

## **Nightingale Virtual Respiratory Care**

### **Significantly Improved Outcomes for Asthma and COPD**

#### **Introduction:**

This paper:

1. Elucidates the need for improvement in respiratory care for asthma and COPD beyond devices and monitoring, towards hyper-personalization based on individual needs.
2. Highlights the issues affecting scaling of interventional efforts for asthma and COPD.
3. Provides results of our Nightingale Virtual Respiratory Care Program, demonstrating the clearly improved outcomes as measured by clinically validated tools, and the testimonials of members themselves.

#### **Background**

##### **Increased adaptation on many levels:**

For a long time, studies have shown that patients living with chronic diseases can experience a process of behavioral, functional, and psycho-social adaptation to their limitations over time.<sup>1</sup> Consider that a person breathes an average of 22,000 times per day and that it is rare to sustain thinking about breathing for any appreciable time frame. Subsequently it would be very difficult for us to work on anything else if breathing involved conscious effort or at the very least required us to be aware of it happening. Patients with asthma and COPD go a step further and develop sub-conscious adaptations to accommodate for decreased breathing capacity, to the point where they may be insensitive to changes in breathing that may alert them to worsening conditions.

The healthcare system needs to do much more to help these patients and while medication can help reduce exacerbation in asthma and COPD the healthcare system is unable to support these patients as they require assistance far beyond medication.

##### **Asthma – Expensive, No Meaningful Movement in Outcomes:**

With 25 million Americans suffering from asthma, the daily asthma attack rate is upwards of 44k per day. An asthma management plan could significantly reduce this occurrence and despite being in existence for numerous decades, the statistics around asthma are continuing to worsen.

A critical component of optimizing asthma control is the engagement of patients as active participants in their asthma management. Motivated and well-informed patients can assume a great deal of control over their asthma care, but few have even received basic asthma education. In fact, education on asthma self-management (ASME) is part of the CDC's 6 | 18 Initiative, targeting six common and costly health conditions with 18 proven interventions.<sup>2,3</sup> Several studies involving diverse cohorts, including Medicaid and Medicare populations, have shown that patient education decreases hospitalizations, minimizes asthma exacerbations,

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1 Livneh H, Wilson LM, Duchesneau A, et al. Psychosocial adaptation to epilepsy: the role of coping strategies. *Epilepsy Behav.* 2001;2(6):533–544. doi:10.1006/ebbeh.2001.0284 - [DOI](#) - [PubMed](#)

2 Education on Asthma Self-Management. Published online December 1, 2020. <https://www.cdc.gov/asthma/exhale/as-me.htm>

3 CDC's 6 | 18 Initiative: Accelerating Evidence into Action. Published online October 4, 2018. <https://www.cdc.gov/sixteen/index.html>

and improves daily function.<sup>4,5,6</sup> However, programs requiring frequent, in-person consultations are not scalable and have continuously failed to engage an adequate number of patients to have a broad-based impact.

### **COPD co-morbidities and attendant issues:**

Patients with COPD often present with clinical co-morbidities, but psychosocial and neuropsychological problems are also frequent.<sup>7</sup> In particular, approximately 74% of persons with COPD are current or former smokers, while others may have developed COPD with no known cause.

Typically diagnoses of COPD occur after the age of 45. Most COPD patients are, in fact, seniors. There are a variety of learned behaviors and adaptations that need to be addressed in totality to ensure successful outcomes.

### **Improved outcomes driven by self-management education:**

Many studies show that a whole health approach involving COPD self-management education results in improved outcomes, improved health-related quality of life (HRQoL). Nonpharmacological interventions complement pharmacological therapy and enhance outcomes. Aside from pharmacological treatment, the consensus for COPD management emphasizes offering comprehensive pulmonary rehabilitation including patient education, exercise training, psychosocial support, and nutritional intervention.<sup>8</sup>

The psychological construct that increased HRQoL and reduced impairment drives improved adherence is true for people with COPD – when patients see meaningful results and experience tangible improvement, they are more willing to engage in behaviors that perpetuate those results. Sometimes they need help to draw the conclusion about what is causing the improvements.

### **Health Care Originals' Nightingale Virtual Respiratory Care Program Description and Outcomes:**

Our virtual care platform, Nightingale, is a Virtual Respiratory Care Program that demonstrates meaningful improvement in outcomes by providing patients/members with individualized combinations of self-management education, unparalleled insights from ADAMM - our proprietary wearable device and app, dedicated respiratory therapists and wellness coaches.



HCO's proprietary ADAMM wearable – the world's first ambulatory cough monitor

4 Bailey WC, Richards JM, Brooks CM, Soong SJ, Windsor RA, Manzella BA. A randomized trial to improve self-management practices of adults with asthma. *Arch Intern Med.* 1990;150(8):1664-1668.

5 Worsnop CJ, McDonald CF. Asthma self-management with regular support reduces health care use and improves QoL at 8 mo. *Ann Intern Med.* 2020;173(12):JC67. doi:10.7326/ACPJ202012150-067

6 Castro M, Zimmermann NA, Crocker S, Bradley J, Leven C, Schechtman KB. Asthma intervention program prevents readmissions in high healthcare users. *Am J Respir Crit Care Med.* 2003;168(9):1095-1099. doi:10.1164/rccm.200208-877OC

7 Pierobon A, Sini Bottelli E, Ranzini L, Bruschi C, Maestri R, Bertolotti G, Sommaruga M, Torlaschi V, Callegari S, Giardini A. COPD patients' self-reported adherence, psychosocial factors and mild cognitive impairment in pulmonary rehabilitation. *Int J Chron Obstruct Pulmon Dis.* 2017;12:2059-2067 <https://doi.org/10.2147/COPD.S133586>

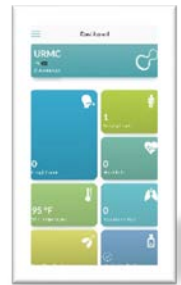
8 Labrecque M, Rabhi K, Laurin C, et al. Can a self-management education program for patients with chronic obstructive pulmonary disease improve quality of life? *Can Respir J.* 2011;18(5):e77-e81. doi:10.1155/2011/263574

In addition, Nightingale provides accommodation for SDOH related to health care access for everyone and a health outcome factors-based program within which Nightingale is implemented. In contrast with traditional, in-person consultations, Nightingale provides convenient at-home patient education with repeated, ongoing check-ins.

### Nightingale – the necessary complement to pharmacological therapy

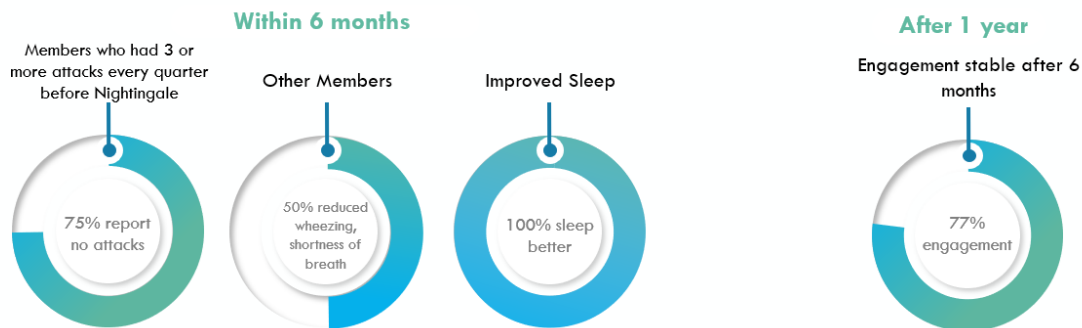
Nightingale as described embodies the tenets established as being necessary beyond pharmacological treatment and includes:

- Enhanced self-monitoring – patients understand their **leading indicator** data in more detail through ADAMM.
- We facilitate daily airway clearance through provision of OPEP devices.
- Self-management education – tips, education delivered in a variety of ways that are patient-friendly, easy to understand.
- Respiratory therapists provide clinical insight to patients.
- Life coaches address some psychosocial issues, helping patients to visualize life goals that drive increased adherence as they are realized.



HCO's App

### Nightingale delivers differentiated results quickly, keeping patients engaged



- 75% of the most uncontrolled members, characterized by 3 or more exacerbations in the quarter immediately preceding Nightingale program start, report no attacks within 6 months.
- 50% of the other members report reduced wheezing, shortness of breath.
- 100% of members report better sleep. Better sleep = better performance = better outcomes.

These results, which are tangible to members, drive engagement such that it stabilizes after 6 months.

Provider-driven asthma and COPD intervention programs typically show ROI of \$1.90 - \$20 per \$1 invested. These programs are not scalable, are overly clinical focused and take a long time to show impact (1 – 4 years). Nightingale is scalable, whole-person focused and demonstrates meaningful impact from as early as 3 to 6 months.

## Nightingale outcomes deemed clinically efficacious using validated tools

One measurement of asthma and COPD impairment is the St. George's Respiratory Questionnaire (SGRQ), which measures overall health, daily life, and perceived well-being. We use the St. Georges Respiratory Questionnaire (SGRQ) for mapping progress of our members over time. SGRQ has been shown to be predictive of COPD outcomes.<sup>9</sup>

SGRQ is a disease-specific instrument designed to measure impact on overall health, daily life, and perceived well-being in patients with obstructive airways disease such as COPD. Scores range from 0 to 100, with higher scores indicating more limitations.

SGRQ is separated into a Symptom score, an Activity score, and an Impact score. The Symptoms component reflects frequency and severity. The Activities score reflects how activities cause or are limited by breathlessness. Impact components (social functioning, psychological disturbances resulting from airways disease) reflect well on quality of life.

A clinically significant change for the patient is consistently around 4 units.<sup>10</sup> For context, mepolizumab (a biologic drug approved in 2015 for a certain phenotype of severe, uncontrolled asthma) accounted for an improvement in SGRQ of -5.3 points and -6.2 points in recent clinical trials.<sup>11</sup>

According to the American Thoracic Society, for the SGRQ a mean change of:

- 4 units is associated with slightly efficacious treatment,
- 8 units for moderately efficacious change and
- 12 units for very efficacious treatment<sup>12,13</sup>

**6-month data from Nightingale users reveals an improvement in SGRQ of -11 to -20 points.**

Nightingale's SGRQ results show that we are clinically efficacious in limiting impairment.

<sup>9</sup> **Citation:** Müllerova H, Gelhorn H, Wilson H, et al. St George's Respiratory Questionnaire score predicts outcomes in patients with COPD: Analysis of individual patient data in the COPD Biomarkers Qualification Consortium Database. *Chronic Obstr Pulm Dis.* 2017; 4(2): 141-149.

doi: <http://doi.org/10.15326/jcopdf.4.2.2017.0131>

<sup>10</sup> Jones PW. Interpreting thresholds for a clinically significant change in health status in asthma and COPD. *Eur Respir J.* 2002;19(3):398-404. doi:10.1183/09031936.02.00063702

<sup>11</sup> Nelsen LM, Cockle SM, Gunsoy NB, et al. Impact of exacerbations on St George's Respiratory Questionnaire score in patients with severe asthma: post hoc analyses of two clinical trials and an observational study. *J Asthma Off J Assoc Care Asthma.*

<sup>12</sup> Jones PW and the Nedocromil Sodium Quality of Life Study Group. Quality of life, symptoms, and pulmonary function in asthma: long-term treatment with nedocromil sodium examined in a controlled multicenter trial. *Eur Respir J* 1994, 7:55-62

<sup>13</sup> Jones PW. Interpreting thresholds for a clinically significant change in health status in asthma and COPD. *Eur Respir J.* 2002 Mar, 19(3):398-404

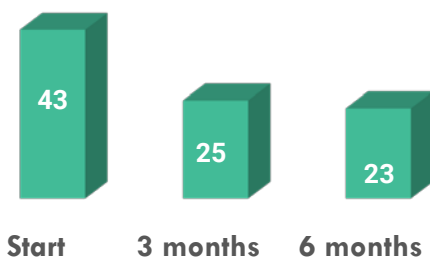
### Total SGRQ Score



We focus first on ensuring that patients are aligned with a life goal and see results in 3 months.

The sharp decrease in SGRQ score within the first 3 months is key. Patients understand quickly that Nightingale works for them, which results in sustained adherence and ongoing compliance.

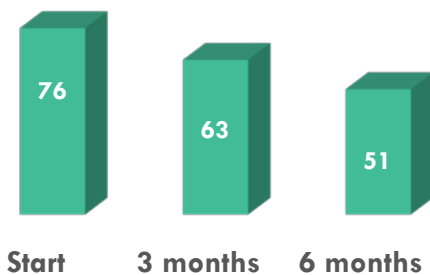
### Improvement in HRQoL



Quality of life is perhaps the major contributor from a psychosocial perspective and is what drives this significant improvement in HRQoL (Health-Related Quality of Life) within the first 3 months.

Because patients see results in areas meaningful to them, **results are sustained.**

### Sustained improvement in Symptoms



Improvement in symptoms is driven by increased adherence. **We help patients draw the connection to improved symptoms because of medication adherence.**

**Because we encourage regular airway clearance where applicable, medicines are also more effective.**

We effectively work against the normal psychological barriers – people may not be able to tell independently when something is working, so they stop, or conversely, they may

stop when they feel better, not drawing the connection that they need to continue to comply to feel better.

### Nightingale improves sleep quality

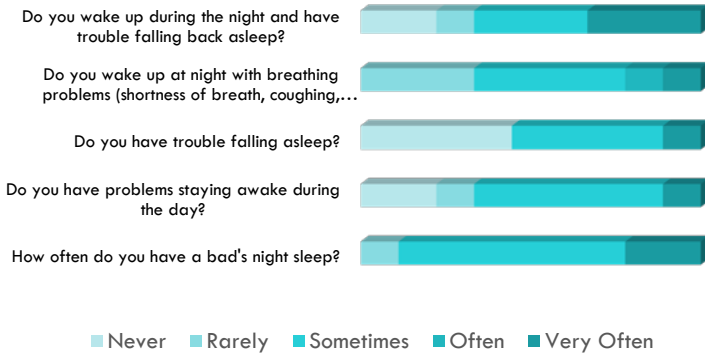
We use the COPD and Asthma Sleep Impact Scale (CASIS) to measure sleep quality of our members. CASIS scores show significant positive correlation with the Medical Research Council (MRC) Dyspnoea Scale.<sup>14</sup> The CASIS instruments is valid and useful in understanding the overall impact of COPD on daily life, fatigue, and sleep impairment in patients with moderate to severe COPD.<sup>15</sup>

<sup>14</sup> Serin EK, Ister ED, Ozdemir A. The relationship between sleep quality and dyspnea severity in patients with COPD. *Afr Health Sci.* 2020;20(4):1785-1792. doi:10.4314/ahs.v20i4.32

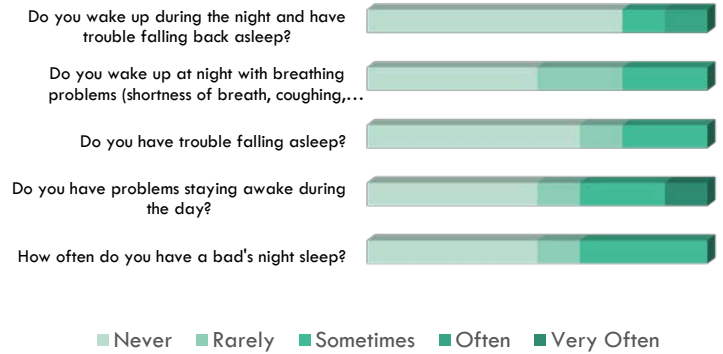
<sup>15</sup> Miravittles M, Iriberrri M, Barrueco M, Lleonart M, Villarrubia E, Galera J: Usefulness of the LCPD, CAFS and CASIS Scales in Understanding the Impact of COPD on Patients. *Respiration* 2013;86:190-200. doi: 10.1159/000341175

Once again, the whole-health approach of Nightingale ensures our members experience improved sleep, which is another key underpinning to improvement in depression and quality of life perception.

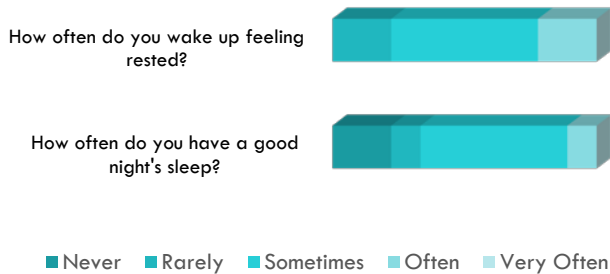
Sleep Problems at Start



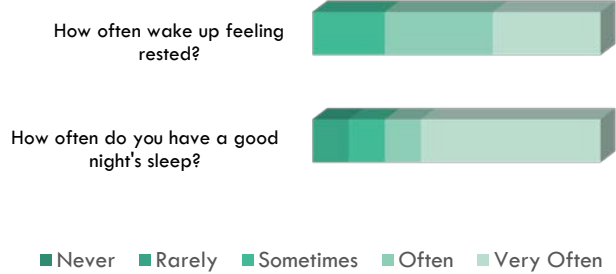
Sleep Problems at 6 Months



Frequency of good restful sleep at start



Frequency of good, restful sleep at 6 months



**Testimonials from our members:**

Although the clinical instruments show it, the best testament to our effectiveness are the words of the members themselves.

*“Working with the Nightingale Program has helped me ensure I take my inhaler regularly. I haven’t missed a dose of medication in weeks now which is not something I could have said in the past. I had the interesting opportunity to express my wellness vision through artwork. I breathe easier having participated in the Nightingale Program.”* **Member with COPD**

*“The Nightingale system has really helped me with clearing my airways – I understand better how to do it and have better results. I like how their Respiratory Therapist engages with me and having them to talk to really helps me to understand my medication and condition better.”* **Member with COPD**

*“The Nightingale program has helped me take care of my health. I have become more aware of my peak flows. Using the app to log my peak flows meant I didn’t have to keep track on paper. Talking to the health coach reminded me about ways to take care of my asthma. My health goal was to have my asthma under control and get back to activities like jogging and singing. I have met ALL my goals!”* **Member with asthma**

*Additional testimonial from this member:*

*Addendum: “I had a follow up appointment with my pulmonologist in January (2022). My pulmonary function tests were improved! My Dr. was impressed by the results and how well I was breathing. I believe the improvement in my breathing and test results are because of my diligence using the tools provided by the Nightingale Program. I’m glad I decided to participate in the Nightingale Program, it has made a positive impact on my quality of life.”*

### **Summary**

Outcome improvement in asthma and COPD needs to be addressed systematically in a scalable manner. Nightingale creates a self-sustaining cycle whereby patients experience tangible outcomes in areas important to them, understand what’s causing the improvement, and continue to adhere to what works because of our coaching, unparalleled leading indicator insights with ADAMM and our flexible touchpoints.

**We welcome the opportunity to work with payers interested in improving outcomes and reducing costs for their COPD and member populations. Contact us:**

**Sharon Samjitsingh**  
[Sharon@healthcareoriginals.com](mailto:Sharon@healthcareoriginals.com)  
**O: 585-471-8215**  
**C: 585-230-5792**

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