Prevalence of Insomnia Symptoms in Patients With Sleep-Disordered Breathing*

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Objective: **To assess the prevalence of insomnia symptoms in patients with objectively diagnosed sleep-disordered breathing (SDB).**
Design: **Retrospective medical chart review of a representative sample of patients with SDB.**
Setting: **University sleep-disorders clinic and laboratory.**
Patients: **Two hundred thirty-one patients with SDB were selected from a pool of approximately 2,000 patients with sleep disorders.**
Measurements: **Data were extracted from intake questionnaires and polysomnographic studies.**
Results: **Of 231 patients with SDB diagnoses, 115 patients reported no insomnia complaints (SDB-only patients) and 116 patients reported clinically meaningful insomnia complaints (SDB-plus patients). Compared to SDB-only patients, SDB-plus patients reported significantly worse mean sleep characteristics consistent with insomnia, including sleep latency (17 min vs 65 min), total sleep time (7.2 h vs 5.6 h), and sleep efficiency (92% vs 75%). SDB-plus patients experienced significantly more psychiatric disorders, cognitive-emotional symptoms, and physical and mental symptoms that disrupted or prevented sleep. SDB-plus patients also reported greater use of sedative and psychotropic medications and had significantly more primary complaints of insomnia, restless legs or leg jerks, and poor sleep quality despite having relatively similar referral rates for sleep apnea or complaints of loud snoring.**
Conclusions: **Problematic insomnia symptoms were reported by 50% of a representative sample of patients with objectively diagnosed SDB. Research is needed to determine the degree to which insomnia and related symptoms and behaviors interfere with SDB treatment.**
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Key words: insomnia; obstructive sleep apnea; sleep-disordered breathing; upper airway resistance syndrome

Abbreviations: AHI = apnea-hypopnea index; BMI = body mass index; CPAP = continuous positive airway pressure; $minSaO_2$ = minimum arterial oxygen saturation; OSA = obstructive sleep apnea; REM = rapid eye movement; SDB = sleep-disordered breathing; UARS = upper airway resistance syndrome

Research investigations of insomnia[1] and sleep-disordered breathing (SDB)[2] are becoming more prevalent. Yet, scant research has been conducted on patients with both disorders.[3] Surprisingly, most cited research describing this intuitively frequent combination of the two most common sleep disorders occurred 1 or 2 decades ago and rarely included random samples.[4–10] Still, the exploratory findings from a few studies point to interesting clinical perspectives about patients with both insomnia and SDB. For example, women with SDB may present with more insomnia features than men,[4,9] and SDB patients with insomnia appear to suffer from less hypoxia and sleepiness than patients with classic sleep apnea.[4]

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The dearth of research in this area may arise from the assumption that SDB patients experience sleep maintenance insomnia or recurrent awakenings[11] without concomitant difficulty returning to sleep. As such, "insomnia" associated with SDB appears to be clinically irrelevant. Current American Academy of Sleep Medicine practice parameters for the diagnosis of SDB[11] in fact depart from an earlier version of the International Classification of Sleep Disorders

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construct[12] by no longer using the term *insomnia* in the diagnostic criteria.[11] Most studies or reviews on this topic have attempted primarily to clarify the role of polysomnography in assessing insomnia,[3,13–15] and a few of these works have assessed SDB prevalence rates in insomniacs. Generally, these studies[3,14] concluded that the evaluation of insomnia does not routinely require polysomnography. Parenthetically, the studies from which these practice parameters were derived were absent the use of nasal pressure transducer technology, which assesses subtle airflow irregularities.[16] Preliminary research suggests that insomnia and SDB have a more complex relationship than previously observed.[17,18] One uncontrolled study[18] recently documented an SDB prevalence of 91% in crime victims seeking treatment for insomnia.

Regardless of how these two common sleep disorders are related, it may prove worthwhile to consider their relationship as a "two-way street," particularly if insomnia symptoms in SDB patients manifest as primary comorbid conditions, requiring treatments distinct from and supplemental to sleep breathing therapies.[15,19] Speculatively, comorbid insomnia could influence compliance with SDB therapies, such as continuous positive airway pressure (CPAP) or oral airway devices.[4,20–22] And, with the growing influence of managed care,[23] a patient with complex sleep disorders (such as comorbid insomnia and SDB) might not receive the level of follow-up required to maximize treatment outcomes. As a preliminary step in learning more about this clinical presentation, the current study focused on the frequency of insomnia complaints in patients with obstructive sleep apnea (OSA) and upper airway resistance syndrome (UARS). The study included a representative sample of SDB patients treated at a university sleep-disorders clinic. We hypothesized that a sizeable proportion of patients with objectively diagnosed SDB would report clinically important insomnia symptoms, and that SDB patients who reported comorbid insomnia would report greater symptom distress compared with SDB patients without complications.

Materials and Methods

Patient Sample

The study was approved by the Human Research and Review Committee of the University of New Mexico Health Sciences Center. From July 1, 1997, through December 31, 1999, approximately 2,000 new patients at the University Hospital Sleep Disorders Center completed an extensive "sleep medicine history" at intake. The current study included all adult patients whose surnames began with the letters "A", "B", and "C" (n = 252). Of these 252 patients, 231 received a diagnosis of SDB and constitute the study sample. The other 21 patients had mostly complex sleep disorders, involving narcolepsy, periodic limb movements, sleep terrors, and rapid eye movement (REM) behavior disorder. A few insomniacs were excluded who appeared to have UARS because they did not meet our stringent criteria for this diagnosis (see below). Pertinent demographics for these 231 individuals included the following: 159 men and 72 women (mean age, 51 years; range, 19 to 78 years), mean body mass index (BMI), 33.6; Hispanic, 29%; non-Hispanic white, 55%; married, 57%; working, 46%; retired, 21%; and disabled, 21%. The primary referral sources for these patients were family medicine physicians, general practitioners, internists, and pulmonologists (87%), with a small proportion of referrals from cardiologists, neurologists, otolaryngologists, and psychiatrists (13%). Nearly 80% of patients were evaluated by a sleep specialist before undergoing polysomnography.

SDB Diagnoses

Diagnoses were made in all 231 patients by standard polysomnography (97%), or an EdenTrace II Plus Digital Recorder (model 37111; EdenTec; Eden Prairie, MN) [3%]. EdenTrace monitors were used in grossly apparent OSA cases to expedite care. Polysomnography was performed in the University Hospital Sleep Disorders Center Laboratory. Technicians prepared the patients using the international 10–20 system of electrode placement and the collodian set-up. The recording had a 14-channel montage: left outer canthus-A_2; right outer canthus-A_1; C_3-A_2; C_4-A_1; O_1-A_2; chin; ECG; left leg-right leg; snore; oral-nasal thermistor; chest effort; abdominal effort; arterial oxygen saturation; and position. Polysomnography was scored manually according to Rechtschaffen and Kales[24] by a registered polysomnographic technician. Two types of events were scored. An apnea was a ≥ 75% decrease in airflow for at least 10 s. Hypopnea was a 50 to 75% decrease in airflow coupled with either a 4% oxygen desaturation or an arousal. Minimum arterial oxygen saturation ($minSaO_2$) was recorded by pulse oximetry. Snoring patterns were assessed qualitatively by the reviewer based on observations from the snore channel and assigned to one of four categories (constant, frequent, intermittent, infrequent).

Self-reported sleep complaints reported on the sleep history and objective sleep study data were used to determine OSA diagnoses based on current American Academy of Sleep Medicine research criteria,[11] including sleepiness (criteria A), or at least two of five sleep-related symptoms (criteria B) [sleep breathing difficulties, recurrent awakenings, unrefreshing sleep, daytime fatigue, and impaired concentration], and an apnea-hypopnea index (AHI) of ≥5/h (criteria C). Criteria A or B were also used for UARS diagnoses, but criteria C was determined differently because thermistors were used on polysomnography. UARS diagnoses were established with polysomnographic findings of airflow irregularities (subcriteria hypopneas) coupled with EEG microarousal activity or the presence of intermittent or frequent crescendo snoring culminating in an EEG microarousal.[25–27] On average, this abnormal airflow and arousal activity was present on at least 30% of all recorded 30-s epochs of sleep. In all patients with UARS, the AHI was < 5/h. However, because of the lack of actual indexes for respiratory effort-related arousals in these patients, UARS diagnoses were deemed valid only when objective resolution of subcriteria hypopneas (presumed respiratory effort-related arousals) was demonstrated during CPAP titrations. A board-certified sleep specialist examined all polysomnographic records to determine final SDB diagnoses; for most UARS diagnoses, the patient's sleep clinic physician also reviewed the recording for clinical correlation.

Insomnia Complaints

Insomnia symptoms were based on a three-item scale (Cronbach's $\alpha = 0.52$) in which patients were asked if they usually

(1) take > 30 min to fall asleep, (2) wake up a lot, and (3) if awakened, have difficulty returning to sleep. The patients answered each question categorically (0 or 1), and then the scores were summed (range, 0 to 3). Patients with an insomnia score of 0 or 1 were considered to be without insomnia because they experienced one of three conditions: no insomnia complaints, recurrent awakenings but no difficulty returning to sleep, or rare awakenings associated with difficulty returning to sleep. Comparison of groups with an insomnia score of 0 (n = 40) vs an insomnia score of 1 (n = 75) yielded no statistically significant differences for demographic, objective, or outcome variables. Thus, the group of patients with insomnia scores of 0 to 1 was designated as "SDB-only" (n = 115). Patients with an insomnia score of 2 or 3 reported clinically apparent insomnia, including difficulties with falling asleep, staying asleep, and returning to sleep. Comparison of groups with an insomnia score of 2 (n = 63) vs an insomnia score of 3 (n = 53) yielded no statistically significant difference for demographic, objective, or outcome variables. Thus, the group of patients with insomnia scores of 2 to 3 group was designated "SDB-plus" (n = 116). SDB-only and SDB-plus patients were the primary focus of the analysis.

Procedures and Measures

From the sleep medicine history, data were extracted on patient responses regarding chief complaints, sleep history, past mental health, and review of systems. For chief complaints, patients selected from a list of eight primary sleep disorders or symptoms that best described their current problems with sleep. These included sleep apnea referral, loud snoring, difficulty falling asleep, difficulty staying asleep, nightmares, restless legs or leg jerks, daytime fatigue or sleepiness, and poor sleep quality. Patients were instructed to select all applicable items. The section on sleep history provided information on sleep latency, total sleep time, total hours in bed, and other symptoms related to SDB and insomnia. The sections on past mental health and review of systems provided information on past psychiatric disorders, medication use, and cognitive-emotional complaints. To compare patients with uncomplicated SDB (SDB-only group) with those who suffered insomnia and SDB (SDB-plus group), five brief scales were devised based on extracted data. Scales were comprised of a few clinical questions to which patients responded categorically (0 = no, or 1 = yes). Their responses were summed to provide a total score in which higher scores reflected greater severity in all instances:

1. Sleep breathing scale (range, 0 to 5): (1) loud snoring; (2) moving from a bed or bedroom due to loud snoring; (3) witnessed breathing cessation; (4) choking, gasping, or struggling for breath; and (5) other sleep breathing complaints.
2. Physical symptom scale (range, 0 to 4): (1) trouble breathing, (2) restless legs, (3) indigestion, and (4) pain, any of which the patient associated with prevention or disruption of sleep.
3. Mental symptom scale (range, 0 to 2): (1) racing thoughts and ruminations, and (2) anxiety and fear, each of which the patient associated with prevention or disruption of sleep.
4. Psychiatric disorders scale (range, 0 to 4): (1) anxiety, (2) depression, (3) posttraumatic stress disorder, and (4) panic attacks, which were reported in the past mental health history.
5. Cognitive-emotional scale (range, 0 to 8): (1) attention or concentration, (2) memory, (3) depressed feelings, (4) anxious feelings, (5) irritability, (6) hostility, (7) frustration, and (8) claustrophobia, which were reported as problematic on review of systems.

Statistical analysis was conducted using analysis of variance to compare means, and χ^2 was used to compare frequencies between SDB-only and SDB-plus groupings. Statistical significance was set at 0.05. Effect sizes between groups for pertinent variables were calculated with Cohen's *d* or differences in group proportions.

Results

Prior to the primary analysis, patients with OSA and UARS diagnoses were compared on pertinent variables to determine significant differences. There were 211 OSA patients and 20 UARS patients. As expected, significant differences were found only for AHI (OSA = 56.7 [40.1] vs UARS = 2.5 [1.5]; $F[1,227] = 34.5$, $p < 0.0001$) and $minSaO_2$ (OSA = 74.0 [13.7] vs UARS = 84.2 [6.6]; $F[1,225] = 10.34$, $p = 0.001$). No other differences were found for demographic, objective, or outcome variables; therefore, due to the small number of UARS patients, they were combined into their respective SDB-only and SDB-plus groupings for the primary analysis.

Comparison of the demographics between these two primary groups (SDB-only and SDB-plus) revealed no differences in age, gender, and BMI. Work status (homemaker, student, working vs disabled, retired) and marital status (married, cohabitation vs single, widowed, divorced) were collapsed into dichotomous variables. There were no significant differences between groups for work status, but the SDB-only group had significantly more single individuals ($\chi^2 = 10.36$, $p = 0.001$). For ethnicity, the sample was sufficient for comparing non-Hispanic whites and Hispanics; SDB-plus comprised a significantly greater proportion of non-Hispanic whites ($\chi^2 = 4.60$, $p = 0.03$). Objective sleep findings revealed no differences between SDB-only and SDB-plus groups for $minSaO_2$, snoring pattern, OSA or UARS diagnosis; AHI was 58/h in the SDB-only group compared with 46/h in the SDB-plus group ($F[1,227] = 4.67$, $p = 0.03$).

The two groups described their primary sleep problems (chief complaints) at similar rates for sleep apnea referral, loud snoring, daytime fatigue or sleepiness, and nightmares; however, parallel with their insomnia scale scores, SDB-plus patients reported significantly more chief complaints of difficulty falling asleep and difficulty staying asleep than SDB-only patients. SDB-plus patients also complained somewhat more of restless legs or leg jerks and of poor sleep quality (Table 1).

SDB-plus patients reported severe sleep latency problems, markedly reduced total sleep time, and very poor sleep efficiency, compared to SDB-only patients. Although the two groups attained similar sleep breathing scores, SDB-plus patients reported nearly twice as many physical symptom complaints that were alleged to interfere with sleep (Table 2).

SDB-plus patients averaged three cognitive-emotional complaints compared with two complaints on

Table 1—*Patients Reporting Sleep Complaints by SDB Groups

Complaints	Groups: SDB-only (n = 115)	Groups: SDB-plus (n = 116)	χ^2 (*df*)	p Value	$\%_1$–$\%_2$†
Sleep apnea	49	47	0.04 (1)	0.85	2
Loud snoring	73	66	1.21 (1)	0.27	7
Falling asleep	3	51	68.48 (1)	< 0.0001	− 48
Staying asleep	10	59	61.02 (1)	< 0.0001	− 49
Nightmares	16	20	0.69 (1)	0.41	− 4
Restless legs or leg jerks	30	47	7.07 (1)	< 0.01	− 17
Day fatigue or sleepiness	71	74	0.23 (1)	0.63	− 3
Poor sleep quality	44	66	10.46 (1)	0.001	− 22

*Data are presented as % unless otherwise indicated. *df* = degrees of freedom.
†Difference in percentage between SDB-only ($\%_1$) and SDB-plus ($\%_2$) groups.

average in SDB-only patients. SDB-plus patients reported more than twice as many mental symptoms interfering with sleep and nearly twice as many psychiatric disorders compared to SDB-only patients. Of the 51 patients in the entire sample receiving psychotropic medications, 29% were in the SDB-plus group (n = 34) compared with 15% in the SDB-only group (n = 17). Of those using prescription or nonprescription sleeping aids on a nightly or weekly basis (n = 58), 36% were in the SDB-plus group (n = 42) and 14% were in the SDB-only group (n = 16; Table 3).

Of the 116 SDB-plus patients, an interesting subset was noted, consisting of 20 patients who presented to the sleep center with classic insomnia; they were neither referred for sleep apnea nor did they complain of loud snoring. Instead, five patients complained of sleep-onset insomnia, six patients complained of sleep maintenance insomnia, and nine patients complained of both. Thirteen patients also reported daytime fatigue or sleepiness. This subset of 20 insomnia presenters—to reiterate, all with SDB diagnoses—reported extremely reduced total sleep time (4.7 h) and sleep efficiency (66%). When probed on the questionnaire, 45% reported loud snoring, but their sleep breathing scale scores were on average less than half of those for the primary SDB-only or SDB-plus groups.

Discussion

In a university sleep-disorders clinic, insomnia symptoms were widely prevalent in a representative sample of objectively diagnosed SDB patients with OSA or UARS. Patients with SDB and insomnia suffered from more physical and mental symptoms and psychiatric disorders, all of which might contribute to or exacerbate insomnia complaints.[28–30] In addition, 37% of study patients received sedating and/or psychotropic medications, and SDB-plus patients accounted for twice as many medication users as SDB-only patients. Although this study did not examine SDB treatment compliance, it will be important to determine to what extent sleeplessness influences the use of CPAP or oral airway devices in patients with SDB and insomnia. We predict that those with greater insomnia complaints have greater

Table 2—*Sleep Profiles, Sleep Breathing Scale, and Physical Symptom Scale by Group

Profile/Scale	Groups: SDB-only (n = 115)	Groups: SDB-plus (n = 116)	*F* (*df*)	p Value	*d*†
Sleep latency, min	16.99 (25.08)	64.94 (85.40)	51.84 (1,217)	< 0.0001	0.88
Total sleep time, h	7.22 (1.86)	5.56 (1.59)	51.75 (1,222)	< 0.0001	0.87
Total time in bed, h	7.84 (1.74)	7.74 (2.38)	0.13 (1,213)	0.72	0.05
Sleep efficiency, %	92.00 (12.94)	75.06 (20.96)	50.04 (1,211)	< 0.0001	0.87
Sleep breathing scale, 0–5 (α = 0.65)‡	3.13 (1.33)	3.08 (1.48)	0.08 (1,229)	0.78	0.04
Physical symptom scale, 0–4 (α = 0.46)‡	1.07 (1.05)	1.72 (1.21)	19.23 (1,229)	< 0.0001	0.55

*Data are presented as mean (SD) unless otherwise indicated.
†In the four instances of statistical significance, positive Cohen's *d* values reflect moderate (approximately 0.50) to large (> 0.80) effect sizes, demonstrating worse sleep profiles and symptoms for SDB-plus patients.
‡Cronbach's α.

Table 3—*Cognitive-Emotional Symptom, Mental Symptom, and Psychiatric Disorders Scales, and Percentage Using Sleep and Psychotropic Medication by Group

Variables	Groups: SDB-only (n = 115)	Groups: SDB-plus (n = 116)	χ^2 (*df*) or *F* (*df*)	p Value	*d*† or $\%_1$–$\%_2$
Cognitive-emotional scale, 0–8 ($\alpha = 0.76$)	2.18 (2.05)	2.96 (2.36)	7.09 (1,229)	< 0.01	0.35
Mental symptom scale, 0–2 ($\alpha = 0.40$)	0.43 (0.61)	0.97 (0.75)	37.11 (1,229)	< 0.0001	0.73
Psychiatric disorders scale, 0–4 ($\alpha = 0.71$)	0.88 (1.17)	1.58 (1.42)	16.56 (1,229)	< 0.0001	0.52
Sleep medications	14	36	15.26 (1)	< 0.0001	− 22%
Psychotropic medications	15	29	7.09 (1)	< 0.0001	− 14%

*Data are presented as mean (SD) or % unless otherwise indicated.

†Positive Cohen's *d* values reflect small (approximately 0.30), moderate (approximately 0.50), and large (> 0.80) effect sizes, demonstrating greater mental symptoms and disorders for SDB-plus patients.

difficulty adapting to sleep breathing medical equipment because they spend too much time awake and aware of the devices.[17] Sleep hygiene and cognitive-behavioral treatments[31] and/or judicious use of sedatives for the treatment of insomnia might prove instrumental in facilitating adaptation to CPAP or airway appliances for such patients. However, it remains to be seen how such a clinical program would operate in a sleep center working under managed-care pressures.

It is worth noting that SDB processes may also cause, exacerbate, or otherwise contribute to insomnia.[3,4,8–15,17–21,31–34] This may occur through the development of psycho-physiologic conditioning in response to repeated awakenings, which in turn could lead to frustration and dissatisfaction with sleep behaviors.[1,31] This may promote further ruminations about sleep and subsequent sleep onset or maintenance insomnia.[1,31] Interestingly, a study employing nasal pressure transducer technology[16] reported a surprisingly high rate of SDB in a select group of crime victims seeking treatment for insomnia,[18] and subsequent CPAP treatment yielded marked insomnia improvement in some of these patients.[34] Nonetheless, "CPAP for insomnia" would seem like a nonstarter. In our clinical and research experience, insomniacs can successfully adapt to CPAP, but the resources needed to facilitate the use of the breathing mask in an insomniac with SDB requires a threefold increase in time and effort compared to a classic OSA case.

The relationship between insomnia and SDB remains unclear. It is important to clarify why some patients with recurrent SDB awakenings suffer from insomnia whereas others do not. A thorough chronology of the inception of sleep disorders in such patients may provide clues to a potential bidirectional relationship between SDB and insomnia. Or, perhaps SDB patients with greater symptom distress from whatever causes are simply at greater risk for developing comorbid insomnia. While it seems probable that SDB could exacerbate insomnia complaints through varying patient response to sleep fragmentation and poor sleep quality, it is less certain how insomnia might exacerbate SDB. Speculatively, sleep fragmentation that is commonly associated with insomnia may worsen SDB through greater exposure to less stable, lighter stages of non-rapid eye movement sleep (stage 1) or through fragmentation effects on upper-airway muscle tone.[35] Conversely, decreased REM sleep, also commonly observed in insomnia, may protect this type of patient from even worse SDB by decreasing exposure to the greater airway collapsibility associated with REM physiology.[36]

It is noteworthy that the two groups were very similar in their sleep breathing complaints and averaged similar BMIs, minSaO_2, snoring patterns, and AHIs (both groups averaged severe indexes). Thus, to identify SDB-plus patients prior to polysomnographic evaluation requires a complete sleep history to evaluate insomnia symptoms and their impact on overall sleep dysfunction. Furthermore, in light of the markedly reduced mean sleep efficiencies reported in the SDB-plus group, it may be prudent to address sleep consolidation needs with behavioral methods before such patients undertake a CPAP titration or prior to their subsequent use of CPAP or oral appliances. Failing to educate or treat the patient with sleep hygiene maneuvers or advanced cognitive-behavioral therapies to consolidate sleep might be associated with CPAP noncompliance. Admittedly, treating such patients is time-consuming and difficult in a managed-care setting, particularly if there is an expectation that most SDB cases would follow the classic textbook description in which the patient is sleepy and has no insomnia complaints.

While the preceding discussion may seem axiomatic to some sleep specialists, more pulmonary medicine and critical care specialists are becoming in-

volved in clinical sleep medicine,[37] and it is unknown to what extent such providers receive training in the treatment of insomnia. Our objective is not to impugn the work of pulmonologists, a specialty group that brings substantial expertise and perspective to the field of sleep-disorders medicine. However, it has been noted[38] that pulmonary sleep specialists may have greater difficulty in managing nonpulmonary cases, although, there is no extant literature on pulmonologists' capacity to treat insomnia symptoms. To be sure, a university environment might attract more complex sleep-disorders patients. Notwithstanding, if SDB treatment compliance were linked inversely with comorbid insomnia in some proportion of patients, sleep medicine practitioners, including pulmonologists, will need proper training or experience in the use of sleep hygiene and other cognitive-behavioral strategies in the management of insomnia. As sleep medicine continues its evolution toward a multidisciplinary specialty, such expertise will be required routinely.[10,39]

Primary care physicians also have an important role to play in this process because they must be able to distinguish insomnia patients with SDB who need referral for polysomnography from insomnia patients without SDB who require other forms of treatment. Similarly, mental health practitioners who treat insomnia patients referred by other physicians must also consider the potential for undiagnosed SDB in their patients, particularly when pharmacotherapy or psychotherapy are ineffective in ameliorating insomnia symptoms. As such, it would be equally important to determine whether practicing psychiatrists and psychologists, specializing in insomnia treatment, receive appropriate training and experience in the assessment of SDB. These complex symptom presentations may be especially difficult to assess because certain SDB patients with severe insomnia, like the subset of 20 patients in our sample, describe such overarching episodes of sleeplessness that attention is diverted away from a potential SDB diagnosis. More active consideration of SDB in the differential diagnosis of insomnia will improve the capacity of all clinicians to identify these complex cases and to distinguish those who need polysomnography.

Generalizability of these findings to other environments is limited because data were collected from a single university sleep clinic, which may have disproportionately attracted more complex cases. The clinic also does not employ standardized insomnia instruments to measure insomnia severity. Therefore, it is unknown from this study the extent to which these comorbid insomnia symptoms were clinically relevant in these patients and how they might affect SDB treatment and other patient outcomes. The temptation may be to assume that these findings are epiphenomenal or coincidental and therefore clinically insignificant; however, such perspectives are probably a function of so little research having been conducted on patients with both insomnia and SDB. Regardless, no definitive practice parameters can be offered based on this study, although we anticipate that additional research in this area will confirm that SDB and insomnia cooccur frequently, and that each disorder has important influences on the other condition and on overall treatment success. Treatment studies measuring CPAP or oral airway device compliance with and without concurrent insomnia treatment for this type of SDB patient will provide greater clinical insights into these complex sleep-disorders cases.

In summary, 50% of a representative sample of SDB patients appeared to have clinically substantive insomnia symptoms; of these 116 cases, 20 patients presented with chief complaints of insomnia only. For patients with insomnia and SDB, assessment and treatment is likely to be more time intensive if appropriate therapeutic regimens were to be provided for both sleep disorders. In the current climate of managed-care medicine and its impact on sleep-disorders centers and laboratories, it remains to be seen whether or not these complex patients are receiving the proper amount and quality of care.

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Appendix

Three modules from the sleep medicine history were used to elicit information on sleep habits, sleep breathing symptoms, and insomnia symptoms:

Sleep-Wake Schedule

1. On average, how long does it usually take you to FALL ASLEEP?
2. On average, how many HOURS OF SLEEP do you usually get?
3. On average, how many HOURS IN BED do you usually spend?
4. What is your usual bedtime?
5. What is your usual wake-up time?

Sleep and Breathing

1. Would you or others say that you SNORE LOUDLY?
2. Have you or others ever MOVED from your bed/bedroom because of your snoring?
3. Would you or others say that you STOP BREATHING while you sleep?
4. Would you or others say that you CHOKE, GASP, or STRUGGLE for breath in your sleep?
5. Do you have any other TROUBLE BREATHING while you sleep?

1. Does it usually take you longer than 30 MINUTES to fall asleep?
2. Do you WAKE UP a lot during your sleep?
3. If awakened, do you have trouble RETURNING to sleep?

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