Predictors of CPAP Non-Compliance One Year Post-Discharge in Obstructive Sleep Apnea Syndrome Patients

Preditores de Não-Adesão à CPAP Um Ano Após Alta Médica em Doentes com Síndrome de Apneia Obstrutiva do Sono

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Abstract:

Introduction: Continuous positive airway pressure (CPAP) therapy is the gold standard for obstructive sleep apnea syndrome (OSAS). However, its compliance remains a clinical challenge. This study aimed to determine the CPAP non-compliance rate one year after medical discharge and identify predictors of non-compliance.

Methods: This observational study included OSAS patients who were discharged from the Pulmonology consultation at the Unidade Local de Saúde do Alto Ave between January and November 2023, after symptom correction and demonstrating compliance to CPAP (according to the European Respiratory Society and American Academy of Sleep Medicine guidelines).

One year after discharge, patients were again classified as adherent (maintaining use for ≥4 hours on ≥70% of nights) or non-adherent (remaining cases). A binary logistic regression was performed to identify predictors.

Results: A total of 403 patients were included. The non-compliance rate one year after discharge was 28.0%. A lower Apnea-Hypopnea Index (OR = 0.939), diabetes (OR = 5.801), alcohol consumption (OR=1.018), divorced status (OR = 10.243), baseline excessive daytime sleepiness complaint (OR = 0.199), Epworth Sleepiness Scale (OR = 1.209) and lower CPAP use at discharge (OR = 0.797) were identified as independent predictors for CPAP non-compliance one year after discharge.

Conclusion: Tailored follow-up strategies are essential to improve CPAP compliance, especially for high-risk patients identified through these predictors.

Keywords: Continuous Positive Airway Pressure; Patient Compliance; Sleep Apnea, Obstructive.

Resumo:

Introdução: O tratamento com *continuous positive airway pressure* (CPAP) é o tratamento padrão para a síndrome da apneia obstrutiva do sono (SAOS), mas a sua adesão é um desafio na prática clínica. Este estudo visa determinar a taxa de não-adesão ao CPAP um ano após alta médica e identificar preditores de não-adesão.

Métodos: Este estudo observacional incluiu doentes diagnosticados com SAOS e com alta médica da consulta de Pneumologia da Unidade Local de Saúde do Alto Ave entre Janeiro e Novembro de 2023 após correção dos sintomas de SAOS e demonstrarem adesão ao CPAP (de acordo com as normas da Sociedade Respiratória Europeia e da Academia Americana de Medicina do Sono).

Um ano após alta, os doentes foram novamente classificados como aderentes (mantiveram uso de CPAP por ≥4 horas/noite em ≥70% das noites) ou não aderentes (restantes). Realizou-se uma regressão logística binária para a identificação dos preditores.

Resultados: Foram incluídos 403 doentes. A taxa de não-adesão ao CPAP um ano após a alta foi de 28,0%. Um índice de apneia-hipopneia reduzido (OR = 0,939), diabetes (OR= 5,801), consumo de álcool (OR=1,018), estado civil divorciado (OR = 10,243), queixa de sonolência diurna excessiva (OR = 0,199), Escala de Sonolência de Epworth (OR = 1,209), e menor uso de CPAP na alta (OR = 0,797) foram identificados como preditores independentes para a não-adesão ao CPAP um ano após alta.

Conclusão: Aumentar a adesão ao CPAP um ano após a alta médica é crucial para o bem-estar dos doentes e reduzir custos desnecessários. A identificação dos preditores de não-adesão pode auxiliar na identificação dos doentes com alto risco de abandono e melhorar o seu seguimento.

Palavras-chave: Apneia Obstrutiva do Sono; Cooperação do Doente; Pressão Positiva Contínua nas Vias Aéreas.

Introduction

Obstructive sleep apnea syndrome (OSAS) is a worldwide prevalent sleep-related breathing disorder characterized by recurrent episodes of upper airway obstruction during sleep, leading to apneas or hypopnea.[1] These episodes cause intermittent hypoxemia, fragmented sleep, recurrent arousals, increased respiratory effort, and heightened sympathetic

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nerve activity, which adversely impact metabolic, cardiovascular and neurocognitive functions.[2-4]

The symptoms of OSAS vary widely and occur during the day and night, significantly reducing an individual´s quality of life, and increasing their risk for work-related and traffic accidents.[5-6] Additionally, OSAS is recognized as a risk factor for cardiovascular morbidity and mortality.[7-8]

Effective treatment requires a multidisciplinary approach and should be individualized.[9,10] Continuous positive airway pressure (CPAP) therapy is the first-line treatment for moderate-to-severe OSAS, effectively reducing symptoms, improving sleep quality, and mitigating associated health risks.[11,12]

CPAP compliance is defined as usage of ≥4 hours on ≥70% of nights.[9,10] Even though CPAP's proven benefits, its acceptance and compliance remain challenging in clinical practice, with a non-compliance rate of 34.1%.[13] Several determinants have been described to contribute to treatment discontinuation, including disease severity, comorbidities, and psychological distress.[14-16]

In Portugal, patients diagnosed with OSAS at the Pulmonology, Sleep Respiratory Disorder clinic, with CPAP prescription, can begin therapy at no cost to the patient.[17] After establishing compliance, symptom improvement, and treatment efficacy, these patients are discharged to Primary Health Care (PHC) for continued follow-up.[18]

Although there are some studies on long-term CPAP compliance, there is a lack of research evaluating compliance after hospital discharge.

This study aims to determine CPAP non-compliance rate one year after medical discharge in patients with OSAS at the Pulmonology Department of Unidade Local de Saúde do Alto Ave (ULS AAVE), and to identify independent predictors for CPAP discontinuation in this population.

Methods

This observational and single-center study was conducted at the Pulmonology Department of ULS AAVE. The target population comprised adult patients diagnosed with OSAS and undergoing CPAP therapy who were discharged of the from the Respiratory Sleep Disorder outpatient clinic of Pneumology Department between January and November 2023. This time frame was selected for convenience and to ensure an adequate follow-up period to assess CPAP compliance status.

The inclusion criteria included all patients with a medical indication for CPAP therapy and discharged after demonstrating therapeutic efficacy, compliance with CPAP treatment, and resolution of symptoms. Patients who developed respiratory insufficiency, died or underwent a bariatric surgery and achieved OSAS remission before completing one-year post-medical discharge were excluded of the study. Additionally, patients without an available CPAP usage report at the one-year re-evaluation after discharge were also excluded from the study.

A database containing all relevant variables, and all data were anonymized and stored in a Microsoft Excel® file. Data were collected at three-time points: before treatment (symptoms and behaviors related to sleep and a polysomnography study), at the medical discharge appointment (sociodemographic characteristics, comorbidities, CPAP device information and usage report) - through SClínico® medical records -, and one year after discharge through the CPAP usage report obtained from the home respiratory care company.

Direção Geral de Saúde (DGS), Portugal's public health authority, defines CPAP compliance based on the European Respiratory Society and American Academy of Sleep Medicine criteria.[17] Based on these criteria, patients who were compliant with the CPAP therapy at the discharge moment, were categorized into two groups according to their compliance to CPAP therapy one year after medical discharge: Compliant Group 1 year post-discharge (Compliant Group): patients who used CPAP for ≥4 hours on ≥70% of nights and Non-compliant Group 1 year post-discharge (Non-Compliant Group): patients who used CPAP for <4 hours on ≥70% of nights or ≥4 hours on <70% of nights.

Statistical analysis was performed using IBM® SPPSS® Statistics Software, version 29. Normality was checked using histograms, measures of skewness and kurtosis and normality tests (Shapiro-Wilk test). In the descriptive analysis, categorical variables were presented as absolute frequency (n) and proportions (%). Missing values were omitted when calculating proportions. The Chi-square test and Fisher's exact test were used to compare categorical variables between groups. The assumptions for Chi-square use were checked. Continuous variables were described as means (M) and standard deviations (SD) for normally distributed data, and medians (Mdn) with interquartile ranges (IQR) for skewed distributions. Normality was checked using histogram, measures of skewness and kurtosis and the Shapiro-Wilk test. Comparisons between the Compliant and Non-Compliant Groups were performed to identify baseline patient differences associated with CPAP compliance. Accordingly, the Student's t-test was applied to compare normally distributed variables, while the Mann-Whitney U test was used for non-parametric distributed data, between groups. The Wilcoxon Signed-Rank test was used to compare non-normally distributed data from the same group at different time points. Patients with missing data were excluded from pairwise comparisons. A binary logistic regression identified predictors of non-compliance. The model's goodness of fit was evaluated using the Hosmer–Lemeshow test to assess the agreement between observed and predicted outcomes. Statistical significance was set at $p < 0.05$, with a 95% confidence interval (CI).

The ethical approval was obtained from the institutional review board, according to the most recent version of the Helsinki Declaration (2024).

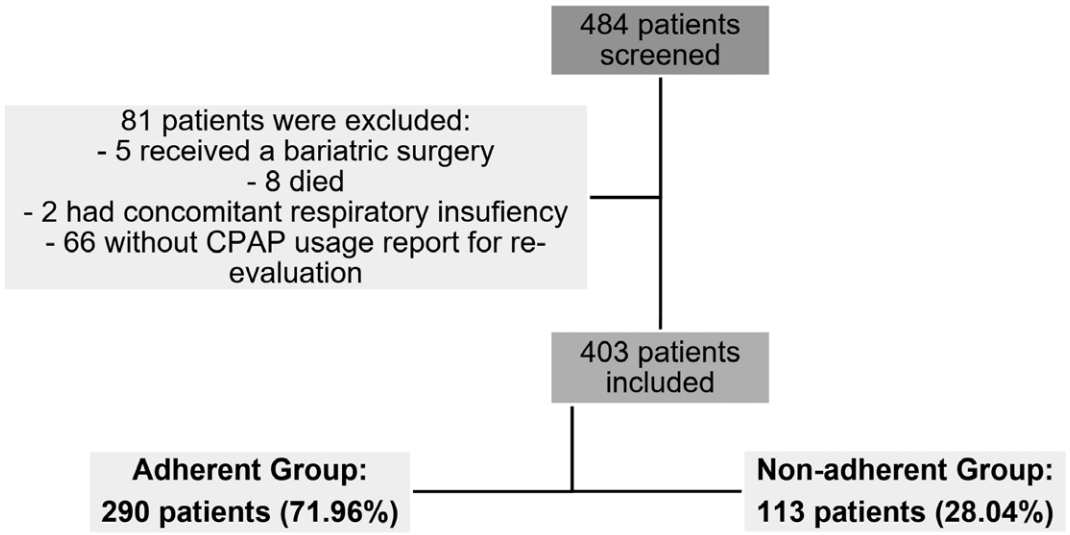

Figure 1: Patient flowchart.

Results

A total of 484 patients diagnosed with OSAS who demonstrated efficacy and compliance with CPAP therapy at the time of their discharge were screened. Of these, 81 patients were excluded, as illustrated in Fig. 1. Of the 403 included patients, 290 used CPAP for ≥4 hours on ≥70% of nights, one year after discharge, and were allocated to the Compliant Group and 113 patients showed non-compliance being part of the Non-Compliant Group, as shown in Fig. 1. The CPAP non-compliance rate one year after medical discharge was 28.0%. Among the non-compliant patients, 22 patients (19.5%) returned their CPAP equipment, and 3 (2.7%) were referred to our center for further management.

The sociodemographic and background characteristics of the patient population are detailed in Table 1. The mean age was 63.98 ± 11.16 years, and 67.0% of patients were male. The median body mass index was 30.69 (IQR 6.13), with over half of the patients (52.9%) classified as obese. The most prevalent comorbidities were hypertension (67.0%) and dyslipidemia (58.3%).

The most reported symptoms before diagnosis were snoring and excessive daytime sleepiness (EDS) (77.9% and 64.0%, respectively). A significant difference was observed between the Compliant and Non-Compliant Groups regarding snoring ($p = 0.022$).

The median Epworth Sleepiness score was 10.0 (IQR 9.0) for the compliant group and 12.0 (IQR 9.0) for the Non-compliant Group, with no significant differences.

Differences in sleeping habits between the groups were found, with the Compliant group averaging 7.63 ± 1.38 hours of sleep compared to 7.21 ± 1.73 hours in the Non-Compliant Group, $p = 0.024$.

Detailed OSAS diagnostic data (Table 2) showed that the Compliant Group had a higher median Apnea-Hipopnea Index (AHI) (32.0) compared to the non-compliant group (25.8), without differences in OSAS severity distribution. The CPAP device and its maintenance services were provided by different companies and all had auto-CPAP devices. Initial compliance significantly differed between groups ($p < 0.001$), with 19.1% initially non-adherent, including 14.1% in the adherent group and 31.9% in the non-adherent group. The Non-Adherent Group had a longer median CPAP usage duration (37.0 months) than the adherent group (33.5 months).

At the discharge moment, the overall median residual AHI was 1.4 (IQR 1.7) and CPAP usage was significantly higher in the Adherent Group (97.0%, IQR 7.0) than in the Non-Adherent group (80.0%, IQR 19.0), $p = <0.001$ (Table 3). Regarding the results at one year after discharge, the median residual AHI was 1.4 (IQR 2.0) and a p-value of < 0.001 was observed regarding the usage percentage between the two groups (Table 3).

The Adherent Group demonstrated a significant decrease of 3.0% in CPAP usage at discharge and one year later. A significant difference was also observed in the residual AHI between the two time points ($p = 0.048$). In contrast, the non-Adherent Group exhibited a notable decline in CPAP usage with a significant difference ($p < 0.001$) (Table 4).

Several variables were identified as significant independent predictors of CPAP non-compliance one year after discharge, including diabetes (OR = 5.801), EDS (OR = 0.199), AHI (OR = 0.939), divorced status (OR = 10.243), active alcohol habits (OR = 1.018), Epworth Sleepiness Scale (ESS) (OR = 1.209), and CPAP usage at discharge (OR = 0.797) (Table 5). The model's goodness of fit, assessed by the Hosmer–Lemeshow test, was adequate (χ^2 (8) = 12.78, $p = 0.120$).

Table 1: Baseline characteristics (Adherent Group *versus* Non-Adherent Group)

	Total	SCORE2-Diabetes: High and very high risk (n=15)	SCORE2-Diabetes: low and moderate risk (n=10)	*p*-value (effect size)
Age (years), M ± SD	63.98 ±11.16	63.92 ± 11.04	64.12 ± 11.51	0.439
Sex (male), n (%)	270 (67.0%)	198 (68.3%)	72 (63.7%)	0.382
BMI (Kg/m2), Mdn (IQR)	30.69 (6.13)	30.42 (6.20)	31.20 (6.08)	0.946
Education level, n (%)				0.983
Illiterate/4th grade	100 (24.8%)	72 (27.8%)	28 (27.7%)	
6th grade	75 (18.6%)	55 (21.2%)	20 (19.8%)	
9th grade	81 (20.1%)	59 (22.8%)	22 (21.8%)	
Secondary school	61 (15.1%)	42 (16.2%)	19 (18.8%)	
Academic degree	43 (10.7%)	31 (12.0%)	12 (11.9%)	
Employed, n (%)	202 (50.1%)	144 (49.7%)	58 (51.3%)	0.763
Marital status, n (%)				0.198
Single	74 (18.4%)	60 (24.6%)	14 (14.7%)	
Married	205 (50.9%)	142 (58.2%)	63 (66.3%)	
Divorced	35 (8.7%)	23 (9.4%)	12 (12.6%)	
Widowed	25 (6.2%)	19 (7.8%)	6 (6.3%)	
Place of residence (rural), n (%)	225 (55.8%)	166 (57.2%)	59 (52.2%)	0.361
Family history of OSAS, n (%)	75 (18.6%)	57 (22.8%)	18 (18.2%)	0.344
Alcohol consumption, n (%)				0.855
None	159 (39.5%)	109 (38.9%)	50 (46.3%)	
Light	120 (29.8%)	96 (34.3%)	24 (22.2%)	
Moderate	82 (20.3%)	57 (20.4%)	25 (23.1%)	
Excessive	27 (6.7%)	18 (6.4%)	9 (8.3%)	
Smoking habits, n (%)				0.132
Non-smoker	243 (60.3%)	174 (60.0%)	69 (61.1%)	
Active smoker	46 (11.4%)	32 (11.0%)	14 (12.4%	
Former smoker	114 (28.3%)	84 (29.0%)	30 (26.5%)	
Target organ disease				0.132
None	88%	80%	100%	
Microvascular	12%	20%	0%	
Macrovascular	0%	0	0%	
Both	0%	0	0%	
Dyslipidemia, n (%)	235 (58.3%)	165 (56.9%)	70 (61.9%)	0.356
Diabetes *mellitus*, n (%)	106 (26.3%)	69 (23.8%)	37 (32.7%)	0.067
Hypertension, n (%)	270 (67.0%)	193 (66.6%)	77 (68.1%)	0.760
Arrythmias, n (%)	69 (17.1%)	50 (17.2%)	19 (16.8%)	0.919
Previous MI, n (%)	31 (7.7%)	24 (8.3%)	7 (6.2%)	0.481
Previous cerebral stroke, n (%)	27 (6.7%)	21 (7.2%)	6 (5.3%)	0.486
Depression, n (%)	74 (18.4%)	51 (17.6%)	23 (20.4%)	0.519
Anxiolytics intake, n (%)	90 (22.3%)	61 (21.0%)	29 (25.7%)	0.316
Sedatives intake, n (%)	54 (13.4%)	37 (12.8%)	17 (15.0%)	0.545
Snoring, n (%)	314 (77.9%)	234 (81.8%)	80 (71.4%)	0.022 (0.114)
Sleeping habits (hours), M±SD	7.51±1.50	7.63±1.38	7.21±1.73	0.024 (0.114)
EDS, n (%)	258 (64.0%)	182 (62.8%)	76 (67.9%)	0.428
ESS, Mdn (IQR)	11.0 (10.0)	10.0 (9.0)	12.0 (9.0)	0.056

Continuous variables are presented as M ± SD if normal distribution and as Mdn (IQR) if skewed distribution, and categorical variables as n (%). Comparisons between the two groups were made using Student's t-test (p-value, Cohen's d) and the Mann-Whitney U test (p-value, r) for normally and non-normally distributed data, respectively. Chi-square test (p-value, ϕ) was used to compare categorical variables.
Abbreviations: Adherent Group - Adherent Group 1 year post-discharge; Non-Adherent Group - Non-adherent Group 1 year post discharge; M, Mean; Mdn, median; SD, standard deviation; n, absolute frequency; %, percentage; IQR, Interquartile Range; BMI, Body Mass Index; OSAS, obstructive sleep apnea syndrome; MI, myocardial infarction; EDS, Excessive Daytime Sleepiness; ESS, Epworth Sleepiness scale.

Table 2: Obstructive sleep apnea syndrome's characterization and continuous positive airway pressure information (Adherent Group *versus* Non-Adherent Group)

	Total (n = 403)	Adherent Group (n = 290)	Non-Adherent (n = 113)	*p*-value (effect size)
AHI, Mdn (IQR)	30.70 (26.5)	32.0 (27.7)	25.8 (19.6)	<0.001 (0.187)
Severity of OSAS, n (%) Mild Moderate Severe	 55 (13.8%) 137 (34.3%) 208 (52.0%)	 35 (12.2%) 92 (32.1%) 160 (55.7%)	 20 (17.7%) 45 (39.8%) 48 (42.5%)	0.051
Company provider, n (%) 0 1 2 3 4 5 6	 39 (9.7%) 127 (31.5%) 57 (14.1%) 59 (14.6%) 30 (7.4%) 84 (20.8%) 7 (1.7%)	 25 (8.6%) 94 (32.4%) 48 (16.6%) 37 (12.8%) 23 (7.9%) 58 (20.0%) 5 (1.7%)	 14 (12.4%) 33 (29.2%) 9 (8.0%) 22 (19.5%) 7 (6.2%) 26 (23.0%) 2 (1.8%)	0.180
Type of mask, n (%) Nasal Oronasal	 225 (55.8%) 178 (44.2%)	 163 (56.2%) 127 (43.8%)	 62 (54.9%) 51 (45.1%)	<0.001 (-0.202)
CPAP initial compliance, n (%) No Yes	 77 (19.1%) 326 (80.9%)	 41 (14.1%) 249 (85.9%)	 36 (31.9%) 77 (68.1%)	0.361
Treatment duration until discharge (months), Mdn (IQR)	12.0 (16.0)	11.5 (16.0)	13.0 (19.0)	0.330
Treatment duration until reassessment (months), Mdn (IQR)	35.0 (21.0)	33.50 (20.0)	37.0 (17.0)	0.025 (0.112)

Continuous variables are presented as median(IQR) by its skewed distribution, and categorical variables as n(%). Comparisons between the two groups were made using the Mann-Whitney U test (p-value, r) for non-normally distributed data. Chi-square test (*p*-value, ϕ) was used to compare categorical variables.
Abbreviations: Adherent Group, Adherent Group 1 year post-discharge; Non-Adherent Group, Non-adherent Group 1 year post discharge; n, absolute frequency; %, percentage; IQR, Interquartile range; Mdn, Median; AHI, Apnea-Hypopnea Index; The values in bold stand for statistically significant differences ($p<0.05$).

Table 3: Continuous positive airway pressure report at discharge and one year after discharge (Adherent Group *versus* Non-Adherent Group)

	Total (n = 403)	Adherent Group (n = 290)	Non-Adherent (n = 113)	*p*-value (effect size)
Residual AHI at discharge, Mdn (IQR)	1.4 (1.7)	1.4 (1.75)	1.3 (1.55)	0.554
Usage at discharge (%), Mdn (IQR)	94.0 (15.0)	97.0 (7.0)	80.0 (19.0)	<0.001 (0.499)
Residual AHI post-discharge, Mdn (IQR)	1.4 (2.0)	1.4 (2.1)	1.4 (1.7)	0.480
Usage post-discharge (%), Mdn (IQR)	88.0 (33.0)	94.0 (13.0)	26.0 (55.0)	<0.001 (0.770)

Continuous variables are presented as median (IQR) by its skewed distribution, and categorical variables as n (%). Comparisons between the two groups were made using the Mann-Whitney U test (p-value, r) for non-normally distributed data. Chi-square test (p-value, ϕ) was used to compare categorical variables. Abbreviations: Adherent Group, Adherent Group 1-year post-discharge; Non-Adherent Group, Non-adherent Group 1 year post discharge; n, absolute frequency; %, percentage; IQR, Interquartile range; Mdn, Median; AHI, Apnea – Hypopnea Index. The values in bold stand for statistically significant differences ($p<0.05$).

Table 4: Comparison of continuous positive airway pressure compliance and efficacy at discharge and one year after medical discharge (Adherent Group *versus* Non-Adherent Group)

		At medical discharged	1 year after medical discharge	*p*-value (effect size)
Adherent Group (n=290)	Percentage of usage, Mdn (IQR)	97.0 (7.0)	94.0 (13.0)	<0.001 (-0.633)
	AHI, Mdn (IQR)	1.4 (1.75)	1.4 (2.1)	0.048 (0.116)
Non-Adherent Group (n=113)	Percentage of usage, Mdn (IQR)	80.0 (19.0)	26.0 (51.0)	<0.001 (-0.864)
	AHI, Mdn (IQR)	1.3 (1.55)	1.4 (1.7)	0.072

Calculated by the Wilcoxon test, p-value (r). The effect size $r=z/\sqrt{n}$ was calculated.
Abbreviations: Adherent Group, Adherent Group 1-year post-discharge; Non-Adherent Group, Non-adherent Group 1 year post-discharge; IQR, Interquartile range; Mdn, median; AHI, Apnea–Hypopnea Index. The values in bold stand for statistically significant differences ($p<0.05$).

Table 5: Logistic binary regression modeling the risk for continuous positive airway pressure non-compliance one year after medical discharge

Variables	B	Standard Error	OR	*p*-value
Age (years)	0.045	0.039	1.046	0.243
Sex (female)	-1.283	0.695	0.277	0.065
BMI (kg/m2)	0.054	0.065	1.056	0.405
Education level (illiterate/4th grade)	0.211	0.824	1.235	0.798
Marital status (divorced)	2.327	0.991	10.243	0.019
Place of residence (rural)	-0.147	0.502	0.863	0.770
Smoking habits (yes)	-0.024	0.841	0.976	0.997
Alcohol habits (yes)	0.018	0.613	1.018	0.011
Diabetes (yes)	1.758	0.576	5.801	0.002
Depression (yes)	-0.106	0.651	0.899	0.870
Multiple symptoms (yes)	0.204	0.714	1.226	0.775
EDS (yes)	-1.616	0.772	0.199	0.036
ESS	0.190	0.062	1.209	0.002
AHI	-0.063	0.025	0.939	0.011
Treatment duration	0.004	0.007	1.000	0.953
Initial adhesion (yes)	0.415	0.630	1.514	0.511
Sleeping habits (hours)	0.002	0.167	1.002	0.990
Type of mask (facial)	0.217	0.502	1.242	0.666
CPAP usage at discharge (%)	-0.227	0.038	0.797	<0.001

Abbreviations: OR, odds ratio; B, beta coefficient; BMI, Body Mass Index; EDS, excessive daytime sleepiness; ESS, Epworth sleepiness Scale; AHI: Apnea-Hypopnea Index; The values in bold stand for statistically significant differences ($p < 0.05$).

Discussion

The CPAP therapy is the most used treatment for OSAS, but its compliance remains a significant challenge. Non-compliance exacerbates symptoms, increases cardiovascular risks, and negatively impacts patient's well-being.

With a median follow-up of approximately 3 years since CPAP initiation, our study found that 28.0% of the 403 patients were non-adherent to CPAP therapy one year after medical discharge. Unlike other studies, our analysis specifically included patients who had initially adhered to CPAP therapy upon discharge but later abandoned treatment. This differs from Qiao *et al*, who reported 74.3% non-compliance after two years of follow-up, while Jacobsen *et al* found a similar rate of 21.3% after three years of follow-up since the beginning of CPAP therapy.[16,19] It is important to highlight that our study excluded patients who discontinued CPAP during follow-up visits at our centre, which contrasts with the methodology of other studies. This selection criterion may contribute to an underestimation of our non-compliance rate compared to published data.

A recent Portuguese study highlighted significant gaps in the follow-up care of CPAP users. Similarly, in our study, only 3 of 113 non-compliant patients were referred back to the sleep center, reflecting insufficient referral from primary care services. This low rate of re-referral may delay the identification of non-adherent patients and hinder timely clinical reassessment and intervention. These findings underscore the need for more efficient and prompt referral pathways, along with regular consultations, consistent CPAP monitoring, and side effect management.[18,20]

Compliance with CPAP therapy carries both clinical and economic implications, as the National Health System fully funds its costs. In 2021, €113.9 million was spent on home respiratory care, with a significant share for CPAP therapy.[21] Non-adherent patients miss therapeutic efficacy, creating unnecessary costs. Our study found that only 19.5% of non-compliant patients returned their CPAP devices, emphasizing the need for improved follow-up care to enhance treatment effectiveness and reduce avoidable expenses.

Overall, our results underscore the importance of continuous monitoring, structured follow-ups, and individualized care to enhance long-term compliance and prevent deterioration of health outcomes. Ongoing adjustments to CPAP therapy are essential, as treatment needs evolve.[22]

Recent reviews identify various predictors of CPAP compliance.[23] In our study, diabetes *mellitus* emerged as a strong independent predictor of non-compliance (OR = 5.801, $p = 0.002$), aligning with prior research.[16-24] These results may be related to the higher treatment burden associated with managing multiple chronic conditions, which can lead to the

deprioritization of CPAP use and negatively impact long-term compliance.[25]

Active alcohol consumption increases the likelihood of CPAP non-compliance by 1.018 times. Similarly, Jeong *et al* identified frequent alcohol consumption as an independent predictor of non-compliance. Alcohol exacerbates sleep disturbances and diminishes CPAP's therapeutic effects, thereby increasing the risk of non-compliance.[26]

Divorced patients are 10.243 times more likely to be non-compliant with CPAP therapy. Social support plays a critical role in compliance, with divorced individuals showing higher rates of non-compliance.[27]

Patients with severe but asymptomatic OSAS show lower CPAP compliance, while those with severe EDS adhere better due to symptom relief.[28] Our study found EDS protective against non-compliance (OR = 0.199, $p = 0.036$), unlike other Portuguese study.[29]

Higher ESS scores were linked to an increased risk of non-compliance (OR = 1.209), consistent with Milinovic *et al* findings, which also showed that higher ESS scores were associated with reduced CPAP compliance, contrary to expectations.[30]

Our findings suggest a complex relationship between EDS and ESS in predicting CPAP non-compliance. While both are subjective, ESS evaluates active and passive sleepiness, with active sleepiness being more severe. ESS variability may stem from patient biases, particularly in rural or illiterate populations (55.8% rural, 24.8% illiterate), affecting the accuracy of results, and leading to varied classifications.

A lower AHI independently predicted CPAP non-compliance one year post-discharge. Greater OSAS severity has been linked to improved long-term compliance likely due to the increased symptom burden motivating compliance.[15,19]

Lastly, higher CPAP usage at the discharge moment ($p < 0.001$) was a protective factor against future non-compliance, emphasizing the importance of establishing consistent usage patterns before discharge.

Sociodemographic and psychological factors identified in other studies did not predict compliance in this study, likely due to distinct baseline characteristics and this study design.[15]

The identification of patients at higher risk of abandoning CPAP therapy offers practical opportunities to optimize patient care. Rather than adopting a uniform approach, clinicians should implement proactive, personalized interventions for these patients. These may include more frequent follow-up appointments, early reassessment of difficulties, and structured phone contact to reinforce therapy compliance and address emerging issues. Telemedicine may further support these efforts by enabling regular monitoring and timely adjustments, particularly for patients in rural or hard-to-reach areas. This integrated approach could significantly improve long-term treatment success and reduce the burden of untreated OSAS.

However, the study's retrospective and single-center design may introduce bias and limit the generalizability of the findings. The exclusion of patients without CPAP usage data may also have affected compliance estimates. Additionally, all patients used Auto-CPAP devices, whose pressure algorithms can vary, potentially influencing treatment consistency. To strengthen the evidence base, the authors suggest future multicenter, prospective studies to validate these results and assess the impact of targeted compliance strategies across broader patient populations.

Conclusion

Our study highlights the challenges of maintaining CPAP compliance in OSAS patients after hospital discharge, with a non-compliance rate of 28.0% one-year post-discharge. Unlike previous studies, we specifically analyzed patients who initially adhered to treatment but later discontinued it, identifying key independent predictors of non-compliance, including diabetes *mellitus*, active alcohol consumption, divorced status, higher ESS scores, and lower AHI. Recognizing these predictors can help clinicians implement targeted interventions to support high-risk patients and enhance long-term compliance.

To address these challenges, a structured follow-up approach is essential, integrating regular monitoring, early reassessment, and individualized interventions. Telemedicine strategies could play a crucial role in overcoming logistical barriers, enabling timely adjustments, and improving treatment outcomes. Furthermore, the low re-referral rate from primary care highlights a gap in post-discharge management, emphasizing the need for better coordination between healthcare providers. Given the economic burden of CPAP therapy on the healthcare system, optimizing compliance is critical to ensuring both clinical effectiveness and cost-efficiency.

Future multicenter, prospective studies with continuous monitoring are needed to explore CPAP compliance across diverse populations. These studies could provide valuable insights into long-term compliance trends and inform strategies to improve patient compliance, ultimately reducing the burden of untreated OSAS. ■

Contributorship Statement

AC – Manuscript drafting, data analysis, and critical review of the text
FC – Manuscript drafting, data collection and analysis
HD – Critical review of the text
All authors approved the final version to be published.

Declaração de Contribuição

AC – Redação do manuscrito, análise de dados e revisão crítica do texto
FC – Redação do manuscrito, colheita e análise de dados
HD – Revisão crítica do texto
Todos os autores aprovaram a versão final a ser publicada.

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