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## Adherence To Positive Airway Pressure Therapy With A Structured Patient Adherence Management Program

### Abstract

Telehealth has generated interest in the effort to increase patient adherence to continuous positive airway pressure (CPAP) therapy, as well as reduce the time necessary to reach adherence. A structured patient management program, the Patient Adherence Management Service (PAMS), is a telehealth service that includes the use of personal sleep coaches and respiratory therapists to conduct motivational interviewing, therapy education and support for patients new to PAP therapy.

A retrospective analysis involving new patients from three (3) durable medical equipment (DME) providers (N= 4,383) who were managed in the PAMS program and a control group consisting of new PAP patients not participating in the PAMS program (N= 54,455) from the Philips Resironics' EncoreAnywhere database was conducted to identify differences in adherence rates, hours of use, and time to reach the CMS definition of CPAP compliance.

The analysis revealed that 79.5% of new PAP patients in the PAMS program achieved the CMS definition of CPAP adherence within 90 days, compared to 63.1% in a standard care control group. Further, the same structured patient adherence management program resulted in 65.6% and 74.8% adherence rates at 30 days and 60 days respectively, compared to 50% and 59.2% of patients in the control group ( $p < 0.001$  for both analyses).

Patients included in the PAMS program showed improved adherence rates, higher hours of use, and faster time to meeting the compliance guidelines compared to patients receiving standard care. A structured, consistent approach to patient outreach, coaching, motivation and education is related to better patient therapy adherence and increased use of PAP therapy.

## Background

Adherence to CPAP is less than optimal and can be influenced by patient and disease characteristics, therapy titration procedures, therapy technology and side effects, and psychological and social factors<sup>1</sup>. Adherence to CPAP can be low even in the carefully controlled setting of a clinical trial<sup>2</sup> and has been observed to decline over time with and without structured interventions to improve it<sup>3</sup>.

Several interventions to improve adherence have been evaluated. One study suggested the use of hypnotics during CPAP titration may improve adherence in the first 6 weeks of treatment<sup>4</sup> and another study showed a benefit in adherence when a hypnotic was used for the first two weeks of treatment<sup>5</sup>. Monitoring adherence remotely and contacting patients to address issues (persistent high mask leak, poor adherence, and high residual AHI or high auto-CPAP pressure) resulted in higher adherence than waiting for the patient to come in for clinic visits<sup>6</sup>. Another study used a structured, interactive voice response system to improve CPAP adherence<sup>7</sup>. A recent review paper suggested five steps to maximizing adherence: assessing patient readiness, setting goals and engaging and empowering the patient in their care, maximizing experiences early in the course of treatment, and implementing a planned, proactive, well thought out follow up program<sup>8</sup>. Additionally, involving patients in healthcare decision making improved adherence to medication in patients with asthma<sup>9</sup>.

In an effort to identify an efficient means for increasing patient adherence with CPAP therapy, an evaluation of a structured patient adherence management program, PAMS, for patients with OSA that utilizes telemedicine to affect motivation, therapy education, and coaching, was undertaken. The aim of the study was to compare adherence in a large cohort of patients in the structured patient adherence management program to a random sampling of non-program patients who initiated treatment in the same timeframe.

## Methods

In this retrospective, observational analysis, we evaluated patients from three (3) durable medical equipment (DME) providers who participated in the PAMS program. Elements of the program included the use of a modem to transmit real time therapy information to a secure database (EncoreAnywhere, Philips Respironics, USA) and a team of "CPAP Sleep Coaches" and Respiratory Therapists who reviewed the therapy equipment and followed a defined patient outreach protocol that identified patient issues and either resolved or escalated the issues to a health care provider. The DME set up the patient's device initially and entered patient data in EncoreAnywhere. The CPAP Sleep Coach contacted the participant within the first 5 days of starting treatment as noted in EncoreAnywhere to identify device or other therapy issues. For patients who were struggling with therapy, motivational interviewing techniques<sup>10</sup> focused on the importance of using therapy, confidence in using therapy, and self-efficacy. Subsequent CPAP Sleep Coach contacts were dictated by a structured outreach protocol and with guidance from a proprietary algorithm and the level of adherence presented by the patient. Patients who opted out of therapy, required a prescription change, who could not be contacted, were not using therapy, or who had health issues were referred back to their DME or physician.

Patients included in the analysis were either in the adherence management program or were randomly selected from the EncoreAnywhere database. The control group was randomly selected from EncoreAnywhere and their adherence data were analyzed based on the first day of therapy data in EncoreAnywhere. For this group, the first day of treatment dates were matched to the first day of treatment dates of the PAMS program patients. To be included in the analysis, all patients had to have patient records in EncoreAnywhere for at least 90 days.

### Statistical Methods

Continuous endpoints were compared between the control group and adherence management groups using an independent-samples t-test. Average adherence statistics could only be examined at the 30-day interval, because the wireless modems used to transmit patient usage data to EncoreAnywhere were deactivated for participants who met the CMS adherence criteria by that time point. The Fisher's Exact test compared the percentage of participants achieving CMS adherence at several intervals, ranging from 21 - 90 days. Statistical comparisons were considered significant at  $p < 0.05$ .

### Results

In the PAMS structured adherence management program, there were 4,383 patients who had at least 90 days of data and were contacted within the first five days of being set up in EncoreAnywhere. A control group of 54,455 patients with at least 90 days of data was identified from EncoreAnywhere. All patients initiated treatment between March of 2013 and December of 2014.

Adherence at 30 days was significantly higher in the PAMS group with respect to average hours of use on all days ( $5.3 \pm 2.4$  vs.  $4.4 \pm 2.7$  hrs./night,  $p < 0.001$ ), on days used, percent of days used and days with four or more hours of use (Table 1).

**Table 1:** Adherence Analysis

		Mean	± Standard Deviation	Median	p-value*
Adherence, All Days (Hours/Night)	Control Group	4.4	2.7	4.8	$p < 0.001$
	Adherence Management Group	5.3	2.4	5.6	
Adherence, Days Used (Hours/Night)	Control Group	5.2	2.5	5.6	$p < 0.001$
	Adherence Management Group	5.8	2.1	6.0	
Percent of Days Used	Control Group	74.0	32.8	90.3	$p < 0.001$
	Adherence Management Group	86.2	22.7	96.8	
Percent of Days with $\geq 4$ hours of use	Control Group	57.6	36.2	67.7	$p < 0.001$
	Adherence Management Group	70.2	30.8	80.6	

\*Independent-Samples t-test

Adherence data were analyzed to determine the proportion of participants in each group who meet adherence requirements implemented by the Center for Medicare Services (CMS). Adherence was analyzed at 21, 30, 60, and 90 days of treatment for both groups to determine the proportion of participants who averaged at least 4 hours of use per night on at least 70% of the nights (Table 2). At each interval, the PAMS group had a greater proportion of patients who met the CMS requirements for adequate adherence.

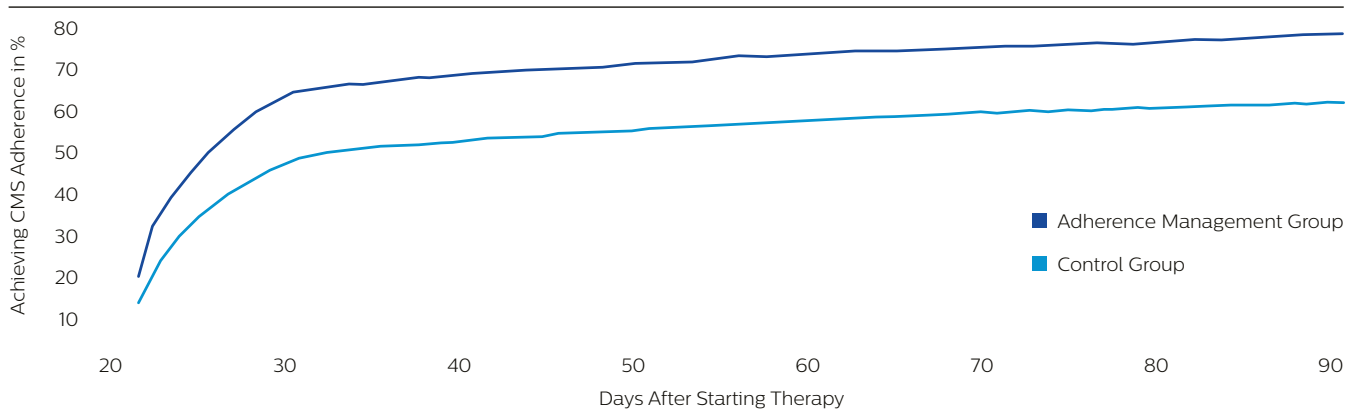
**Table 2:** CMS Adherence Analysis

	% Meeting CMS Criteria at:			
	21 days	30 days	60 days	90 days
Control Group	15.3%	50.0%	59.2%	63.1%
Adherence Management Group	21.8%	65.6%	74.8%	79.5%
p Value*	$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$

\*Fisher's Exact Test

Figure 1 shows adherence for both groups over 90 days of treatment. The structured PAMS program consistently had a larger proportion of patients meeting CMS criteria in the first 90 days of treatment.

### CMS Adherence Over Time in %



**Figure 1.** Proportion Meeting CMS Adherence Criteria Days 21 – 90 of Treatment

### Discussion

In this large cohort of patients, adherence was significantly higher with a structured program that proactively contacted all patients and continued to contact patients based upon their adherence compared to patients receiving standard care. Follow up in the first week of treatment, assessing treatment outcomes and immediate resolution of therapy issues have been associated with higher levels of adherence<sup>11</sup>. The PAMS program includes all of these elements. Another adherence program that included promoting self-efficacy and providing patient education<sup>12</sup> resulted in greater adherence than standard care. Adherence in this study is similar to that reported in an evaluation of group social cognitive therapy focusing on goal setting, treatment outcomes and coping<sup>13</sup>. The difference in adherence is similar to another structured program that provided educational intervention by phone<sup>14</sup>.

The consistent and significant differences in the measures of adherence and the significantly higher rates of reaching CMS adherence requirements demonstrate that patients in a triaged, proactive, and structured program (N = 4,383) can achieve higher levels of adherence than that seen in the general 'control group' population (N = 54,455) over a 90 day period. The size of both groups, even though unbalanced, support the generalizability of these findings. The control group population is large enough to represent a spectrum of standard care practices and serves as a good benchmark for comparison against the structured adherence management program.

Because the PAMS program was tailored based on patient reported problems and therapy use, a high level of patient satisfaction should have been seen since patients should have been receiving the right amount of information and support.

There was approximately a 16% higher rate of patients meeting CMS adherence requirements at each interval in the PAMS group compared to the control group. This is slightly lower than what was seen in a retrospective analysis evaluating the impact of the DreamMapper (Philips Respironics, USA) mobile application on adherence. In that analysis, the percentage of patients meeting CMS adherence requirements was approximately 22% higher for those with DreamMapper. The difference may be due to the higher self-motivation displayed by CPAP patients who choose to download and utilize a mobile application versus patients who were placed in the PAMS program by their care provider.

In a recent review of the use of patient technology solutions, patients using the DreamMapper application while participating in the PAMS program were more likely to be adherent than patients not using DreamMapper, participating in the PAMS Program or both. In the conservative analysis, 89% of the patients placed in PAMS program who used the DreamMapper application (5,958 patients) met CMS compliance requirements compared to those not using it and with more hours of use across the 90 day trial period (5.0 +/-2.8).

# Summary

In this large set of data, adherence seen in patients using a structured patient adherence management program was greater than that seen in a randomly selected sample representing a standard care model over a 90 day period. We believe the PAMS program helps engage patients proactively and provides the motivation, coaching and support to improve the speed and rate at which they accept their use of CPAP therapy for OSA.

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