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Enhancing Adherence to Positive Airway Pressure Therapy for Sleep Disordered Breathing

Tonya Russell MD

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Abstract and Introduction

Abstract

Sleep disordered breathing is made up of a group of conditions that include obstructive sleep apnea, central sleep apnea, complex sleep apnea, and sleep-related hypoventilation. Continuous positive airway pressure (CPAP) is the first-line therapy for obstructive sleep apnea. The other forms of sleep disordered breathing require different types of positive airway pressure (PAP). Adherence to PAP can be challenging and affected by multiple factors. Educating the patient regarding the consequences of untreated sleep disordered breathing and the benefits of PAP is the first step in improving adherence. Attention to social, psychological, and demographic factors that may contribute to difficulty complying is important. Addressing side effects such as nasal symptoms and equipment usability issues is also beneficial. Compliance can be monitored by the data download cards present in PAP machines, but clinicians must be aware of the limitations of the data obtained. The challenges of improving adherence occur along with the increasing need to demonstrate to payers a patient's adherence to and benefit from PAP therapy.

Introduction

Obstructive sleep apnea (OSA) and other forms of sleep disordered breathing have been described in historical and popular literature since the time of Dionysius. Most famously, Charles Dickens described a character with obvious sleep disordered breathing in his book *The Posthumous Papers of the Pickwick Club*.[1] Within the medical literature, Burwell and co-workers coined the term "Pickwickian Syndrome" in 1956 when describing a patient presenting with severe daytime sleepiness, morbid obesity, and heart failure symptoms.[2] Jung and Kuhlo later described neurophysiological studies of patients with "Pickwickian" features who demonstrated recurrent apneas lasting up to 40 seconds during sleep.[3]

Sleep disordered breathing is composed of multiple entities including OSA, central sleep apnea (CSA), and sleep-related hypoventilation. OSA is due to recurrent narrowing of the upper airway during sleep leading to apneas or hypopneas, while CSA is due to a lack of central drive to breathe during sleep. Sleep-related hypoventilation can be due to a variety of causes, but can be seen alone or concomitantly with OSA in the morbidly obese. OSA is the most common form of sleep disordered breathing and has an estimated prevalence of 2 to 4% in the general population.[4] The same population study noted a strong association with obesity. Given the increasing prevalence of obesity in the United States, the prevalence of OSA has also likely increased.[5] As OSA is the most common form of sleep disordered breathing, this article will primarily focus on adherence to positive airway pressure (PAP) therapy for OSA.

Health Consequences of Sleep Disordered Breathing

OSA is associated with an increased risk of hypertension, coronary artery disease, other cardiovascular events, and stroke.[6–11] There are also health risks to the general public, as untreated OSA is associated with increased risk of motor vehicle collisions, although the increased risk of collisions is not necessarily related to increased sleepiness.[12,13] A meta-analysis evaluating the risk of motor vehicle collisions in drivers with OSA compared with drivers without OSA demonstrated an odds ratio of 2.52. This odds ratio allowed for an estimate that OSA contributes to 810,000 collisions and 1,400 fatalities annually in the United States.[14]

Positive Airway Pressure Therapy

Until the early 1980s, tracheostomy was the only recognized effective therapy for OSA. Continuous positive airway pressure (CPAP)

was first noted as a potential therapy when Sullivan et al described the successful use of nasal CPAP as a pneumatic stent in five patients with OSA.[15] CPAP is now recognized as first-line therapy for the treatment of OSA. Treatment of OSA can significantly reduce the number of accidents, economic costs, and loss of life associated with vehicular collisions.[14] Therapy with CPAP can also improve control of hypertension and reduce the risk of cardiovascular events.[10,16–19] Healthcare utilization is significantly higher in patients with untreated OSA. Kapur et al demonstrated that in the year before diagnosis, patients with OSA had a mean annual medical cost that was $1,300 more than controls.[20] The annual medical fees for patients with OSA are significantly reduced after treatment with CPAP.[21] Therefore, compliance with PAP is critical to improve health outcomes and decrease health care costs in patients with OSA. Although the optimal nightly duration of CPAP use is dependent upon the variable evaluated, it appears that 7 hours is likely the time point beyond which there is no further significant improvement in symptoms such as daytime sleepiness or functional status measures.[22]

There is also increasing pressure from payers to demonstrate compliance with PAP. Many insurance companies are now following the lead of the Centers for Medicare and Medicaid Services (CMS) and will no longer continue to pay for PAP if the Medicare definition of compliance is not met. The Medicare definition of compliance is at least 4 hours of use on 70% of the nights during a period of 30 consecutive days in the first 90 days. Most studies evaluating compliance use a definition of either ≥ 4 hours per night or ≥ 4 hours per night 70% of the time.

Compliance has been reported to range from 40 to 84% depending upon the design of the study and the population examined. Factors that may contribute to nonadherence with PAP also depend upon the study evaluated. Patients' impression of PAP after their first night of therapy appears to play a significant role in their long-term compliance. Other factors such as body mass index (BMI), Epworth sleepiness scale, apnea–hypopnea index (AHI), CPAP pressure, gender, and socioeconomic factors have been associated with compliance in some studies, while other studies have not demonstrated an association with these factors.[23–34] summarizes potentially intervenable factors that can influence adherence to PAP therapy along with possible solutions to improve adherence.

Table 1. Factors that may affect adherence to PAP therapy and interventions that may improve adherence to PAP therapy

Factors	Interventions
First impression of PAP	Pretreatment education regarding importance of PAP Sedative–hypnotic use during PAP trial
Lack of understanding of health consequences of sleep disordered breathing and benefit of PAP	Referral to a sleep specialist before diagnostic testing for sleep disordered breathing Recurrent, directed education
Bed partner's perception of PAP	Education of bed partner on importance of PAP use
Mask/equipment usability issues	Education on mask and equipment use at the time of PAP setup Mask fitting clinics Wireless monitoring of PAP use for earlier identification of poor use, high mask leak, or high residual respiratory disturbance index
Nasal symptoms	Heated humidification
Claustrophobia	Lower profile nasal masks or nasal pillows Desensitization

Insomnia	Cognitive behavioral therapy Sedative-hypnotic medication
Restless legs syndrome (RLS)/periodic limb movements of sleep (PLMS)	Assessing for and treating RLS symptoms during the initial evaluation Assessing for PLMS on the polysomnogram and treating if disruptive
Central sleep apnea or sleep-related hypoventilation	Assessing for comorbid conditions or medication use that may increase the risk of central sleep apnea or hypoventilation Using the proper modality of PAP for central sleep apnea or hypoventilation if present
Intolerance to PAP	Ramp features Flex or pressure release modes if difficulty exhaling against PAP Auto-titrating positive airway pressure Bilevel positive airway pressure

Abbreviation: PAP, positive airway pressure.

Psychological and Social Factors

The first barrier to CPAP use is often a patient's misperception that OSA does not represent a serious medical condition. Those patients who assign a high health value to the treatment of OSA or who perceive more negative consequences related to the sleep disturbance from OSA are more likely to be compliant with CPAP.[35,36] Aloia et al demonstrated that measures of readiness and self-efficacy can be valuable in predicting long-term use of PAP, but are most useful when measured after the patient has experienced PAP (i.e., after 1 week) rather than before experiencing PAP.[37] Patients who self-refer for a sleep evaluation are more likely to be adherent than those who are referred at a partner's urging, probably due to higher motivation or appreciation for the effects of untreated OSA.[38] Younger patients with more inaccurate beliefs regarding OSA and its health consequences are less likely to be compliant.[39] Compliance to therapy is also lower among patients who have experienced a recent life stressor such as death of a family member or hospitalization.[40]

Discussing with the patient the health risks of OSA and benefits of CPAP use before a sleep study can impact compliance. Patients who have consulted with a sleep physician before their sleep study have improved adherence when compared with patients who are directly referred for a sleep study by a non-sleep physician. Those patients who consulted a sleep specialist used CPAP for a mean of 58 minutes longer per night than those who were directly referred for a study.[28,41] The improvement in use is likely due to increased patient education regarding the impact of untreated OSA and addressing potential concerns and barriers to CPAP use by the sleep specialist.

More intensive educational programs have demonstrated benefit in increasing compliance with CPAP. Programs that have been helpful focus on more directed and repetitive education of the patient regarding the health and quality-of-life consequences of untreated OSA. In one study, physicians used standard education versus reviewing key portions of the polysomnogram with the patient to demonstrate the severity of the OSA. The intervention group had an increased CPAP compliance of 97% at 12 months compared with 74% in the standard education group.[42] In a second study, peer counselors were used to reinforce self-efficacy, motivational effects, outcome expectations, and risk perception versus standard education. The group who worked with peer

counselors demonstrated an average nightly use of 5.2 hours versus 4 hours at 90 days of therapy.[43] Multiple nights of CPAP titration and home visits with the patient and their partner at 7, 14, and 28 days in addition to 4 months after starting therapy resulted in higher mean nightly use at 6 months. The nightly use was 5.3 hours in the home visit group compared with 4 hours for standard care.[38] However, in-person intensive education programs have the potential to be laborious and costly. Therefore, studies evaluating use of telecommunication systems for educational reinforcement are intriguing.

A pilot study evaluating a telephone communications system to assess early adherence in 30 patients showed promise. The patients were randomized to either standard care or receiving computer-based phone calls which through a series of questions ascertained compliance and reinforced education regarding the importance of CPAP use. The phone calls were made 3 days after starting CPAP and then weekly for 2 months. Although not statistically significant, there was a potentially clinically significant increase in CPAP use to 4.4 hours per night in the group receiving the phone calls versus 2.9 hours per night in the standard care group.[44] A larger trial of 250 patients also used a telecommunication system to try to improve compliance. Patients were randomized to either receive CPAP education or general health education via a telephone-based system. Patients in both groups were instructed to call in weekly during the first month of treatment and then monthly for the remainder of the first 12 months. The CPAP system assessed self-reported use and then provided directed modules to improve education and motivation to use CPAP. The general health communication system allowed the patient to choose topics from general and preventive medicine. At 12 months, 44.7% of the CPAP telecommunication group was using therapy > 4 hours as opposed to 34.5% of the control group.[45]

OSA can have a significant impact on the life of the bed partner.[46] In turn, the bed partner's response to the patient being treated with PAP can affect the patient's compliance rate both positively and negatively. Patients who are married or in a live-in relationship show higher compliance.[34] Bed partners of patients treated with PAP for OSA overall have a subjective improvement in their quality of sleep and quality-of-life rankings.[47,48] However, some bed partners report a disruption of their sleep due to PAP, and less than half of patients with OSA state they would use PAP if it was disruptive to their partner's sleep.[49,50] Patients who also perceive decreased intimacy with their partner due to PAP demonstrate lower compliance.[51] Therefore, it is important to try to address any concerns that the patient or their bed partner has regarding how PAP may directly affect the bed partner.

Interface and Side Effects

The type of interface used with PAP can impact the compliance rate. Patient preference is typically for a nasal mask, and nasal masks are generally associated with higher compliance than oronasal (full face) masks.[32,52] Higher leak rates and higher residual respiratory disturbance index (RDI) have been noted with oronasal masks as compared with nasal masks, although in one study that noted these associations, a chin strap was used with all nasal mask applications. There was no difference in the pressure requirements between nasal and oronasal masks.[53, 54] Higher residual RDI is associated with decreased compliance.[51] Increased mask leak can increase the risk of developing central apneas which may disrupt sleep and affect adherence to therapy.[55]

Nasal pillows appear to be at least equivalent to nasal masks in terms of effectiveness and compliance. Nasal pillows may lead to fewer adverse events.[56,57] In a small set of patients, nasal pillows produced similar air leaks and residual AHI as nasal masks, even at pressures greater than 15 cm H_2O. In general, nasal pillows are rated as being less claustrophobic.[58] A sensation of claustrophobia is associated with lower compliance.[59] Mask selection needs to be based on patient preferences, leak pattern, and adequate fit. Desensitization can be useful in patients who experience claustrophobia and require therapy with PAP. The program consists of gradually increasing use of the PAP mask while awake in addition to techniques such as biofeedback and progressive muscle relaxation before using PAP with sleep.[60]

Difficulty using PAP equipment can significantly impair compliance with 76% of patients who report substantial usability problems demonstrating no nights of PAP use. The most common complaints with usability involve applying the mask and head gear.[61] Careful instruction and demonstration of mask application is important.

Nasal symptoms such as congestion or dryness are some of the most commonly reported side effects of CPAP and can lead to nonadherence. Up to 20% of patients have nasal congestion prior to beginning PAP.[62] Topical nasal steroid sprays are often recommended to patients who complain of nasal congestion while on CPAP. Yet in a study evaluating nasal steroid spray versus

placebo and the impact on nasal symptoms and CPAP use, there was no significant difference in CPAP compliance between the two groups. Both groups used CPAP for approximately 4 hours in the first 4 weeks. In addition, there was no difference in nasal symptoms between the two groups. Interestingly, both groups had a decline in nasal symptoms during the 10-day baseline period in which a nasal steroid or placebo was used before CPAP initiation, and both groups had a similar increase in nasal symptoms after CPAP initiation.[63] When nasal steroids were compared with heated humidification, the group receiving heated humidification had fewer nasal symptoms with CPAP use, although there was no difference in adherence between the two groups.[64] Heated humidification, unlike cool pass-over humidification, also increases the number of hours used per night when compared with no humidity.[62] In a series of patients who described nasal obstruction as the reason for noncompliance, septoplasty and inferior turbinate reduction resulted in a significant improvement in CPAP use from 0.5 hour per night preoperatively to 3.9 hours per night postoperatively.[65]

Other Sleep Disturbances

Approximately 68% of patients who are diagnosed with OSA have insomnia at baseline. Sleep maintenance insomnia (awakening in the middle of the night) is the most common complaint, although there is overlap with early and late insomnia. Patients who experience insomnia and OSA are more likely to have daytime impairment. They also have lower compliance with CPAP. Sleep maintenance insomnia is associated with decreased compliance independent of the AHI.[66] In one study evaluating the impact of CPAP treatment for OSA on insomnia, full users were defined as using PAP ≥ 4 hours per night for ≥ 5 days per week. All others were considered partial users. The average nightly use for full users was 6.8 hours per night and for partial users was 3.5 hours per night. Interestingly, the percentage of patients with sleep maintenance insomnia who experienced improvement in their insomnia complaints was significant in both partial users and full users compared with baseline, but it was higher in full users. Both groups had a baseline prevalence of approximately 59% for sleep maintenance insomnia. At 2-year follow-up, the prevalence of sleep maintenance insomnia was 30.7% for full users and 43.5% for partial users.[67]

Restless legs syndrome (RLS) may occur in 8 to 9% of patients with OSA. The majority of patients with RLS also have periodic limb movements of sleep (PLMS).[68] In a small series of patients, the severity of RLS and the periodic limb movement index (PLMI) improved with use of CPAP to treat concomitant OSA without any additional therapy specifically for the RLS or PLMS.[69] In another study of 30 patients, those with RLS and OSA who are treated with CPAP report higher fatigue levels than patients with only OSA who are treated with CPAP. The degree of subjective CPAP compliance in the two groups was evaluated and reinforced via phone contact, but the objective compliance is not stated. Therefore, it is not clear if RLS may have been associated with decreased adherence to CPAP which resulted in increased fatigue levels.[70] Although the effect of RLS and PLMS on PAP compliance is not readily apparent, in theory, a patient who is having difficulty initiating sleep due to RLS or maintaining sleep due to PLMS may be less adherent.

Complex sleep apnea is defined as the development of CSAs while on PAP for OSA. Approximately 6.5% of patients initiated on CPAP for OSA will develop complex sleep apnea. However, the central apneas can attenuate over time, and the percentage of patients with persistent complex sleep apnea is 1.8% of OSA patients treated with CPAP. Patients who have persistent central apneas use PAP for fewer hours per night.[71] Adaptive (auto) servo ventilation can be used to treat complex sleep apnea and improve the sleep disruption associated with the central apneas. Adaptive servo ventilation units stabilize breathing and treat central apneas by providing variable levels of support based on algorithms that assess flow or tidal volume and allow for machine-initiated breaths if needed.[72,73] Patients with central apnea or sleep-related hypoventilation at baseline are not adequately treated with CPAP and will require other modalities of PAP such as bilevel PAP (with or without a backup rate) or adaptive servo ventilation.

Modality of Positive Airway Pressure

Traditionally, CPAP, in which one pressure is applied throughout the respiratory cycle, has been used to treat OSA. However, there are other modalities of PAP that have been evaluated to determine if modality affects compliance. Auto-titrating positive airway pressure (APAP) allows for the machine to self-titrate through a range of pressures based on when it senses flow limitation. It has been hypothesized that APAP may improve compliance due to increased comfort related to lower mean pressure. A meta-analysis

evaluating APAP versus CPAP in the treatment of patients with moderate-to-severe OSA demonstrated a lower mean pressure in APAP by 2.2 cm H_2O compared with CPAP. However, there was no significant difference in the residual AHI, improvement in daytime sleepiness, or hours of use per night. The pooled estimate of the difference in use between APAP and CPAP was 0.2 hour per night.[74] Heart rate variability is a surrogate for examining the autonomic nervous system regulation. CPAP therapy for OSA results in an improvement in heart rate variability parameters compared with pretreatment state, whereas APAP does not. This difference occurred despite both CPAP and APAP resulting in significant improvement in the AHI from baseline. These data suggest that treatment with APAP may be insufficient to ameliorate some of the autonomic cardiovascular responses in OSA.[75] Regardless, as there is more concern for lowering health care costs, there is more impetus to use APAP in the treatment of OSA rather than performing an in-laboratory titration to determine a CPAP setting.

Modes to allow a decrease in the CPAP pressure early in the expiratory phase have been developed. Typically, these pressure release (flex) modes can be set to allow for a 1 to 3 cm H_2O change. The impact of pressure release on adherence has been variable. Both CPAP and CPAP with flexible mode show a significant improvement in AHI and mean sleep latency on maintenance of wakefulness test. There are studies that have demonstrated no difference in hours per night of use between CPAP and CPAP with pressure release even though the pressure release mode was rated as more comfortable.[76–78] Yet, there are also studies that demonstrate on average 1.7 hours greater use per night with the pressure release mode.[79,80] All of these studies recruited patients with severe OSA. The addition of a pressure release or flex mode should be considered in patients who complain of discomfort on CPAP, especially when exhaling.

Bilevel PAP in which a higher pressure is applied during the inspiratory phase and a lower pressure is applied during the expiratory phase has been used as an alternative therapy to CPAP in patients with OSA. It is often used when patients have ongoing obstructive events despite maximal CPAP settings or are intolerant of CPAP. Failure of CPAP ranges from 9 to 23% of patients treated for OSA. Patients who fail CPAP have higher BMI, higher $Paco_2$, lower Pao_2, lower mean nocturnal saturations, and higher AHI.[81–83] These data would suggest that patients who fail CPAP are more likely to have comorbid conditions such as chronic obstructive pulmonary disease or obesity hypoventilation. In patients with OSA and a BMI ≥ 30, 20 to 30% of patients will also have obesity hypoventilation.[84] As the BMI increases, there is a greater risk of obesity hypoventilation, with a prevalence of 48% for hospitalized hypercapnic patients with a BMI of ≥ 50.[85] In patients with morbid obesity, the possibility of concurrent hypoventilation with the need for treatment with a PAP modality other than CPAP should be considered.

If bilevel PAP is being considered for issues of discomfort on CPAP, the Positive Airway Pressure Titration Task Force of the American Academy of Sleep Medicine recommends trying to determine the factors leading to discomfort on CPAP and treating those factors first before changing to bilevel. However, consideration can be given to switching to bilevel if the patient has ongoing discomfort or continued obstructive events at a CPAP setting of ≥ 15 cm H_2O. A minimum IPAP–EPAP gradient of 4 cm H_2O and a maximum gradient of 10 cm H_2O are recommended. In addition, it is recommended to only increase the IPAP and EPAP until evidence of obstruction is eliminated, and not to increase for ongoing episodes of desaturation with resaturation unrelated to obstructive events.[86]

Use of Sedative–Hypnotics

Non-benzodiazepine sedative–hypnotic agents can help decrease sleep latency and consolidate sleep. Therefore, they may be useful in patients who have difficulty falling asleep with CPAP. Studies have been conducted evaluating the impact of eszopiclone, zolpidem, and zaleplon on CPAP adherence. The studies differ in the timing and duration of administration of the sedative–hypnotic agent. One study evaluated the impact on CPAP adherence of 3 mg of eszopiclone given at the time of CPAP titration. The group who was premedicated with eszopiclone had shortened sleep latency and better sleep efficiency during the titration. In addition, they demonstrated improved adherence during the first 4 to 6 weeks of therapy. However, although more of the patients in the eszopiclone group met the CMS definition of compliance than the placebo group, it was only slightly more than half of the patients (53.1 vs. 27.1%), and overall compliance was not ideal.[87] In contrast, administration of 10 mg of zaleplon versus placebo at the time of CPAP titration did not improve adherence at approximately 1 month when both groups had an average use of 5 hours per night.[88] A 2-week administration of eszopiclone 3 mg versus placebo during the initial use of CPAP resulted in a longer mean

period of compliance meeting CMS definition (17.6 vs. 13.3 weeks). During the 6th and final month of the trial, 48% of patients in the eszopiclone group met the CMS compliance definition compared with 25% of the placebo group.[89] On the contrary, a 2-week administration of zolpidem 10 mg during initial CPAP use when compared with placebo and no pill showed no difference between the three arms in compliance at the end of 4 weeks. However, it should be noted that the adherence in the placebo arm (50% meeting CMS criteria for compliance) was higher than in the eszopiclone studies.[90] It is difficult to suggest that use of non-benzodiazepine sedative–hypnotics during CPAP titration and the initial treatment with CPAP is useful in improving adherence to therapy in all patients, but it may have a role in those patients who are at high risk for poor compliance.

A meta-analysis has demonstrated that the administration of non-benzodiazepine sedative–hypnotics does not worsen AHI or oxygen saturation nadir on or off CPAP, so the use of these medications in recently diagnosed OSA patients would likely not confer any increased worsening of the OSA even if the patients do not use their CPAP.[91] However, a study evaluating the effects of sedative medications in patients with undiagnosed OSA does demonstrate an increased risk of motor vehicle collisions. While some of these patients were prescribed non-benzodiazepine sedative–hypnotics, the data do not clearly delineate if non-benzodiazepines confer the same risk as the other sedatives prescribed.[92]

Monitoring of Compliance

Compliance with PAP can be monitored both subjectively and objectively. Subjective reports of compliance often result in an over reporting of adherence, and cannot be reliably used to differentiate between compliance and noncompliance.[93] Most PAP devices now have data cards that can be downloaded to provide information regarding use. However, the algorithm for how data are obtained and reported depends on the machine. Therefore, the reported data are not standardized. In general, the data obtained can include date ranges of use, number of nights used and not used, percentage of nights with use, percentage of nights with use ≥ 4 hours or < 4 hours, average use on all nights, and average duration of use on nights when used. The American Thoracic Society (ATS) recently issued a statement regarding CPAP tracking systems. The statement suggests that while the data from downloads are useful, more studies need to be done to clearly demonstrate the impact the data have on patient outcomes. In addition, clinicians need to be aware that the definitions for AHI and excessive mask leak as noted on the download are not standardized and can be difficult to interpret, although the high and low extremes of these variables are helpful in determining factors that may impact adherence.[94]

While the insurance industry standard is to follow the CMS definition of compliance, the authors of the statement recommend that a patient be considered adherent if they are using PAP for more than 2 hours per night and having improvement in daytime functional status, although the patient should be encouraged to use the PAP for the entire sleep time. They also recommend assessing use at 1 week, 4 to 6 weeks, 12 weeks, 6 months, and then annually because the pattern of adherence is often determined early.[94]

More PAP devices now have a feature allowing data to be downloaded wirelessly. A small pilot study among veterans suggested a trend toward improved adherence in those patients whose use was monitored wirelessly with the data leading to a clinical care pathway to improve adherence versus standard care with a phone call at 1 week and in-office visit at 1 month. Although the difference in use was not statistically significant, the trend suggests a clinically significant difference with 4.1 hours of use per night in the wirelessly monitored group versus 2.8 hours of use in the standard care group.[95] In a second study evaluating the usefulness of wireless download, patients were randomized to standard care with a phone call soon after initiating therapy and an office visit at 4 to 6 weeks compared with daily download of compliance data with contact by a coordinator if certain clinical parameters were met (i.e., high leak, poor use, residual AHI > 10). The wirelessly monitored group had a higher average use of 3.2 hours per night as compared with 1.8 hours per night in the standard care group. On the nights used, the duration of use in the wirelessly monitored group was 5.4 hours as opposed to 3.4 hours in the standard care group.[96]

Conclusion

Sleep disordered breathing, especially OSA, is increasingly prevalent with significant impact on functional status and comorbid conditions, as well as health care utilization. CPAP is an effective therapy for OSA when used consistently. However, patient

adherence is often challenging and can be affected by a variety of factors. Compliance is frequently determined early in the course of treatment with CPAP. Therefore, education to improve a patient's understanding of the consequences of untreated OSA and to address any concerns or potential barriers to CPAP use before the diagnosis of OSA and initiation of CPAP is important. In addition, proper fitting and instruction on mask and head gear application can potentially have a significant impact. Close follow-up and intensive education in the first few months of CPAP use appear to improve compliance. Approximately 24% of nonadherent patients will increase their use to greater than 4 hours per night with repeat education regarding the consequences of untreated OSA, refitting of the mask, adding humidification, and addressing nasal congestion.[97] Patients who receive home visits and intensive support to address the above issues demonstrate improved use at 3 and 9 months compared with patients receiving standard follow-up.[98] Although the majority of the data regarding PAP adherence is for patients with OSA, it stands to reason that similar factors can affect adherence with other modalities of PAP used to treat other forms of sleep disordered breathing.

Intensive educational and support programs with frequent follow-up require dedicated staff whose time and commitment may not be reimbursable. In addition, as payers push for more use of ambulatory studies to diagnose OSA and initiation of APAP at home, more patients may be treated by non-sleep specialists who may not have the time or knowledge to provide the education and troubleshooting that is often necessary to promote adherence. They also may not consider the possibility of other sleep disturbances that could affect PAP adherence or other forms of sleep disordered breathing that require a modality other than CPAP. More insurance providers are also requiring demonstration of adequate use of PAP within the first 90 days or patients may not be able to keep their equipment. These diverging goals present a challenge to physicians in general, and the sleep specialist community specifically, to continue to provide the care and education necessary to improve our patients' health and quality of life.

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