Performance of Sleep Histories in an Ambulatory Medicine Clinic*

Impact of Simple Chart Reminders

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Background: The sleep history is essential to recognizing clinically important sleep disorders, but little is documented about its performance in the primary care setting.

Study objectives: To estimate the frequency of documented sleep histories by medical house officers (HOs) in an ambulatory medicine clinic and to assess whether a chart reminder influences their performance.

Design: We reviewed the performance of medical HOs after introduction of a medical record form that included a simple sleep history prompt among reminders relating to health promotion. For each of 108 HOs, we randomly selected a chart with a sleep history prompt and one without.

Results: Any sleep history was documented in only 37 of 216 medical records (17%), including 21 of 122 patients (17%) with risk factors for obstructive sleep apnea (OSA). Use of chart reminders was associated with nearly a fivefold increase of sleep histories (29% vs 6%, p < 0.001), and charts with prompts had more notations about specific sleep complaints (2.6 ± 0.9 vs 1.0 ± 0.0 notes per patient, p < 0.0001). Sleep histories were recorded less often (p < 0.001) than histories of cigarette smoking or alcohol use. Although 24% of physicians appeared to be influenced by the prompt, sleep problems were included on problem lists of only six patients (3%). Overall, the frequencies of diagnostic studies (1% of all patients, 6% of those with sleep histories) or documented therapeutic recommendations (0%) relating to sleep were low, whether or not chart reminders were used, with sleep testing obtained in only one patient. Sleep interventions were documented less often than smoking cessation or weight loss (p < 0.002).

Conclusions: Sleep histories are seldom documented by medical HOs, even in patients at risk for OSA. Use of a simple chart reminder was associated with an increased frequency of recorded sleep histories, but had no clear impact on diagnosis or treatment. If sleep problems and their management are to be prioritized appropriately, then the obstacles to obtaining sleep histories and to following up cues to sleep disorders must be clarified and overcome.

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Key words: ambulatory clinic; chart reminders; sleep apnea; sleep histories

Abbreviations: HOs = house officers; OSA = obstructive sleep apnea; PGY = postgraduate year

Sleep disorders are common, affecting 40 million Americans, with an estimated annual cost of $15.9 billion.1,2 Because individuals with sleep disorders have increased morbidity and mortality,3–7 the prevention, recognition, and treatment8–10 of sleep disorders represent important priorities for primary care physicians. Recent epidemiologic observations suggest that approximately 90% of persons with clinically significant obstructive sleep apnea (OSA) have not been recognized.11 Historical information regarding a patient’s sleep might enable health professionals to identify this underappreciated problem, but the frequencies with which sleep histories are obtained and the ways in which they might be promoted optimally are unclear. We evaluated the ambulatory clinic performance of medical house officers (HOs) to address the following questions: How often is any sleep history documented in the medical records of patients evaluated in a general medicine clinic? How does the performance of sleep
histories compare with that of other health promotion histories? Does the use of simple chart reminders relating to sleep contribute to an increased frequency of documented sleep histories? Is documentation of a sleep history associated with recorded diagnostic or therapeutic plans relating to sleep disorders?

**Materials and Methods**

**Background**

We reviewed the medical records of ambulatory patients evaluated in the Wake Forest University Physicians Internal Medicine Clinic and assessed performance of HOs from a 3-year accredited internal medicine residency program affiliated with Wake Forest University School of Medicine and North Carolina Baptist Hospital. The medical records of resident physicians from three levels of training from June of 1991 to June of 1996 were included in this review (n = 118). Fellows from subspecialty services were excluded.

**Chart Reminder**

One of two standardized forms was available in the clinic for recording each new ambulatory clinic encounter. One form had no prompts and the other contained written chart reminders with pertinent cues relating to medical history, social history, family history, immunization records, smoking or alcohol history, sexual history, and sleep history. The latter prompt included three questions: (1) Hypersomnolent? (2) Difficulty sleeping? (3) Interference with daily function by sleep problems? All three questions were flagged with a yes or no response to be checked by the HO. HOs had received prior instruction about sleep disorders and OSA during conferences within their ambulatory medical curriculum. At the time of orientation to their general medicine clinic rotation, they had received instruction about the medical record forms used in the clinic, but no specific additional emphasis on the sleep prompt. HOs were unaware of the review of sleep history documentation.

**Chart Selection**

During the transition of our ambulatory clinic from the use of medical record forms without chart reminders to those which included reminders, both forms were available. The particular form used for any given patient visit was determined arbitrarily by the clinic administrative staff without any input from the medical HO. (That is, the HO did not know which form would be in the chart before he or she opened it). Although clinic staff did not choose the particular form used for a visit according to a formal random number scheme, it was believed that they had no particular biases in assigning forms and that it would make for a fair test of the impact of the reminder to compare results with and without reminders during the same period. (Indeed, patient characteristics are similar in the two groups [see Results], indicating that selection bias is unlikely.) A computerized listing of each physician’s medical records was obtained from the clinic visit log. Because these computerized records did not include an indicator variable specifying whether or not the chart contained a sleep history, we could not simply randomly select charts with and without sleep histories. Instead, the medical records were permuted randomly for each physician, and the first charts with and without forms incorporating sleep reminders were included in the analysis. That is, the first chart in the randomly permuted list for each physician was reviewed. If that chart had a prompt, then the next chart from the permuted list without a prompt for that particular physician was also included. If the first chart had no reminder, then it was included along with the next chart from the list that had a reminder. Ten physicians had charts of one type only and were excluded from the analysis, leaving 108 physicians and 216 charts in the study.

**Data Collection**

Data collected included patient demographic characteristics, initial complaint, nature of the clinic visits (eg, immediate precipitating factors), medical history, medications (including sedatives or hypnotics), allergies, initial vital signs including BP and weight, and a review of symptoms including insomnia, snoring, obesity, restorative sleep, excessive daytime hypersomnolence, and other drug use. Diagnostic tests (including polysomnography, thyroid function or pulmonary function testing, pulse oximetry, arterial blood gas analysis, chest roentgenograms, and ECGs), specific management changes (including patient instruction about weight loss, smoking cessation, and prescription or discontinuation of sleeping pills), and referrals to pulmonary, otolaryngology, or psychiatry consultants were recorded. Whether a sleep history was documented or not and the frequency with which sleep disorders were listed in the patient’s problem list were recorded. The performance of polysomnograms in these clinic patients was confirmed through independent review of the computerized records of the Wake Forest University/Baptist Medical Center sleep laboratory.

**Statistical Analysis**

Usual χ² tests were used to compare patient characteristics between groups. Fisher’s Exact Tests were used when cell counts were small. A McNemar’s test was used to assess differences between chart reminder groups in the frequency of sleep histories. This test accounts for the matching related to the HO. General estimating equation methodology as implemented in Proc Genmod (SAS Institute; Cary, NC) was then used to assess the effect of chart reminder status on the decision to obtain a sleep history after adjustment for patient characteristics as well as the HO. Differences were regarded as statistically significant if p < 0.05.

**Results**

**Physician Population**

The physicians were 75% male, and 36% of the physicians were PGY (postgraduate year)-1; 34%, PGY-2; and 30%, PGY-3.

**Patient Population**

The patients had a mean age of 47 years (range, 16 to 90 years); one third were men. These distributions were similar to the general demographic characteristics of clinic patients (mean age, 46.9 years, with 62% women). Forty-five percent of the population was hypertensive, and 28% was obese. One hundred twenty-two patients (56%) were regarded (and doc-
umented) as hypertensive or obese, and these individuals were regarded as having increased risk for OSA.12–15 Patients with and without chart reminders had similar age, sex, and racial distributions; frequencies of conditions associated with sleep disorders; and predispositions to OSA (suggesting little if any selection bias on the part of the administrative staff in assigning medical forms to charts; Table 1). Reasons prompting patient presentations to the clinic were also similar in each group.

**Frequency of Sleep Histories**

Sleep histories were documented in 37 of 216 medical records (17%) overall, and were documented significantly more often in the chart reminder group (31 of 108, 29%) than in the non–chart reminder group (6 of 108, 6%; p < 0.001; Fig 1). In the 122 patients with increased risk of OSA, any sleep history was recorded in 21 patients (17%), including 18 of 60 patients (30%) with chart reminders and 3 of 62 patients (5%) without.

Patients with positive sleep histories were somewhat older (52 ± 4 vs 47 ± 3 years) and more often had a history of depression (16% vs 9%), but the differences between groups were not statistically significant (all, p > 0.05). Higher proportions of patients with documented sleep histories had previous myocardial infarction (19% vs 12%) or syncope (8% vs 3%), but these trends were not statistically significant (all, p > 0.05).

Of the 108 physicians, 75 physicians (70%) did not obtain any sleep history whether a chart reminder was available or not, 27 physicians (25%) obtained a sleep history only in the presence of a sleep history prompt, 2 physicians (2%) obtained a sleep history only in the absence of a chart prompt, and 4 physicians (3%) obtained sleep histories with and without prompts. The likelihood of documented sleep histories did not vary with PGY level of HO training.

More total notations related to sleep were made in charts with reminders than in charts without reminders, and included references to difficulty sleeping (32 patients, 36%), impaired daily function related to sleep (27 patients, 31%), hypersomnolence (24 patients, 29%), habitual snoring (1 patient, 1%), witnessed choking (1 patient, 1%), and nonrestorative sleep (2 patients, 2%). When sleep histories were recorded, charts with sleep prompts had a mean (± SD) of 2.6 ± 0.9 notations per patient, vs a mean of 1.0 ± 0.0 notations per patient for those charts without prompts (p < 0.0001). Of the 37 patients with a sleep history recorded, 12 responded positively, 20 negatively, and 5 with both positive and negative responses to questions related to sleep. Of the 17 patients responding positively, 4 complained of hypersomnolence, 10 had difficulty sleeping, 6 had impaired daily function, 1 had habitual snoring, and 1 had nonrestorative sleep.

**Frequencies of Recorded Smoking and Alcohol Use**

Alcohol use and cigarette smoking histories were documented in 33% and 45% of patients, respectively. These overall frequencies of alcohol and smoking histories were significantly higher than sleep histories (p < 0.001). Notations related to alcohol and smoking use were made significantly more often in the chart reminder group (51% and 70%, respectively) than in the control group (14% and 20%, p < 0.001).

**Frequencies of Diagnostic Tests and Therapeutic Interventions**

Sleep was mentioned in the problem list in only 6 of 37 patients (14%) in whom a positive sleep history

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**Table 1—Demographic Characteristics: Chart Reminder vs Non-Chart Reminder Groups**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Chart Reminder Group (n = 108)</th>
<th>Non-Chart Reminder Group (n = 108)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race, %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>51</td>
<td>61</td>
</tr>
<tr>
<td>Nonwhite</td>
<td>49</td>
<td>39</td>
</tr>
<tr>
<td>Hypertension</td>
<td>50 (46)</td>
<td>47 (44)</td>
</tr>
<tr>
<td>Obese</td>
<td>31 (29)</td>
<td>29 (27)</td>
</tr>
<tr>
<td>Risk for OSA</td>
<td>60 (55)</td>
<td>62 (57)</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>14 (13)</td>
<td>14 (13)</td>
</tr>
<tr>
<td>Angina pectoris</td>
<td>16 (15)</td>
<td>18 (17)</td>
</tr>
<tr>
<td>Syncope</td>
<td>5 (5)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Depression</td>
<td>11 (10)</td>
<td>11 (10)</td>
</tr>
<tr>
<td>Sleep medication use</td>
<td>12 (11)</td>
<td>7 (6)</td>
</tr>
</tbody>
</table>

*p < 0.001

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**Figure 1.** Any sleep histories were documented significantly more often in patients with chart reminders.
was obtained (four with chart reminders and two without). Diagnostic tests or interventions pertaining to sleep were noted infrequently whether or not any sleep history was documented (Table 2). When a sleep history was documented, interventions related to sleep were performed in 5% of patients. Polysomnograms were ordered for only one patient in the chart reminder group and for no one in the control group, and no nocturnal pulse oximetry studies were obtained. Independent review of sleep laboratory logs confirmed that only this single polysomnogram was performed in these 216 clinic patients. Similarly, the overall frequencies of documented therapeutic interventions (including behavioral modification or consultative input) were low, and did not differ with the use of chart reminders. Positive histories in patients with cigarette smoking or obesity were more often (p < 0.002) associated with documented health promotion interactions (smoking cessation in 17%; weight loss in 50%). Although 26 of the 216 patients (12%) were receiving sleeping pills, none had documentation stating whether these medications had been discontinued or continued. Overall, neither the use of chart reminders nor the presence of a positive sleep history appeared to influence sleep management.

**DISCUSSION**

The sleep history is key to the recognition of persons with potentially treatable sleep disorders, but little is known about the frequency with which it is obtained in the primary care setting. Although the presence of obesity, witnessed apnea, difficulty sleeping, and interference with daily activity have been shown to be sensitive indicators of sleep disorders, published reports suggest that a sleep history is sought infrequently. In 1990, Everitt and colleagues noted that 40% of physicians who were presented with a hypothetical elderly patient vignette elicited a sleep history. In an educational study at our institution, medical interns infrequently (13%) and community-based practitioners never obtained sleep histories during observed health promotion encounters with standardized simulated patients. Our finding of a documented sleep history in only 6% of the charts without sleep prompts in a population of whom 57% were at risk for OSA and 6% were receiving sleeping pills is consistent with such prior reports and indicates an important underprioritization of sleep problems.

**Chart Reminders Increase Sleep Histories**

We found that the use of chart reminders was associated with an approximately fivefold increase in the frequency of any sleep histories, from 6 to 29%. Numerous survey instruments have been designed to promote recognition of patients likely to have sleep disorders, but such use of brief chart prompts in a primary care setting has not been reported previously. Chart reminders were not only associated with a higher frequency of any sleep histories, but also more complete documentation, because more notifications per patient (2.6 vs 0.1) were made about sleep in charts with sleep prompts. The low frequency of snoring documented in these patients was surprising, in view of the high general prevalence of this symptom and the emphasis placed on it during HO instruction about OSA. Although this finding might reflect the low overall prioritization of sleep histories, it might also suggest that these patients or their physicians do not regard snoring as a significant medical problem.

Inquiries about sleep were documented significantly less often than those relating to tobacco or alcohol use in this clinic population. As in other investigations, use of chart reminders more often identified persons who used alcohol and smoked cigarettes (threefold and fourfold increases, respectively). The infrequency of the latter in the medical records without chart prompts was somewhat surprising and suggests that a general underemphasis on prevention activities or a global underdocumentatation of these behaviors in the medical records might have influenced these observations. Although bias in the clinic staff’s distribution of forms with chart reminders to HOs more predisposed toward health promo-

<table>
<thead>
<tr>
<th>Diagnostic Test or Intervention</th>
<th>Chart Reminder Group (n = 108)</th>
<th>Non-Chart Reminder Group (n = 108)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polysonogram</td>
<td>1 (1)</td>
<td>0</td>
</tr>
<tr>
<td>ECG</td>
<td>7 (7)</td>
<td>7 (7)</td>
</tr>
<tr>
<td>Thyroid function studies</td>
<td>18 (17)</td>
<td>11 (10)</td>
</tr>
<tr>
<td>Pulmonary function tests</td>
<td>1 (1)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Chest radiograph</td>
<td>6 (6)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Arterial blood gas</td>
<td>1 (1)</td>
<td>0</td>
</tr>
<tr>
<td>Pulse oximetry</td>
<td>0</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Do not smoke</td>
<td>8 (7)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Lose weight</td>
<td>18 (17)</td>
<td>13 (12)</td>
</tr>
<tr>
<td>Decrease caffeine</td>
<td>0</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Decrease in sleep medication use</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pulmonary consult</td>
<td>2 (2)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Otolaryngology consult</td>
<td>2 (2)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Psychiatry</td>
<td>1 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Neurology</td>
<td>1 (1)</td>
<td>3 (3)</td>
</tr>
</tbody>
</table>

* Data are presented as No. (%).
tion cannot be excluded absolutely, the characteristics of patients and clinic encounters were similar in each group. Notwithstanding these and other limitations of chart audits in appraising clinician behaviors, sleep concerns were rarely documented.

Impact of Histories on Sleep Testing and Interventions

Even when a sleep history was recorded, sleep was noted in the problem lists of only four patients (11%) and had no discernible impact on patient management, but the small number of patients with documented histories suggesting OSA limits this analysis. Diagnostic or therapeutic interventions specifically directed toward sleep were recorded infrequently in patients with or without chart reminders, whether any sleep history was documented or not. This finding held for the patients who had predispositions for OSA and for those using sleeping pills. Although the retrospective design of this chart review might have underestimated the frequency of sleep studies obtained, independent review of sleep laboratory logs confirmed that only one patient underwent polysomnography. Interestingly, any sleep histories were less often associated with documented health promotion recommendations than histories positive for smoking and the presence of obesity, suggesting gradations in physician responsiveness to these ambulatory care issues. It is possible that alternative chart reminders of other sleep symptoms (e.g., snoring, choking, witnessed apnea) or care maps directly coupling positive historic cues to a management algorithm might have more effectively promoted action by these physicians.

Implications for Clinicians and Educators

Although the optimal screening instrument for detecting persons with clinically important OSA has not been defined, several characteristics of an effective tool can be envisioned. The brevity of chart reminders provides theoretical and practical advantages over lengthy questionnaires in the constraints of a busy clinical practice. Chart reminders have had a proven utility in not only identifying a condition, but also in influencing outcomes related to it, and have had proven efficacy in changing physician performance.21–24 In one investigation, their use increased both the documentation of smoking and physicians’ referrals to smoking cessation counseling: 70% of smokers were counseled to quit once they were identified.23 Chart reminders have also been used with varying success to address anemia, influenza, and cancer screening.21–22 A recent meta-analysis of randomized controlled trials has confirmed that chart reminders not only improve the identification of a disease under study, but also enhance preventive practices.27 Sleep histories were not addressed in those investigations. The fivefold increase in sleep histories we observed was remarkable considering that this instrument was not coupled to a specific educational intervention promoting its use. It is likely that the combined use of the prompt and an action on it would be enhanced further with focused education. The current analysis focused only on the frequencies of documented sleep histories. We did not appraise potential effects of the prompt itself as a general sleep educational intervention.

If potentially treatable sleep problems are to be recognized and managed, then the barriers to optimal health-care provider behaviors must be defined and addressed. Further prospective study may require not only a larger cohort but also a refined prompt that more emphatically promotes a response by the caregiver. The low frequency of action may reflect physicians’ suboptimal knowledge and attitudes about sleep disorders and suggests an important educational need. The American Sleep Disorders Association Taskforce 2000 Survey has confirmed that physicians receive, on average, only 2.1 h of education in the area of sleep disorders after 4 years of medical education.28 Although this finding represented an improvement from 1978, when only 10% of medical schools provided any meaningful instruction about sleep, the prevalence and clinical importance of sleep problems mandates fundamental changes in medical education. It is noteworthy that our HOs had prior instruction about OSA and other sleep disorders. The performance of sleep histories by more senior physicians, most of whom have not had such instruction during their medical training, merits particular study. Enhancing physicians’ behaviors relating to sleep presents major challenges and will require unique modifications of primary care ambulatory curricula if sleep histories are to be appropriately prioritized, implemented, and, when elicited, acted on. We believe that chest clinicians active in the evaluation and management of patients with sleep-disordered breathing must have a major role in this educational effort.

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