Factors Affecting the Decision to be Treated with Continuous Positive Airway Pressure for Obstructive Sleep Apnea Syndrome

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ABSTRACT: **Background:** Obstructive sleep apnea syndrome (OSAS) is a sleep-related breathing disorder characterized by excessive daytime sleepiness, accidents and high medical expenses. The first line of treatment for OSAS is continuous positive airway pressure (CPAP).

Objectives: To examine attitudes and beliefs as well as physiological and sociodemographic factors affecting OSA patients' decision whether or not to purchase a CPAP device.

Methods: The study was divided into two stages; in the first, 83 subjects completed self-administered questionnaires prior to sleep examination (polysomnography, PSG). The questionnaires related to sleep habits, sleep disorders, questions organized around health belief model (HBM) concepts, sociodemographic information, health status and PSG examination. In the second stage, 3 months later, 50 OSAS patients were interviewed by telephone, which included questions about their reasons for purchasing/not purchasing the CPAP device.

Results: Only 48% of the OSAS patients purchased the CPAP device. The significant factors positively affecting the decision included higher levels of physiological factors such as body mass index (coefficient 0.36, $P < 0.05$) and respiratory disturbance index (coefficient 0.16, $P < 0.05$), higher income levels (coefficient 3.26, $P < 0.05$), and higher levels of knowledge about OSAS (coefficient -2.98, $P < 0.1$).

Conclusions: Individuals who are more aware of their own health condition, are better informed about OSAS and have higher incomes are more likely to purchase the device. We suggest reducing the level of co-payment and providing patients with more information about the severe effects of OSAS.

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KEY WORDS: obstructive sleep apnea syndrome (OSAS), Health Belief Model (HBM), continuous positive airway pressure (CPAP), physiological factors, sociodemographic factors

PSG = polysomnography

Obstructive sleep apnea syndrome is a sleep-related breathing disorder that involves episodes of upper airway obstruction [1]. OSAS is a common condition that affects about 2%–4.4% of women and 4–11% of men in the middle-aged population [2]. The disorder can result in a number of serious consequences that affect psychological, physiological, emotional, neurocognitive and cardiovascular functioning [3]. It appears that undiagnosed OSAS results in increased rates of accident in the workplace [4], more absenteeism, greater morbidity, and higher medical expenses [5].

The first line of treatment for most OSAS patients is continuous positive airway pressure [6]. The CPAP device effectively lowers the apnea-hypopnea index, decreases excessive daytime sleepiness, improves daily functioning and quality of life, and decreases the risk of cardiovascular events [7]. Nevertheless, CPAP is often a difficult treatment, with side effects such as nose stuffiness and air leaks around the mask [8]. CPAP treatment has been found to be cost effective. For example, in Canada the calculated average treatment cost was $3354 per QALY (Quality Adjusted Life Year) [9]. Because of the importance of this treatment, in some countries, such as Germany, Britain, parts of Canada and the United States, CPAP devices are given to patients free of charge. According to the policy of the Israel Ministry of Health, patients must pay a deductible amount to purchase the device, which is equal to about 20–44% of an employee's average monthly wage, depending on type of supplementary insurance [10].*

Despite the importance of using the device, compliance with CPAP can be low [11]. According to a recent study by Simon-Tuval et al. [12], only 40% of the patients who need CPAP treatment purchase the device. The study found that CPAP purchase was affected by level of income, positive experience of family member and/or friend, reports that

OSAS = obstructive sleep apnea syndrome
CPAP = continuous positive airway pressure

*The CPAP costs between 2000 and 3600 NIS (shekels) (US$ 570–1030, automatic versus non-automatic device) for patients without full complementary insurance. Since according to the Central Bureau of Statistics, an employee's average monthly wage in Israel in October 2010 was 8189 NIS ($2340), this means that the device costs about 24–44% of the average employee's wage in Israel.

the spouse sleeps separately, and the apnea-hypopnea index. Brin and co-workers [10] reported that in Israel only 35% of patients with severe OSAS (respiratory disturbance index > 30/hr or RDI < 30/hr and Epworth sleepiness scale > 10) purchased a CPAP device. In addition, the findings of Brin et al. [10] indicate that a) rates of compliance/adherence to CPAP increase with monthly income and socioeconomic status, and b) other supporting factors affect device purchase, such as severity of illness, physician and sleep laboratory staff recommendations, and spousal support.

Only a few studies have used the Health Belief Model [13] to explain CPAP compliance [14]. The HBM is an expectancy-value theory originally developed to explain adherence to preventive health care regimens but is also used to predict treatment compliance (e.g., flu shot vaccination) [15]. The model specifies four categories of subjective beliefs that determine the likelihood of individuals acting to protect their health. The categories are:

- *Perceived susceptibility*, describing the degree to which an individual believes a negative health outcome is likely
- *Perceived severity*, referring to the anticipated severity of the outcome, should it occur
- *Benefits,* referring to the anticipated positive consequences of acting to protect one's health
- *Barriers*, referring to the anticipated negative consequences of acting to protect one's health

Olsen et al. [14] examined HBM among patients newly diagnosed with OSAS and unacquainted with CPAP treatment (had never tried CPAP before) in order to determine the contribution of psychological constructs as compared to biomedical indices in predicting CPAP adherence. The results show that HBM constructs alone explained 22% of the variance in CPAP adherence, whereas HBM constructs and biomedical indices together explained 32% of the variance in CPAP adherence. The results suggest that patients have developed beliefs and expectations about OSAS and CPAP pressure even before they try CPAP treatment.

OBJECTIVES

The current study examined factors affecting the decision to be treated with OSAS among patients in a sleep laboratory at a large hospital in Israel. Previous studies have used the HBM for predicting device adherence after participants were diagnosed with OSAS [15,17]. In the current study, we developed a version of the HBM that is suitable for patients before their first OSAS examination and can be used to predict their decision to purchase a CPAP device after being diagnosed with OSAS. In addition, the current study adds to the existing literature by combining several factors to predict the decision to purchase a CPAP device, including a) attitudes and beliefs regarding OSAS and its treatment (a version of the HBM suitable for patients *before* their first OSAS examination); b) personal factors, such as level of health motivation and knowledge about the syndrome (to the best of our knowledge this is the first study to examine health motivation attitude as a factor that may affect the decision to buy a CPAP device); c) sociodemographic factors; and d) physiological factors such as respiratory disturbance index and body mass index.

RDI = respiratory disturbance index
HBM = Health Belief Model

PATIENTS AND METHODS

THE MODEL

Using regression equations for the analytical model, we examined the factors affecting the decision to purchase a CPAP device among patients with OSAS. The analytical model examines the effect of each one of the explanatory variables on the dependent variables, with all other variables controlled, including sociodemographic characteristics. In the regression equation, CPAP purchasing status (yes or no) was the dependent variable. The explanatory variables included:

- **HBM1 – perceived susceptibility:** Individuals at the low end of the susceptibility spectrum deny the possibility of having OSAS, while those at the high end feel they are in real danger of having OSAS
- **HBM2 – perceived seriousness severity:** This category describes the level of an individual's beliefs concerning the severity of and potential difficulties caused by OSA, such as disruption in everyday activities
- **HBM3 – perceived benefits of OSAS treatment (CPAP):** This category describes the level of an individual's beliefs concerning what he or she stands to gain by being treated for OSA (CPAP)
- **HBM4 – perceived barriers to getting OSAS treatment (CPAP):** This category describes the level of an individual's beliefs concerning potential difficulties caused by OSAS treatment, such as inconvenience, unpleasantness and cost.

We expected that intention to be treated for OSAS by CPAP would be positively affected by higher levels of susceptibility, seriousness and benefits (HBM1–HBM3), and negatively affected by higher levels of barriers (HBM4).

Subjective and personal factors: health motivation, referring to degree of motivation for other health behaviors; and knowledge about OSAS. We expected that higher levels of health motivation and knowledge would positively affect an individual's intention to be treated for OSAS by CPAP [15].

Sociodemographic factors: age groups and income. We expected that higher age and higher income level would positively affect intentions to purchase a CPAP device

Physiological factors: RDI, which is the number of respiratory disturbances per hour of sleep, and BMI. Some researchers have suggested that RDI is the main predictor of CPAP compliance [12,17], while others found that gender, age, BMI and improved excessive daytime sleepiness are the main predictors of CPAP compliance [18]. In line with these results, we expected that higher levels of RDI and BMI would positively affect the intention to purchase a CPAP device.

DESIGN AND PROCEDURE

The study was approved by the Helsinki Committee and the Ethics Committee of the Max Stern Academic College of Emek Yezreel. Informed consent was obtained from all participants. Figure 1 demonstrates the stages of the diagnostic and therapeutic process. Between July 2008 and July 2009, subjects in the sample suspected of having OSAS (n=83) were recruited for overnight polysomnographic monitoring at the sleep laboratory of a large hospital in northern Israel. The study group included 47 males and 36 females, and excluded patients under the age of 18 and those with language difficulties. At this stage, participants completed a self-administered questionnaire and an informed consent form. The questionnaires and cover letters were distributed among the patients during their stay at the sleep laboratory. The cover letter attached to the self-administered questionnaire explained the purpose of the study and its voluntary nature. In the event that patients were diagnosed with OSAS, the letter asked them to participate in a short telephone survey after 3 months.

In the second stage, about 3 months later, 66 patients (of 83) who were diagnosed with mild or severe OSAS and were recommended for CPAP therapy were contacted by phone. Fifty participants remained after we excluded 16 subjects whom we were unable to contact again by telephone after 3 months (missing data).

MEASURES

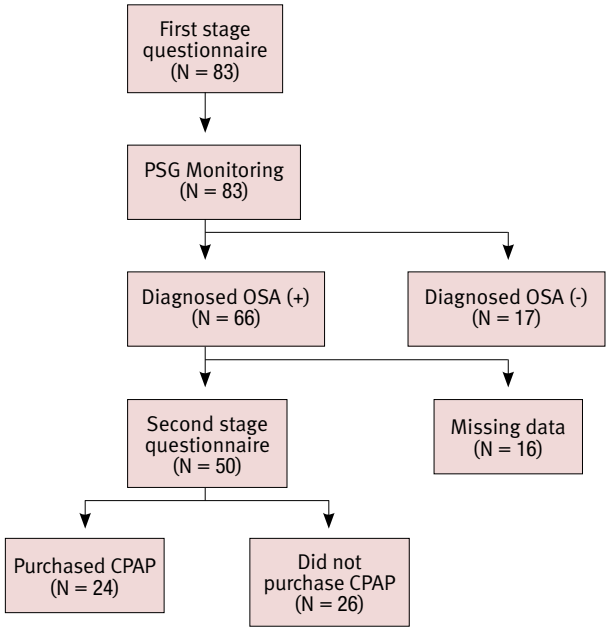
FIRST STAGE QUESTIONNAIRE

The first stage research questionnaire was a self-administered instrument that consisted of the following parts:

- ***Sleep questionnaire:*** All patients completed self-administered questionnaires regarding sleep habits, sleep disorders and sleepiness. The sleep disorders questionnaire comprised 10 questions on a Likert scale of 1–7, ranging from "never" to "always" (MSQ: Mini Sleep Questionnaire) [19]. The sleep habit questionnaire reflected participants' assessment of their sleep time and quality (PSQI: Pittsburgh Sleep Quality Index) [20]. The sleepiness questionnaire comprised eight questions on a Likert scale of 0–3, ranging from "never" to "always" (Epworth sleepiness scale) [21].

BMI = body mass index

Figure 1. Diagram showing the stages of diagnostic and therapeutic process



- ***Polysomnographic study:*** Participants underwent standard clinical whole night PSG following their physician's recommendation [1]. Sleep architecture was analyzed according to Rechtshafen and Kales criteria [22]. The severity of OSAS was determined by the respiratory disorder index, which represents the number of apnea and hypopnea occurrences per hour of sleep.
- ***HBM variables:*** This part of the questionnaire was developed for the current study using items thematically organized around HBM concepts and suitable for participants before being diagnosed with OSAS. The final version of the questionnaire was determined after data from a pilot questionnaire distributed among 20 patients were analyzed and reexamined by one of the authors, an expert on sleep. The questionnaire included items measuring the four categories of susceptibility, seriousness, benefits, and barriers, as well as the categorical variables of knowledge and health motivation [Table 1a in the Appendix]. Items in the HBM predictor categories were measured on a 5-point Likert-type scale, with the following possible responses: strongly agree (1), agree (2), neither agree nor disagree (3), disagree (4), and strongly disagree (5). Each scale was defined as a sum of separate questions, with the sign of a correlation coefficient between the question and the scale divided by the number of questions.
- ***Sociodemographic information:*** Questions on age, marital status, education and nationality were included in this section.

SECOND STAGE QUESTIONNAIRE

The telephone questionnaire conducted in the second stage of the research (after about 3 months) included the following parts: a) whether or not the individual purchased a CPAP device; b) the main reasons for purchasing/not purchasing a CPAP device; c) reported individual monthly income measured on a 5-point Likert-type scale, ranging from "much lower than the average income" (response of 1) to "much higher than the average income" (response of 5). We informed participants of the average monthly income in Israel at that time for singles and for families (according to Israel Central Bureau of Statistics data) [23].

DATA ANALYSIS

The statistical package STATA 10 SE was used to analyze the data. Chi-square tests were used to determine how selected categorical variables (e.g., gender), including demographic factors, were related to the dependent variable: status of purchasing a CPAP device.

The statistical significance of the difference between the continuous variable means (e.g., age, summary scales, etc.) for two different groups (for example, for participants who purchased the CPAP and those who did not) was determined by the *t*-test. Logistic regressions were conducted to identify the impact of sociodemographic variables, factors derived from the HBM model, and physiological factors on CPAP device-purchasing status.

Of the 66 participants in the second stage, 16 participants were eliminated because they could not be located after 3 months. Inspection of the data file suggested that the missing data of 16 participants were random, evidenced by the finding that there were no significant differences in age, gender, BMI, MSQtot or PSQItot between the group of 16 and the group of 50 completed data sets. Therefore, this group was deleted from the logistic regression analysis, leaving 50 cases for analysis.

RESULTS

DESCRIPTIVE STATISTICS

Table 1 summarizes the basic demographic information and characteristics of the sample according to CPAP device-purchasing status. The table reveals that among the 50 participants who answered the telephone questionnaire (in the second stage after 3 months) and were diagnosed with OSAS (27 males and 23 females), 56.5% of females and 40.7% of males purchased a CPAP device. No significant differences were found between those who purchased a device and those who did not with respect to age, perceived health status, and education level. However, the results indicate that the percentage of individuals purchasing a CPAP device among those with lower than average income level was significantly lower than among those with average and above average income levels (34.5% vs. 68.4%, $P = 0.02$)*. In addition, with respect to physiological factors the results indicate that the mean values of BMI and RDI were significantly higher among those who purchased a CPAP device than among those who did not purchase a device (35.0 ± 1.71 vs. 30.2 ± 1.16, $P = 0.02$ for the BMI, and 40.83 ± 4.19 vs. 21.58 ± 2.52, $P < 0.001$ for the RDI). Moreover, the mean values of MSQ-total were significantly lower for those who purchased a CPAP device than for those who did not (3.42 ± 0.24 vs. 4.14 ± 0.25, $P = 0.04$). Nevertheless, no significant difference was found for Epworth sleepiness scale-total and PSQI-total between those who purchased a device and those who did not.

Table 1. Comparison of sample characteristics by purchasing status of CPAP

		Did not purchase N= 26	Purchased N=24	*P* value
		%	%	
Gender	Female (%)	43.5%	56.5%	0.39
	Male (%)	59.3%	40.7%	
Health status	Good	53.8%	46.2%	0.76
	Bad	44.4%	55.6%	
Education*	< 12 yrs	36.8%	47.4%	0.43
	≥ 12 yrs	43.3%	30.0%	
Income	Under average	65.5%	34.5%	0.02
	Average and above	31.6%	68.4%	
		Mean (SD)	Mean (SD)	
Age (yrs)		55.84 (2.54)	56.04 (2.25)	0.95
BMI		30.20 (1.16)	35.00 (1.71)	0.02
RDI		21.58 (2.52)	40.83 (4.19)	<0.001
ESS total		9.15 (0.92)	9.91 (1.19)	0.61
PSQI total		7.77 (0.84)	6.35 (0.60)	0.18
MSQ total		4.14 (0.25)	3.42 (0.24)	0.04

* The sum is not 100% since not all subjects reported their education level

MAIN REASONS FOR ACCEPTING OR REJECTING CPAP TREATMENT

The top motivators for purchasing a CPAP device were: a) to reduce my tendency toward sleepiness (87.5%), b) because of the sleep test results (87.5%), c) to reduce the risk of death (79%), d) my spouse encouraged me to buy it (79%), e) difficulty breathing (71%), and f) the device trial improved my

MSQ = Mini-Sleep Questionnaire
PSQI = Pittsburgh Sleep Quality Index

*In addition, we examined the correlation between education and income for the group of participants that did not purchase the CPAP and for the group that did purchase the CPAP. For the first group we found a significant Spearman correlation ($r = 0.466$, $P = 0.04$), while for the second group no significant correlation was found.

Table 2. Mean values of Health Belief Model measures by purchasing status of CPAP

Variable*	Did not purchase Mean (SD)	Purchased Mean (SD)	*P* value
Susceptibility	3.90 (0.19)	3.72 (0.21)	0.53
Seriousness	2.89 (0.20)	2.84 (0.18)	0.88
Benefits	3.88 (0.10)	3.89 (0.21)	0.95
Barriers	2.18 (0.18)	2.14 (0.20)	0.89
Health motivation	3.86 (0.13)	3.55 (0.19)	0.17
Knowledge	4.03 (0.10)	3.69 (0.16)	0.08

* The 5-point scale for the HBM categories ranged from "strongly agree" (1) to "strongly disagree" (5)

sleep quality (71%). Respondents were permitted to select more than one reason. The main reasons for deciding *not* to purchase a CPAP device were: a) no time to buy it (100%), b) I tried it but it did not help me (80%), c) the CPAP device is too expensive (76%), and d) I think the device is not effective (68%).

RESULTS FOR HBM CATEGORIES

Table 2 shows the mean values of the HBM model categories and the two categories of health motivation and knowledge variables as indices on a 5-point Likert scale [the scale for HBM categories ranged from "strongly agree" (1), to "strongly disagree" (5)] measured by CPAP purchasing status. The Cronbach alpha coefficients for the HBM categories were as follows: perceived susceptibility (HBM1) 0.592, perceived seriousness (HBM2) 0.704, perceived benefits (HBM3) 0.748, perceived barriers (HBM4) 0.842, health motivation 0.744, and knowledge 0.692.

The results in Table 2 indicate that for individuals who purchased a CPAP device, the levels of the following six categories did not significantly differ from the levels for individuals who did not purchase a device (incompatible with our hypotheses): susceptibility (3.72 purchased, 3.90 did not purchase); seriousness (2.84 purchased, 2.89 did not purchase); benefits (3.89 purchased, 3.88 did not purchase); health motivation (3.55 purchased, 3.86 did not purchase); and barriers (2.14 purchased, 2.18 did not purchase). Only the mean value of the knowledge category was significantly lower (as expected) for those who purchased a CPAP compared to those who did not (3.69 and 4.03, respectively, $P = 0.08$). This result indicates that those who purchased a device have higher levels of knowledge about obstructive sleep apnea syndrome than those who did not purchase a CPAP device.

RESULTS OF THE ANALYTICAL MODEL

The analytical model examines the effect of each of the explanatory variables on the dependent variable, while controlling for all other variables. Table 3 presents the results of the logistic regression. The dependent variable is a dichotomous variable that is equal to 1 if the individual purchased a CPAP device and to 0 if not. The independent variables are income level, physiological factors (BMI and RDI), knowledge about OSAS syndrome, and the HBM categories. The results of the regression indicate that the significant factors positively affecting the decision to purchase a CPAP device are higher income levels, higher levels of physiological factors (BMI and RDI), and higher levels of knowledge about OSAS syndrome.* Nevertheless, and incompatible with our hypotheses, the HBM categories were not significant factors affecting CPAP purchasing status. We also examined a regression model that included the demographic factors of age and gender, but these factors were not found to be significant and were therefore omitted in the next stage.

Table 3. Results of logistic regression: the dependent variable is purchasing CPAP status

Dependent variables	Coefficient	SE	*P* value
Constant	-12.7	7.09	0.07
Income	3.26	1.41	0.02
BMI	0.36	0.15	0.02
RDI	0.16	0.07	0.04
Susceptibility (HBM1)*	-0.88	0.75	0.23
Seriousness (HBM2)*	0.14	1.32	0.91
Benefits (HBM3)*	1.16	1.08	0.28
Barriers (HBM4)*	-0.09	0.91	0.92
Knowledge*	-2.98	1.79	0.09
Pseudo R2	0.63		
N	43		

* The 5-point scale ranged from "strongly agree" (1) to "strongly disagree" (5)

Next, we ran a second regression (not shown in the data) in which we omitted the most insignificant HBM categories (2-4) from the independent variables and added the variable Health Motivation (with three categories: low, where the rank was ≤ 3; average, where the rank was > 3 and < 3.5; and high, with rank > 3.5). The results show that the significant factors positively affecting the decision to purchase a CPAP device are higher income levels ($P < 0.05$), higher levels of physiological factors (BMI, $P < 0.06$, and RDI, $P < 0.0001$), higher levels of perceived susceptibility (HBM1) to OSAS ($P < 0.03$), and higher levels of health motivation (people with average health motivation were more likely to buy a CPAP device than those with low health motivation, $P < 0.02$).

The results also indicate that 58% of the 26 OSAS patients who did not purchase a CPAP device declared their intention to get the device if offered to them free of charge. However,

*Since for the knowledge items (see Table 1a in the Appendix) the 5-point scale ranged from "strongly agree" (1) to "strongly disagree" (5), a negative coefficient in the regression means that individuals who disagree with the items describing knowledge about OSAS tend not to purchase the CPAP device.

42% said they would not get a CPAP device even if it were offered for free.

DISCUSSION

The current study examined factors affecting the decision to purchase a CPAP device among patients in a sleep laboratory in Israel before they were examined for OSAS. In particular, the study examined HBM variables applicable to patients *before* their first OSAS examination, personal factors such as health motivation and knowledge about the syndrome, sociodemographic factors, and physiological factors.

The results of the analytical model indicate the following significant factors that *positively* affect the decision to purchase a CPAP device: higher levels of physiological factors (BMI and RDI), higher income levels, higher levels of knowledge about OSAS, and higher levels of health motivation. These results suggest that people who are more aware of their own health condition and have more information about OSAS tend more to purchase the device. These results are in line with the findings of Smith et al. [24] that OSAS patients who knew more about OSAS had more positive attitudes towards CPAP treatment. Furthermore, three of the four HBM variables are not significant factors in explaining the decision to purchase a CPAP device, which is inconsistent with our hypotheses. After physiological factors and sociodemographic variables were controlled, perceived susceptibility was the only HBM category that significantly affected the decision to purchase a CPAP device. In other words, people who feel they are at risk of having OSAS even before being examined at the sleep lab tend more to purchase a CPAP device, compared to those who do not feel they are at risk. This result confirms our hypothesis that beliefs about OSAS syndrome prior to OSAS testing may predict the decision to purchase a CPAP device. Janz and Becker [13] distinguished between the literature on treatment compliance, in which susceptibility is not a strong predictor, and preventive health behavior, in which it is. They suggested that people currently experiencing symptoms focus attention on immediate costs and benefits of treatment at the expense of long-term health issues. OSAS sufferers are often greatly impaired by immediate symptoms, but are less knowledgeable about salient information on long-term problems. Therefore, providing important information on the long-term consequences of OSAS may increase their intentions to be treated.

The results also indicate that higher income levels increase the chances of purchasing a CPAP device, compatible with previous findings [10,12]. That is to say, a lower income population and those with insufficient medical insurance coverage may exhibit poor compliance in purchasing a CPAP device (patients also forego prescription medicines because of the high level of patient cost-sharing, and this is particularly the case for vulnerable groups) [25]. This result reflects inequality in the health care system, since the level of co-payment in Israel is constant regardless of patient income [10]. Therefore, canceling the co-payments for OSAS patients from lower income population groups may encourage them to be treated (76% of those who did not purchase a CPAP device said it was too expensive for them). However, even if CPAP devices are offered free of charge, only 58% of OSAS patients will purchase a device. In addition to the device being too expensive, we found other reasons for deciding not to purchase a CPAP device: "No time to buy" and "I tried and it did not help me."

As for physiological factors, the results indicate that the mean values of BMI and RDI were significantly higher among those who purchased a CPAP device [12,18]. These results were in line with those of Hui et al. [17], but are not compatible with those of Olsen et al. [14], who found that physiological and disease severity variables, such as RDI, and drops in saturation of O_2 during sleep, were unimportant in early prediction of CPAP adherence. The main difference between the results is the time when subjects completed the questionnaires: at baseline after OSAS diagnosis in Olsen et al. [14] compared to during the first meeting before PSG in the current study.

The present study is limited by the modest sample size. In addition, the use of self-report measures of HBM constructs may represent another limitation of the study; however, the use of validated measures overcomes some of the subjectivity associated with this. Moreover, beliefs can only be tested through self-report measures. In conclusion, understanding patient beliefs regarding OSAS and CPAP treatment may provide a basis for developing targeted interventions to promote the purchase of CPAP devices.

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Appendix A. Table 1a: HBM categories and categorical variables*

Variables		Statements
	Susceptibility	• My chances of having OSAS are good • I worry a lot about having OSAS
	Seriousness	• Having OSAS would disrupt my family • Having OSAS would make daily activities more difficult • If I find that I have OSAS, I may lose my job • If I do have OSAS, this syndrome is a more serious disease
	Benefits	• Getting OSAS treatment will prevent me from having the syndrome • Getting OSAS treatment will prevent me from missing work • Getting OSAS treatment will improve my alertness during the day • Benefits of OSAS treatment are multiple
	Barriers	• Getting OSAS treatment may involve pain • Getting OSAS treatment involves many risks • Receiving OSAS treatment involves high financial cost for me • I'm concerned about the side effects of OSAS treatment • Getting OSAS treatment involves making large concessions for me • Getting OSAS treatment is inconvenient for me
Categorical variables	Health motivation	• I have periodic dental examinations every year, in addition to visiting a dentist for specific problems • I follow medical orders because I believe they will benefit my health status • I search for new information related to my health • I exercise regularly at least twice a week • I often perform actions that will improve my health • I have periodic tests every year, in addition to visiting a doctor when I am sick
	Knowledge	• OSAS may have serious symptoms • OSAS can cause other more serious diseases (such as heart disease) • OSAS can cause death • OSAS can affect alertness during the day and may lead to dangerous situations • People who are overweight often suffer from OSAS syndrome

* The 5-point scale for the categories ranged from "strongly agree" (1) to "strongly disagree" (5)