

Compliance with Continuous Positive Airway Pressure in Patients with Obstructive Sleep Apnea

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Obstructive sleep apnea (OSA) is caused by upper airway obstruction during sleep and increases risk for stroke and cardiovascular morbidity. It is also related to excessive daytime sleepiness and cognitive dysfunction in affected adults. Additionally, OSA also affects children, manifesting as growth retardation and neurobehavioral abnormalities. Continuous positive airway pressure (CPAP) therapy is the treatment of choice for moderate to severe disease in adults and in some of the pediatric population. CPAP therapy reduces daytime sleepiness, improves quality of life, and reduces risk for cardiovascular morbidity and mortality in individuals with OSA. Although CPAP therapy is effective in these patients, it has significant limitations regarding compliance. Accordingly, the purpose of this review was to investigate factors impacting compliance with treatment including socioeconomic/demographic characteristics, nasal obstruction, previous upper airway surgery, severity of OSA, psychological factors, support/intervention of CPAP, and device-related factors. Additionally, factors associated with CPAP compliance in children are also discussed.

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Key Words Sleep apnea syndromes, Continuous positive airway pressure, Patient compliance.

INTRODUCTION

Obstructive sleep apnea (OSA) is characterized by repetitive upper airway obstruction and failure of normal ventilation that causes hypoxemia and arousal during sleep. The estimated prevalence of OSA is approximately 22% (9–37%) in adult males and 17% (4–50%) in adult females, and 1–5% in the general pediatric population [1,2]. OSA increases the risk for stroke and cardiovascular disease from hypertension, and endothelial dysfunction because of sympathetic activation. It is also related to excessive daytime sleepiness and cognitive dysfunction in affected adults [3–5]. Also, OSA is a cause of growth retardation and neurobehavioral abnormalities in children [1].

Since the first report describing continuous positive airway pressure (CPAP) therapy as an effective treatment for OSA in 1981 [6], it has been regarded as first-line therapy in individuals with moderate to severe OSA [7]. CPAP treatment reduces daytime sleepiness and improves quality of life, and also reduces cardiovascular morbidity and mortality [8–10]. Although CPAP is an effective treatment modality in patients with OSA, it has significant limitations in terms of compliance. In various studies, the terms “adherence” and “compliance” are often used interchangeably, and the definition of these terms is regarded as the average number of hours of nightly use. Additionally, according to the Centers for Medicare and Medical Services, adequate adherence or compliance of CPAP is defined as using a CPAP device for ≥ 4 hours daily and $\geq 70\%$ of nights [11]. In this review, the terms are unified and hereafter referred to as “compliance.” It has been reported that approximately 29–83% of patients are non-compliant with CPAP treatment [12], with the suboptimal use of CPAP also identified in the pediatric population

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[13,14]. Thus, many investigators have conducted studies that have focused on determining the factors that impact CPAP compliance, and have also identified effective strategies to encourage better compliance. The purpose of this review was to organize studies investigating compliance with CPAP therapy according to various factors including socioeconomic/demographic characteristics, nasal obstruction, previous oropharyngeal surgery, severity of OSA, psychological factors, support/intervention of CPAP, and device-related factors (Table 1). Additionally, we also investigated factors associated with CPAP compliance in children (Table 2).

SOCIOECONOMIC/DEMOGRAPHIC CHARACTERISTICS

Several studies have assessed CPAP compliance according to

various characteristics including age, sex, ethnicity, and socioeconomic status (SES). Kohler et al. [15] conducted a large study using the Kaplan-Meier survival analyses for long-term [median 3.9 (interquartile range 1.5–6.9 years)] compliance in 639 patients undergoing CPAP treatment. The authors reported that age and sex were not significantly associated with CPAP compliance. In a prospective cohort study with 221 patients using CPAP six months after initial treatment, Gulati et al. [16] did not find associations between compliance with CPAP therapy and age, sex, or education level. Another study that performed the Cox proportional hazard analysis among 163 patients also reported that age did not affect compliance, although female sex [adjusted relative risk 2.8 (mean 1.4 ± 5.4); $p = 0.002$] and body mass index ≤ 30 kg/m² [adjusted relative risk 2.2 (mean, 1.2 ± 4); $p = 0:006$] were predictive factors for non-compliance [17]. However, in a randomized, double-blind, sham-controlled trial with 138 patients with moderate-to-severe OSA over eight

Table 1. Factors influence in CPAP compliance in adults

Factor	Result
Socioeconomic/demographic characteristics	
Age	Controversial
Sex	Controversial
Ethnicity	African Americans showed lower compliance than Caucasians
Socioeconomic status	High socioeconomic level is associated with adequate compliance
Nasal obstruction	
Obstructive nasal disease (nasal septal deviation, inferior turbinate hypertrophy, nasal valve collapse)	Associated with poor compliance
Chronic rhinosinusitis	Limited data on the effects of ESS on sleep apnea
Septoplasty, turbinoplasty	Nasal surgery improves compliance
Intranasal steroid treatment	No benefit
Prior oropharyngeal surgery	
UPPP	Can reduce the pressure and might increase compliance
Severity of OSA	
AHI, RDI, ODI, CT90, nadir SpO ₂	As worse the OSA, compliance was increased
Psychological factors	Self-efficacy before initiation increases compliance
Support/intervention	
Reinforced education	Controversial
Intensive support	Controversial
Telemonitoring care	Could increase the compliance
Explanation with PSG viewing	Explanation of disease severity with viewing their PSG data could increase the compliance
Device factors	
Pressure delivery mode	Controversial in APAP vs. CPAP and no difference in BiPAP vs. CPAP
Oral vs. nasal interface	Controversial but initial mask selection can influence the compliance
Heated humidity	Controversial

ESS: endoscopic sinus surgery, UPPP: uvulopalatopharyngoplasty, OSA: obstructive sleep apnea, AHI: apnea-hypopnea index, RDI: respiratory disturbance index, ODI: oxygen desaturation index, CT90: the percentage of duration with O₂ desaturation of < 90%, PSG: polysomnography, APAP: auto-titrating positive airway pressure, CPAP: continuous positive airway pressure, BiPAP: bilevel positive airway pressure

Table 2. Factors influence in CPAP compliance in children

Factor	Result
Socioeconomic/demographic characteristics	
Age	Controversial
Sex	Not associated but one study reported that female sex is associated with better compliance
Maternal education level	Controversial
Severity of OSA	Not associated but one study reported that higher baseline AHI showed better compliance
Psychological factors	Self-efficacy before initiation increases compliance

OSA: obstructive sleep apnea, AHI: apnea-hypopnea index, CPAP: continuous positive airway pressure

weeks of CPAP treatment, May et al. [18] reported that, according to adjusted linear analysis, elderly age was strongly associated with improvement in adherence {35 min/decade [95% confidence interval (CI) 13–57 min/decade]}. As such, we found that the impact of age and sex on compliance with CPAP treatment remains controversial. Various studies have reported that SES was significantly associated with CPAP compliance. Long-term unemployment, residing in socioeconomically deprived areas, low income level, and living alone were associated with significantly lower compliance with CPAP therapy [16,19–24]. A retrospective study that included 266 OSA patients who underwent CPAP therapy reported that compliance was associated with the neighborhood SES level, independent of other characteristics [24]. Additionally, Gangnadoux et al. [22] reported that retired patients demonstrated higher compliance than those currently working [odds ratio (OR) 1.414 (95% CI 1.097–1.821); $p = 0.007$]. Several studies have reported that African Americans demonstrated lower compliance with CPAP therapy than Caucasians [17,18,20,25,26]. In contrast, however, a retrospective study that included 128 African American patients and 102 Caucasian OSA patients reported no racial differences in CPAP compliance [27].

NASAL OBSTRUCTION

Many patients complain of nasal discomfort including nasal dryness, sneezing, post-nasal drip, and nasal congestion during CPAP treatment [28]. Disease in these individuals will worsen because of various nasal pathologies including nasal septal deviation, inferior turbinate hypertrophy, and nasal valve collapse [29]. These types of nasal discomfort may play a role in intolerance to CPAP therapy. A prospective study of 77 OSA patients who underwent nasal CPAP treatment reported that higher nasal resistance was a significant factor in CPAP non-acceptance

(OR + 0.1 Pa/cm³/s: 1.48; $p = 0.002$) [30]. Inoue et al. [31] reported that nasal disease or total nasal resistance (TNR) were crucial factors for the discontinuation of CPAP in the early stage [TNR ≥ 0.4 Pa/cm³/s: exp (B) 0.188; $p = 0.011$], and long-term CPAP compliance could be predicted from early CPAP compliance [initial use rate ≥ 70 : exp (B) 6.714; $p < 0.001$]. Similar results were reported by Park et al. [32] in a retrospective study with 47 OSA patients who received CPAP treatment [adherent ($n = 24$), non-adherent ($n = 23$)]. A higher grade of septal deviation and inferior turbinate hypertrophy were observed more in the non-adherent group than the adherent group, with a difference that was statistically significant. Thus, the authors recommend that nasal diseases are adequately treated before CPAP initiation for better long-term compliance. Treatment targeted at improving increased nasal resistance may also improve compliance with CPAP therapy [29]. Several studies have reported that nasal surgery can improve compliance with CPAP therapy. Camacho et al. [33] reported that the regular use of CPAP was 38.7% in patients before nasal surgery and improved to 90.2% after nasal surgery, and 89.1% of patients not using CPAP subsequently accepted it after nasal surgery in a subgroup analysis. In a randomized double-blind, placebo-controlled study with 22 patients [case ($n = 17$) vs. control ($n = 5$)], Powell et al. [34] investigated the effect(s) of temperature-controlled radiofrequency (TCRF) reduction for turbinate hypertrophy on CPAP compliance. They concluded that TCRF turbinate treatment improved compliance with CPAP therapy (mean compliance change -0.04 ± 0.05 vs. 0.06 ± 0.12 ; $p = 0.007$). Another study reported similar results with septoplasty plus inferior turbinoplasty, with CPAP compliance improving after surgery (0.5 h/night to 3.9 h/night) in 20 OSA patients intolerant to nasal CPAP therapy [34]. Also, Mickelson [29] reported that there were limited data regarding the effect of endoscopic sinus surgery (ESS) on sleep apnea; as such, it is unclear if ESS only had direct effect on nasal resistance. Nevertheless, the authors suggest that it may have a secondary benefit in reducing sinonasal inflammation.

We also reviewed studies investigating the effect of topical nasal steroid on CPAP compliance. A prospective randomized study with 125 OSA patients who tolerated nasal CPAP therapy via nasal mask reported that application of topical nasal steroid(s) yielded no benefit to CPAP compliance four weeks after treatment [35]. Another a randomized, double-blinded, placebo-controlled study reported the same result after four weeks of treatment with topical fluticasone propionate [36].

PREVIOUS OROPHARYNGEAL SURGERY

Oropharyngeal surgery includes uvulopalatopharyngoplasty (UPPP), another crucial treatment modality for mild and moderate OSA. However, the reported success rate in unselected pa-

tients has been as low as 40% [37]. Thus, physicians should consider additional—if not alternative—CPAP treatment for patients in whom surgery is ineffective. A prospective cross-sectional study with 47 OSA patients undergoing CPAP therapy reported that upper airway occlusion caused by tonsillar hypertrophy, may increase pressure in CPAP therapy. This study suggests that correcting this problem may be effective in increasing CPAP compliance [38]. Accordingly, we reviewed several studies that compared CPAP compliance between patients with and without history of oropharyngeal surgery for OSA. Hong et al. [39] retrospectively conducted such an evaluation of 86 patients and reported that the CPAP compliance rate was higher in the surgery group than in the control group three months after initiation of CPAP treatment, although the difference was statistically insignificant (87.5% vs. 60.7%, respectively; $p = 0.243$). However, the mean daily hours of usage was significantly higher in the surgery compared with the control group (6.39 h/day vs. 4.73 h/day, respectively; $p = 0.007$). Similarly, Azbay et al. [40] reported that among 67 CPAP-intolerant patients, 32 tolerated CPAP well after oropharyngeal surgery. Additionally, results from the two other studies investigating CPAP pressure reduction after oropharyngeal surgery also support increases in CPAP compliance [38,41].

SEVERITY OF OSA

We found several studies reporting that the severity of OSA according to apnea hypopnea index (AHI), respiratory disturbance index (RDI), nocturnal desaturation, and oxygen desaturation index (ODI) could affect compliance with CPAP treatment. Riachy et al. [42] conducted a cross-sectional cohort study with 138 OSA patients who underwent CPAP treatment and reported that mean RDI (33.41 ± 24.70 vs. 22.96 ± 19.28 ; $p = 0.028$) and ODI (24.86 ± 23.18 vs. 14.64 ± 18.83 ; $p = 0.023$) were significantly higher, and nadir oxygen saturation ($80.33 \pm 10.86\%$ vs. $85.18 \pm 16.88\%$; $p = 0.017$) was significantly lower in the compliant group three months after initiation of CPAP therapy. They also reported that mean RDI (34.90 ± 24.40 vs. 27.00 ± 22.90 ; $p = 0.050$) and ODI (26.80 ± 24.60 vs. 18.10 ± 20.60 ; $p = 0.029$) were significantly higher in the compliant group at the end of the observation. Additionally, higher ODI at diagnosis [hazard ratio (HR) 0.98; $p = 0.048$] was independently associated with short-term compliance with CPAP therapy. Campos-Rodriguez et al. [43] conducted a prospective cross-sectional study with 357 non-sleepy OSA patients who received CPAP treatment and reported that AHI [46.5 (95% CI 33.0–63.0) vs. 33.0 (95% CI 26.5–52.5); $p < 0.001$] and the percentage of duration with oxygen desaturation $< 90\%$ [10.0 (95% CI 2.2–27.0) vs. 5.0 (95% CI 1.1–15.0); $p < 0.001$] were significantly higher in the compliant group. Baratta et al. [44] conducted a prospective study with 295 patients with moderate or severe OSA syndrome

(OSAS; AHI ≥ 15 events/h) with a median follow-up of 74.8 months and reported that lower severity of OSAS [HR 0.66 (95% CI 0.46–0.94); $p < 0.023$] was an independent predictor of non-compliance with CPAP therapy. Also, a large cohort study performed by Kohler et al. [15] reported that ODI was independently associated with long-term compliance with CPAP [HR per 1 event, 0.97 (95% CI 0.96–0.98); $p < 0.001$]. Thus, various parameters reflecting the severity of OSA appeared to be significantly associated with compliance to CPAP therapy; more specifically, as disease severity increased, compliance also increased.

PSYCHOLOGICAL FACTORS

This category includes perception of the risk for disease, outcome expectancy, and self-efficacy of treatment. Stepnowsky et al. [45] initially assessed pretreatment perception of outcome expectations and treatment self-efficacy variables based on the social cognitive theory. The authors reported that these variables, measured one week after initiation of CPAP therapy, were significantly associated with one-month CPAP compliance. Additionally, Weaver et al. [46] developed the self-efficacy in sleep apnea (SEMSA) scale, with supplementation of limitations of the prior study. Baron et al. [47] reported that self-efficacy was significantly associated with CPAP use [$r = 0.08$, standard error (SE) = 0.03, $p < 0.01$], and higher treatment self-efficacy positively affected CPAP use. Sawyer et al. [48] conducted a prospective study with 66 OSA patients undergoing CPAP treatment and reported that, although baseline SEMSA domains did not influence CPAP use, post-education self-efficacy was positively affected at one week and one month of CPAP use. Recently, Philip et al. [49] conducted a retrospective cross-sectional study with 288 OSA patients undergoing CPAP therapy and reported that SEMSA self-efficacy score was significantly associated with mean daily CPAP use ($b = 0.581$, SE = 0.174; $p < 0.001$).

SUPPORT/INTERVENTION OF CPAP

We found several studies investigating patient support and intervention that could affect CPAP compliance; however, the results were conflicting. In a prospective randomized controlled study with 112 patients with severe OSA, Meurice et al. [50] reported that oral and written explanations and multiple home visits (i.e., reinforced education) did not demonstrate superiority over simple oral explanation and a home visit (i.e., standard education) for CPAP therapy compliance. Additionally, Hui et al. [51] and Bouloukaki et al. [52] also reported that augmentation of CPAP education, or support or intensive follow-up, did not increase compliance with CPAP therapy. In contrast, Hoy et al. [53] reported that patients who received intensive CPAP support demonstrated higher CPAP usage than the standard

support group six months after initiation of treatment (5.4 ± 0.3 h/night vs. 3.8 ± 0.4 h/night; $p = 0.003$). Also, in a meta-analysis investigating telemonitoring (TM) care and compliance with CPAP therapy in 19 randomized controlled studies that included 2,464 patients, Chen et al. [54] reported that CPAP compliance was significantly higher in the TM care group than the control group [mean difference 0.68 h (95% CI 0.48–0.89 h); $I^2 = 49\%$]. Jurado-Gamez et al. [55] also reported that the patient group, educated about the importance of CPAP adherence while viewing results of their polysomnography (PSG) data before treatment, demonstrated better compliance than the control group six months after the initiation of CPAP treatment (86% vs. 76%, respectively; $p = 0.031$). Additionally, they found that the number of hours of CPAP use was also significantly higher in the intervention group (5 ± 1.8 h/night vs. 4.3 ± 1.7 h/night, respectively; $p = 0.001$). A similar study performed by Falcone et al. [56] reported that PSG chart viewing by OSA patients increased compliance with CPAP therapy at one month (94% vs. 69%; $p < 0.001$), three months (97% vs. 71%; $p < 0.001$), and 12 months (97% vs. 74%; $p < 0.001$) after initiation of CPAP treatment. Thus, we suggest that, although the effects of augmented patient education and intervention with CPAP compliance are controversial, explanation of disease severity and having patients view their PSG data, combined with TM care, may increase compliance with CPAP therapy.

DEVICE-RELATED FACTORS

We found several studies which have evaluated the effects of pressure delivery methods on compliance. A study conducted by Massie et al. [57] reported that auto-titrating positive airway pressure (APAP) have shown higher average daily used hours than CPAP (306 ± 114 min/24 h vs. 271 ± 115 min/24 h, $p < 0.005$). Additionally, Konermann et al. [58] reported that APAP have shown higher average weekly used dates than CPAP (6.5 ± 0.4 vs. 5.7 ± 0.7 , $p < 0.01$). However, several other studies have shown no difference in compliance between APAP and CPAP [59–61]. Also, Gay et al. [62] and Reeves-Hoché et al. [63] reported that the compliance is not different between bi-level positive airway pressure (BiPAP) and CPAP. Hukins [64] reported that although compliance is similar between CPAP and APAP used patients, it is higher with APAP in subjects who complained of side effects.

Several studies have evaluated the effect(s) of various interfaces on compliance. Studies conducted by Khanna and Kline [65] and Anderson et al. [66] demonstrated that oral and nasal interfaces did not demonstrate differences in the average number of hours of CPAP use. However, Rowland et al. [67] reported that, although CPAP adherence did not demonstrate a difference between interfaces, patients reported greater mask comfort, better sleep, and overall preference for a nasal mask than an oral mask.

Additionally, Neuzeret and Morin [68] suggested that initial mask selection can influence adherence and healthcare use during CPAP treatment. Massie and Robert [69] reported that a group using a nasal pillow demonstrated a higher percentage of days of use than the group that used a nasal mask (94.1% vs. 85.7%; $p = 0.02$). Thus, it is crucial to prescribe the optimal interface for successful treatment at the beginning of CPAP therapy.

As mentioned above, nasal or oral dryness are common discomfort during CPAP treatment and reported in approximately 65% of patients [28]. To treat discomfort, heated humidification has been used. Accordingly, several researchers have investigated the association between heated humidification and compliance with CPAP therapy, with conflicting results. Massie et al. [70] reported that the mean duration of daily CPAP use increased when heated humidification was used (5.52 ± 2.1 h/night vs. 4.93 ± 2.2 h/night; $p = 0.001$). Another study conducted by Soudorn et al. [71] also reported that the mean duration of use significantly increased with heated humidification in patients with moderate to severe OSA (5.5 ± 1.5 h/night vs. 5.2 ± 1.4 h/night; $p = 0.033$). In contrast, however, Mador et al. [72] conducted a randomized controlled trial with 98 OSA patients who initially received CPAP treatment and reported that additional heated humidification did not lead to better compliance. Ryan et al. [35] conducted a randomized controlled trial that included 125 OSA patients and reported that, although humidification decreased the frequency of nasal dryness, compliance with CPAP therapy was not improved. Additionally, a recently published meta-analysis by Zhu et al. [73] reported that heated humidification did not improve compliance with CPAP treatment. Thus, we suggest that, although heated humidification during CPAP could improve nasal discomfort, it does not necessarily improve compliance with CPAP therapy.

CPAP COMPLIANCE IN CHILDREN

In general, the initial treatment of choice for pediatric OSA is adenotonsillectomy [74]. However, CPAP treatment may be an alternative therapeutic option in children who experience persistent OSA after surgery or in patients in whom surgery is not recommended or contraindicated [75]. Although CPAP treatment is highly efficacious in pediatric patients with OSA, the compliance rate is low and even in compliant subjects, nightly use is suboptimal. Marcus et al. [13] reported that approximately one-third of patients dropped out before six months, and Xanthopoulos et al. [76] reported that only approximately 21% of children used CPAP < 20 min daily at one month after initiation of CPAP. Hawkins et al. [77] conducted a retrospective review of 140 pediatric patients with OSA and reported that approximately 49% (69/140) demonstrated good compliance. Accordingly, we reviewed the literature pertaining to the assessment of factors associated with pediatric OSA. Several studies

have performed analyses according to the demographic information of children. Although age is a frequently assessed factor in studies investigating compliance with CPAP therapy in children, we found conflicting results. Lynch et al. [78] conducted a prospective study with 25 pediatric patients with OSA and reported that the group adequately compliant with CPAP therapy was younger than the CPAP non-compliant group (10.53 ± 2.17 years of age vs. 13.50 ± 2.32 years of age, respectively; $p = 0.010$). O'Donnell et al. [14] reported that mean daily hours of CPAP use decreased with age (7.2 ± 3.8 hours vs. 4.2 ± 2.7 hours vs. 3.6 ± 3.1 hours in ≤ 5 , 6–12, and 13–18 years' age groups, respectively; $p = 0.013$). Also, Avis et al. [79] reported that the mean age of the adequately compliant CPAP group was younger than the non-compliant group (10.7 ± 2.2 years of age vs. 14.7 ± 1.1 years of age; $p < 0.01$). In contrast, several other studies reported that age was not associated with compliance to CPAP therapy [77,80,81].

Several studies have reported that sex was not significantly associated with CPAP compliance [14,78–82]. In contrast, one study by Hawkins et al. [77] reported that female sex was associated with better adherence [60.9% vs. 39.5%; OR 2.41 (95% CI 1.20–4.85); $p = 0.01$].

Finally, we also reviewed the literature pertaining to CPAP compliance and OSA severity, with several studies reporting that disease severity was not associated with compliance [14,78,80,81]. However, one study reported that patients adequately compliant with CPAP therapy demonstrated higher baseline AHI than that of non-compliant patients [82]. DiFeo et al. [75] reported that the severity of apnea and pressure level was not associated with adherence to CPAP therapy in a prospective study with 56 patients. They also reported that the greatest predictor of CPAP use was maternal education level, with higher levels associated with better outcome ($r = 0.405$; $p = 0.002$ for nights used and $r = 0.290$; $p = 0.033$ for mean hours used/night). In contrast, Lynch et al. [78] reported that maternal education level was insignificantly different between the adequately compliant and non-compliant groups. One study investigating the association between self-efficacy using SEMSA and CPAP compliance in pediatric population reported that the SEMSA score and CPAP compliance were significantly associated ($p = 0.007$), and mean daily CPAP use increased by 48.4 min with every 1 point increase in the SEMSA score (95% CI 13.4–83.4 min) [76].

CONCLUSION

Various factors are associated with compliance with CPAP therapy. Regarding socioeconomic/demographic characteristics, we found that age and sex demonstrated conflicting results, but high SES and Caucasians were associated with good compliance. Nasal disease was significantly associated with compliance to CPAP therapy and treatment of the disease using septo-

plasty or turbinoplasty improved compliance with CPAP therapy. However, the administration of intranasal topical steroid demonstrated no benefit in compliance with CPAP therapy. Several investigators reported that upper airway obstruction can lead to increases in CPAP pressure, and oropharyngeal surgery, including UPPP, can reduce CPAP pressure and may also increase compliance. We found that various parameters of OSA severity were significantly associated with CPAP compliance, and that as disease worsened compliance increased. Self-efficacy before CPAP initiation significantly enhanced compliance, and explanation of disease status to patients by viewing their PSG data and TM care could increase the compliance with CPAP therapy. Regarding device-related factors, prescribing the optimal interface is crucial for good compliance, and heated humidification may improve nasal discomfort during CPAP but not necessarily compliance. In children, sex was not associated with better adherence, and disease severity also demonstrated no association. Self-efficacy before initiation of CPAP therapy in children was also significantly associated with compliance.

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None.

Conflicts of Interest

The authors have no financial conflicts of interest.

Authors' Contribution

Conceptualization: all authors. Formal analysis: Seo MY. Supervision: Lee SH. Writing—original draft: Seo MY. Writing—review & editing: all authors.

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