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Journal of Psychosomatic Research 64 (2008) 427–433

Journal of Psychosomatic Research

A diagnostic symptom profile for sleep disorder in primary care patients

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Received 8 June 2006; received in revised form 25 July 2007; accepted 16 October 2007

Abstract

Objective: The aim of the present study was (1) to evaluate the extent and nature of sleep disorder-related symptoms in the older primary care patient population and (2) to differentiate a pattern of self-reported symptoms that identify patients who should be referred to the sleep clinic for further evaluation. **Method:** One hundred ninety-six older adults recruited from family practice centers were administered a brief symptom survey measure. All were invited to participate in an extensive self-report evaluation, consultation with a sleep medicine specialist, and an overnight polysomnographic study. **Results:** A substantial number of older primary care patients report symptoms related directly or indirectly to physiological sleep disorder. Over 30% of total reported some insomnia, 40% daytime sleepiness, and 10% apnea. Those participants who agreed to pursue further aspects of the study protocol endorsed a higher number and greater severity of primary sleep disorder symptoms than those who declined to continue beyond the first phases. Participants who chose to pursue polysomnography (13% of total) had a very high rate (88.5) of diagnosed sleep disorder. **Conclusion:** This study suggests that an older patient, male or female, who both endorses medically unexplained daytime sleepiness, fatigue, or other sleep disorder related symptoms and agrees to further evaluation, including overnight polysomnography, is at substantial risk for physiologically based sleep disorder. In the future, a brief, validated measure, such as the Sleep Symptom Checklist used in this study, would be an important part of the diagnostic process.

Keywords: Diagnosis; Sleep apnea; Symptom presentation; Primary care; Referral

The presence of sleep apnea/hypopnea syndrome (SAHS) in the older population is believed to be high, in the range of 20–60% [1–4]. However, it is underrecognized in primary care and therefore underdiagnosed and undertreated by sleep disorder specialists [5]. There is a need for clear practice guidelines to identify patients who are likely to have sleep apnea as well as other sleep problems [6–8]. Primary care physicians receive very little training in sleep disorders [7,9,10], and even among sensitized practitioners, referral rates to sleep clinics for sleep apnea evaluation fall well short of the expected population rate [7,10,11].

It is increasingly well known that sleep has a very important role in the maintenance of endocrine, immune, and metabolic functions [12–14]. SAHS disrupts sleep architecture, reduces blood oxygenation, and has an impact on multiple bodily systems [15]. Therefore, patients may present with a wide array of associated symptoms. Some of the patients may report direct signs of SAHS, such as loud snoring and sleep disruption. Others report symptoms such as headache, body pain, and depression, which are indirectly related to sleep apnea and reflect the disorder's impact on other systems [16,17]. Consequently, sleep apnea-related complaints can be presented in a variety of ways and may not be immediately recognized by the primary care physician.

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doi:10.1016/j.jpsychores.2007.10.011

Detecting sleep apnea in the community

In a recent prospective study [18], we recruited a sample of 112 community-based older adults on the basis that they experienced daytime sleepiness, fatigue, or insomnia. They had never been diagnosed with any sleep disorder. They completed an extensive self-report battery that evaluated sleep quality, daytime sleepiness, fatigue, psychological adjustment, and perceived health. They also underwent medical examination and overnight polysomnographic recording. Our findings indicated (1) a very high rate of sleep disorder (77% of the women, 98% of the men) in this self-selected sample, (2) a male-to-female ratio of 1.2 to 1 for diagnosed SAHS, (3) men and women with diagnosed SAHS reported similarly severe apnea signs and symptoms, and (4) virtually no differences in psychological adjustment and few perceived differences in health limitations between men and women with diagnosed SAHS. Our self-selected community sample clearly showed high rates of SAHS. However, our data could not explain why SAHS, particularly in women, is underrecognized by primary care physicians. Therefore, the appropriate next step was to sample older patients in the primary care system.

Present investigation

Our overall goal was to improve identification of symptomatic cases in primary care. The specific aims of the study were (1) to evaluate the presence and severity of sleep disorder symptoms in older primary care patients and (2) to discover a symptom constellation or "profile" that could identify patients who should be referred to the sleep clinic for further evaluation. We surveyed a wide range of sleep disorder symptoms, including those directly and indirectly consequent to SAHS, to reflect its pervasive effects.

Method

Participants

Participants were 196 older adults (71 men: mean age=69.93, S.D.=9.1; 125 women: mean age=69.96, S.D.=10.8) recruited from the waiting areas of three family practice centers. Inclusion criteria were age 50 and over, community resident, volunteer, and sufficient cognitive and language skills to complete measures in English or French.

Measures

Sleep Symptom Checklist

This data collection instrument was developed for the present investigation based upon items from prior validated questionnaires (e.g., Structured Sleep and Medical History [19], Sleep Questionnaire [20], Beck Depression Inventory [21], Spielberger State-Trait Anxiety Inventory [22], SF-36 Health Survey [23]). Our aim was to design a brief measure, one that, potentially, would be practical in a busy general practice office and was oriented to specific sleep disorders such as sleep apnea, periodic limb movement disorder or insomnia. The Checklist consists of 21 items on one page relating to direct and indirect signs and symptoms of sleep disorder, including snoring, breathing interruption in sleep, insomnia, daytime fatigue, sleepiness, and psychological maladjustment. Participants place a check mark next to the symptoms they experienced within the prior month. For each symptom checked, they (*a*) rate its severity from 1 to 3 (a score of 0 is attributed if an item is not checked), (*b*) indicate if the symptom was discussed with their physician at the current appointment or (*c*) within the past year. In an open-ended format, they report what, if anything, their doctor recommended in terms of referral or treatment. The temporal stability of the severity ratings was evaluated using a 3-week test–retest format with a convenience sample of 21 individuals (14 female, 7 male; mean age=46.1, S.D.=12.1). Pearson product–moment correlations showed acceptable temporal stability ($r=0.79$, $P<.01$, for the total score). Cronbach's alpha was .74 for the first administration and .68 for the second. Reliability testing demonstrated good internal consistency for the measure (Cronbach's alpha=0.86 for checked symptoms; 0.88 for severity ratings) [24].

Polysomnographic Assessment

Participants were monitored in a supervised sleep laboratory from 10 p.m. to 7 a.m. Monitoring includes three leads, electroencephalogram (EEG), electrooculography, bilateral anterior tibialis and chin electromyogram, electrocardiogram, pulse oximetry, nasal and oral airflow with nasal pressure cannulae (a thermistor for backup if technical difficulties were detected during recording), and respitrace bands for measurement of respiratory effort [25]. All signals were acquired on a digital data management system (Sandman, Nellcor–Puritan Bennett & Tyco, Ottawa, Canada). One polysomnographic technologist with 10 years of experience manually scored the studies blind to the results of symptom assessments. Sleep stages were first scored in 30-second epochs according to standard criteria [26]. Next, EEG arousals were scored according to standard current consensus criteria [27]. An apnea event was scored when there was a cessation of breathing for ≥10 s. A *hypopnea* was defined a priori as an event lasting at least 10 s with a decrease of >50% from a baseline in the amplitude compared to the mean of the largest 3 breaths over the previous 4 epochs or a lesser reduction in airflow signal amplitude accompanied by either at least a 3% desaturation or an EEG arousal [28]. Leg movements, apnea events, and associated arousals were scored manually according to the scoring rules established by the Atlas Task Force of the American Sleep Disorders Association [29]. The cutoff criterion for defining a case with significant apnea/hypopnea as well as

Table 1
Comparison of Decliners, Dropouts, and Completers: percentage of respondents who experienced the symptom last month

SSC items	Decliners (n=150)	Dropouts (n=20)	Completers (n=26)	χ^2	*P*
Waking up and trouble getting back to sleep	32.7	35.0	57.0	6.02	.049 *
Insomnia	23.3	25.0	46.2	5.95	.051
Trouble falling asleep	25.3	15.0	57.7	13.38	.001 **
Poor sleep quality	18.0	15.0	57.7	20.54	.000 ***
Waking up too early in the morning	20.0	30.0	57.7	16.54	.000 ***
Waking often to urinate	44.7	35.0	69.2	6.64	.036 *
Daytime sleepiness	38.0	35.0	73.1	11.66	.003 **
Lack of vitality	31.3	25.0	50.0	4.15	.125
Bodily pain	42.0	30.0	61.5	5.07	.079
Daytime fatigue	52.0	35.0	69.2	5.39	.068
Limited in doing things because of health	28.0	20.0	46.2	4.49	.106
Sleep is nonrefreshing	18.0	25.0	50.0	12.88	.002 **
Waking with a dry mouth	41.3	35.0	61.5	4.32	.115
Snoring	34.9	45.0	50.0	2.61	.271
Interruption of breathing during sleep	6.0	5.3	34.6	20.95	.000 ***
Parts of body jerk at night	12.7	0.0	23.1	20.28	.000 ***
Falling asleep during the day when not wanted	16.7	25.0	30.8	3.27	.195
Waking with a headache	12.0	0.0	30.8	10.19	.006 **
Depression	23.3	10.0	19.2	1.95	.377
Poor emotional well-being	16.7	10.0	23.1	1.39	.498
Anxiety	30.0	20.0	50.0	5.49	.064

* $P<.05$.
** $P<.01$.
*** $P<.001$.

periodic limb movements was 10 or more events per hour of EEG sleep.

Procedure

Testing was carried out in 4 phases. Participants were paid a modest honorarium and were reimbursed for parking and travel expenses. The protocol for the study was reviewed and approved by the Research Ethics Committees of both McGill University and the Mount Sinai Hospital of Montreal.

Phase 1 (waiting room)

A research assistant, stationed in the waiting room of each of three primary care settings, approached all individuals from the appropriate age group. The study was described to potential participants and they were asked to read and sign an information and consent form. Patients who were willing to complete the one page checklist (~10 min completion time) were administered the Sleep Symptom Checklist (SSC) immediately after they left their doctor's office.

All patients were informed about the remaining aspects of the study and invited to participate, except for those meeting the following exclusion criteria: current clinically acute major medical or psychiatric illness, previously diagnosed sleep apnea/hypopnea syndrome, restless legs syndrome/periodic limb movement disorder, parasomnias or severe sleep phase disorder, or dementia precluding completion of questionnaires.

Phase 2 (questionnaire battery)

Individuals recruited in Phase 1 who agreed to continue in the study were given an appointment to complete the full questionnaire battery, which took 1–2 h. This aspect of the study is not reported here.

Phases 3 and 4 (sleep clinic assessment)

Participants who agreed to do this underwent a medical examination by a sleep medicine specialist (Phase 3) and an overnight stay in the sleep laboratory for polysomnographic (PSG) evaluation (Phase 4). After completion of the PSG, participants were offered a follow-up meeting with one of the team members to review any important assessment findings. In cases where there was a significant finding for primary sleep disorder, participants were offered treatment options and follow-up at the sleep clinic.

Approximately 400 patients were approached by the research assistant and invited to complete the checklist. One hundred ninety-six agreed to Phase 1. On the basis of this study protocol, participants received one of the following designations:

Decliners: those who completed the SSC (Phase 1), but declined further participation (*n*=150).
Dropouts: those continuers who dropped out before completing Phase 4 (PSG) and who participated in the questionnaire/interview stage (Phase 2) and/or the clinical evaluation by a sleep specialist (Phase 3) (*n*=20).
Completers: those continuers who completed Phase 4 (overnight PSG) as well as Phase 2 and/or Phase 3 within a delay of about 7 months (*n*=26).

Table 2
SSC factor loadings based on symptom severity ratings

SSC item	Factor 1: Insomnia	Factor 2: Daytime Aspects	Factor 3: Sleep Disorder	Factor 4: Psychological Maladjustment
Waking up and trouble getting back to sleep	**0.79**	0.21		
Insomnia	**0.72**			0.31
Trouble falling asleep	**0.71**	0.23		
Poor sleep quality	**0.67**	0.33	0.29	
Waking up too early in the morning	**0.60**		0.38	
Waking often to urinate	**0.47**		0.24	
Daytime sleepiness	**0.44**	0.37	0.34	
Lack of vitality		**0.74**		0.24
Bodily pain		**0.69**		
Daytime fatigue	0.31	**0.65**		0.23
Limited in doing things because of health		**0.62**	0.26	0.36
Sleep is nonrefreshing	0.40	**0.59**	0.36	
Waking with a dry mouth			**0.71**	
Snoring			**0.64**	
Interruption of breathing during sleep		0.21	**0.56**	
Parts of body jerk at night	0.41		**0.52**	0.31
Falling asleep during the day when not wanted		0.32	**0.50**	0.27
Waking with a headache		0.41	**0.42**	
Depression	0.20			**0.84**
Poor emotional well-being		0.23		**0.75**
Anxiety	0.28	0.31		**0.53**

Note. (N=196). Factor loadings less than .2 were deleted. Bold numbers indicate factor assignment.

Two participants among the Decliners had a prior diagnosis of sleep apnea and none of those wishing to continue in Phases 2 and 3 met the exclusion criteria.

Any participant found as a result of the study evaluation to have a previously undetected illness or a clinically significant psychological or psychiatric disorder, determined by the research team according to *Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition* or the Beck Depression Inventory, was referred for appropriate follow-up.

Results

Table 1 shows the percentage of respondents in each group who experienced each symptom within the past month. Chi-square tests show that, on 10 comparisons, a higher percentage of Completers (n=26) endorsed the symptom compared with Decliners (n=150) or Dropouts (n=20).

To organize the data into more manageable categories for further analysis, a principal components factor analysis was carried out using varimax rotation on the SSC severity ratings. This analysis yielded 4 factors, accounting for 51.8% of the variance. The factors were designated as four severity subscales and labelled: Insomnia, Daytime Aspects, Sleep Disorder, and Psychological Maladjustment. Subscale items and their factor loadings are presented in Table 2. Temporal stability of the subscales, measured by Pearson test–retest correlations on the sums of the severity ratings for each subscale of the convenience sample (n=21) were as follows: .79 (Insomnia), .77 (Daytime Aspects), .85 (Sleep Disorder), and .80 (Psychological Maladjustment) [19]. All correlations were significant at the .01 level.

Severity subscale means and standard deviations for men and women are presented in Table 3. A one-way multivariate analysis of variance (MANOVA) was carried out. This was significant: $F(4,191)=3.99$, $P=.004$. Univariate F test results show that men had significantly higher severity ratings on the Sleep Disorder subscale and that women had higher scores on the Psychological Maladjustment subscale. No other significant differences were obtained between men and women.

We next compared the SSC severity subscale scores of the 3 participant groups: Decliners, Dropouts, and Completers. SSC severity subscale score means and standard deviations for the three groups are presented in Table 4. A MANOVA test comparing the three groups on the four SSC severity subscales was significant, $F(8,380)=7.38$, $P<.001$. Post hoc univariate F tests revealed that the Completers differed from both the Decliners and Dropouts on three of the four Subscales (i.e., all except Psychological Maladjustment). This indicates that whether or not the individual completed the study protocol has an important association with symptom severity.

For those participants who completed the final phase (i.e., PSG study: $n=26$), results indicate that 85.7% of women and 91.7% of men had diagnosable SAHS [apnea–hypopnea index (AHI) greater than or equal to 10]. Half of the women and one man with diagnosed sleep apnea also had diagnosable periodic limb movement disorder (index greater than 10). Table 5 presents means and standard deviations for the body mass index (BMI), PSG findings and subscale scores for the 11 men and 12 women diagnosed by PSG as having a sleep disorder. Analysis by gender revealed no significant differences in subscale scores between men and

Table 3
Sex differences on SSC severity subscales

Subscale	Gender	Mean	S.D.	$F(2,191)$	P
Insomnia	Male	3.75	4.32	.011	NS
	Female	3.81	4.12		
Daytime Aspects	Male	3.14	3.77	.029	NS
	Female	3.24	3.55		
Sleep Disorder	Male	2.72	3.12	6.09	.014 *
	Female	1.78	2.24		
Psychological Maladjustment	Male	0.77	1.71	4.22	.041 *
	Female	1.34	1.91		

Note. Males: n=71; females: n=125.

* $P<.05$.

Table 4
Comparison of SSC severity subscale scores of participants who completed different numbers of phases of the investigation

SSC severity subscale	Participant status	Mean severity score	S.D.	$F(2,193)$	P	Post hoc comparison
Insomnia	A. Decliners	3.04	3.42	22.75	.000	C>A,B
	B. Dropouts	3.30	3.77			
	C. Completers	8.50	5.70			
Daytime Aspects	A. Decliners	2.84	3.32	8.49	.000	C>A,B
	B. Drop Outs	2.55	3.63			
	C. Completers	5.82	4.31			
Sleep Disorder	A. Decliners	1.79	2.32	12.76	.000	C>A,B
	B. Drop Outs	1.65	1.95			
	C. Completers	4.40	3.50			
Psychological Maladjustment	A. Decliners	1.12	1.97	4.91	NS	
	B. Drop Outs	0.65	1.09			
	C. Completers	1.58	1.55			

Note. Higher SSC severity subscale score indicates greater symptom severity. Sample sizes are as follows: Decliners: n=150; Dropouts: n=20; Completers: n=26.

women other than on the Psychological Maladjustment subscale, where women indicated greater symptom severity than did men.

Discussion

This study revealed a wide range of sleep disorder-related symptoms in a sample of older primary care patients. A substantial percentage of the patients (more than a third) reported experiencing several signs such as insomnia, daytime fatigue and sleepiness, as well as snoring. When these patients were offered more extensive evaluation of their daytime function and nocturnal sleep quality, those who completed the protocol (Completers) both experienced the most symptoms within the past month and rated their symptoms as most severe. These findings suggest that the number and severity of symptoms drives individuals to accept lengthy and fairly burdensome further evaluation when this is offered to them. A similar phenomenon was found in our previous study with older community dwelling participants [18]. Those individuals self-identified as having daytime sleepiness, fatigue, or nocturnal sleep problems and were subsequently found to have a high rate of diagnosed sleep disorder on completion of the study protocol.

In the present investigation, a very high percentage of individuals (85.7% of women and 92% of men) who completed all phases of the study were diagnosed via polysomnography as having a treatable sleep disorder such as SAHS and/or periodic limb movement disorder. This represents approximately 12% of all individuals who completed the initial checklist (SSC). Notably, these are patients who might not have been diagnosed but for their participation in a research study. However, this percentage still falls well short of the epidemiological estimates for this age group. The 4 steps of the extensive protocol and the inconvenience of an overnight sleep study in a hospital may have discouraged some "at-risk" individuals. Perhaps more people would have pursued further evaluation if their physician had been involved in the referral process.

Our findings yield a possible clue concerning the underrepresentation of women referred to sleep clinics for evaluation of potential sleep apnea. The men in our sample reported more severe specific sleep disorder signs compared to the women. The women reported more severe psychological difficulties. Such sex differences may underlie a

Table 5
Characteristics of men (n=11) and women (n=12) who were diagnosed with sleep disorder via polysomnography

	Women		Men		
	Mean	S.D.	Mean	S.D.	t Test
Age	67.75	10.77	72.27	8.70	NS
BMI	29.34	5.88	28.92	6.76	NS
Periodic limb movements (events/h)	21.54	30.09	7.04	21.33	NS
AHI	33.52	25.43	35.45	15.24	NS
SpO_2, sleep	96.81	1.81	96.47	1.34	NS
SpO_2, minimum	88.63	4.78	88.99	2.55	NS
SSC					
Insomnia severity subscale	10.41	5.00	7.05	5.99	NS
Daytime Aspects severity subscale	7.64	4.49	4.32	4.05	NS
Sleep Disorder severity subscale	4.14	2.86	3.64	3.23	NS
Psychological Maladjustment severity subscale	2.55	1.21	1.00	1.55	P=.017

different manner of expression of symptoms that may make it easier for the primary care physician to identify male patients at risk for sleep apnea. Equally at risk women patients may distract the physician by their psychological complaints and be diagnosed with depression [30].

A limitation of the study is that there does not seem to be an ethically feasible way of evaluating the Decliners with polysomnography. Although the fact that patients who did not pursue the study protocol to its conclusion also had fewer and less severe symptoms makes it tempting to assign a lower risk status to them, we cannot know with certainty how many undiagnosed sleep disorders exist in that group. Moreover, the design of the present study does not allow us to assess sleep disorder prevalence for this older, primary care population.

In spite of these limitations, aspects of our study protocol suggest possible screening procedures for sleep disorders that can be implemented in primary care settings. A brief survey instrument, such as the SSC, can be used to increase the identification and referral of patients at risk for sleep disorder but who do not fit the typical sleep apnea profile (male, obese, snorer). We are presently developing and validating this measure as part of a waiting room protocol that includes patient information and self-evaluation materials designed to facilitate patient and physician communication.

The current study has already identified four subscales for such a measure: insomnia-related (Insomnia), daytime fatigue and sleepiness (Daytime Aspects), primary sleep disorder (Sleep Disorder), and psychological aspects (Psychological Maladjustment). Psychometric properties of these subscales indicate good internal consistency and very good temporal stability. Participants who completed all phases of the study had higher symptom severity scores on the Insomnia, Daytime Aspects, and Sleep Disorder subscales than those who declined to complete all phases of the study. Further development of the measure would establish cutoff scores in either number or severity of symptom clusters that indicate the need for referral to a sleep laboratory.

Attempts to increase diagnostic accuracy of SAHS on the basis of self-report data alone have been reported in the literature [31–35]. However, in those studies, the samples were patients who had already been recognized as probable sleep disorder cases and who had been referred to a sleep laboratory. The screening measure developed in the present study applies to a general primary care population. Interestingly, in a previous investigation where a wide of range of both directly and indirectly related symptoms were included, factor analysis revealed a similar factor structure to that obtained in the present study [31]. Other studies have examined a limited number of directly related symptoms and characteristics (e.g., snoring, breathing interruption, BMI). For example, the Berlin Sleep Apnea Questionnaire [34] is valid for only one sleep disorder; in a general practice clinic, a single one-page tool that helps identify the various common sleep disorders (including insomnia, restless legs syndrome) would certainly be more practical than three to five separate questionnaires, each directed at rating the risk or severity of its own sleep disorder.

The difference in number and severity of symptoms between those individuals who completed the initial SSC and then chose to continue through subsequent phases of the study versus those who declined to continue has important implications. Of those participants who completed all phases (i.e., including an overnight polysomnography evaluation at the sleep lab), 88.5% had a significant sleep disorder, including SAHS, periodic limb movement disorder, or both. Number and severity of symptoms appear to be strong motivating factors for persisting through the study process. The diagnostic implication of this phenomenon is that an older patient, male or female, who both endorses medically unexplained daytime sleepiness, fatigue, or other sleep disorder-related symptoms and who agrees to further evaluation, including overnight polysomnography, has a high likelihood of having a physiologically based sleep disorder.

We believe that a brief, self-administered checklist, such as the SSC, has a potential utility in primary care that has been lacking to this point [36,37], namely, to increase the timely identification and referral of patients with sleep disorders.

Acknowledgments

This research was supported by a grant from the Canadian Institutes of Health Research.

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