Psychological variables as predictors of adherence to treatment by continuous positive airway pressure

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ABSTRACT

Study objectives: We examined whether psychological variables enable us to predict adherence to CPAP in order to construct a predictive model to identify patients at risk of abandoning treatment.

Method: One hundred and twenty-two Obstructive Sleep Apnoea (OSA) patients were studied before and one month after beginning CPAP treatment. All patients completed four psychological evaluation instruments before CPAP treatment: a health perception questionnaire (Nottingham Health Profile: NHP), a mental health rating scale (Hospital Anxiety and Depression Scale: HADS) and two disease-specific questionnaires that measure the patient’s understanding of OSA and its treatment (Apnea Knowledge Test: AKT) and his attitudes to OSA and CPAP (Apnea Beliefs Scale: ABS).

Results: Thirty percent of the participants were non-adherent at one month. Decision-tree analysis indicated that it was possible to correctly classify 85.7% of non-adherent patients using three baseline factors (Emotional reactions score [NHP], age, and total score on ABS). Logistic regression analyses confirmed these two psychological variables as independent predictors of adherence.

Conclusion: Assessing psychological well-being and subjective health status at onset of CPAP enables the identification of patients at risk of abandoning CPAP treatment. This subgroup could then be targeted early to receive supportive and educational measures to improve adherence rates.

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1. Introduction

Obstructive sleep apnoea syndrome (OSAS) is a common condition [1] with symptoms of daytime somnolence, fatigue, irritability [2], depression and impaired cognitive function [3]. OSA is associated with high cardiovascular risks [4] and increased risk of road traffic accidents [5]. Continuous Positive Airway Pressure (CPAP) is an effective treatment for OSA, improving symptoms, reducing accidents and improving quality of life [6,7].

Patients have variable responses and adaptations to CPAP treatment and thus require different medical and paramedical input. Some individuals find immediate improvement in symptoms and a renewed dynamism that makes acceptance of the treatment relatively easy [8]. However, if the patient has difficulty in accepting the diagnosis [9], suffers unpleasant side effects of the treatment, or experiences no obvious improvement in health status or quality of life, then there may be difficulties in adaptation to the treatment regime [10].

It would be useful if evaluations made at the point of diagnosis or at initiation of treatment could identify patients liable to have little problem with their CPAP or, in contrast, those who are likely to experience difficulties with adaptation. If patients could be stratified early on during their treatment, then strategies of adapted professional input could be applied to correct problems and use patient contact time to the greatest effect.

Apart from technical problems associated with the equipment, factors potentially influencing the level of CPAP compliance include measures of the initial severity of OSAS, such as the Respiratory Disturbance Index (RDI) or daytime somnolence at the time of diagnosis, as well as subjective improvement under treatment [11]. One factor affecting adherence to this demanding treatment is the level of involvement and education by healthcare professionals at the time of initiation of treatment [12]. Several studies have demonstrated improved adherence with increased patient-education input [13]. An important factor in the adherence to any long-term treatment is the beliefs the patient holds about his health, his illness and its treatment. These ideas, known in psychology as “health beliefs,” are thought to affect the patient’s “health behaviours” [14]. Health behaviours refer to the actions, habits and activities adopted by the patient, including his attempts to seek
remedies for his illness and his willingness to adhere to medical advice.

The extent to which patients’ adaptation to treatment is influenced by psychological factors remains unclear. The idea that subjective health measures predict patient behaviours implies that psychological evaluations might aid in identifying the patients likely to be non-adherent.

The current investigation aimed to explore the beliefs and measure the subjective health of OSA patients embarking on CPAP treatment to see what factors influenced adherence levels with CPAP therapy. Specifically, we examined to what extent psychological variables help predict patient adherence to CPAP. These factors included quality of life and psychopathology, as well as patients’ understanding of and attitude to their illness and CPAP treatment.

2. Patients and methods

2.1. Participants

All newly-diagnosed OSA patients were assessed, excepting those participating in other research protocols. The only exclusion criterion concerned the patients who were unable to answer the questionnaire. Polysomnography continuous recordings were taken with electrode positions C3/A2-C4/A1-Cz/01 of the international 10–20 Electrode Placement System, eye movements, chin electromyogram and ECG with modified V2 lead. Sleep was scored manually according to standard criteria [16]. Airflow was measured with nasal pressure associated with the sum of buccal and nasal thermistor signals. Respiratory effort was monitored with abdominal and thoracic bands. An additional signal of respiratory effort (i.e., pulse transit time) was recorded concurrently. Oxygen saturation was measured using a pulse oximeter (Biox-Ohmmeda 3700; Ohmeda, Liberty Corner, NJ, USA). An apnea was defined as a complete cessation of airflow for at least 10 s, and an hypopnea as a reduction of at least 50% in the nasal pressure signal or a decrease between 30% and 50% associated with either oxygen desaturation of at least 3% or an EEG arousal (defined according to the Chicago report) [17], both lasting for at least 10 s. Apneas were classified as obstructive, central or mixed according to the presence or absence of respiratory efforts. The classification of hypopneas as obstructive or central was based on the pulse transit time signal [15] and the shape of the respiratory curve of nasal pressure (flow limited aspect or not) [18]. A Respiratory Disturbance Index (RDI) was calculated and defined as the number of apneas and hypopneas per hour of sleep (full polysomnography) or per hour of recording (polysomnography without EEG recording). Sleep apnea was defined as an RDI of at least 15/h. Patients were recruited by one of the authors (CP) following diagnosis and before the treatment was initiated in a home-care service (Agir à Dom) in Grenoble (affiliated with the French respiratory homecare network [ANTA-DIR]) [10,19]. All patients were seen by trained nurses at this home-care centre, and they were given a detailed explanation of sleep apnoea and its possible consequences; time was spent choosing an adapted mask and machine. Patients returned home with an auto-adjust titrating CPAP device, and a contact telephone number was provided. The CPAP treatment pressure was fixed at the 95th percentile of adequate pressure defined by the auto-adjust machine. A structured follow-up protocol was then applied (telephone contact at eight days and clinical review at one month, as used for all patients in the home-care service), with special attention for those patients having difficulty adapting to their treatment regime.

Patients were informed of the methods and gave written consent to participate. The study was approved by the Hospital Ethics Committee (Grenoble University Hospital).

2.2. Method and tools

In addition to the routine evaluations for new users of CPAP, the patients in our study completed some research questionnaires in the home-care centre one hour before the appointment with the nurse. These were incorporated into a structured research interview, which included French versions of the following four questionnaires:

Hospital Anxiety and Depression Scale (HADS) [20]: this instrument screens for anxiety and depressive symptomatology in non-psychiatric hospital settings and primary care. This patient-rated scale has 14 items: seven for depression and seven for anxiety. Score ranges indicate normal, borderline or pathological levels of anxiety or depression.

Nottingham Health Profile (NHP) [21]: patients indicate whether or not they are experiencing health-related symptomatology. The NHP presents 38 self-descriptive phrases, with a Yes/No response choice. This gives a profile of current problems in six areas: sleep, energy, emotional reactions, pain, physical mobility and social isolation. This instrument is an internationally used indicator of health-related quality of life or subjective health status. Higher scores indicate higher numbers of health-related complaints.

Apnea Belief Scale (ABS) and Apnea Knowledge Test (AKT): these two disease-specific questionnaires measure patients’ beliefs and knowledge about their OSA and treatment by CPAP. These instruments were constructed and validated by Smith et al. (2004) [22] and we translated them into French for this study.

* The ABS contains 24 statements which evaluate the patient’s beliefs about his illness and CPAP treatment. High ABS scores indicate accurate beliefs about the illness and treatment; lower scores indicate misconceptions about OSA and CPAP.

* The AKT measures the patients understanding of his illness and its treatment by CPAP; the questionnaire has 15 items, including 13 multiple-choice items and 2 open-ended questions. High AKT scores indicate better knowledge of OSA and its treatment; lower scores indicate poor understanding of OSA and CPAP.

2.3. Procedure

Patients completed the four questionnaires before beginning CPAP therapy. Adherence was measured by reading the hour-meters which gave the average number of hours of CPAP run time per night for one month.

2.4. Statistical analyses

Statistical analyses were performed using NCSS 97 software (Kaysville, UT, USA). Continuous data were expressed as means (±SD) and non-continuous data in percentages. Normality of data distribution was assessed using Skewness and Kurtosis tests. Comparisons between patients were performed using Student-test (or Mann–Whitney test when data were not normally distributed) for continuous data. Non-continuous variables were compared using a Chi² test (for anthropometric characteristics, parameters of sleep and psychological variables).

In view of the large number of variables evaluated (notably psychological variables), we carried out a preliminary selection, retaining for the following analyses only those variables presenting a p-value <0.2 on comparing the two groups (adherent/non-adherent). Indeed, we measured a large number of variables in the study. Initially, we presented and used the variables having a statistically significant difference (with a p value <0.05), as well as those presenting a tendency towards the difference (with a p value <0.20).
This process enabled us to have a first selection of variables to study.

In order to categorise patients according to their adherence to CPAP, we performed a decision-tree analysis with C4.5 method [23]; the minimal strength required for each node was ten in order to have sufficiently large groups. This method generated an arborisation of parameters, classifying patients into one of two groups: adherent (>4 h/night) or non-adherent (<4 h/night). The TANAGRA [24] software was used. The analysis was conducted on the variables presenting a p-value ≤0.2 in the comparison of means between adherent and non-adherent patients (gender was the only qualitative variable).

Odds ratios were calculated to assess the risk of adherence or non-adherence to CPAP. All the thresholds used to transform the quantitative variables into binary categories were the medians, except for the HADS questionnaire, where we used the standard threshold score recommended by the original authors [20]. An initial equation was constructed using those single variables having a significant odds-ratio for adherence. Then in a second model, we used paired-combinations of variables which had significant odds-ratios for adherence.

### 3. Results

#### 3.1. Participants

One hundred twenty-two patients were recruited (Table 1), including 99 men. These patients suffered from sleepiness (mean Epworth Sleepiness Scale = 10.5 ± 5.3) with a mean age of 56 ± 11 yrs, mean Body Mass Index of 28.3 ± 4.4 kg/m², mean nocturnal SpO2 of 94 ± 2.2% and mean RDI (Respiratory Disturbance Index) of 38.4 ± 19.9/h indicating moderate to severe sleep apnea. Two-thirds of the patients regularly used CPAP (>4 h/night) and one-third were non-adherent (<4 h/night). No significant differences were observed in the socio-demographic and diagnostic characteristics of the patients between those using the CPAP >4 h per night and the others (<4 h/night), including BMI, smoking, alcohol consumption, marital situation, professional situation, SES, nocturnal SpO2 (mean, minimum and time spent at <90% of SpO2) and RDI. However, there was a tendency for younger patients to use CPAP less than older patients (p < 0.2) and also for female patients to be more adherent than males (p = 0.06).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Total population (n = 122)</th>
<th>CPAP use &lt; 4 h (n = 42)</th>
<th>CPAP use &gt; 4 h (n = 80)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>56 ± 11</td>
<td>54 ± 11</td>
<td>57 ± 12</td>
<td>0.18</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>28.3 ± 4.4</td>
<td>28.7 ± 4.6</td>
<td>28.1 ± 4.3</td>
<td>0.50</td>
</tr>
<tr>
<td>Gender (male)</td>
<td>81.1%</td>
<td>90.5%</td>
<td>76.3%</td>
<td>0.06</td>
</tr>
<tr>
<td>Current smoker (yes)</td>
<td>13.1%</td>
<td>16.7%</td>
<td>11.3%</td>
<td>0.40</td>
</tr>
<tr>
<td>Alcohol consumption (yes)</td>
<td>30.3%</td>
<td>28.6%</td>
<td>31.3%</td>
<td>0.76</td>
</tr>
<tr>
<td>Marital situation (couple)</td>
<td>84.4%</td>
<td>85.7%</td>
<td>83.3%</td>
<td>0.78</td>
</tr>
<tr>
<td>Professional situation (active)</td>
<td>57.4%</td>
<td>61.9%</td>
<td>55%</td>
<td>0.46</td>
</tr>
<tr>
<td>Sleep studies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESS total score</td>
<td>10.5 ± 5.3</td>
<td>10 ± 4.9</td>
<td>10.7 ± 5.6</td>
<td>0.45</td>
</tr>
<tr>
<td>Mean SpO2 (%)</td>
<td>94 ± 2.2</td>
<td>94.1 ± 2</td>
<td>94 ± 2.3</td>
<td>0.90</td>
</tr>
<tr>
<td>Min SpO2 (%)</td>
<td>78.1 ± 11.1</td>
<td>78.3 ± 10.5</td>
<td>77.9 ± 11.4</td>
<td>0.90</td>
</tr>
<tr>
<td>Time spent with a SpO2 &lt;90% (% TST)</td>
<td>8.6 ± 14.6</td>
<td>5.9 ± 10.4</td>
<td>9.9 ± 16.2</td>
<td>0.23</td>
</tr>
<tr>
<td>RDI (events/h)</td>
<td>38.4 ± 19.9</td>
<td>38.4 ± 17.2</td>
<td>38.5 ± 21.2</td>
<td>0.79</td>
</tr>
</tbody>
</table>

| BMI, Body Mass Index; TST, total sleep time; ESS, Epworth Sleepiness Score; SpO2, oxyhemoglobin saturation; RDI, Respiratory Disturbance Index. |

### 3.2. Comparison of psychological variables between adherent and non-adherent patients at sleep apnoea diagnosis

We compared the adherent and non-adherent CPAP users (<4 h/night) on their responses to the four questionnaires at baseline. For 10 variables, some differences in psychological states emerged (Table 2) between adherent and non-adherent patients (p < 0.2). Thus adherent patients (>4 h/night) tended to have higher depression scores, more emotional complaints, more problems of social isolation and less energy at baseline. Their scores on the ABS were more likely to be higher (notably, having more trust in medical staff, a more positive attitude to their health, more self-confidence and being more accepting of CPAP treatment) than non-adherent patients.

### 3.3. Prediction of CPAP adherence: a decision tree analysis

The outcome for the decision tree is summarised in Fig. 1. Results were based on adherence (i.e., adherent ≥4 h vs. non-adherent <4 h [mean on-time per night]). This decision tree was read on 4 levels so that the resulting classification tree involved 7 nodes and the error rate was 26.2%. First, the scores for “emotional reactions” (NHP) predicted 86.2% of the patients who were adherent to CPAP when they had many complaints in this section (scores ≥ 39.3); remember that high scores on the NHP reflect increasing numbers of subjective complaints or symptoms. In contrast, for patients who had few emotional complaints (i.e., score < 39.3), the following node indicated that the use of an age variable predicted that 70% of these patients were adherent if they were older than 53.5 years. For younger patients (age < 53.5 years), when the ABS score indicated maladaptive beliefs (score > 84.5), 85.7% of these patients were non-adherent.

### 3.4. Logistic regression analysis

Table 3 shows the results of two multiple logistic regression analyses. On one hand, the logistic regression analysis carried out starting from the variables (p < 0.2) showed that patients with maladaptive beliefs (ABS < 84.5) had 2.21 times more risk of being non-adherent. On the other hand, the logistic regression with different combinations of both psychological and anthropometric variables showed that by combining the variables age and ABS score, patients under 58 years (median) having maladaptive beliefs about disease and treatment (total score ABS < 84.5) were 3.32
times more at risk of being non-adherent (p = 0.02). Moreover, patients combining low scores for “emotional reactions” (NHP) and “acceptance of CPAP” (ABS) were 5.21 times more at risk of being inobservant (p = 0.03). Lastly, the combination of the gender variable and “attitude to health” (ABS) variable indicates that males who had worse attitudes to health (score < 84.5) had 2.37 times more risk of poor adherence (p = 0.048).

4. Discussion

This study investigates the possibility of stratifying CPAP patients early in their experience of this demanding treatment. It is a preliminary study and our results help to identify the most useful variables extracted from these tools that could be applied in future tailored strategies for management of CPAP patients. If one could predict those patients who are most likely to have difficulty with CPAP, one could then develop individualised management strategies. To categorize the patients as adherent or non-adherent, we used a threshold of 4 h per night of CPAP use, chosen according to two recent studies concerning blood pressure control and improvement in daily functioning and their dose-response relationship with CPAP use [25,26]. These studies demonstrated that CPAP benefits became significant after 4 h use per night, with further continuous improvement up to 7 h per night.

Up to 20% of patients may quickly refuse CPAP treatment and a further 25% give up the treatment later. In contrast, 10–20% of patients immediately experience benefit from the treatment and adhere, to the extent that we often hear them saying they “cannot do without treatment” [27]. These dramatically different uses merit different management strategies, depending on causal factors. For example, many patients with poor initial adherence have technical problems which can often be solved by adjustment of the mask and the machine to improve comfort.

Patient education is a very important aspect of adherence. Simple patient education can address basic information, but evaluations of its effectiveness are likely to be skewed by patients’ beliefs about their health and also by their perceptions of the disease and its risks. Given the increasing numbers of patients presenting with SAS and the great diversity of response in adherence, these psychological aspects of care are of increasing importance [12]. We did not examine location as a variable for CPAP adherence. The patients were recruited from the University Hospital Sleep Laboratory, a Sleep Clinic, and private medical practices that followed the same criteria of practice as the Sleep Laboratory. All participants attended the same home-care centre, and all patients were initiated to CPAP in the same home-care network with a similar protocol.

Several recent studies of OSA patients have focussed on psychological factors and their relationship to adaptation to CPAP treat-
ment. Some studies have investigated psychological constructs in the prediction of CPAP adherence (see Olsen et al. [28] for a recent review of studies) by examining cognitive factors, including levels of knowledge about OSA and its treatment by CPAP [22,29,30], as well as beliefs and attitudes to chronic illness, treatment and lifestyle modifications [9,22,29–36]. Emotional issues in OSA patients have also received attention in the context of comorbidity, vulnerability and consequences [37]. Other studies have focused on health-related quality of life and adherence to treatment, emphasizing the patients’ experiences with illness and its impact on daily life and social relationships [2,38,39]. Illness-specific measures evaluating perceptions, attitudes and beliefs relating to OSA and CPAP have been designed to identify non-adherent patients [22,32], and these should improve our ability to examine the role of psychological issues in adherence to treatment.

We have previously reported psychological factors in patients who gave up CPAP treatment after six months of use [9]. That study showed that some patients (even after six months’ experience of treatment and multiple health care contacts) were still not clear about the nature, severity or consequences of OSA and did not consider themselves ill. Such issues need to be identified early in the health care management process and corrective measures undertaken. Thus in this current study we have examined the importance of patients’ beliefs and expectations of CPAP as predictors of adherence. We found that objective measures such as RDI or obesity did not predict adherence, contrary to some previous retrospective studies [11,31]. In contrast, psychological factors (or subjective issues), as measured by the NHP, especially “emotional reactions” and “social isolation,” were predictive of non-adherence. Also, adherent patients tended to score higher for depression on the HAD scale, although this tendency was not statistically significant. Our data demonstrate the importance of considering patients’ personal health experiences and their subjective perception of their health, as well as assessing mood and beliefs; these psychological factors have been identified in recent studies of observance in other chronic diseases, notably hypertension [40] or HIV [41].

Other studies also suggested that patients’ beliefs and perceptions of OSA and CPAP could influence CPAP use [22,29–36]. When patients perceive benefits from their CPAP, they are more adherent [36]. Stepnowsky et al. [29] assessed the relationship between CPAP adherence and psychological variables such as perceived self-efficacy, outcome expectation for CPAP, social support, knowledge, process of change and “decisional balance index.” These variables, evaluated prior to starting CPAP, were not predictive of adherence to treatment; however, when measured at 1-week post-CPAP initiation, they were significantly associated with adherence at one month follow-up. More recently, Aloia et al. [34] have drawn attention to the importance of timing of psychological assessments of CPAP patients. The predictive power of psychological adherence factors appears to be influenced by the time-periods studied, and these have varied in the studies done to date (for example, measures are taken before the onset of treatment, and followed up within days, weeks or months of starting CPAP [28]. Wild et al. [31] showed that psychological variables, such as a high locus of internal control and a high score on a health-value scale, were also associated with good adherence to CPAP. From a psychological point of view, some of these variables are more easily modifiable by psychotherapeutic intervention than others. For example, the benefits of CPAP to a patient’s health can be explained, and his/her preoccupations about treatment can be discussed in a clinical interview. However, psychological interventions for improving adherence rates would not usually aim to modify personality variables (which are more stable phenomena and difficult to change).

Physical factors such as mask comfort and level of leak are important for patient compliance. These factors are addressed systemetically by the home-care team that reviews the patients regularly after follow-up. Given that these technical aspects are treated on a case by case basis in a proactive manner, we did not examine them in a controlled manner in this study. Likewise, we have not systematically performed retitration polysomnography as part of the study, although this option was open to clinicians. In any case, retitration polysomnography would be performed after our one-month reassessment. Further studies of more long-term adherence could address the interaction of psychological factors, long-term patient education, and the revision of physical aspects of OSA treatment.

In our study, adherent patients tended to have a more positive attitude and adaptive beliefs in treatment (as measured on the ABS). Patients with maladaptive beliefs (ABS < 84.5) had 2.21 times greater risk of being non-adherent. Moreover, the “Attitude to health” subscale of the ABS has two items: “good health is secondary to being able to do what I want in life” and “I want to improve my health,” comparable to the health-value scale used by Wild et al. [31] which measured the importance individuals place on their health. Like Wild et al. [31], we note that this dimension is associated with CPAP adherence.

We created a decision tree which allows us to predict good adherence correctly (86.2%). The objective was to identify with precision good adherence, so as to adapt management of CPAP patients and perhaps focus on patients at risk of non-adherence. Our results are of practical interest to carers, since the data demonstrate the possibility of predicting adherence with CPAP by classifying patients on the basis of self-completed questionnaires. These measures are not time-consuming. Thus the decision tree analysis indicates that with a few items of evaluation, it is possible to predict which patients will be adherent. Indeed using 9 items from the “emotional reactions” domain of the NHP, we can identify 86.2% who will be adherent after one month of treatment.

The NHP has previously been used in studies concerning patients with OSA, in particular to evaluate the evolution of complaints after CPAP use [42,43]. However, none of these studies used it to predict the patients’ adherence prior to starting CPAP. In our study, the “emotional reactions” subscale of the NHP enables us to differentiate the adherent from the non-adherent patients before beginning treatment. Thus it is important to assess “emotional reactions” at the onset of treatment to predict observance. Furthermore, Meslier et al. [19] showed that non-adherent patients (CPAP use <4 h/night over at least 6 months) had more “emotional reaction” complaints than observant patients (those using CPAP between 4 h and 7 h/night). Thus these two studies indicate the importance of follow-up screening of these patients (with the NHP, for example). This leads us to suggest longer-term psychological monitoring of patients, given that OSA is a chronic illness and that psychological states may change over time. OSA patients with residual sleepiness also exhibit persistent abnormalities in the NHP “emotional reactions” domain [44].

It is important to specify that “emotional reactions” (in the NHP) are evaluated through nine items exploring a range of potential complaints such as irritability, loneliness, discouragement, loss of pleasure, depressed mood, etc. There are few studies of emotional factors as predictors of adherence with CPAP. In a study of 28 patients, Edinger [37] found that the 20 observant patients (≥ 4 h/night) tended to have lower depression scores on a personality test (MMPI scale) than the 8 non-adherent patients. Stepnowsky et al. [33] did not find an association between CPAP observance and emotional variables such as hostility, anxiety and depressed mood; only “active coping” was significantly associated with subsequent CPAP adherence (between 4.4 to 7.7 h/night).

Our study has some limitations. We have not formally controlled the medical input and educational input of the healthcare staff prior to CPAP induction, nor have we formalised the manage-
ment of problems in the initial weeks following CPAP introduction; we wished to study the pre-treatment psychological factors in the context of standard management or by a clinical team. Likewise, the patients were not all recruited from a single laboratory, although they were provided with CPAP technology and guidance and followed up by the same home-care technical provider. We used CPAP runtime to assess adherence time, while recognising that for some patients this may not reflect mask time [45].

Finally, our findings suggest that psychological variables such as emotional state and beliefs are important in the prediction of CPAP use, indicating the necessity for interventions more adapted to patients’ subjective needs. In a future study, it would be interesting to analyse each questionnaire comparatively to see differences and similarities between these measures. Baseline psychological screening may allow us to categorise patients in terms of their probable adherence, in order to identify those for whom CPAP treatment is possible, as well as determining patients likely to have difficulty adapting to their treatment. This latter group might require more specialised therapeutic support or clinical follow-up to improve adherence levels. Thus, further studies should investigate the effectiveness of tailored strategies addressing the psychological issues that we have identified in order to improve adherence rates.

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