A National Survey of the Effect of Sleep Medicine Specialists and American Academy of Sleep Medicine Accreditation on Management of Obstructive Sleep Apnea

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Study Objectives: To study the effect of American Academy of Sleep Medicine accreditation of sleep centers and sleep-medicine certification of physicians on the management of patients with obstructive sleep apnea (OSA).

Design: Cross-sectional study.

Setting: National web-based survey.

Patients: Six hundred thirty-two patients with OSA.

Interventions: None.

Measurements and Results: Self-reported data on details of whether patients with OSA were using positive airway pressure (PAP) devices, timeliness of the initiation of PAP therapy, and overall satisfaction of care received from physicians and centers. After adjusting for covariates, lack of accreditation or certification status of providers was independently associated with discontinuation of PAP therapy (odds ratio [OR] 1.9, 95% confidence interval [CI], 1.1-3.2; p = .03). Patient education leading to perception of risk associated with OSA (OR 0.5, 95% CI, 0.2-0.9) and medications for nasal congestion (OR 0.3, 95% CI, 0.1-0.8) “protected” against discontinuation of PAP therapy, whereas nasal congestion (OR 1.6, 95% CI, 1.0-2.4) increased the likelihood for discontinuation of PAP therapy. Certified physicians and accredited centers were more likely to educate their patients and received greater satisfaction ratings than non-certified physicians and nonaccredited centers (p < .05). Time delays in instituting PAP therapy were not influenced by accreditation or certification status, but such delays diminished patient satisfaction.

Conclusions: In this web-based survey, accreditation or certification status of sleep centers and physicians was associated with better indexes of clinical management in patients with OSA. Better patient education that fostered risk perception may have been partly responsible for such an association. Prospective studies designed to collect objective data regarding the effect of accreditation or certification status on outcomes in patients with OSA are still needed.

Keywords: Sleep, professional competence, obstructive sleep apnea, patient satisfaction, continuous positive airway pressure, accreditation, patient compliance, treatment refusal, nasal obstruction, nasal decongestants, sleep apnea syndromes


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One such endpoint that poses a challenge in the management of patients with OSA is patient adherence to positive airway pressure (PAP) therapy. While the minimum required adherence—in hours of PAP therapy used per night—is unclear, discontinuation of PAP device is an unambiguous endpoint for treatment failure. In this study, we used such a clear definition of treatment failure—proportion of patients who discontinued PAP therapy—to measure the performance of physicians and sleep centers. Additionally, because patients’ risk perceptions of OSA and their knowledge of their disease condition are important to ensure adherence to therapy, we assessed patients’ perceptions of whether such information was dispensed by their physicians or sleep centers. Lastly, other important benchmarks in the management of patients with OSA, such as timely delivery of care (time lapse between initial sleep study and institution of PAP therapy) and patients’ overall satisfaction with care rendered by their physicians and centers, were also assessed.

Commentary Follows on Pages 143-144
We designed a survey that asked patients about the care they received from their physicians and sleep centers for their OSA condition. The overall purpose of the study was to study the effect of AASM accreditation of sleep centers and sleep-medicine certification of physicians on the clinical management of patients with OSA through a web-based survey. We hypothesized that patients with OSA who are cared for by sleep-certified physicians or AASM-accredited centers are less likely to discontinue PAP therapy than are patients cared for by noncertified physicians and nonaccredited centers. We also hypothesized that patient education regarding OSA and associated risks are provided by a greater proportion of sleep-certified physicians and AASM-accredited centers than by noncertified physicians and nonaccredited centers. Lastly, we hypothesized that sleep-certified physicians and AASM-accredited centers provide more timely care and achieve greater patient-satisfaction ratings than do noncertified physicians and nonaccredited centers.

METHODS

Patients

We conducted a cross-sectional study of 632 patients with OSA across the country using a web-based survey. Of the 842 “hits” to the web site containing the questionnaire, 632 patients took the time to respond to the questionnaire. Patients were naïve to the exact purposes of the study. Patients older than 20 years of age with a diagnosis of OSA were solicited to take the anonymous web-based survey (see Appendix). Such solicitations to participate were placed on web sites frequented by patients with OSA: sleep apnea support groups (American Sleep Apnea Association, Washington, DC), other educational web sites (such as apneanet.org, Glen Ellyn, IL), vendors of PAP therapy devices (such as cpapstore.com, Kennewick, Wash, and cpaptalk.com, Missouri City, TX), and Internet chat groups (such as the one sponsored by the AASM, sleepeeducation.com, Westchester, IL). The Institutional Review Board of the University of Arizona approved the study and waived the need for documentation of written informed consent.

Questionnaire Tool

Patients were asked to respond yes, no, or don’t know to the following questions: (1) whether the physician managing their sleep-apnea condition is a sleep expert (an Internet link to the AASM web site with a state-wise list of certified sleep physicians was provided); (2) whether the sleep center that they received service from was accredited (an Internet link to the AASM web site with state-wise list of AASM-accredited centers was provided); (3) whether they received adequate education from the health-care provider in any form—verbal, audiovisual, or pamphlets; (4) whether such education improved their understanding of their disease condition; (5) whether such education helped them realize the risks associated with OSA; and (6) whether they were satisfied with their physician’s management of their sleep-apnea condition on a 5-point Likert scale that ranged from very dissatisfied (score of 1) to very satisfied (score of 5).11 Also, they were asked to evaluate the sleep center on a 5-point satisfaction scale.11 Patients were asked whether they were continuing to use the PAP device or whether they had stopped using such therapy. Patients were also asked to report when they received their PAP device in relation to their first sleep study and the duration of time that they have had the PAP device.

Potential confounders that may affect acceptance of PAP device were also measured: PAP pressure level, device type (automatic PAP, bilevel PAP, or continuous PAP), presence and severity of nasal congestion, age, sex, height, weight (for calculations of body mass index), and highest education (did not finish high school, finished high school, college, masters, or doctorate). Potential confounders for timeliness in healthcare delivery such as type of health insurance (HMO, PPO, POS, Medicare, or lack of any insurance) were also requested. Also, subjective improvement in sleepiness after the initiation of PAP therapy was measured using a 5-point Likert scale,12 and self-reported hours of PAP-device use was sought. Patient responses were saved in the file server and analyzed in aggregate.

Questionnaire Validation

We measured nasal congestion using a 5-point Likert scale that was previously administered to patients with sleep-disordered breathing.13 Nasal-congestion severity was scored in the following manner: 0 for never congested, 1 for rarely, 2 for sometimes, 3 for most of the time, and 4 for always. Additionally, we revalidated this 5-point Likert scale against a well-validated nasal symptom scale.14,15 We performed such validation in a separate cohort of 54 patients with OSA by correlating nasal-congestion scores obtained by our single question versus the previously well-validated, multiple-question nasal symptom scale. There was good consistency between the 2 measures (Cronbach α coefficient of 0.79).

Initial construction of questions relating to patient satisfaction was based on patient interviews. Subsequently, an initial data set of 50 patient responses and input from sleep-medicine experts was used to identify questions that made the largest contribution to variation in satisfaction scores and to shorten and edit the questionnaire. Internal consistency for the patient education-related questions was excellent (Cronbach α coefficient of 0.93; questions 3, 4, and 5 in Appendix) and good for patient-satisfaction questions (Cronbach α coefficient of 0.75; questions 7 and 8 in Appendix).

Data Analysis

ENDPOINTS

The primary endpoint for analysis was discontinuation of PAP therapy. Secondary endpoints were (1) patients’ perceptions of education they received regarding OSA and risks associated with OSA, (2) time delay in instituting PAP therapy, and (3) overall patient satisfaction of the care delivered by the physician and center, measured separately.

PREDICTORS AND COVARIATES

In order to assess the combined “dose-effect” of sleep certification of physicians and AASM accreditation of the centers on patient outcomes, we assigned patients to 1 of 3 groups: (1) the physician was certified and the center was accredited, (2) either the physician was certified or the center was accredited, and (3) neither was the physician certified nor was the center accredited. From the list of predictors and potential confounders, simple logistic-regression analysis was performed to identify significant
covariates that influenced discontinuation of PAP therapy. Subsequently, we built multivariate logistic-regression models with continued use of PAP device as the dependent variable using significant covariates identified by simple logistic-regression analysis (p < .05).

Also, general linear models were constructed to identify determinants of timely delivery of care and self-reported adherence to PAP therapy (expressed as hours per week). Multicollinearity among independent variables was verified, and, in the event of collinearity, the strongest predictor variable alone was included. Nonparametrically distributed variables—such as time delay—were log transformed to meet assumptions of normality required for multiple regression. All analyses used a list-wise deletion strategy for missing values. Results are presented as mean and standard deviation unless otherwise specified. All tests for significance and resulting p values were 2-sided, with a significance level of .05. All analyses were performed using SPSS v12.0 (SPSS Inc., Chicago, IL). Unadjusted proportions were compared using Pearson χ² test with Bonferroni correction applied when appropriate.

POWER ANALYSIS

Acceptance of PAP-device therapy has been reported to range from 75% to 80% of patients who were prescribed such therapy.16,17 We assumed a PAP-acceptance proportion of 70% in patients cared for by nonaccredited centers or physicians and 80% in the AASM-accredited centers or physicians—a difference of 10%. Based upon such assumptions, we estimated that we would need 412 patients per group—a total of 824 responses (assuming also that α is .05, 2-sided, power of 90% using χ²). We report significant results from the planned midpoint interim analysis—444 responses with accreditation or certification status.

RESULTS

Description of Respondents

Of the 842 “hits” to the web site containing the questionnaire, 632 responded to the survey (overall response rate of 75%). The mean age of patients was 51 ± 10 years (range from 20-89 years) with 35% comprising women. Average body mass index was 35.7 ± 8.9 kg/m², and average continuous PAP pressure was 11.5 ± 3.6 cm H₂O, with 78% of patients having been prescribed continuous PAP devices. A minority of patients were prescribed automatic PAP (10%) and bilevel PAP devices (12%). Of the 632 responses, 444 patients had responded as knowing both their physician’s certification status and their sleep center’s accreditation status, while 188 patients were unaware of the accreditation status of their physician, the certification status of their sleep center, or both.

Discontinuation of PAP Therapy and Adherence

Of the 444 patients who identified physician-accreditation status and center-certification status, 16 (5%) of 307 patients who were cared for by certified physicians and accredited centers had stopped using their PAP devices. In contrast, 7 (7%) of 99 patients cared for by either certified physicians or accredited centers had stopped using their PAP devices, and 8 (21%) of 38 patients who were cared for by noncertified physicians and nonaccredited centers had stopped using their PAP device (χ²; p = .001) (Table 1). Besides accreditation or certification status, Table 2 shows the relationship between other significant covariates (derived from Table 1) and discontinuation of PAP therapy. The odds ratios are hazard ratios for discontinuation of PAP therapy (Table 2). From Table 2, covariates were entered into a forward-regression model (Table 3). Block 1 consisted of covariates that are known to influence acceptance of PAP therapy (age, body mass index, and health insurance), block 2 consisted of covariates of interest (nasal-congestion score and medications for nasal congestion), and block 3 consisted of predictors (lack of accreditation or certification status or risk perception due to patient education).

Multivariate logistic-regression analysis (Table 3) revealed that lack of accreditation of physician or certification of center and severity of nasal congestion score were independently associated with discontinuation of PAP therapy (Table 3). In contrast, patient education leading to enhanced perception of risk associated with OSA, having health insurance, and medications for nasal congestion “protected” against discontinuation of PAP therapy (Table 3). If both risk perception and lack of accreditation or certification

<table>
<thead>
<tr>
<th>Table 1—Proportion of Patients Who Discontinued PAP Therapya</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certification status of physician/accreditation status of center</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Both</td>
</tr>
<tr>
<td>One</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2—Unadjusted Odds Ratios of Determinants of Discontinuation of PAP Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Certification of physician</td>
</tr>
<tr>
<td>Accreditation of center</td>
</tr>
<tr>
<td>Lack of accreditation or certification</td>
</tr>
<tr>
<td>Education regarding OSA</td>
</tr>
<tr>
<td>Risk perception and education</td>
</tr>
<tr>
<td>Severity of OSA</td>
</tr>
<tr>
<td>Nasal congestion score</td>
</tr>
<tr>
<td>Prescription for nasal congestion</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Sex</td>
</tr>
<tr>
<td>Body mass index</td>
</tr>
<tr>
<td>Continuous PAP pressure level</td>
</tr>
<tr>
<td>Automatic PAP</td>
</tr>
<tr>
<td>Health insurance</td>
</tr>
<tr>
<td>Highest education received</td>
</tr>
</tbody>
</table>

PAP refers to positive airway pressure; β estimated coefficient; SE, standard error; CI, confidence intervals.

aUnadjusted proportions
bData are presented as number (percentage). Pearson χ² test for association (p = .001)
cHazard ratio

bDiscontinuous odds ratio (OR)

1p < .05
2p < .10

3Compared to no insurance
Table 3—Hierarchical Logistic Regression Estimating Discontinuation of PAP Therapy

<table>
<thead>
<tr>
<th>Variable</th>
<th>B (SE)</th>
<th>Adjusted OR (95% CI)</th>
<th>Δχ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.01 (0.02)</td>
<td>1.01 (0.97-1.05)</td>
<td>7.66*</td>
</tr>
<tr>
<td>BMI</td>
<td>0.05 (0.03)*</td>
<td>1.05 (0.99-1.11)</td>
<td></td>
</tr>
<tr>
<td>Health insurance</td>
<td>-1.64 (0.71)*</td>
<td>0.19 (0.05-0.77)</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasal congestion score</td>
<td>0.45 (0.22)*</td>
<td>1.57 (1.03-2.41)</td>
<td>8.19*</td>
</tr>
<tr>
<td>Medications for nasal congestion</td>
<td>-1.27 (0.54)*</td>
<td>0.28 (0.10-0.81)</td>
<td></td>
</tr>
<tr>
<td>Step 3†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lack of accreditation or certification</td>
<td>0.62 (0.28)†</td>
<td>1.86 (1.08-3.20)</td>
<td>4.64*</td>
</tr>
<tr>
<td>Risk perception and education</td>
<td>-0.77 (0.36)†</td>
<td>0.47 (0.23-0.93)</td>
<td></td>
</tr>
</tbody>
</table>

PAP refers to positive airway pressure; BMI, body mass index; β estimated coefficient; SE, standard error; CI, confidence intervals; Δχ² = change in χ².

* p < .05
† p < .10
Risk perception and lack of accreditation or certification were collinear; therefore they are inserted separately.

status were entered into the model for Step 4 (not shown in Table 3), accreditation or certification status was no longer significant (B = -0.46; SE = 0.30; p = .12). This is likely due to significant collinearity between these 2 variables (r = -0.27, p < .001). These findings suggest that risk perception and education may mediate the relationship between accreditation or certification status and PAP discontinuation.

Self-reported usage of PAP device was higher for patients cared for by accredited versus nonaccredited centers: 44.3 ± 14.4 versus 39.6 ± 19.8 hours per week, respectively (p = .017). Similarly, patients cared for by certified physicians tended to use their PAP device for longer durations than did patients cared for by noncertified physicians: 44.3 ± 14.4 versus 41.3 ± 18.6 hours per week, respectively (p = .057). General linear models built to adjust for confounders revealed that the self-reported usage of PAP device was explained by variables, similar to those in the logistic-regression models reported for discontinuation of PAP therapy (Table 3). While the combined “dose-effect” of certification or accreditation status, risk perception, prescription of nasal medications, and body mass index were directly related to self-reported adherence to PAP therapy, nasal congestion score was inversely related to self-reported adherence to PAP therapy (p < .05).

Degree of improvement in subjective sleepiness was measured by a 5-point Likert scale that ranged from -1 (sleepiness is worse), 0 (no change), +1 (slightly improved), +2 (substantially improved), and +3 (completely resolved). As expected, the Likert scores for improvement in sleepiness were greater in patients who were continuing to use PAP therapy (1.76 ± 0.78) than in patients who had discontinued such therapy (0.53 ± 1.23; p < .0001) (question 27; Appendix). Moreover, the degree of improvement in sleepiness was directly correlated with the hours of self-reported adherence to PAP therapy (R = 0.44; p < .0001).

Patient Education

Certified physicians and accredited centers were more likely to provide adequate education to patients regarding OSA. Physician certification and center accreditation were associated with a greater proportion of patients receiving adequate education regarding OSA (Table 4). Seventy-seven percent of patients cared for by certified physicians and accredited centers reported receiving adequate education regarding OSA. In contrast, only 43% of patients cared for by noncertified physicians and nonaccredited centers reported receiving adequate education regarding OSA (p < .0001; Table 4). Similarly, the accreditation status of the caring physician and the certification status of the center were also directly related to the proportion of patients who received education that led them to perceive the risks associated with OSA (Table 4). Patients who were cared for by noncertified physicians and nonaccredited centers were more likely to seek information regarding OSA elsewhere than were those patients who were cared for by certified physicians and accredited centers (Table 4). Similar findings were noted when such educational endpoints were

Table 4—Proportion of Patients Receiving Education Based on Physician-Certification and Center-Accreditation Status

<table>
<thead>
<tr>
<th>Physician certification status*</th>
<th>Yes</th>
<th>No</th>
<th>Risk perception</th>
<th>Yes</th>
<th>No</th>
<th>Sought education elsewhere</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified</td>
<td>304</td>
<td>98</td>
<td>309</td>
<td>65</td>
<td>155</td>
<td>145</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Not certified</td>
<td>62</td>
<td>77</td>
<td>94</td>
<td>71</td>
<td>73</td>
<td>43</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>p Value*</td>
<td>&lt; .001</td>
<td></td>
<td>&lt; .001</td>
<td></td>
<td>.02</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Center accreditation status*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accredited</td>
<td>290</td>
<td>98</td>
<td>284</td>
<td>102</td>
<td>148</td>
<td>146</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Not accredited</td>
<td>35</td>
<td>39</td>
<td>40</td>
<td>34</td>
<td>40</td>
<td>22</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>p Value*</td>
<td>&lt; .001</td>
<td></td>
<td>.04</td>
<td></td>
<td>.56</td>
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<tr>
<td>Accreditation-certification status (n=444)*</td>
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<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Physician certified and center accredited</td>
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<td>62</td>
<td>238</td>
<td>60</td>
<td>109</td>
<td>115</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>Neither physician certified nor center accredited</td>
<td>13</td>
<td>25</td>
<td>19</td>
<td>19</td>
<td>21</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p Value*</td>
<td>&lt; .001</td>
<td></td>
<td>&lt; .001</td>
<td></td>
<td>.44</td>
<td></td>
<td></td>
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</tbody>
</table>

Data are presented as number (percentage). OSA refers to obstructive sleep apnea.
*Patients responding as “Don’t know” to receiving education or accreditation of certification status are not shown.
*χ² test with Bonferroni correction.
Figure 1—Time delay for institution of positive airway pressure (PAP) therapy is regressed against patient-reported duration of time lapsed since issuance of PAP device (n = 569). Note that there has been a progressive lengthening of time delays in instituting PAP therapy (r = -.22; p < .0001).

analyzed after patients were grouped by physician-certification or center-accreditation status alone (Table 4).

Timeliness of Care

Timeliness of care—time delay between the first sleep study and when the patient received the PAP device—was a median of 27 days (interquartile range; 7 to 30). Timeliness of care was not related to physician-certification or center-accreditation status, either individually or when considered together (P>.2). Timeliness of care was inversely related to the duration of therapy (R = -0.22; p < .0001; Figure 1). Notably, the insurance status (insured versus not), type of insurance carrier, and issuance of an automatic PAP device were not associated with speedier service (p > .4).

Patient Satisfaction

Patient-satisfaction scores for care rendered by the physician—with a highest score of 5 signifying greatest satisfaction—was higher in patients cared for by certified physicians (3.78 ± 1.18) than noncertified physicians (3.19 ± 1.27; p < .0001). After univariate regressions identified significant explanatory variables, general linear models revealed that the following were independently associated with lower patient-satisfaction scores: not perceiving the risk of OSA through education received, discontinuation of PAP therapy, noncertified physicians, and longer time delays (log of time delay) in instituting PAP therapy (Table 5).

Patient-satisfaction scores for care rendered by the center—with a score closer to 5 signifying greater satisfaction—was higher in patients cared for by accredited centers (4.11 ± 0.98) than those cared for by nonaccredited centers (3.58 ± 1.24; p < .0001). After univariate regressions identified significant explanatory variables, general linear models revealed that the following were independently associated with lower patient-satisfaction scores: time delays in instituting PAP therapy (log of time delay), nonaccredited centers, not perceiving the risk of OSA through education received, and discontinuation of PAP therapy (Table 5).

<table>
<thead>
<tr>
<th>Variable</th>
<th>B (SE)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfied with physician (dependent variable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 1 (R² = 0.09)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Log of time delay | -0.44 (0.10) | < .0001
| Discontinuation of PAP therapy | -1.01 (0.32) | .001
| Non-certified physician | -0.46 (0.13) | < .0001
| Model 2 (R² = 0.21) | | |
| Log of time delay | -0.31 (0.09) | .001
| Discontinuation of PAP therapy | -0.74 (0.23) | .001
| Risk perception | 1.02 (0.10) | < .0001
| Satisfied with center (dependent variable) | | |
| Model 1 (R² = 0.15) | | |
| Log of time delay | -0.29 (0.09) | .001
| Discontinuation of PAP therapy | -0.75 (0.22) | .001
| Risk perception | 0.72 (0.1) | < .0001
| Model 2 (R² = 0.08) | | |
| Log of time delay | -0.34 (0.12) | < .0001
| Discontinuation of PAP therapy | -0.97 (0.29) | .001
| Nonaccredited center | -0.49 (0.15) | .001

PAP refers to positive airway pressure; B estimated coefficient; SE, standard error; CI, confidence intervals.

Risk perception and lack of accreditation or certification were colinear; therefore they are inserted separately.

p < .05

Internal and External Validity

Besides the good-to-excellent internal consistency between components of the questionnaire (Cronbach α coefficient of 0.75 to 0.93; Methods section), we further checked the data for internal and external validity. First, for external validity, the demographics of our patient population (age, height, weight, and sex) and continuous PAP pressure level are very similar to those reported in other large series of patients with OSA. Moreover, the proportion of patients who received continuous, automatic, and bilevel PAP devices—78%, 10%, and 12%—is similar to prior reports (external validity). In order to further assess the internal validity, we correlated self-reported pressure level of the continuous PAP therapy versus self-reported body mass index. In our study, self-reported pressure level prescribed for continuous PAP therapy was positively correlated with body mass index (R = 0.41; p < .0001).

DISCUSSION

To our knowledge, this is the first study to show an effect of physician sleep certification and sleep center accreditation on discontinuation of PAP therapy and self-reported adherence to PAP therapy in patients with OSA. Moreover, in comparison with patients cared for by nonaccredited centers and noncertified physicians, patients cared for by accredited centers and certified physicians were more likely to have perceived the risks of OSA through education and were more satisfied with their care. Time delays in instituting therapy for patients with OSA were not influenced by accreditation-certification status of physicians and centers but unfavorably impacted patient satisfaction. In patients with OSA, worsening nasal congestion and lack of medications for nasal congestion are independent risk factors for discontinuing PAP therapy and low hours of device use.
Risk Perception and Education

Reports cite that between 25% and 50% of patients with OSA may abandon treatment during the first 2 to 4 weeks of treatment.\textsuperscript{23-25} Although physical factors such as poor mask fit, nasal congestion, and high pressure contribute to such nonadherence, psychological factors may play a major role as well.\textsuperscript{7,9} Using the social cognitive model,\textsuperscript{27} Weaver and colleagues developed a questionnaire-based instrument involving 3 major cognitions that play a role in adherence to PAP therapy—patient’s perception of health risk associated with OSA, patient’s expectations of outcomes, and patient’s perceived ability to use the PAP device.\textsuperscript{7} In this instrument, perception of risk was an additional, and important component, believed to determine and predict patient behavior in response to therapy and considered an improvement over a prior model.\textsuperscript{9} Such perception of risk is usually imparted by educating the patient regarding disease-specific outcomes and health risks.\textsuperscript{27,28} In our study, education leading to a patient’s perception of risk due to OSA was associated with decreased odds for discontinuing PAP therapy (adjusted odds ratio [OR] 0.5, \( p = .03; \) step 3, Table 3). This is in agreement with other investigations showing the beneficial effect of intensive education on adherence to PAP therapy.\textsuperscript{29}

Certification-Accreditation Status

In our study, successful education of the patient regarding the health risks of OSA was performed more often by certified physicians and accredited centers than by noncertified physicians and nonaccredited centers (Table 4). Such education leading to risk perception may underlie the lower likelihood for discontinuation of PAP therapy in patients cared for by certified physicians and accredited centers than in patients cared for by noncertified physicians and nonaccredited centers. This is further supported by the collinearity between “risk perception” and accreditation or certification status in our regression model (Table 3). Besides promoting adherence to PAP therapy through education, physicians may favorably influence adherence to PAP therapy by other means: prescription of medications to relieve nasal congestion, heated humidifier,\textsuperscript{30} or choice of mask interfaces.\textsuperscript{31} We have previously reported differences in prescription practices among physicians of various specialties.\textsuperscript{32} Physicians who specialized in the “parent” fields for sleep medicine—pulmonary medicine, neurology, and psychiatry—were less likely to prescribe sedatives to patients with as yet undiagnosed OSA.\textsuperscript{32} Conversely, a survey by Chervin and colleagues appears to indicate that there is wide variability in practice patterns of physicians managing patients with sleep problems—regardless of their certification status.\textsuperscript{31} In the present study, while prescription of medications for nasal congestion protected against discontinuing PAP therapy (OR 0.3, 95% CI 0.1–0.8; \( p = .02; \) Table 3), certified physicians were no more likely than noncertified physicians to prescribe medications for nasal congestion (\( p = .5; \) not shown). Therefore, such a mechanism is unlikely to be responsible for the effect of accreditation or certification status on discontinuation of PAP therapy.

We chose discontinuation of PAP therapy as the primary endpoint because, currently, it is unclear as to what threshold of hourly PAP-therapy use is acceptable and what, if any, are the benefits associated with an extra hour of nightly usage.\textsuperscript{9} In keeping with this line of reasoning, we had originally powered the study based on continuation or discontinuation of PAP therapy and not hourly usage. Nevertheless, we did collect information regarding self-reported hourly PAP use, and the effects of accreditation or certification status on hour-based adherence to PAP therapy was no different than the effect of such status on discontinuation of PAP therapy. Moreover, while self-reporting of PAP-therapy usage is not as accurate as monitoring device compliance using microchip technology,\textsuperscript{26} we do not believe that a systematic bias would have occurred across the patient groups compared in our study.

Nasal Congestion and Therapy

Previous studies have identified nasal congestion and symptoms as important reasons for abandoning PAP therapy or poor adherence.\textsuperscript{7,34} However, a systematic measurement of nasal symptoms using validated questionnaires in patients using PAP therapy has not been performed. Often, such nasal symptoms are attributed to PAP therapy.\textsuperscript{35,36} In our study, however, patients who had already discontinued PAP therapy reported higher nasal-congestion scores than did patients who were continuing to use their PAP devices. This would suggest that nasal congestion might play an important role in acceptance of PAP therapy, and, conceivably, such a role may be independent of the effect of PAP therapy on nasal symptoms. Additionally, the importance of nasal congestion on discontinuation of PAP therapy is further emphasized by our finding that prescription of medications for nasal congestion protected against discontinuation of PAP therapy (OR 0.3, 95% CI 0.1–0.8; \( p = .02; \) Table 3).

Satisfaction Rates

Certified physicians and accredited centers achieved greater satisfaction ratings from patients than did noncertified physicians and nonaccredited centers. Other factors determining patient satisfaction were receiving education leading to perception of health risks associated with OSA and outcome of treatment—whether they continued to use the PAP device or not and timeliness of care. This is consistent with other reports that have identified access to care and physician communication as important determinants of patient satisfaction.\textsuperscript{37,38} In light of this information, the sleep community and healthcare systems need to address the rising wait times (Figure).

Wait Times

We chose the time lapse between first sleep study and delivery of PAP device because these are points in time that the patient is more likely to remember. Our data are consistent with recent reports of time delays for sleep evaluation in the United States,\textsuperscript{10} but the magnitude of our wait times is lower than that reported by Flemons and colleagues.\textsuperscript{10} Such a difference is probably due to the fact that the 2 studies measured different timeframes along the timeline of care delivered to patients with OSA. Our data, however, allow relating the wait times to patient satisfaction and also provide trends that allow extrapolation.

Limitations

There are several limitations to this study. First, this is an observational study, making it difficult to attribute cause-and-effect relationships. Second, self-selection of patients agreeing to participate in this study may not be representative of the average patient. Third, although response rate was good, it is unknown...
as to how the nonrespondents may have influenced the results. Fourth, this Internet-based survey does not include patients without Internet access and may have discounted patients belonging to lower socioeconomic strata or patients with disabilities. Fifth, race demographic was not sought, but we do not believe that this would have significantly affected the sampling because our patients’ age, sex, height, and weight information are very similar to those in previous reports. Lastly, patients were asked to rely on their memory—especially with regard to time delays—and such information may be prone to recall bias.

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REFERENCES

APPENDIX: Questionnaire

This is a research survey. Participation in this survey is entirely voluntary. The purpose of this study is to determine patients' perception of the care they received for their SLEEP APNEA condition.

Please respond to this questionnaire only if you have been diagnosed with OBSTRUCTIVE SLEEP APNEA and if you are at least 20 years old. Participation is anonymous, and the responses will be used only for research purposes and analyzed in aggregate. There is no remuneration for participation.

1. Was the physician who managed your sleep apnea a SLEEP EXPERT?
   You can check this website if your sleep physician is certified in sleep medicine.
   (html link to AASM web site with list of certified sleep physicians)
   Yes
   No
   Don’t know

2. Was the sleep center (the place where you had your sleep study or portable sleep study hooked up) certified by the American Academy of Sleep Medicine?
   You can check to see if your center is AASM accredited at this web site
   (html link to AASM web site with list of certified sleep centers)
   Yes
   No
   Don’t know

3. Did you receive ADEQUATE education about sleep apnea from your providers?
   (Verbal, audiovisual aids, pamphlets, brochures or other)
   Yes
   No
   Don’t know

4. Did such education improve your understanding of sleep apnea?
   Yes
   No
   Don’t know

5. Did such education help you realize the risks associated with sleep apnea?
   Yes
   No
   Don’t know

6. If you did not receive satisfactory education regarding the risks of sleep apnea from your physician and sleep center, did you receive it elsewhere?
   Yes
   No
   Not applicable

7. How satisfied are you with the care you have received from your physician for your sleep apnea condition?
   Very satisfied
   Satisfied
   Neutral
   Dissatisfied
   Very dissatisfied

8. How satisfied are you with the care you received from the sleep center?
   Very satisfied
   Satisfied
   Neutral
   Dissatisfied
   Very dissatisfied
Appendix Cont.

9. Currently, are you using a CPAP, BiPAP, or auto-PAP machine?
   Yes
   No

10. During a typical night, how many hours do you use the machine?
    ___ hrs

11. During a typical week, how many days do you use your (CPAP, BiPAP, or auto-PAP) machine?
    ___ nights

12. How severe is your sleep apnea?
    Mild
    Moderate
    Severe
    Don’t know

13. Do you experience nose congestion?
    Never
    Rarely (once a month)
    Sometimes (2 to 4 times a month)
    On most days (5 to 15 times a month)
    All the time (16 to 30 times a month)

14. If you suffer nasal congestion, were you prescribed any medications to relieve such congestion?
    Yes
    No

15. If you are on CPAP, what is your prescribed CPAP level?
    ___ cm H$_2$O

16. If you are on BiPAP, what are the upper and lower levels (Example: enter as "14/6")
    ___ / ___ cm H$_2$O

17. Are you using an auto-PAP (otherwise called a smart CPAP) machine?
    Yes
    No
    Don’t know

18. What is your gender?
    Male
    Female

19. How old are you?
    ___ years

20. How much do you weigh? (lbs)
    ___ lbs

21. How tall are you? (feet and inches; example: 5'6")
    ___ ft ___ in

22. How long has it been since you were issued a CPAP machine (in months)?
    ___ months

23. How many days did it take between your FIRST sleep study and when you received the machine for treating sleep apnea?
    (Not applicable if you were never prescribed such a machine)
    ___ days
Appendix Cont.

24. What kind of insurance did you have at the time your sleep apnea was diagnosed and treated?
   - HMO
   - PPO
   - POS
   - Medicare
   - VA
   - No insurance
   - Don’t know

26. What is your highest education level?
   - Did not graduate from high school
   - Graduated high school
   - College
   - Masters
   - Doctorate

27. Have your symptoms of sleepiness improved?
   - Completely resolved
   - Substantially improved
   - Slightly improved
   - No change
   - Worse