, 2019, p. 1901003., doi:10.1183/13993003.01003-2019.

Question 1

*How confident are you that the evidence is sufficient to determine the **patient selection criteria** that will improve health outcomes (e.g. laboratory values, co-morbidities, frequency of exacerbations requiring ER or hospital admission, hospital discharge timing, pulmonary function tests, etc.) when used with any category of home NIPPV device?*

Beyond pharmacological treatment, NIPPV is a critical treatment option used to improve oxygen and carbon dioxide gas exchange. Severe COPD patients with chronic hypercapnia are most likely to experience re-hospitalization after a life-threatening episode of acute onset chronic respiratory failure. These patients are often discharged with a PaCO₂ above 55 mmHg after a decompensated or compensated episode of respiratory acidosis due to COPD exacerbation.¹² The use of home NIPPV can significantly lower the risk of mortality and/or hospital admission for patients with CRF and COPD,¹³ has beneficial effects on quality of life with additional improvements in arterial blood gases, dyspnea and daytime sleepiness,¹⁴ and is associated with a lower risk of recurrent severe COPD exacerbation.¹⁵

Both the 2020 GOLD report and 2019 ERS guidelines have provided recommendations on the patient populations that are likely to benefit from home NIPPV, based on their comprehensive review of available evidence. Notably, these independently-conducted reviews have resulted in similar recommendations, particularly for patients with chronic hypercapnia or pronounced daytime persistent hypercapnia (PaCO₂ ≥ 52 mmHg), recent hospitalization or a history of hospitalization for acute respiratory failure, and COPD and OSA overlap syndrome.^{16, 17}

HMV and BPAP devices are covered under different coverage policies. To appropriately address this question across the spectrum of NIPPV technology, both the national coverage determination (NCD)¹⁸ for HMs and the local coverage determinations (LCDs) must be addressed together.¹⁹ The LCD coverage policies include onerous, unnecessary qualification criteria for the device rather than requiring objective testing that assists in the diagnosis of a respiratory disease (e.g. hypoventilation) patient.

ResMed recommends the selection criteria needs to address all patient types and all device types to develop a comprehensive and clinically appropriate coverage policy. In addition, ResMed is confident in the recent evidence and guidelines, particularly recommendations from the GOLD 2020 report²⁰ and the 2019 European Respiratory Society (ERS) guidelines²¹ on long-term home noninvasive ventilation for management of COPD.

¹² Ergan B, Begum, et al. "European Respiratory Society Guidelines on Long-Term Home Non-Invasive Ventilation for Management of COPD." *European Respiratory Journal*, vol. 54, no. 3, 2019, p. 1901003., doi:10.1183/13993003.01003-2019.

¹³ Wilson ME, Dobler CC, Morrow AS, et al. Association of Home Noninvasive Positive Pressure Ventilation With Clinical Outcomes in Chronic Obstructive Pulmonary Disease: A Systematic Review and Meta-analysis. *JAMA*. 2020;323(5):455-465. doi:10.1001/jama.2019.22343

¹⁴ Tsolaki et al. One-year non-invasive ventilation in chronic hypercapnic COPD: Effect on quality of life. *Respiratory Medicine* (2008) 102, 904–911

¹⁵ Cheung et al. A pilot trial of non-invasive home ventilation after acidotic respiratory failure in chronic obstructive pulmonary disease. *Int J Tuberc Lung Dis* 2010;14:642–649.

¹⁶ Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease—2020 report.

¹⁷ Ergan B, Oczkowski S, Rochweg B, et al. European Respiratory Society guidelines on long-term home non-invasive ventilation for management of COPD. *Eur Respir J*. 2019;54(3):1901003. Published 2019 Sep 28. doi:10.1183/13993003.01003-2019.

¹⁸ §240.5 of NCD Manual p.136 https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/ncd103c1_Part4.pdf

¹⁹ U.S. Centers for Medicare & Medicaid Services. Local Coverage Determination (LCD): Respiratory Assist Devices (L33800)".

²⁰ Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease.

²¹ Ergan, Begum, et al. "European Respiratory Society Guidelines on Long-Term Home Non-Invasive Ventilation for Management of COPD." *European Respiratory Journal*, vol. 54, no. 3, 2019, p. 1901003., doi:10.1183/13993003.01003-2019.

Question 2

How confident are you that the evidence is sufficient to determine the NIPPV equipment parameters necessary to promote successful patient-related outcomes (e.g. decreased mortality, decreased frequency of exacerbations requiring ER or hospital admission, increased time to hospital re-admission for respiratory related disease, and improved physical function and quality of life)?

Ventilator technology has evolved significantly over time from simple devices - with two to three modes of ventilation - to complex and sophisticated digital computer-driven machines with several dozen modes, the ability to remotely monitor patient status on a daily basis, and application that spans from the intensive care unit to a patient's home. Innovative ventilator technology has enabled many patients to be successfully treated with non-invasive therapy when they otherwise would have been treated with invasive ventilation via a tracheotomy. The evolution of this technology has combined advances in technological and mechanical engineering, partnered with our ever-growing understanding of respiratory physiology and clinical management of patients.

Clinical findings support the concept that unloading of the ventilatory muscles with a high mean IPAP and mandatory high respiratory rates can improve alveolar ventilation and reduce hypercapnia.^{22, 23} Thus, an evidence-based clinical decision would be to provide bi-level with back-up therapy for patients with CRF in COPD. Scientific evidence evolves over time, as do clinical decisions that stem from these data. Older studies for treating CRF in COPD failed to see significant positive outcomes for mortality or hospitalization, and a common hypothesis is that the ventilation strategy was insufficient to improve gas exchange.^{24, 25} Later studies built upon these learnings, increasing the pressure settings (IPAP) and including higher back-up rates.^{26, 27} In these more recent studies, we see significant improvements in mortality, quality of life and hospitalizations because of a more robust understanding of treatment. This body of evidence provides further support for the type of ventilation therapy – bi-level with back-up rate – that is most likely to provide patients with increased positive clinical outcomes.

With regard to the question on outcome measures, we agree that the outcomes CMS noted in the question are clinically important measures for this patient population with widely varying presentation of illnesses. In addition to these clinical outcomes, there is also clinical interest in cost outcomes given the growing emphasis on overall resource use and cost-effectiveness. For home NIPPV, there is current evidence to support the cost-effectiveness of using a home ventilator device for the treatment of CRF consequent to COPD in the U.S.²⁸ Following the outcome of the HOT-HMV study,²⁹ an analysis was performed to assess the cost effectiveness of HOT-HMV when compared to HOT alone among COPD patients with

²² W. Windisch. Noninvasive positive pressure ventilation in COPD Breathe Dec 2011, 8 (2) 114-123; DOI: 10.1183/20734735.011511.

²³ Coleman JM 3rd, Wolfe LF, Kalhan R. Noninvasive Ventilation in Chronic Obstructive Pulmonary Disease. Ann Am Thorac Soc. 2019;16(9):1091-1098. doi:10.1513/AnnalsATS.201810-657CME.

²⁴ Clini E, Sturani C, Rossi A, et al. The Italian multicentre study on noninvasive ventilation in chronic obstructive pulmonary disease patients [published correction appears in Eur Respir J. 2002 Dec;20(6):1617]. Eur Respir J. 2002;20(3):529-538. doi:10.1183/09031936.02.02162001.

²⁵ Struik FM, Sprooten RT, Kerstjens HA, et al. Nocturnal non-invasive ventilation in COPD patients with prolonged hypercapnia after ventilatory support for acute respiratory failure: a randomised, controlled, parallel-group study. Thorax. 2014;69(9):826-834. doi:10.1136/thoraxjnl-2014-205126.

²⁶ Köhnelein T, Windisch W, Köhler D, et al. Non-invasive positive pressure ventilation for the treatment of severe stable chronic obstructive pulmonary disease: a prospective, multicentre, randomised, controlled clinical trial. Lancet Respir Med. 2014;2(9):698-705. doi:10.1016/S2213-2600(14)70153-5.

²⁷ Murphy PB, Rehal S, Arbane G, et al. Effect of Home Noninvasive Ventilation With Oxygen Therapy vs Oxygen Therapy Alone on Hospital Readmission or Death After an Acute COPD Exacerbation: A Randomized Clinical Trial. JAMA. 2017;317(21):2177-2186. doi:10.1001/jama.2017.4451.

²⁸ G.J. Criner, Q. Gu, P.B. Murphy, L. Fusfeld, B. Brueggemann, T. Goss, and N. Hart. Cost-Effectiveness of Home Oxygen Therapy-Home Mechanical Ventilation (HOT-HMV) for Treatment of Chronic Obstructive Pulmonary Disease (COPD) with Chronic Hypercapnic Respiratory Failure Following an Acute Exacerbation of COPD in the United States (US). A102.May 1, 2018, A2518-A2518.

²⁹ Murphy P et al. Effect of Home Noninvasive Ventilation With Oxygen Therapy vs Oxygen Therapy Alone on Hospital Readmission or Death After an Acute COPD Exacerbation. A Randomized Clinical Trial, JAMA. Published online May 21, 2017. doi:10.1001/jama.2017.4451.

persistent hypercapnia after a life-threatening exacerbation in the United States.³⁰ An incremental cost-effectiveness ratio (ICER) was calculated based on the total cost of each intervention relative to the respective quality adjusted life year (QALY). QALY is a year of life adjusted for quality of life due to an intervention. The base-case ICER was negative \$50,856 per QALY, which means in comparison to HOT alone HOT-HMV is both more effective and cost saving, a dominant therapy strategy. This analysis demonstrates that the probability of HOT-HMV saving costs and improving quality of life is 76%. The combined outcomes of the HOT-HMV trial and the cost-effectiveness analysis show that home oxygen therapy plus home mechanical ventilation is both clinically efficacious and cost-effective.

ResMed is completely confident that the most recent studies using modern devices demonstrate that current NIPPV devices are cost effective and improve patient outcomes.

Question 3

*How confident are you that any improved patient-related outcomes noted above made with any type of NIPPV device in the home, can be attributed to the **use of the equipment alone** as opposed to the **concomitant provision of other support services** like home respiratory therapists, home medication reconciliation and repeated elective hospital admissions?*

Randomized controlled trials are designed to reduce the likelihood that any benefits or risks identified in the trial occur due to factors outside of the experimental treatment. In the case of the NIPPV randomized controlled trials listed in the table below, the main difference between the intervention and control arms is that the intervention arm received NIPPV, and all other aspects of care (including concomitant provision of other support services) were held constant across both groups. Thus, the results from these trials provide a **high** level of confidence that any observed improvements in patient-related outcomes can be attributed to the use of the relevant NIPPV device alone as opposed to the concomitant provision of other support services.

Randomized controlled trials	Intervention	Improved patient-related outcomes
McEvoy et al. 2009 ³¹	NIV plus long-term oxygen therapy (LTOT) versus LTOT alone	Improved survival
Kohnlein et al. 2014 ³²	NPPV versus standard treatment	Improved survival
Murphy et al. 2017 ³³	Home NPPV plus oxygen therapy vs. oxygen therapy alone	Improved survival Reduced hospital readmission

With that said, however, ResMed believes that the care coordination and medical management provided by respiratory support services are essential to ensuring continuum of care. CRF and COPD are complex conditions that require expert care and monitoring. Home telemonitoring technology now allows care

³⁰ Murphy PB et al. Cost-Effectiveness of Home Oxygen Therapy-Home Mechanical Ventilation (HOT-HMV) for the Treatment of Chronic Obstructive Pulmonary Disease (COPD) with Chronic Hypercapnic Respiratory Failure Following an Acute Exacerbation of COPD in the United Kingdom (UK). American Journal of Respiratory and Critical Care Medicine 2018;197:A2517.

³¹ McEvoy RD, Pierce RJ, Hillman D, et al. Nocturnal non-invasive nasal ventilation in stable hypercapnic COPD: a randomised controlled trial. Thorax. 2009;64(7):561-566. doi:10.1136/thx.2008.108274.

³² Köhnlein T, Windisch W, Köhler D, et al. Non-invasive positive pressure ventilation for the treatment of severe stable chronic obstructive pulmonary disease: a prospective, multicentre, randomised, controlled clinical trial. Lancet Respir Med. 2014;2(9):698-705. doi:10.1016/S2213-2600(14)70153-5.

³³ Murphy PB, Rehal S, Arbane G, et al. Effect of Home Noninvasive Ventilation With Oxygen Therapy vs Oxygen Therapy Alone on Hospital Readmission or Death After an Acute COPD Exacerbation: A Randomized Clinical Trial. JAMA. 2017;317(21):2177-2186. doi:10.1001/jama.2017.4451.

teams to oversee patients' clinical data remotely and therefore at a lower cost, on a daily basis. As telemedicine becomes a more integrated part of many patients' therapy, particularly following the COVID-19 global health crisis, we find it important to highlight examples of how telemonitoring capabilities used alongside NIPPV therapies can benefit patients. Real-world evidence on using NIPPV in stable hypercapnic COPD patients has highlighted the benefits of telemonitoring for home ventilation. Clinicians can recognize problems, and are able to intervene quickly to address such issues as titration or mask leak remotely, which leads to better outcomes and lower costs. More recently, a randomized controlled trial demonstrated that home initiation of NIPPV, with the use of telemedicine and telemonitoring, was no less effective to in-hospital initiation in stable hypercapnic COPD patients and reduces costs by over 50%.³⁴ We thus believe it is important to consider the advancements brought to clinical care by telemedicine and its impact on the overall care management approach and healthcare costs to the system.

ResMed is highly confident that the use of modern NIPPV devices incorporating modern remote monitoring capabilities, combined with physician oversight via telemedicine, will help patients who are suffering from debilitating diseases and will save money for CMS.

Question 4

*How confident are you that the evidence is sufficient to provide the **patient usage parameters** that are necessary to achieve the successful patient outcomes in Q2?*

ResMed is concerned that Question 4 is framed in an unnecessarily restrictive manner, because defining patient usage parameters necessary to achieve successful patient outcomes suggests that a one-size-fits-all approach exists—it doesn't. It would be clinically inappropriate to presume that there is a standard amount of pressure, time, or other features of therapy applicable to all Medicare beneficiaries. The reality is that CRF consequent to COPD has disparate causes, and patients are heterogeneous in their response to treatment. Patient usage parameters will vary depending on their clinical manifestations, disease progression, and underlying comorbidities. Clinicians must have the ability to choose appropriate equipment for each patient. COPD is a chronic disease that worsens over time; a patient's needs will change over time.

Notably, both the 2020 GOLD report and 2019 ERS guideline—the most comprehensive studies of the use of NPPV with these patients—do not provide recommendations on the patient usage parameters necessary to achieve the successful patient outcomes. In the absence of evidence that a one-size-fits-all approach exists for this patient population, defining patient usage parameters will unnecessarily limit patient access to treatments without improving outcomes.

There is not sufficient evidence to indicate patient usage parameters are appropriate to achieve successful patient outcomes and clinical stakeholders have uniformly criticized length of usage as a criterion. Relying upon patient usage parameters would place patients at risk and interfere with clinical decision making.

³⁴ Duiverman ML, Vonk JM, Bladder G, et al. Home initiation of chronic non-invasive ventilation in COPD patients with chronic hypercapnic respiratory failure: a randomised controlled trial. *Thorax*. 2020;75(3):244-252. doi:10.1136/thoraxjnl-2019-213303.

Conclusion

ResMed appreciates the convening of the MEDCAC to assess and provide recommendations on the home use of NIPPV in patients with CRF consequent to COPD.

We believe strongly that this conversation should take into account the broader patient populations and clinical scenarios to appropriately assess this topic and allow sufficient time for a robust response from the clinical and patient communities.

MEDCAC should strongly consider recent evidence and guidelines, particularly recommendations from the GOLD 2020 report³⁵ and the 2019 ERS guidelines³⁶ as state of the art in clinical practice that should be entitled to great weight. The use of modern NIPPV devices incorporating modern remote monitoring capabilities, combined with physician oversight via telemedicine, will help patients who are suffering from debilitating diseases and will save money for CMS. Finally, patient usage criteria should not be included in recommendations for NIPPV coverage policy.

We thank CMS and the MEDCAC for the opportunity to comment on this important topic. Please contact Larissa D'Andrea at Larissa.DAndrea@ResMed.com or (858) 836-6837 with any questions.

Sincerely,



Carlos M. Nunez, M.D.
Chief Medical Officer
ResMed

³⁵ Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease.

³⁶ Ergan, Begum, et al. "European Respiratory Society Guidelines on Long-Term Home Non-Invasive Ventilation for Management of COPD." European Respiratory Journal, vol. 54, no. 3, 2019, p. 1901003., doi:10.1183/13993003.01003-2019.