

The Effect of Physician Continuing Medical Education on Patient-Reported Outcomes for Identifying and Optimally Managing Obstructive Sleep Apnea

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Study Objective: To evaluate the effect of continuing medical education (CME) activities on patient reported outcomes with regard to (1) screening for excessive sleepiness (ES) and obstructive sleep apnea (OSA) and (2) appropriate referral and treatment.

Methods: A total of 725 patients were recruited from 75 providers who either participated or did not participate in Transtheoretical Model (TTM)-based OSA CME activities. Patient reported outcomes from participating (n = 36) and non-participating providers (n = 39) were compared using generalized estimating equations examining random effects of provider as unit of assignment.

Results: Patients' reports demonstrate that participating physicians were 1.7 times more likely to initiate discussion of sleep problems than non-participating physicians ($t_{1,411} = 3.71$, $p = 0.05$) and 2.25–2.86 times more likely to administer validated measures for OSA (Epworth Sleepiness Scale and STOP-BANG). Patient reports

also indicated that participating clinicians (79.9%) were significantly more likely to recommend seeing a sleep specialist compared to non-participating clinicians (60.7%; $t_{1,348} = 9.1$, $p < 0.01$, OR = 2.6). Furthermore, while 89.4% of participating clinicians recommended a sleep study, only 73.2% of the non-participating physicians recommended one ($t_{1,363} = 11.46$, $p < 0.001$, OR = 3.1).

Conclusions: Participation in TTM-based OSA CME activities was associated with improved patient reported outcomes compared to the non-participating clinicians.

Keywords: obstructive sleep apnea, patient-reported outcomes, continuing medical education, behavior change, stages of change, Transtheoretical Model

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The American Academy of Sleep Medicine (AASM) reports that obstructive sleep apnea (OSA), the most common form of sleep-related breathing disorder (SRBD), “is characterized by repetitive episodes of complete or partial upper airway obstruction occurring during sleep” that are typically associated with “reduction in blood oxygen saturation and are usually terminated by brief arousals from sleep.”¹ OSA is associated with significant social, functional, and clinical consequences including shortened life expectancy, increased risk of hypertension, heart attack, stroke, congestive heart failure, irregular heartbeat, coronary artery disease, and depression^{2–5} as well as increased risk of perioperative complications.⁶

The prevalence of SRBD is increasing steadily. Peppard et al.³ report double-digit increases in prevalence since 1988–1994. Based on their cohort study, the population prevalence of moderate to severe SDB (defined as apnea-hypopnea index ≥ 15 or apnea-hypopnea index ≥ 5 and symptoms of daytime sleepiness) in adults aged 30–70 is nearly 20%. The prevalence of OSA is even higher ($\geq 50\%$) in patients with cardiac or metabolic disorders.⁷

BRIEF SUMMARY

Current Knowledge/Study Rationale: Despite the increasing prevalence and harmful sequelae of obstructive sleep apnea (OSA), 80% to 90% of adults with OSA remain undiagnosed. There is therefore an urgent need to promote performance change related to its identification and management.

Study Impact: CME activities that included behavior change messages increased the likelihood that physicians would initiate a discussion about sleep problems, administer measures of excessive sleepiness and OSA, recommend sleep studies, or refer to a sleep specialist. The integration of CME and behavior change messages designed for clinicians in all stages of readiness to implement recommended practices for the identification and optimal management of OSA is a promising approach to increasing the extent to which those guidelines are adopted.

Comprehensive clinical guidelines outlining diagnostic, assessment, treatment (e.g., initiation of positive airway pressure (PAP) therapies, use of behavioral therapies, oral appliances, surgical options, or adjunctive therapies), and management algorithms have been issued for patients with potential or diagnosed OSA.^{8,9} Guidelines recommend, among other things, that questions about OSA should be included in routine health

evaluations and that a comprehensive sleep examination should be performed for patients with suspected OSA.⁸

Primary care physicians (PCPs) should therefore consider OSA in patients with predisposing risk factors such as obesity, large neck circumferences, snoring, daytime sleepiness, and hypertension.⁴ Remarkably, however, 80% to 90% of adults with OSA remain undiagnosed.^{6,10} Early reports indicate that PCPs did not recognize or diagnose OSA in their patients.^{11,12} Furthermore, many clinicians do not routinely screen for sleep conditions. Despite the availability of easy-to-administer self-report measures, such as the Epworth Sleepiness Scale¹³ and the STOP-BANG questionnaire,¹⁴ screening tools are underused, resulting in a failure to identify hallmark symptoms of OSA, such as excessive sleepiness and snoring.¹⁵ Nearly 40% of responding clinicians reported that they do not screen their patients for excessive sleepiness, the hallmark symptom of OSA.

One promising approach for increasing the diagnosis and optimal management of OSA is clinician education. Continuing medical education (CME), which has been identified as a promising strategy for improving clinical outcomes,¹⁶ has a long and well-established history of improving clinician knowledge.¹⁷ Increasingly, the focus of CME is shifting from the traditional provision of knowledge to improvements in performance and clinical practice.¹⁸ Strategies for maximizing the effectiveness of CME (e.g., tailoring content to the educational needs and goals of the learner¹⁹) are being explored. Controlled trials demonstrated that internet-based CME significantly increases the probability of making evidence-based clinical decisions.^{20,21} Tailoring educational content to readiness to adopt a performance change is also likely to play a key role.²²⁻²⁵

The Transtheoretical Model (TTM) is an integrative model that describes behavior change as a progression through a series of five stages of readiness: (1) Precontemplation: not intending to adopt the best practices, (2) Contemplation: intending to adopt the best practices in the next six months, (3) Preparation: intending to adopt the best practices in the next 30 days, (4) Action: adopted the best practices less than six months ago, and (5) Maintenance: adopted the best practices more than six months ago. The TTM could provide a useful framework for tailoring CME content in that leveraging the principles of the TTM permits the inclusion of behavior change statements to ensure activities meet the needs of all physicians, even those who are not prepared to adopt the desired performance. Messages on the benefits of adopting the best practices are important for clinicians in the Precontemplation stage, for example, whereas suggestions for how to overcome the barriers to adopting the best practices and messages about being inspired by other clinicians who have already adopted the best practices are more important for clinicians in the Contemplation stage. Clinicians in the Action stage benefit from recommendations about how to structure their practice to facilitate implementation of the best practices (e.g., prompts in EMR) and how to overcome situations in which it might be difficult to implement the best practices. Previous research demonstrates that applying the TTM can improve performance significantly more than standard education. Specifically, physicians randomized to educational content matched to their readiness to diagnose, treat, and make referrals for depression demonstrated significantly higher performance improvements on those clinical practices

two months post-intervention as compared to those randomized to standard education.²³ Johnson et al.²⁶ demonstrated that incorporating TTM messages into CME activities for individualizing care for rheumatoid arthritis increases the likelihood that physicians will move to more advanced stages of change for adopting a performance change, but no research to date has examined the impact of TTM-based CME activities on patient-reported outcomes.

The goal of this study was to evaluate the effect of accredited CME activities with a foundation in the TTM on patient-reported outcomes regarding screening and treatment for OSA.

METHODS

As part of a larger study, the TTM was applied to the design and evaluation of an internet-based CME curriculum including three activities designed to promote the identification and optimal management of obstructive sleep apnea (OSA) and one of its primary symptoms, excessive sleepiness (ES). For clinician participants, that performance improvement was defined by the adoption of the following best practices:

- Incorporating sleep-related questions to screen for the presence of OSA during:
 - Comprehensive physical examinations
 - Routine office visits when symptoms (e.g., tiredness, fatigue, ES, insomnia, bed partner report of snoring or snorting, abrupt awakening from sleep with gasping or choking), physical findings (e.g., big neck, crowded oral pharynx, elevated body mass index), or comorbidities (e.g., hypertension, obesity, diabetes, congestive heart failure) suggest an increased likelihood of OSA
- Assessing degree and severity of ES using a validated self-assessment tool (e.g., Epworth Sleepiness Scale)
- Assessing likelihood of OSA using a brief validated screening tool (e.g., modified Berlin, STOP-BANG)
- Referring patients to a sleep medicine center when OSA is suspected or the differential diagnosis is not clear
- Developing an appropriate treatment plan for OSA that includes positive airway pressure devices (e.g., continuous positive airway pressure), patient education, behavioral strategies (e.g., weight loss), and symptomatic treatment with antihypertensive medications and wake-promoting medications for residual ES as indicated
- Monitoring patients for adherence to OSA treatment regimen as well as effectiveness and effects of OSA treatment on ES and associated morbidities

The three activities, described in more detail in **Table 1**, were delivered free of charge in varied formats online by Medscape Education.²⁷ The first was a Clinical Anthology (a 3-article collection activity focused on various aspects of OSA) entitled Evidence-Based Best Practices in Obstructive Sleep Apnea Management²⁸ that included an expert interview and 2 case reports. The second was an interactive case-based activity that employed a “test, then teach” methodology intended to challenge clinician participants to demonstrate their skills in the care of patients with OSA, from screening through intervention, and provide relevant feedback immediately to

Table 1—Educational content: learning objectives, content focus, and learner experience.

Activity Title	Learning Objectives	Content Focus	Designated Maximum AMA PRA Category 1 Credits™	Learner Experience*
Evidence-Based Best Practices in Obstructive Sleep Apnea Management	<ol style="list-style-type: none"> 1. Enumerate the underlying causes of, risk factors for, and comorbid conditions of OSA 2. Describe screening tools for OSA 3. Discuss methods for improving patient-provider communication and patient adherence 4. Design an effective care plan to treat and manage OSA, including pharmacologic and nonpharmacologic interventions and follow-up/monitoring plans to support adherence 	Identifying obstructive sleep apnea and how to tailor treatment to the individual, approaches to managing residual symptoms and the impact effective management can make on patient's quality of life, motivation for primary care providers to identify OSA in their patients.	1.25	6,800 word activity divided into 3 chapters. Two chapters applied a case-based design with 2 interactivity polling questions. The third chapter used an interview design with experts responding to questions.
Differential diagnosis and treatment of patients complaining of tiredness	<ol style="list-style-type: none"> 1. Enumerate the risk factors for, comorbid conditions of, and consequences of OSA 2. Describe the screening tools for OSA 3. List the potential positive consequences of an early and accurate OSA diagnosis 4. Assess methods for improving patient adherence to OSA treatment 5. Design an effective care plan to treat and manage OSA, including pharmacologic and nonpharmacologic interventions and follow-up/monitoring plans to support adherence 	Through the view of realistic patient scenarios, clinicians were placed into diagnosis and management decisions related to OSA.	1.75	5,000 word case-based activity with 11 clinical decision questions. Each question included immediate peer-comparison and expert feedback.
Answers to your questions on excessive sleepiness and sleep apnea in primary care	<ol style="list-style-type: none"> 1. Enumerate the underlying causes of, risk factors for, and comorbid conditions of OSA 2. List the potential positive consequences of an early and accurate OSA diagnosis 3. Understand methods for improving patient adherence to treatment 4. Design an effective care plan to treat and manage OSA, including pharmacologic and nonpharmacologic interventions and follow-up/monitoring plans to support adherence 	Answered common questions, such as how can you identify the many patients with obstructive sleep apnea in a primary care practice? How much do you know about treatments for OSA beyond CPAP? and What can you do to encourage patients to stick with treatment for OSA?	1	5,500 word activity divided into 3 chapters. Each chapter addressed 3–5 typical clinical questions related to the treatment of OSA.

* Each question takes approximately 30–90 seconds to answer.

improve their clinical skills.²⁹ The final activity was an Ask the Expert Collection, in which the 6 most common questions collected from the initial 2 activities were addressed by experts.³⁰ Each of the activities included a brief pretest to assess the participating clinician's readiness to identify and optimally manage obstructive sleep apnea (OSA) and one of its primary symptoms, excessive sleepiness (ES) as defined above. Clinicians could report that they were not intending to do so in the next 6 months (Precontemplation stage); intending to do so in the next 6 months (Contemplation stage); intending to do so in the next month (Preparation stage); already doing so for < 6 months (Action stage); or already doing so for > 6 months (Maintenance stage).

The educational content for each activity included behavior change messages relevant to clinicians in all stages of change for adopting the performance improvement. The messages were based on the well-established theoretical principles of the

TTM, as well as on information gathered from thought leader interviews conducted during the development of the activities which addressed topics such as key benefits and barriers and difficult situations. The Ask the Expert collection, for example, included the following messages to overcome common barriers to screening for OSA:

“It is crucial to remind ourselves that time screening for OSA is well spent given the potential consequences prevented and improved quality of life and emotional well-being patients experience when it is treated. Other clinicians have said it is extremely rewarding to hear from patients whose lives have been dramatically improved by treating their OSA.”

“It is possible to reduce the time needed for screening (e.g., patients completing questionnaires at home prior

to visit or in waiting room). It will be helpful to use cues to prompt screening (e.g., flag in EMR, particularly for patients with any of the likely co-morbid conditions).”

In addition, at the conclusion of each activity, clinician participants received behavior change suggestions matched to their individual readiness to engage in the performance improvement (see examples from one activity in the appendix). The behavior change recommendations varied from one activity to the next.

To mimic real-world conditions as closely as possible, clinicians registered on Medscape had access to all 3 activities regardless of previous participation in CME for OSA. The activities were promoted via regularly scheduled outreach messages. Clinicians could choose to participate in 1, 2, or 3 activities when they were released.

Participants

For the current study, English-speaking US clinicians (physicians, nurse practitioners and physician assistants) were eligible to participate if they were licensed to practice medicine and reported a specialty of primary care, pulmonology, or psychiatry. While it is possible that some of these clinicians had full or part-time involvement in sleep medicine, sleep medicine specialists were not targeted, and no clinician reported that as his or her primary specialty. English-speaking patients aged ≥ 21 years were eligible if they were experiencing excessive sleepiness, were suspected of having OSA because they report other symptoms suggestive of OSA, or had recently been diagnosed with OSA.

Procedure

Clinicians who met the eligibility criteria and had participated in one or more of the accredited CME activities categorized from the TTM-based OSA curriculum ($n = 4,500$) were identified by Medscape, the CME provider. A group of clinicians from the same specialties who had not participated in any of CME activities ($n = 4,500$) were also identified. Each group received 2 email invitations to join the study. The invitations, which were sent by Medscape, explained the requirements of the study and the incentive (\$500) for participation. Interested clinicians could click on a link in the email to review the informed consent documentation, complete a brief survey, and provide their contact information to the research team. The brief clinician survey included the same assessment of each clinician’s readiness to identify and optimally manage OSA and ES. Clinicians were then mailed survey packets for distribution to 40–50 patients treated in their practice that met the patient eligibility criteria (outlined above). All patient survey packets included an informed consent form for the patient and the 45-item patient survey, as well as a postage-paid return envelope. The second email invitation was similar to the first but also offered the option of paper or online versions of survey packets for patients. Patients opting for the online survey option ($n = 15$ eligible patients from participating clinicians and $n = 49$ eligible patients from non-participating clinicians) provided informed consent prior to responding to the survey. Clinicians were eligible to receive the incentive (in the form of a check) when ≥ 11 eligible patients returned assessments. The study was approved by the Institutional Review Board at Pro-Change Behavior Systems, Inc.

Measures

The following measures were administered to the patients.

Epworth Sleepiness Scale (ESS)

The ESS is a widely used, validated 8-item scale measuring subjective sleepiness. Response options are 0 = unlikely to fall asleep to 3 = high chance of falling asleep.^{13,31}

STOP-BANG

The STOP-BANG is an 8-item screening tool for OSA focusing on snoring, tiredness during daytime, observed apnea, high blood pressure, body mass index, age, neck circumference, and gender.¹⁴

Frequency of Scale Administration

A single question for each scale asked the patient to report whether the clinician asked the patient ESS and STOP-BANG questions in the past. Response options include (1) No, (2) Yes, once before, and (3) Yes, more than once before.

Discussion of Sleep Problems

Two questions assessed whether patients had spoken with their physicians about a sleep problem and who had initiated the discussion.

Recommendations for Tests and Treatments

A series of 11 questions assessed recommendations clinicians provided to patients for various methods of diagnosing (seeing a sleep specialist, having a sleep study) and treating a sleep disorder (taking a prescription drug, taking an OTC sleep aid, taking an herbal supplement, using a PAP device, changing sleep habits, using a non-medical treatment, or trying alternative medicine).

Data Analyses

The primary outcome measures were patient reports of whether clinicians initiated a discussion about sleep; administered the ESS and/or STOP-BANG; and recommended follow-up tests and treatment when appropriate. The generalized estimating equation method of analysis was used to control for intra-class correlations within each provider. Datasets were analyzed using complete data methodology—in this case, generalized estimating equations (GEE) examining random effects of provider as unit of assignment—and the results pooled by using SAS v9.1 PROC MIXED for the continuous outcomes and PROC GLIMMIX for the categorical outcomes using either the binary or multinomial distributions. Statistical significance of the results was evaluated using a *t*-test. GEE allows analysis of data for continuous and categorical outcomes.³² All GEEs, which were run with an unstructured variance matrix, used the control group (i.e., non-participating clinicians) as reference. Odds ratios were calculated for each analysis.

RESULTS

Study Group

Clinicians

A total of 176 participating clinicians accessed the brief survey from the link in the email invitation. 78.1% of the

participating clinicians took part in a single CME activity. Another 19.4% participated in 2 activities.

Sixteen participants were removed due to fraudulent practices (e.g., unlicensed providers) or no data. Fraudulent practices included 2 unlicensed physicians returning 11 patient surveys each that they had completed themselves in the same ink, all of which requested payment be mailed to the same address ($n = 2$). As the “patient” surveys all arrived within a 2–3 day period, they were flagged and excluded by astute research assistants. In other instances, multiple requests from parties with the same last name were flagged as suspicious. If attempts to verify participation of a “suspicious” patient were unanswered by the patient, a participant was deemed fraudulent and excluded. Ninety-two (57.5%) of the remaining clinicians provided contact information. Of these, 38 had patients who returned surveys. However, 2 of these providers did not have any eligible patients, resulting in final sample of 36 providers who had participated in the TTM-based OSA educational activities and recruited eligible patients. The number of eligible patient surveys returned per treatment group provider ranged from 1 to 27, with a mean of 7.1.

Of the 168 non-participating clinicians who accessed the survey, 11 did not provide any data and 5 were excluded for fraudulent practices. Roughly 59% ($n = 90$) of the remaining clinicians provided contact information. Of these, 42 had patients who returned surveys. However, 3 of these providers did not have any eligible patients, resulting in a final sample of 39 providers who had not participated in any of the educational activities. The number of eligible patient surveys returned per non-participating provider ranged from 1 to 30, with a mean of 11.8. **Table 2** describes the specialty of clinician participants included in the patient outcome study. Over half (68.3%) of the providers reported that their specialty was primary care. The remainder of the sample included psychiatrists (24%), pulmonary medicine physicians (6.4%), and geriatricians (1.3%). Nearly half of the primary care participants were physicians (48.4%), and an almost equivalent number were nurses/advanced practice nurses (45.8%).

Patients

A total of 725 patients were recruited by eligible providers to participate in the current study. The majority of patient participants were White, non-Hispanic (70.2%); just over half (51.8%) were female. Ages ranged from 21 to 89, with a mean age of 52.8 (**Table 3**).

Discussing Sleep Problems

Patients of participating providers were more likely to report that their physician initiated a discussion about sleep compared to patients of non-participating clinicians (43.4% versus 31.7%), $t_{1,411} = 3.71$, $p = 0.05$, $OR = 1.67$ (see **Table 4**).

Administering Validated Measures

Epworth Sleepiness Scale (ESS)

As **Table 4** indicates, patients of participating clinicians (57.1%) reported that their clinicians were more likely to have asked the ESS at least once in the past compared to non-participating clinician patients (43.3%), $t_{1,533} = 5.41$, $p < 0.01$.

Table 2—Patient outcomes study: specialties.

Specialty	N	%
General, Internal, and Family Medicine	213	68.3
Psychiatry/Mental Health	75	24.0
Pulmonary Medicine	20	6.4
Geriatrics	4	1.3
Total	312	100

Follow-up tests revealed that participating clinicians were more likely than non-participating clinicians to administer the ESS more than once $t_{1,533} = 3.04$, $p < 0.01$, $OR = 2.25$. No significant differences were found between the patients of participating versus non-participating clinicians on ESS scores.

STOP-BANG

Significant differences were found for the STOP-BANG, with the patients of participating clinicians endorsing more symptoms of OSA (mean = 4.86) than non-participating clinician patients (mean = 4.09), $t_{1,513} = 7.6$, $p < 0.01$. As shown in **Table 4**, patients of participating clinicians (47.7%) reported that their clinicians were more likely to have asked the STOP-BANG questions at least once in the past compared to non-participating clinician patients (35.3%), $t_{1,548} = 4.75$, $p < 0.01$. Follow-up tests revealed that the participating clinicians were more likely than non-participating clinicians to administer the STOP-BANG more than once, $t_{1,548} = 3.04$, $p < 0.01$, $OR = 2.86$.

Referral to Sleep Specialist of Sleep Study

As reported by the patients, participating clinicians (79.9%) were significantly more likely to recommend seeing a sleep specialist compared to non-participating clinicians (60.7%; $t_{1,348} = 9.1$, $p < 0.01$, $OR = 2.6$; see **Table 4**). Similarly, while 89.4% of participating clinicians recommended a sleep study, only 73.2% of the non-participating physicians recommended one, $t_{1,363} = 11.46$, $p < 0.001$, $OR = 3.1$ (see **Table 4**).

Treatment Recommendations

Patients of participating clinicians (73.7%) reported that their clinicians were significantly more likely to make recommendations for further tests/treatment compared to patients of non-participating clinicians (53.1%; $t_{1,591} = 9.81$, $p < 0.01$, $OR = 2.72$; see **Table 4**).

DISCUSSION

The aim of the current analyses was to evaluate the effect of accredited CME activities with a foundation in the TTM on patient-reported outcomes regarding the extent to which clinicians adopted best practices for the identification and optimal management of OSA. The effect of the curriculum was evidenced by changes in how likely clinicians were to screen for OSA and ES and make recommendations for follow-up tests and treatments.

Given the under-recognition of OSA despite its increasing prevalence and the harmful sequelae,³ there is an urgent need to promote performance change related to its identification

Table 3—Patient demographics.

	Participating		Non-Participating		Total	
	N	%	N	%	N	%
Gender						
Male	144	54.8	194	44.3	338	48.2
Female	119	45.2	244	55.7	363	51.8
Ethnicity						
White, non-Hispanic	189	73.0	313	68.6	502	70.2
Black, non-Hispanic	36	13.9	96	21.1	132	18.5
Asian American	9	3.5	5	1.1	14	2.0
Native Hawaiian/Pacific Islander	1	0.4	0	0.0	1	0.1
American Indian/Alaska Native	3	1.2	3	0.7	6	0.8
Other	0	0.0	2	0.4	2	0.3
Combination	5	1.9	11	2.4	16	2.2
Hispanic	16	6.2	26	5.7	42	5.9
Income						
Under \$25,000	83	31.6	170	37.9	253	35.5
\$25,000 to \$49,999	61	23.2	145	32.3	206	28.9
\$50,000 to \$74,999	47	17.9	61	13.6	108	15.2
\$75,000 to \$99,999	27	10.3	38	8.5	65	9.1
\$100,000 or more	45	17.1	35	7.8	80	11.2
	Participating		Non-Participating		Total	
Age						
N	257		437		694	
Mean	52.8		50.5		51.3	
Standard deviation	13.1		14.8		14.2	
Range	21 to 81		21 to 89		21 to 89	

Table 4—Proportion of clinicians initiating discussion about sleep, administering objective measures, and making referrals by group.

	Patients of Participating Clinicians	Patients of Non-Participating Clinicians
Initiated Discussion		
Patient	56.6%	68.3%
Clinician	43.4%	31.7%
Administered Objective Measures		
Epworth Sleepiness Scale		
No	42.9%	56.7%
Yes, once	31.7%	29.1%
Yes, more than once	25.4%	14.2%
STOP-BANG		
No	52.3%	64.7%
Yes, once	25.6%	27%
Yes, more than once	22.1%	8.3%
Made Referrals and Recommendations		
Sleep specialist	79.9%	60.7%
Sleep study	89.4%	73.2%
Future tests and treatment	73.7%	53.1%

were more likely to (1) initiate discussions about sleep problems, (2) administer standardized assessments to diagnose and monitor OSA and excessive sleepiness, (3) recommend a sleep study, (4) refer patients to sleep specialist, and (5) recommend further tests and treatment. Compared to non-CME participation, the odds ratios for implementing well-established diagnosis, assessment, and treatment guidelines for OSA were 1.7 to 3 times higher for clinicians participating in CME activities.

The results described here have important implications for informing interventions to promote performance change related to SRBDs, particularly OSA, a major challenge in today’s health care system. The majority of participating clinicians took part in a single CME activity. Almost 20% participated in only two activities. Despite the limited “intervention dose,” the curriculum had a significant impact on clinician behavior, perhaps due in part to the embedded behavior change messages.²⁶ These results add to the growing evidence to support clinician education based on readiness to change.^{22–24} The findings are similar to those of Shirazi and colleagues,²⁴ who reported that education tailored to different stages of readiness to address depression in primary care enabled clinicians to move to more advanced stages of readiness, and the findings of Johnson et al.²⁶ who reported that TTM-based CME for specialists increased readiness to employ best practices in individualizing early and aggressive treatment of rheumatoid arthritis. The appeal of this type of approach to improve clinical practice

and management. Patient-reported outcomes indicate that clinicians who participated in one or more of the CME activities

is enhanced when one considers how cost-effectively online CME can be provided and the convenience it offers clinicians.

This study had a number of strengths, including reliance on patient-reported outcomes rather than clinician self-report—which incidentally was consistent with the patient-reported data. Other strengths of the study include the inclusion of a comparison group, the nationwide sample of patients and clinicians, and the rigorous definition of the desired performance change. The strength of the analytic approach and use of the physician as the unit of analysis are also noteworthy.

While the sample size was sufficient to detect the effects present, the response rate was lower than expected. Another concern is that self-selection bias was operating among participating clinicians in that only those who had succeeded in adopting the guidelines agreed to participate in this patient study. It is also possible that clinicians invited patients they presumed most likely to return the surveys in an effort to meet the requirements for the incentive. A final concern is that the study did not include a non-TTM education control group for comparison. Thus, the results need to be replicated in a larger study. Future studies may benefit from another means of distributing the assessment to the patient rather than relying on the clinician to deliver them. Alternatively, patient-clinician interactions could be audio-recorded³⁴ or charts audited to obtain objective data. Although the quasi-experimental design may be considered a limitation, randomization was not possible. Inviting non-participating clinicians from the same specialties as participating clinicians reduces some of the concern about lack of a true experimental design.

In conclusion, this study demonstrates that the integration of CME with behavior change messages designed for clinicians in all stages of readiness to implement recommended practices for the identification and optimal management of OSA is a promising approach to increasing the extent to which those guidelines are adopted. While likely not a sufficient solution in and of itself, the fact that the prevalence of sleep-disordered breathing has increased as much as 55% in some subgroups in the past two decades³ indicates that all available tools should be brought to bear on this challenge.

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APPENDIX

Posttest Feedback Based on Stage of Change

Precontemplation

You're not currently ready to identify and optimally manage obstructive sleep apnea (OSA) and one of its primary symptoms, excessive sleepiness (ES).

As you just heard, OSA is relatively common, but frequently unrecognized and untreated. And although awareness of OSA is increasing among health providers, the negative impact of OSA on individuals and society is often not appreciated. Imagine how the increased identification and management of OSA could improve not only your patients' immediate symptoms of OSA and ES, but may also have broader synergistic effects on comorbid conditions. Equally important, addressing OSA would dramatically improve your patients' quality of life and ability to function safely and productively at work and in the community.

This is the second in a series of programs on OSA and ES. New CME activities and important links will be added in the coming months and can be found at www.medscape.com.

Contemplation

You're getting ready to identify and optimally manage obstructive sleep apnea (OSA) and one of its primary symptoms, excessive sleepiness (ES).

As you just heard, OSA is readily diagnosable and very effective strategies are available. To lessen the burden on your practice, Dr. Neubaer described quick and easy screening tools for both ES and OSA, and outlined a team approach involving the patient, family, sleep specialist and PCP.

Over the next few months, remind yourself that adopting this best practice has clear advantages such as minimizing

the immediate and long-term consequences of untreated OSA, including the risk of multiple comorbid conditions and safety implications.

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Preparation

You're ready to identify and optimally manage obstructive sleep apnea (OSA) and one of its primary symptoms, excessive sleepiness (ES).

In the next 30 days, make a plan for implementation. Share it with your staff and work with them to put the right systems into place. Consider:

- How you will screen patients for excessive sleepiness at routine physicals or when co-morbid conditions, physical findings, or patient symptoms suggest an increased likelihood of ES or OSA
- How your EMR can be utilized to identify patients at increased risk for OSA
- Where you will refer patients for a sleep study.

Remind yourself that adopting this approach to early identification and treatment of OSA has clear advantages such as minimizing the immediate and long-term consequences of untreated OSA, including the risk of multiple comorbid conditions and motor vehicle accidents.

This is the second in a series of programs on OSA and ES. New CME activities and important links will be added in the coming months and can be found at www.medscape.com.

Action

You're leading the field by adopting best practices for identifying and optimally managing obstructive sleep apnea (OSA) and one of its primary symptoms, excessive sleepiness (ES).

Continue to watch the literature for advances in testing and treating OSA and ES. And remind yourself that you're doing an important thing for your patients, as well as for the employers and larger community who are benefiting from the increased productivity and decreased risk of accidents your patients are now experiencing.

This is the second in a series of programs on OSA and ES. New CME activities and important links will be added in the coming months and can be found at www.medscape.com.

Maintenance

You've been leading the field as an early adopter of best practices for identifying and optimally managing obstructive sleep apnea (OSA) and one of its primary symptoms, excessive sleepiness (ES). Now, can you help the late adopters in your community get on board sooner rather than later?

Share with them the ways you have successfully integrated OSA and ES screening, referral to a sleep specialist, and follow-up. Encourage them to take the steps that you have to ensure that all patients get the screening and treatment they need.

This is the second in a series of programs on OSA and ES. New CME activities and important links will be added in the coming months and can be found at www.medscape.com.