

Original article

# Low rates of recognition of sleep disorders in primary care: comparison of a community-based versus clinical academic setting

Raymond C. Rosen<sup>a,b,\*</sup>, Rochelle Zozula<sup>a,b</sup>, Eric G. Jahn<sup>c</sup>, Jeffrey L. Carson<sup>d</sup>

<sup>a</sup>The Comprehensive Sleep Disorders Center, Robert Wood Johnson University Hospital, New Brunswick, NJ, USA

<sup>b</sup>Department of Psychiatry, UMDNJ-Robert Wood Johnson Medical School, Piscataway, NJ, USA

<sup>c</sup>Department of Environmental and Community Medicine, The Eric B. Chandler Health Center, New Brunswick, NJ, USA

<sup>d</sup>Department of Medicine, Division of General Internal Medicine, UMDNJ-Robert Wood Johnson Medical School, New Brunswick, NJ, USA

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## Abstract

**Objective:** To determine the prevalence and recognition of sleep disorders in a community-based outpatient health setting compared to a university-based clinic in the same geographical location.

**Background:** Sleep disorders are highly prevalent, affecting up to 70 million Americans to varying degrees. Despite increased risk for sleep disorders among minority or medically-indigent individuals, little attention has been paid to the sleep-related needs of these populations.

**Methods:** Two main data collection strategies were employed: (1) intensive database search for sleep-related diagnoses using ICD-9-CM diagnostic codes; (2) review of symptom checklists from patient charts. If database search revealed a positive sleep diagnosis, patient's chart was further queried for clinical assessment and outcome.

**Results:** The overall prevalence rate of sleep-related disorders in the community-based sample was 0.1%. According to chart review, younger patients and those of Hispanic origin were less likely to report sleep complaints or to have these diagnoses recorded by a physician. The overall prevalence rate of sleep diagnoses in the university-based sample was 3.1%. Age and gender were not significant predictors overall in this population, although sleep diagnoses varied significantly by gender.

**Conclusions:** A low rate of recognition and diagnosis of sleep disorders was observed in both settings. Overall, these findings strongly emphasize the need for increased education and training in sleep disorders, particularly in community-based outpatient settings. © 2001 Elsevier Science B.V. All rights reserved.

**Keywords:** Sleep disorders; Prevalence; Recognition; Primary care practice; Medical education

## 1. Introduction

The role of sleep disorders in our nation's health, productivity, and quality-of-life has been the subject of intense public and scientific scrutiny in the past

decade [1,2]. There is increasing evidence from both epidemiological and survey studies that disturbed sleep is a common complaint, effecting up to 70 million Americans to varying degrees [2–5]. In the National Institute of Mental Health Epidemiologic Catchment Area study which was conducted between 1981 and 1985, individuals 18 years of age and older were queried about sleep complaints and psychiatric symptoms [3]. Of the 8000 individuals interviewed in this survey, 10.2% complained of persistent insomnia

\* Corresponding author. Department of Psychiatry, UMDNJ-Robert Wood Johnson Medical School, 675 Hoes Lane, Piscataway, NJ 08854, USA. Tel.: +1-732-235-4485; fax: +1-732-235-5818.

E-mail address: rosen@umdnj.edu (R.C. Rosen).

and 3.2% reported symptoms of hypersomnia. Of note, a large proportion of the respondents who complained of insomnia or hypersomnia had concomitant psychiatric disorders.

The prevalence of sleep complaints was recently investigated in a large cohort of elderly (over age 65) individuals [6]. Based upon data collected in the 'Epidemiologic Studies of the Elderly' project conducted by the National Institute of Aging [7], the prevalence of sleep complaints was compared in three representative, community-based cohorts. Between 23 and 34% had symptoms of insomnia, and between 7 and 15% 'rarely or never' felt rested upon awakening in the morning. Many of the sleep complaints in this population were attributed to the effects of comorbid medical or psychiatric illnesses in the sample.

The prevalence and risk factors associated with sleep-disordered breathing have also been investigated in several studies [8–12]. In particular, recent data from the Wisconsin Sleep Cohort Study has been used to estimate the prevalence of undiagnosed sleep-disordered breathing in middle-aged adults, aged 30–60 years [2]. Results of this study indicated that 2% of women and 4% of men met the 'minimal' diagnostic criteria for the sleep apnea syndrome (apnea-hypopnea index (AHI) >5 and daytime hypersomnolence). Based upon polysomnographic criteria alone (AHI > 5), 24% of men and 9% of women in this age group had significant sleep-disordered breathing.

Despite the high prevalence of sleep disorders in most studies, evidence suggests that a small minority of cases are identified or diagnosed by an appropriate health care provider. For example, one study showed only 17 positive diagnoses for sleep disorders in a search of more than a million patient records [13]. This is less than 1/1000 of the number of positive diagnoses that one would expect, based upon current estimates [2–9]. A recent study examined the prevalence of sleep complaints in hospitalized patients in a tertiary care medical center [14]. Although nearly half (47%) of the patients reported either insomnia or excessive daytime somnolence on a sleep questionnaire, no medical record included any patient symptom related to sleep.

The under-reporting of sleep disorders appears to be especially problematic in specific ethnic or minority groups. This omission is potentially significant, since strong data exist that African-Americans, parti-

cularly those under age 45 years, are at higher risk for obstructive sleep apnea syndrome (OSAS) [10]. According to one study, 31% of young African-Americans in a community sample had a respiratory disturbance index (RDI) greater than 10 events/h. This is compared to approximately 10% of Caucasians in the same age cohort [11]. Research also suggests that there is a higher comorbidity of hypertension and sleep apnea in African Americans, and that the risk of complications (i.e. stroke) may be higher in these patients due to elevation in nocturnal blood pressures as a result of OSAS. In addition, using home-interview and home-recording techniques, Kripke et al. have estimated that the prevalence of sleep-disordered breathing in the United States is approximately three times higher among middle-aged (40–64 years) minority groups (including Hispanics, African-Americans and Asian-Americans) compared to non-Hispanic whites. Adjusting for age and gender, the Hispanic and non-white prevalence for sleep-disordered breathing (greater than 20 events/h) was 16.3%, compared with a prevalence of 4.9% for non-Hispanic whites [12]. Insomnia has also been more frequently reported among persons of lower socioeconomic status [15]. Despite this increased at-risk status, relatively little attention has been paid to the special needs of medically indigent or minority populations, or the training of health care professionals that provide for them.

The present study was designed to investigate the prevalence and predictors of sleep-related diagnoses in a large, community-based health center with a high percentage of minority and medically indigent patients. Multiple data sources were evaluated to provide optimal assessment of the incidence of sleep disorders in this population. The center was selected for study based upon the breadth of medical services provided, wide age range and ethnic distribution of the patient population, and availability of a computerized database and medical record system. For purposes of comparison, we evaluated the prevalence of sleep-related diagnoses in an academically-based, general internal medicine practice in the same geographical location. The present study represented the first phase of a two-part NIH-funded project, in which we plan to conduct a follow-up assessment following intensive in-service training in sleep and sleep disorders for medical, nursing and allied health providers at both facilities.

## 2. Methods

### 2.1. Description of the sample

The *Eric B. Chandler Health Center* (EBC) is a comprehensive, family-oriented Community Health Center operated by Robert Wood Johnson Medical School in New Brunswick, NJ. The Center serves primarily low income and medically indigent individuals from the Greater New Brunswick area. According to a census taken in September 1997, the Center provides primary health care to over 20 000 patients. The majority of patients are ethnic minorities, being either African-American or Hispanic. Currently, the patient ethnic profile is as follows: 36% Hispanic, 26% African American, 17% Caucasian, 4% Asian, 1% 'other', and 16% 'not identified'. Over 74% of the Center's patients are Medicaid recipients, 5% receive Medicare, 5% have partial insurance and 16% are medically indigent. As a Federally Qualified Health Center, EBC provides high quality ambulatory health care services, which are culturally sensitive, accessible, and affordable, and address the needs of the community through specific programs. The Center also participates actively with Robert Wood Johnson Medical School and Rutgers University in the training of residents, medical students and other health professionals.

The *General Internal Medicine Clinic* (GIMC) of the Robert Wood Johnson Medical School was selected as a comparison site for the present study. This clinic provides primary care services in an academic setting to a broad outpatient sample. Although precise statistics were not available on the ethnic or socio-economic composition, the sample is largely Caucasian and middle-class. Like the Eric B. Chandler Center, the GIMC serves as a primary teaching site for medical students, residents and fellows in General Internal Medicine. A computerized database and individual medical records are also available.

### 2.2. Data collection

To provide optimal assessment of the prevalence of sleep disorders in each setting, two complementary and convergent data collection strategies were employed. First, assessment of physicians' recognition and diagnosis of sleep-related disorders was

performed through an intensive search of the computer databases for diagnostic codes related to specific sleep disorders. If there was an indication for a sleep disorder, the patient's chart was further queried for clinical assessment and outcome. Second, patient reports of sleep complaints were assessed through a review of symptom checklists obtained from patient charts. Additionally, if the chart review revealed a positive sleep complaint, physician follow-up was further investigated (e.g. chart notations for sleep study referral, use of prescription sleeping medication, or behavioral interventions). Chart reviews at both sites were conducted by the same individuals under the supervision of two experienced sleep specialists (R.R., R.Z.).

#### 2.2.1. Chandler database review

A retrospective assessment of all formal sleep diagnoses was conducted based upon database review. The database is accessible through a NCR System 3430 computer, which provides on-line interactive computer services running a UNIX-based system. A total of 105 092 patient encounters/visits to the center were scanned on the EBC database. A total of 20 418 patients were sampled during the database review process. All ICD-9-CM diagnostic codes pertaining to specific sleep disorders were included for consideration.

#### 2.2.2. Symptom checklist and medical record review

Following the computerized database review, a second level of evaluation consisting of individual patient chart reviews was conducted. This was intended to provide a more in-depth assessment of individual patient records, and to obtain complementary data on the presence of sleep complaints and disorders in the patient population. A total of 500 active patient charts were randomly selected as representative of the total clinic population. Patients were considered as active if their last clinic visit was within the past 2 years. Based upon a total availability of approximately 20 000 active patients, it was decided to review every 40th chart. Information extracted from the chart included the following: (1) patient demographics (MR#, name, age, gender, ethnicity); (2) Patient Symptom Checklist; (3) notation from physician progress notes and physical examination findings; (4) indication for sleep study (actually

performed or recommended); (5) findings of sleep study (if performed); (6) prescription for specific sleep medication (drug and dosage); and (7) other interventions.

Patients' subjective sleep complaints were obtained by reviewing a self-administered, symptom checklist. This brief health history form is administered to all adult patients at intake and includes a specific item on 'difficulty sleeping'. Additionally, all adolescents received an Adolescent Health Questionnaire, which specifically addresses the following sleep-related complaints: 'trouble falling asleep'; 'awakening during the night'; 'being tired during the day'; and 'occasionally wetting the bed'. Similarly, the Infant/Child Progress Notes address the specific issues of where the child sleeps in relation to their parents, the maximum hours of sleep, and if any sleep problems exist (i.e. difficulty falling asleep and sleeping through the night). Due to the large Hispanic population served by the Chandler Health Center, Patient Symptom Checklist forms and Infant/Child Progress Notes were administered in Spanish, as well as in English.

### 2.2.3. General Internal Medicine database review

In order to assess whether prevalence rates were comparable to other clinic settings in the local New Brunswick area, we retrospectively examined the computer database of the GIMC of Robert Wood Johnson Medical School. A total of 3134 active patients were sampled during the database review (same criteria as in Section 2.2.2 above). Only active patients were assessed in order to match the data collection format and time period assessed in the community sample. As in the Chandler review, all ICD-9 CM diagnostic codes pertaining to sleep disorders were included.

## 3. Results

### 3.1. Chandler database findings

A total of 20 patient cases with positive sleep diagnoses were identified out of 20 418 patients scanned (i.e. overall prevalence rate = 0.1%). Two patient cases were identified with a diagnosis of Narcolepsy (ICD-9-CM code 347.0). Eighteen cases were identified with ICD-9-CM codes 780.50–780.59. The most

common diagnoses were insomnia with sleep apnea (ICD-9-CM code 780.51) and insomnia, NOS (ICD-9-CM code 780.52). Table 1 shows the prevalence of specific diagnoses for the entire sample. Database review did not reveal any diagnostic codes related to 'specific disorders of sleep of non-organic origin' (ICD-9-CM codes 307.40–307.49).

The mean age of the sample of patients with sleep-related diagnostic codes was  $42.4 \pm 16.4$  years (range, 20–70 years). The sample of diagnosed patients consisted of 11 males (mean age,  $40.9 \pm 17.8$ ) and nine females (mean age,  $45.2 \pm 14.8$ ). The ethnic composition of the group was as follows: six African-American, six Caucasian, two Asian, one American Indian and two Hispanic. Three patients had no data available for ethnic background.

Of the 20 individuals identified with positive sleep diagnoses in the EBC database, 17 patient charts were available for detailed review. This review revealed that 14/17 patients reported 'difficulty sleeping' on the Patient Symptom Checklist. Eleven of these patients' charts noted 'difficulty initiating or maintaining sleep'; two cases were associated with sleep-disordered breathing. Four of the insomnia cases were associated with affective disorder. Interestingly, one patient who reported having symptoms suggestive of narcolepsy for over 20 years (i.e. sleep attacks, cataplexy, hypnagogic hallucinations) had been treated with a long-term course of anticonvulsant medication, although clinical EEG findings were negative for seizure disorder in this patient.

Of the 17 available charts for patients with positive sleep diagnoses, a total of 5/17 patients were recommended for polysomnographic evaluation. Four patients were males and one female; the mean age was 39.4 years. Three nocturnal polysomnographic (NPSG) studies were eventually performed, two of which were positive for moderate OSAS (one study also revealed concomitant hypoventilation during sleep). Both of these patients were given a trial of continuous positive airway pressure (CPAP) titration; one patient admitted to being non-compliant with treatment, while the other patient reported 'sporadic' CPAP usage on follow-up. Of note, both of these patients had previously been diagnosed with schizophrenia. The third patient underwent NPSG to rule out narcolepsy. Based on sleep study findings, the patient was diagnosed with upper airway resistance syndrome.

Seven patients with diagnoses of insomnia with sleep apnea (ICD-9-CM code 780.51) or insomnia, NOS (ICD-9-CM code 780.52) were given prescriptions for sedative/hypnotics or over-the-counter medications for their insomnia complaints. Of the patients diagnosed with complaints of insomnia, three patients received instructions for behavior modification techniques, which included typical sleep hygiene recommendations (i.e. reduction of caffeine intake; earlier bedtime; regular wake-up time).

### 3.2. Patient Symptom Checklist/chart review

Based upon an intensive review of 500 representative patient charts, 19.2% ( $N = 96$ ) of the sample reported a specific complaint of 'difficulty sleeping' on the Patient Symptom Checklist. According to the chart notes, 42 patients (43.7% of those with specific sleep complaints), were queried regarding their sleep by the clinician. Results of this query revealed that the majority of sleep difficulty complaints (73.8%) were associated with specific problems of initiating or maintaining sleep (i.e. insomnia-related). Three patients indicated that their main complaint was excessive daytime sleepiness. Two patients indicated both difficulty initiating and maintaining sleep, as well as daytime somnolence. Three individuals reported sleeping problems that were related to episodes of

parasomnia (i.e. one patient reported night terrors; one experienced sleepwalking; one patient reported bruxism). However, none of these three individuals were referred for NPSG evaluations. Only one patient out of the 96 reporting a sleep complaint (1.0%) received a formal (ICD-9-CM) sleep diagnosis.

Chart review further indicated that 4/96 patients (4.2%) who reported difficulty sleeping were referred for more specialized evaluation. Two patients (both pediatric cases) underwent NPSG at Robert Wood Johnson University Hospital. One study was positive for obstructive sleep apnea; the other was not. Further ENT procedures (i.e. tonsillectomy/adenoidectomy) were recommended for the patient with positive sleep study findings, however, this patient was lost to follow-up. Regarding the two other patients who were referred for specialized evaluation but did not receive NPSG studies, one patient was a 5-year-old male with a probable diagnosis of OSAS; the other was a 26-year-old female with a probable diagnosis of nocturnal seizure disorder. These findings were reflected in the low percentage of patients receiving a formal sleep diagnosis (1.0%) in the chart review sample.

### 3.3. Predictors of sleep complaints

A further analysis was conducted on predictors of sleep complaints in our sample, particularly the

Table 1  
Prevalence rates for sleep diagnoses in a community-based health center vs. general internal medicine clinic

ICD-9-CM sleep disorder codes	Community health center		Internal Medicine Clinic	
	No. of diagnoses	%Total sample	No of diagnoses	%Total sample
Persistent disorder of initiating/maintaining sleep (307.42)	–	–	8	0.30
Phase shift/disruption of 24-h sleep-wake cycle (307.45)	–	–	1	0.03
Somnambulism/night terrors (307.46)	–	–	1	0.03
Short sleeper (307.49)	–	–	1	0.03
Narcolepsy (347)	2	0.01	2	0.06
Sleep disturbance, unspecified (780.50)	–	–	9	0.30
Insomnia with apnea (780.51)	8	0.04	–	–
Other insomnia, not otherwise specified (NOS) (780.52)	7	0.03	39	1.20
Hypersomnia with obstructive sleep apnea (780.53)	1	0.005	–	–
Other hypersomnia (780.54)	2	0.01	–	–
Dysfunction associated with sleep stage arousal (780.56)	–	–	1	0.03
Sleep apnea (780.57)	3	0.01	40	1.30
Other sleep disturbance (780.59)	–	–	7	0.20
Total prevalence	23	0.11 <sup>a</sup>	109	3.5 <sup>a</sup>

<sup>a</sup> Prevalence rates reflect some patients with multiple sleep diagnoses.

effects of gender, age and ethnic background. Patient demographics are presented in Table 2. For gender, the chart review sample was representative of the total population at EBC (7814 M/12 604 F). The male/female ratio was exactly 0.62 for both the patients in the chart review and the overall clinic patient population. The patients who underwent chart review were also representative of the age and ethnic composition of the total population at the Center.

The chart review sample was stratified according to age and the presence of sleep complaints. Based on this analysis, the highest percentage of sleep complaints was reported in the 56–80-year-old group (34.3%). Patients aged 31–55 years comprised the next highest prevalence group for sleeping difficulty (31.0%). Only 9.4% of patients in the youngest age category (1–15 years) were reported to have specific sleep complaints. The effects of age (<31 vs.  $\geq 31$  years) on the prevalence of sleep complaints in this sample were found to be highly significant ( $\chi^2 = 28.18$ ,  $P < 0.0001$ ).

Additional analyses were conducted on the effects of gender and ethnic background on the prevalence of sleep complaints. No significant differences were found for the effects of gender on self-reported sleeping difficulty ( $\chi^2 = 0.81$ ,  $P = 0.37$ ), although 65.6% of those with sleep complaints were female (Table 3). However, this percentage is consistent with the overall proportion of female patients in the Center. In contrast, a significant overall effect of ethnic background on the prevalence of sleep complaints was observed ( $\chi^2 = 11.96$ ,  $P < 0.05$ ). In comparing prevalence rates among the three major ethnic groups (African-Americans, Hispanics, Caucasians), substantially lower rates

of sleep complaints were observed among Hispanics compared to both African-Americans ( $\chi^2 = 4.79$ ,  $P < 0.05$ ) and Caucasians ( $\chi^2 = 10.77$ ,  $P < 0.01$ ). No difference was observed in the incidence of sleep complaints between African-Americans and Caucasians ( $\chi^2 = 1.53$ ,  $P = 0.22$ ) (see Table 3).

### 3.4. General Internal Medicine Clinic database findings

A total of 98 patients with positive sleep diagnoses were identified from 3134 patient charts reviewed. This translates into an overall prevalence rate of 3.1%. Table 1 shows the number of cases and prevalence rates for specific sleep diagnoses for the entire sample. The mean age of patients with sleep-related diagnoses was  $58.8 \pm 17.6$  years (range, 19–91 years). The sample consisted of 53 males (mean age,  $56.1 \pm 16.4$ ) and 45 females (mean age,  $61.9 \pm 18.7$ ). Specific ethnic data were not available for the GIMC sample, although the large majority of patients were Caucasian. Overall, age was not a significant predictor for sleep complaints in this population ( $\chi^2 = 20.96$ ,  $P = 0.46$ ). However, sleep diagnoses varied significantly by gender ( $\chi^2 = 14.98$ ,  $P < 0.05$ ). Males were more frequently diagnosed with sleep-disordered breathing (i.e. Sleep apnea, unspecified; ICD-9-CM code 780.57); females with sleep initiation or maintenance difficulties (insomnia NOS; ICD-9-CM code 780.52).

Further review of 98 GIMC patients with identified sleep disorders revealed a total of 16 patients who received formal polysomnographic evaluation. Fourteen of these patients were diagnosed with OSAS; two

Table 2  
Patient demographics for intensive chart review sample ( $N = 500$ )

Demographic characteristics	No. of subjects in sample	% of sample	Total clinic population percentages
Gender (M/F)	192 M/308 F	38.4/61.6	38.3/60.6
Age (years, mean $\pm$ SD)	25.5 $\pm$ 18.6	N/A	N/A
<i>Ethnicity</i>			
Asian	32	6.4	4.4
African-American	140	28.0	26.1
Caucasian	91	18.2	16.6
Hispanic	165	33.0	36.2
Other	44	8.8	1.1
Missing cases	28	5.6	15.6

were diagnosed with Narcolepsy. Of the 14 patients with OSAS, 11 were using CPAP therapy or bi-level positive airway pressure at the time of study. One patient with sleep apnea utilized a positional device (tennis ball) and one other patient underwent surgical correction of the upper airway (tonsillectomy and uvulopalatopharyngoplasty). Thirty-four patients were given prescriptions for their insomnia or sleep disturbance complaint; one patient was taking an over-the-counter sleeping aid. Two patients with the diagnosis of narcolepsy (347.0) were both receiving stimulant medications.

#### 4. Discussion

Previous studies have indicated a low rate of recognition and diagnosis of sleep disorders in outpatient and inpatient health care settings [13,14]. In the present study, low rates were observed in both a community-based and clinical academic center

compared to national prevalence estimates [2–9]. This trend was especially striking in the database review at the Eric B. Chandler Center. In this community-based, largely minority outpatient clinic, an extremely low overall diagnosis rate (0.1%) was found, despite relatively high rates of patients' self-reported sleep complaints (19.2%) on a standardized symptom checklist. Not surprisingly, sleep apnea and insomnia were the most frequent diagnoses at both centers, although a much higher rate of sleep-related diagnoses of 'non-organic origin' were recorded in the GIMC sample. Similarly, a markedly higher proportion of patients in the GIMC sample were referred for specialized sleep disorders evaluation or NPSG studies. Clinical follow-up was found to be inconsistent or lacking in both settings.

How do the results of this study compare to other similar studies? According to a study performed by the National Commission on Sleep Disorders Research, database review of more than a million patient records revealed only 17 positive sleep-related diagnoses [13]. This is equivalent to an even a lower prevalence rate (<0.002%) than that found in our two samples (0.1%; 3.1%). Another recent study examined the prevalence of sleep complaints in patients being admitted to the general medical service of a Veterans Affairs tertiary care medical center [14]. Despite the fact that nearly half (47%) of the patients reported symptoms of insomnia, excessive daytime somnolence, or both on a sleep questionnaire, no medical record included any patient symptom related to sleep. In addition, Shochat et al. recently reported prevalence rates for insomnia in primary care patients as high as 69% (50% reporting occasional insomnia and 19% with chronic insomnia) [16]. The data were derived from sleep questionnaires which were distributed at the primary care clinic during patient intake. They concluded that the primary care population has a higher prevalence of insomnia than the general population due to concomitant psychiatric and medical illnesses. It must be emphasized that the numbers reflected in the study of Shochat et al. study do not represent actual chart documentation or diagnostic coding. In the present study, a review of a symptom checklist completed by all patients at the Eric B. Chandler Health Center revealed a prevalence rate for sleep complaints of 19.2%. However, only one patient out of the 96 reporting a sleep complaint

Table 3  
Predictors of sleep complaints in community-based sample (N = 500)

Patient characteristics	Number of subjects with sleep complaint/total in sample	Percentage sleep complaints × patient characteristic
<i>Gender<sup>a</sup></i>		
Male	33/192	17.2
Female	63/308	20.5
<i>Age range (years)<sup>b</sup></i>		
0–15	17/180	9.4
16–30	22/140	15.7
31–55	45/145	31.0
56–80	12/35	34.3
<i>Ethnicity<sup>c</sup></i>		
Asian	6/32	18.8
African-American	30/140	21.4
Caucasian	26/91	28.6
Hispanic	20/165	12.1
Other	9/44	20.5
Missing cases	5/28	17.9

<sup>a</sup>  $\chi^2 = 0.81, P = 0.37$ .

<sup>b</sup>  $\chi^2 = 28.18, P < 0.0001$ .

<sup>c</sup>  $\chi^2 = 11.96, P < 0.05$ .

received a formal sleep diagnosis (ICD-9-CM code for sleep disorder).

Several factors might account for the low rate of recognition and diagnosis of sleep disorders in outpatient healthcare settings. First, the lack of education in sleep in both undergraduate and postgraduate medical training has been documented in a number of studies [17–21]. Results of a 1992 national survey of medical education showed that most medical students receive less than 2 h of total education in sleep and sleep disorders prior to graduation [18]. Physician and patient attitudes may also play an important role, as sleep is often devalued as a significant health-related behavior by large segments of the population. In terms of physician practice, obtaining a sleep history is fundamental for making a proper diagnosis. In a study of experienced primary care practitioners and medical interns using simulated patients, those without previous training in sleep disorders rarely obtained a sleep history (0 and 13%, respectively); interns who received training in sleep disorders asked the patient about sleep more frequently (81.8%) [20]. The authors suggested that the sleep history was neglected diagnostic information across all groups; a finding which is consistent with previous reports of clinicians' practice [22].

According to results of a recent survey by the National Sleep Foundation [23], most US adults regularly get less sleep than they feel they need and fewer than 20% of adults have initiated a discussion about sleep problems with their doctor. Most individuals with sleep complaints, according to this survey, either do not believe their complaints are serious enough to warrant medical attention or that a physician could provide effective help. Finally, time constraints, lack of reimbursement for evaluation or treatment of sleep disorders, and other systems-based issues appear to act as further barriers to effective medical care. These latter factors might be relevant in accounting for the particularly low rates of recognition in community-based health settings, such as in the present study.

An interesting finding in the present study was the lower rate of self-reported sleep complaints among Hispanic patients, compared to African-American and Caucasian patients in the EBC sample. Other data suggest that prevalence estimates for sleep-disordered breathing in middle-aged Hispanics and other minority members are roughly three times higher in comparison with non-Hispanic whites [12]. Although

there is no obvious explanation for the difference observed in our sample, it may be that different cultural practices or attitudes towards sleep (e.g. the 'siesta') might result in fewer sleep difficulties or complaints in the Hispanic population. On the other hand, the similarly high rates of sleep complaints among African-American and Caucasian individuals in our sample is in contrast to the findings of at least one recent study suggesting that sleep complaints are less prevalent among elderly African-Americans, compared to age-matched Caucasian adults [24]. As noted earlier, other evidence suggests that African-American males, particularly those under age 45, may be at increased risk for the development of obstructive sleep apnea [10], as well as the cardiovascular sequelae commonly associated with the disorder. One possible reason for the higher rate of reported complaints in African-Americans in the EBC sample may be attributed to the fact that the sample tended to be younger than the elderly sample cited in the study by Blazer et al. The mean age of the EBC sample of patients with sleep-related diagnostic codes was  $42.4 \pm 16.4$  years. Clearly, the under-attention to recognition and diagnosis of sleep disorders in the African-American population still represents a major public health concern.

Some limitations of the present study are worth noting. Despite extensive database review and the use of convergent data collection procedures, deficiencies in the computerized database and patient medical records limited the extent of data retrieval. For example, of the 20 patients identified with positive sleep diagnoses in EBC database (20 418 total cases), only 17 charts were available for intensive review. Similar deficiencies were noted in the GIMC sample, particularly the lack of detailed information regarding patients' ethnic origin and socioeconomic status. Although marked differences were observed in the overall recognition and diagnosis rates between the two settings, firm conclusions cannot be drawn regarding the determining factors involved. While it is tempting to conclude that differences in the proportion of ethnic minorities and medically indigent patients significantly influenced the rate of recognition of sleep disorders across the two settings, other factors might have accounted for the difference. Clearly, this finding warrants further replication.

Overall, these findings strongly emphasize the need for increased education and training in sleep disorders



for physicians and other allied health professionals. In addition, deficiencies in systems-related issues must also be addressed in both community-based and clinical academic settings. As noted above, the present study was designed as the first phase of a two-part project in which the long-term effects of an intensive educational intervention in both settings will be evaluated. The second phase is currently underway and results will be available in the near future.

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