Primary Care Continuing Medical Education Improves Use of Evidence-Based Practices and Patient Health Outcomes in Shift Work Disorder: A Mixed-Methods, Clinician Case-Control, Patient-Reported Educational Outcomes Study

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ABSTRACT

Background: Shift work disorder (SWD) is a condition that is commonly underdiagnosed and undertreated by primary care providers (PCPs) despite the existence of American Academy of Sleep Medicine guidelines for diagnosis and treatment. Providers of continuing medical education (CME) rarely use both quantitative and qualitative methods in evaluation of the educational effectiveness of CMEs for improving the quality of care for patients with this disorder.
Methods: This is a mixed-methods study to assesses the educational effectiveness of a case based CME webcast activity for improving PCP patient care. Baseline data from nationwide surveys, physician interviews and patient-reported outcome questionnaires were used to inform CME content development. Data were collected every quarter for 15 months after the CME activity. Performance data and patient data were assessed both quantitatively (by t-test) and qualitatively (with pattern-matching) to identify PCP-specific issues.
Results: The small effect size correlation due to CME participation was 0.23, indicating that 16.7% more patients were managed with AASM diagnostic and treatment strategies for SWD than at baseline. Activity participation increased performance in using recommended strategies for SWD over time by 17.7%, or a 58.6% increase in the patients receiving care (baseline n = 82; follow-up n = 36; overall increase $P < .0001$; diagnostic increase $P = .0068$; nonpharmacological treatment increase $P < .0001$; and pharmacotherapy increase $P < .05$). Case-control comparison showed that participants' use of these practices at follow-up (n = 82) was significantly greater overall for diagnosis and treatment than nonparticipants' use of the same practices (n = 16). Mixed methods provided a context for self-reported rates of use of specific strategies from baseline physician interviews. Patients (n = 8) of interviewed PCPs provided pilot data that corroborated or exceeded PCP reported rates of all measures except use of the sleep diary and use of the standard treatment of planned napping. In addition, 75%-100% of patients reported being better in 6 out of 7 measures of improved outcomes than they were before they received a diagnosis.
Conclusions: The CME webcast activity addressed baseline gap data verified by mixed methods, and was associated with an increase in use of evidence based practices for patients with SWD, and with practice changes that extended to sleep disorders other than SWD. Future needs were identified through analysis of mixed data from repeated measures and patient data. Surveys and in-depth interviews were used to provide practice reminders and extend learning among participants. Our study demonstrates the effectiveness of a mixed-methods outcomes research approach in designing CME, one that combines both quantitative and qualitative data assessment.

INTRODUCTION

Shift work disorder (SWD) is a circadian rhythm sleep disorder (CRSD) characterized by excessive sleepiness and insomnia in people who work nonstandard hours – eg, occasional nights, rotating schedules, and permanent night work [1]. SWD continues to be underdiagnosed and undertreated even though 1 in 5 workers in the United States do shift work [2-4]. SWD is prevalent: 32% of night workers and 26% of rotating-shift workers meet the minimal diagnostic criteria for SWD [4,5]. SWD's excessive sleepiness component is associated with poor work performance, impaired quality of life and heightened risk of injury to self and others [2,4,6]. Primary care providers (PCPs) who see patients with these complaints are uniquely positioned to improve the safety and quality of life of patients with SWD if properly diagnosed [2,6,7]. The Institute

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Table 1. American Academy of Sleep Medicine (AASM) Summary Recommendations for the Evaluation and Management of Shift Work Disorder (SWD) [1,9]

Evaluation and Diagnostic Strategies	
AASM-recommended evaluation strategies [9]: • *Indicated (Guideline, or second-level evidence):* o Use of a sleep log or diary is indicated in the assessment of patients with a suspected CRSD* • *Indicated (Option, or third-level evidence):* o Actigraphy is indicated to assist in evaluation of patients suspected of CRSDs, including SWD	Sleep diagnostic approaches lacking evidence for SWD evaluation [9]: • *The Morningness-Eveningness Questionnaire (MEQ)* • Circadian phase markers • Polysomnography, or CPAP** testing: Polysomnography is indicated to rule out another primary sleep disorder in patients with symptoms suggestive of both a CRSD and another primary sleep disorder, but is not routinely indicated for the diagnosis of CRSDs
Other best practices in conducting a complete sleep history, according to an AASM review [1]: • Completing the *Epworth Sleepiness Scale* • Questioning about the work schedule • Questioning about difficulty staying awake • Questioning about difficulty sleeping	
Treatment Strategies	
AASM-recommended treatment strategies [9]: • *Indicated (Standard, or first-level evidence):* o Planned napping before or during the night shift is indicated to improve alertness and performance among night shift workers • *Indicated (Guideline, or second-level evidence):* o Timed light exposure in the work environment and light restriction in the morning, when feasible, is indicated to decrease sleepiness and improve alertness during night shift work o Administration of melatonin prior to daytime sleep is indicated to promote daytime sleep among night shift workers o Hypnotic medications may be used to promote daytime sleep among night shift workers. Carryover of sedation to the nighttime shift with potential adverse consequences for nighttime performance and safety must be considered o Modafinil† is indicated to enhance alertness during the night shift for SWD • *Indicated (Option, or third-level evidence):* o Caffeine (stimulant) is indicated to enhance alertness during the night shift for SWD	

*CRSD = circadian rhythm sleep disorder.
**CPAP = continuous positive airway pressure.
†The agent armodafinil is related to modafinil; however, it was not available when practice parameters were developed.

of Medicine has emphasized the need to expand awareness of SWD among healthcare professionals and has identified opportunities for improving education in the area of sleep medicine [8]. However, PCP management of SWD remains suboptimal despite the American Academy of Sleep Medicine and International Classification of Sleep Disorders recommendations for managing CRSDs [5,7,9]. Continuing medical education can be a valuable tool for translating evidence to practice for clinicians in this scenario [10].

Clinical Practice Gaps

Gaps in clinician knowledge, competence and performance have been studied with regard to SWD [7,11,12]. In this study we selected the following clinical practice gaps as needing additional refinement through pre-initiative, in-depth interviews and address through CME: 1) PCPs are unaware of evidence-based strategies for diagnosing SWD, 2) PCP treatment plans often fail to implement AASM-recommended treatment strategies for SWD, and 3) PCPs often fail to educate patients about the advantages of recommended treatment strategies for SWD in helping with SWD's underlying circadian rhythm misalignment.

Research Questions

This study was designed to assesses PCP utilization of the currently recommended diagnostic and treatment guidelines for SWD (Table 1) [1,2,9,13]. Educational outcomes studied the effects of clinician participation in the case-based CME webcast activity on their diagnosis and treatment approaches for SWD. Identified practice gaps were recast as research questions for this study:

- Will PCPs who participate in a case-based CME webcast report a change in their rates of assessing patients with suspected SWD by using evidence-based diagnostic strategies for SWD, and will patients corroborate PCP use of these strategies?
- Will PCPs report a change in their rates of treating patients with SWD by recommending AASM-aligned treatment strategies after participating in the CME webcast, and will patients corroborate PCP recommendations of these strategies?
- What outcomes will be reported by patients who receive diagnosis and treatment for SWD after their PCPs participate in the CME webcast?
- Will patients whose PCPs participate in the CME webcast show improvement after receiving treatment for SWD?

PCP and patient data, analyzed through a mixed-methods research approach, were used to evaluate the effectiveness of a CME

activity – as well as its related reinforcements and calls for clinical reflection (via surveys and interviews) – for improving primary care for patients with SWD.

METHODS

A CME-certified webcast activity presented a patient case scenario designed to challenge PCPs' diagnostic skills and to increase their implementation of recommended practice guidelines for SWD (full course materials available at http://www.cmeoutfitters.com/pdf/CR-011%20LIVE%20CG.pdf). The case was presented over 11 of the first 16 content slides. The live activity (on August 2, 2012) comprised a 30-minute case discussion (supported by evidence-based data), followed by a 30-minute, question-and-answer session that gave participants the opportunity to discuss cases from their own practices with faculty. Additional target clinicians had access to the entire activity through October 11, 2013, via an on-demand, enduring webcast module. Both live and enduring modules were available in web-based, podcast, and telephone-only formats upon participants' free registration to use the CME contents at either of 2 websites.

The slides presented a predisposing, case-based, learning exercise that centered on a 45-year-old patient with the chief complaint of excessive tiredness at work (Table 2). In Visit 1, the patient's history, physical examination findings, and scores on questionnaires were given. In the case scenario, the PCP did not question the patient about his work schedule and instead ordered a sleep study for possible obstructive sleep apnea. Only after sleep study results showed no clinically significant sleep apnea did the PCP ask the patient about his sleep patterns, and found the patient worked rotating night shifts, which was consistent with possible SWD. This illustrated that one question about work schedules should have been included in the occupational history, especially given the patient's primary complaint. Doing so might have prevented unnecessary referral and led to an earlier diagnosis. Faculty members emphasized several points in discussing Visit 1: a) concerns regarding drowsy driving, b) use of the *Epworth Sleepiness Scale* (*ESS*) in evaluating excessive sleepiness, c) the link between sleep disorders and cardiovascular consequences if hypertension is diagnosed, and d) the treatment plan for the sleep complaint.

Table 2. Case Patient and Office Visit Details Presented in the 60-Minute CME Webcast Activity

Visit 1
Chief Complaint/History of Present Illness • Patient is a 45-year-old, divorced man who seeks care from his primary care doctor for being sleepy at work and on his commute home • "I can't stay awake on my commute home and sometimes on the job. When I drive home, I open the window."
Exam • BP: 148/92 • Overweight (Height: 5'9"; Weight: 210 lbs.; BMI: 30) • Moderately large neck circumference
Work-Up • Not asked specifically about work • Given *Epworth Sleepiness Scale* (*ESS*); score = 14 • Hypertension (HTN) and cardiovascular risk assessment
Working Diagnosis • Obstructive sleep apnea (OSA) • Essential HTN (has had 2 other elevated readings in the past 3 months)
Plan • For sleep complaint o Tell him not to drive home if he can make other arrangements or to stop and nap if he is very sleepy o Sleep study o Sleep diary, improve sleep hygiene • For HTN o Metabolic panel; BUN/creatinine, lifestyle modification; nutrition referral; start beta blocker
Interim
• Sleep study results inconsistent with OSA, but consistent with shift work disorder (SWD) o Apnea hypopnea index: 4.5 o Sleep onset latency: 1 minute o Sleep efficiency: 95% for first 2 hours, then awake for next 2 hours
Visit 2
Interview • You noted the SWD pattern to his sleep study, so you ask about his work • He provided details that he is a night shift worker, 4 of 7 days a week • Has been compliant with HTN medication and has started exercising; has lost 2 lbs.
Exam • BP: 136/86 • Weight: 208 lbs.
Diagnosis • SWD
Plan • Treat SWD per AASM guidelines, including method of teaching patients about circadian clock • Nonpharmacological strategies to shift the circadian clock (eg, light boxes at work, sunglasses on way home, and sleep in totally dark room)

Study Groups

PCPs were identified as clinicians in an opt-in database. Eligible scopes of practice were medical doctors (MDs), osteopaths (DOs),

physician assistants (PAs), advanced nurse practitioners (ANPs) who self-identified as primary care providers. Two mutually exclusive PCP groups contributed baseline and follow-up data via interviews, surveys, and tests. Patients of participants in the group of interviewed physicians were surveyed anonymously. Nonparticipating PCPs were recruited for a control group.

All participants could request up to 1.0 *AMA PRA Category 1 Credit*™. Some participants and nonparticipants received gift card incentives for completing surveys, and interviewed participants received honoraria (Table 3). Because patients submitted anonymous data and could not be identified, no incentives were offered to them. To encourage physician and patient participation, the 20 interviewed physicians who recruited patients were offered a blanket incentive, to be issued if 20 patients submitted forms.

Table 3. Educational Outcomes Assessment Tools by Study Group

Participants Who Requested Credit and Completed Related Testing and Surveying
• Timing: Immediate • 5-item, knowledge-based posttest data • Comments on clinical applicability of activity content • Affirmations of commitments to carry out recommended practices
Interview Group, Participants, With Physicians' Participation Confirmed
• Timing: 3-month snapshot with 2 physicians, to support outcomes planning; full group interviews at 9 months • Incentive: $200 for completing pre-activity interview, CME Webcast, and commitment to complete post-activity interview • Reprise of portions of the pre-activity interview Discussion Guide, to garner practice change data
Survey Group, Participants
• Timing: 12 months (competence) and 15 months (performance) • Recruitment for 12- and 15-month surveys was limited to post-test live and archive participants through the end of the 10th month • Incentive (15-month only): $25 Amazon.com gift card for completing all required questions • Competence survey with clinical scenarios and an open-ended question asking PCPs to choose a treatment option and describe why it works and how they would instruct patients to use it • Performance survey gathering self-assessed performance-in-practice and self-efficacy data, as well as barriers to change or ongoing gaps
Survey Group, Nonparticipants (Validated Control Group)
• Timing: 15 months (performance), simultaneous with participant survey • Incentive: $10 Amazon.com gift card for completing all required questions • Performance survey gathering self-assessed performance-in-practice and self-efficacy data, as well as any barriers or ongoing gaps
Patient Group (Sample of Interview Group PCPs' Patients Under Care for SWD)
• Timing: 6 months • Incentive: All 20 interviewed physicians were offered $15 Starbucks gift cards if researchers received complete surveys from 30 discrete patients • Patient-reported outcomes (PRO) questionnaires distributed by PCPs to their patients with SWD • Content details and additional methods described in text

Assessments - Baseline Surveys and Interviews

Pre-activity data from a nationwide Clinical Practice Assessment Questionnaire (CPAQ) and in-depth interviews were used to inform faculty development of activity content. The CPAQ was designed and distributed in June and July of 2012 (via Survey Monkey) to a national audience of PCPs who manage patients in the workforce. This 35-item questionnaire (26 questions on content or practice and 9 on demographic or clinical practice characteristics) provided data on SWD awareness, knowledge, attitudes, and performance. The interviews, conducted in June 2012, were 20- to 30-minute, recorded telephone sessions using a structured discussion guide with both open- and close-ended questions. A nonclinical research team member conducted interviews after receiving instruction on standardized interview delivery methods.

Assessments - Outcomes Surveys and Interviews

Assessments of live and enduring activity participant groups were done at 3, 6, 9, 12, and 15 months after the live activity date (August 2, 2012). This schedule was used to avoid creating long surveys or discussions seen in the pre-activity tools and to avoid having performance-related questions provide hints or answers to case-vignette questions (tools described in Table 3). Questions distributed across these tools covered SWD epidemiology and clinical characteristics, clinician attitudes, evidence-based diagnostic and treatment practice patterns, and reflection. Some interview questions were matched in the surveys, as the groups were exclusive. Because of the large volume of data collected, this study utilized only those specific items of performance-related and patient-reported data needed to answer the research questions. All tools supported serial education and reinforcement through repeat measures and contacts, and influenced 9-month performance data from interviewed PCPs and 15-month follow-up performance data from surveyed PCPs.

Patient-Reported Outcomes (PRO) Questionnaire

The custom PRO questionnaire assessed overall patient satisfaction with care, effectiveness of treatment, the degree to which the clinician was providing care based on AASM evidence and guidelines, and patient understanding of and adherence to SWD treatment. The patients were not informed of the expected strategies of evidence-based care per AASM recommendations; they were instead asked to evaluate, in plain language, the extent to which such care was

provided, to elicit data for comparison. For example, the question, "Did your doctor ask you to keep a sleep diary for at least one week, where you wrote down what time you were sleeping and getting up every day?" was reported as the strategy, "Patients asked to keep sleep diary."

The form was distributed to patients at 6 months post-activity, online and on paper, via the offices of participating PCPs. The PRO questionnaire specified that patients should have *International Classification of Diseases* (9th edition; *ICD–9*) diagnostic code 327.36 (circadian rhythm sleep disorder, shift work type) [14]. Patients voluntarily completed the paper questionnaire and returned it to the physician's office or accessed an identical online survey through Survey Monkey (without source-computer tracking). PCPs were assured that researchers would not report anonymously collected patient data derived from a PCP office's facsimile machine to any outside organization.

Qualitative Analyses

Physician responses to 4 pre-activity interview questions (2 diagnosis, 2 treatment) were uploaded to *NVivo10* software. To support investigator triangulation [15], one of the authors (who did not conduct interviews), read through each set of responses and, using the constant comparative method, identified broad themes, patterns, and trends in and across responses.

Quantitative and Statistical Analyses

For all educational outcomes measures, the independent variable was participation in the case-based CME webcast on SWD diagnosis and treatment. The performance outcomes expectation was the recommendation of a AASM-aligned strategy. Self-assessed performance rates regarding diagnosis were included if PCPs (both participants and nonparticipants) affirmed that they currently had patients with complaints of excessive sleepiness. Rates regarding treatment were included if responding PCPs affirmed having patients with SWD. The significance level for quantitative data was set at $P = .05$. Cohen's d and the effect-size correlation ($r_{dv,iv}$) of the grouped participant data at pre- and post-activity assessments were calculated to evaluate the effectiveness of CME participation in changing PCP diagnosis and treatment of SWD.

To evaluate for performance change over time, combined pre-activity raw data from the CPAQ and interviews were compared with combined post-activity raw data from the 9-month follow-up interview and 15-month follow-up survey groups; questions at each time frame were identical, except in rare cases that were otherwise noted. Included participants were not paired but all met eligibility requirements for the PCP target population, and assessment methods ensured that pre-activity data collection dates preceded follow-up dates. Individual metrics were analyzed for statistically significant changes by the two-tailed t-test for independent samples (using Microsoft Excel 2010 for data preparation and GraphPad QuickCalcs online: http://graphpad.com/quickcalcs/ttest1/?Format=C). Combined metrics indicating overall use of care strategies were analyzed to determine the educational effect size of the activity in changing performance, using Becker's online tool for calculating Cohen's d and effect-size correlation ($r_{dv,iv}$) using means and standard deviations (http://www.uccs.edu/lbecker/index.html).

PRO data were summarized mathematically. PCPs in the surveyed group were omitted from the analysis of relationships between PCP and PRO data because their patients were not given an opportunity to respond.

RESULTS

The effect-size correlation of the change in the percentage of patients with whom PCPs carried out evidence-based diagnostic and treatment practices as a result of participation in this activity was 0.23. Taking all diagnostic and treatment approaches in this study together, patients of participants received significantly higher recommendation rates of evidence-based care strategies than patients of nonparticipants received. The mean percentage of patients of participants who used all evidence-based strategies was 19.1 percentage-points higher than for patients of nonparticipants, corresponding to 66.0% more patients of participants than of nonparticipants ($P < .0001$; participant follow-up mean 48.0% of patients, SD 38.9%, n = 36; nonparticipant mean 28.9% of patients, SD 32.7%, n = 16). Follow-up data also showed that participation in the CME activity was associated with a 17.7 percentage-point increase from baseline, which corresponded to a significant (58.6%) increase in patients receiving care, or more than half again as many patients as before CME participation ($P < .0001$; baseline mean 30.3% of patients, SD 34.6%, n = 82; follow-up mean 48.0% of patients, SD 38.9%, n = 36).

Respondents to Interviews, Surveys, and Tests

The data below detail response counts for specific items in surveying and testing tools. Sample sizes for whole tools were as follows: baseline target population data from the nationwide survey, or CPAQ, n = 62; pre-activity participant interview, n = 20; 15-month, follow-up outcomes survey, n = 18; follow-up post-activity participant outcomes interview, n = 18; and patients of interviewed participants, n = 8 (pilot data); sample sizes of additional tools shown in Table 3 but not reported are beyond the scope of this paper. At the 9-month follow-up, all 18 interviewed physicians had identified and diagnosed SWD in their patients during the previous 6 months. SWD was diagnosed in a median of 3 patients (interquartile range 2-10 patients) and a mean of 7.8 patients; the higher mean indicates that a few physicians had diagnosed many more SWD cases than most physicians in this group. Two of 20 physicians in the interview group could not be reached for follow-up.

Diagnostic Strategies: Quantitative Outcomes

Table 4 summarizes self-assessed performance levels – the percentage of patients reporting excessive sleepiness in whom PCPs used evidence-based diagnostic strategies for SWD. Before the activity, guidelines for the identification and diagnosis or treatment of SWD were familiar to 38.7% of clinicians in the nationwide CPAQ (n = 62) and 10.0% of clinicians participating in the interviews (n = 20). Interviewed physicians had widely varying strategies for evaluating and diagnosing suspected SWD; these largely focused on patient history. PCPs in the CPAQ group had higher self-assessed rates than interviewed PCPs in terms of questioning patients about difficulty sleeping, difficulty staying awake, and the type of shifts worked. History-taking that included patient work schedules showed improvement among interviewed PCPs. Pre-activity data validated the predicted performance gap; 56.5% of CPAQ PCPs and 40.0% of interviewed PCPs had asked patients about work shifts, which for both groups was less often than they had asked about difficulty staying awake and far less often than they had asked about difficulty sleeping. At 9-month follow-up, 50.0% of interviewed PCPs were asking about work shifts (n = 18) which was close to the CPAQ PCP group baseline rate of 56.5% (CPAQ data were not included in either the change analyses or in Table 4, which presents data as a percentage of patients, because this question had no counterpart in the 15-month follow-up survey).

Interviewed PCP-reported rates of implementation of AASM diagnostic and treatment practices varied widely from the percentages of patient-reported rates of these practices (Table 5). Among diagnostic

Table 4. Self-Assessed Performance Levels: Percentage of Patients in Whom Primary Care Providers Used Evidence-Based Diagnostic Strategies [1,9] for Shift Work Disorder in Patients Reporting Excessive Sleepiness

Diagnostic Strategy	Baseline Rate: Mean % (SD)	Follow-Up Rate: Mean % (SD)		Participant* Rate Change Over Baseline Population† Rates: Post- Minus Pre-Activity Rates			Between-Group Comparison: Participant* Minus Nonparticipant‡ Rates		
	Target Population (n = 82)†	Participants (n = 36)*	Nonparticipants (n = 16)‡	Difference (percentage-points)	Change Over Time (%)	Significance§ (*P* value)	Difference (percentage-points)	Magnitude (participant % versus nonparticipant)	Significance§ (*P* value)
Patients (%) Questioned About Work Shift¶	32.0% (40.2%)#	43.7% (32.2%)#	--	11.7	**36.5% increase**	No (*P* > .05)	--	**--**	--
Patients (%) Asked to Keep Sleep Diary	31.3% (36.4%)	46.8% (40.0%)	28.2% (32.1%)	15.5	**49.7% increase**	Yes (*P* < .05)	18.7	**66.3% greater**	No (*P* > .05)
Patients (%) Asked to Complete *Epworth Sleepiness Scale*	23.8% (35.0%)	53.8% (37.3%)	27.3% (28.7%)	30.0	**125.9% increase**	Yes (*P* < .0001)	26.5	**97.3% greater**	Yes (*P* < .02)
Summary Data									
Between-Group Summary (Mean use, two diagnostic strategies with nonparticipant data)#	--	50.3% (38.6%)	29.9% (19.9%)	--	**--**	--	20.4	**68.4% greater**	Yes (*P* < .01)
Participant Change Summary (Mean use, all three# diagnostic strategies)	28.0% (35.0%)	49.0% (37.3%)	--	20.9	**74.7% increase**	Yes (*P* < .0001)	--	**--**	--

*Participant outcomes data: follow-up survey (up to 15 months post, n = 18) + interview (9 months post, n = 18). See also note # below.
†Baseline population data from the nationwide survey, or CPAQ (n = 62), + interview (n = 20).
‡Nonparticipant survey for outcomes comparison (15 months).
§Two-tailed *t*-test for independent samples.
¶Pre-activity question phrased with yes/no answer choices for the question, "Do you routinely ask your patient about what shift they work?" For comparison with post-activity data, "no" responses transformed to 0.0% of patients, and "yes" responses transformed to 80.0% as the lower end of an informed estimate of "routine" as a range from 80%–100%.
#Data regarding questioning about work shift from participant interviews only: n = 20 pre-activity interviews; n = 18 post-activity interviews. Pre-activity CPAQ data omitted because the follow-up survey lacked the counterpart question.

strategies, asking about the work shift was highest in patient-reported rates and highest in the difference between patient- and PCP-reported rates. With the other 2 diagnostic strategies, patient- and PCP-reported rates were more consistent with each other, but interestingly, the group reporting the higher rate of each strategy was reversed.

Qualitative Context of Baseline Diagnostic Practices

Interview analysis showed PCP time constraints and either clinical recognition or classification of SWD as key factors associated with the low baseline clinical suspicion for SWD shown in CPAQ data. In interviews, physicians discussed how the differential diagnoses of sleep complaints – eg, sleep apnea, obesity, benign prostatic hyperplasia, depression, and the possible comorbidities associated with sleep disruption – highlighted competence gaps in exploring sleep complaints. Additionally, although PCPs were aware of the importance of classifying sleep complaints, they noted that classification was not a clear-cut process because symptoms could be primary or secondary.

The main evaluation strategy that physicians reported using for patients who presented with sleep complaints was taking a sleep or occupational history. Physicians predominantly used a conversational style of questioning to conduct these histories, which they defined as "good" or "detailed" if they included the following: a social history (family disruption, problems at work); the nature of the complaint (excessive drowsiness, irritability, fatigue or minor accidents); the presence of comorbidities; patient strategies to deal with disrupted sleep; and questions about sleep routine. Notably, questions about patient strategies and routine relate to treatment more than to diagnosis.

Treatment Strategies: Quantitative Outcomes

Table 6 shows PCP performance as the percentage of patients to whom PCPs recommended specific, AASM-aligned treatment strategies for SWD. Summary results for all 3 nonpharmacological, all 3 pharmacological, and all 6 multimodal treatments are presented for participants' practice changes over time and participants' rates of recommending these therapies over nonparticipants' rates (all were greater).

Before the activity, many treatment strategies were underused. One third to half of PCPs (n = 82) recommended 4 AASM-aligned therapies to none of their patients with SWD – standard practice, planned napping (40.2%); guideline practice, timed lighting (45.1%) and morning light restriction (50.0%); and practice option, caffeine (36.6% of PCPs). PCPs overall used prescription-based pharmacological management with more patients than they used caffeine or nonpharmacological strategies. Among the 20 interviewed physicians, 40.0% recommended pharmacotherapy to 80.0% of patients with SWD, and all had employed pharmacotherapy in at least some

Table 5. Differences in Post-Activity Usage of American Academy of Sleep Medicine-Aligned Diagnostic and Treatment Strategies [1,9] by Interviewed Primary Care Physicians, as Reported by Those Physicians (n = 18) and Their Patients With Shift Work Disorder Who Were Asked Plain-Language Questions Regarding These Strategies (n = 8)

Category	Strategy	Use by PCPs per PCP Report*: Mean patients (%) with whom practice was used	Use by PCPs per Patient Report†: Patients (%) stating that PCP recommended use	Difference (Percentage-Point): Patient-report† minus PCP-report*
Diagnostic Strategy	Patients questioned about work shift	43.6	100.0	56.4
	Patients asked to keep sleep diary	46.2	37.5	-8.7
	Patients asked to complete *Epworth Sleepiness Scale*	49.6	62.5	12.9
Nonpharmacological Therapy	Planned napping	58.9	37.5	-21.4
	Timed light exposure	57.5	62.5	5.0
	Morning light restriction after night shift‡	36.5	100.0	63.5
Pharmacological Therapy	Administration of melatonin	18.2	100.0	81.8
	Modafinil [or armodafinil]§	42.9	75.0	32.1
	Caffeine (stimulant)	46.2	87.5	41.3

*Interviewed PCP report at 9 months after PCP participation in CME webcast.
†Patient report regarding interviewed PCP usage at 6 months after PCP participation in CME webcast.
‡Light restriction for night-shift workers, measured as "Recommend[ation of] using dark glasses during your patient's morning commute home after a night shift."
§The agent armodafinil is related to modafinil; however, it was not available when practice parameters were developed.

Table 6. Self-Assessed Performance: Percentage of Patients in Whom Primary Care Providers Recommended American Academy of Sleep Medicine (AASM)-Aligned Treatment Strategies [9] for Shift Work Disorder

Mode	Evidence (AASM Level)	Treatment Strategy	Baseline Rate*: Patient (%) Mean (SD)	Follow-Up Rate: Patient (%) Mean (SD)		Participant† Rate Change Over Baseline Population Rates*: Post- Minus Pre-Activity Rates			Between-Group Comparison: Participant† Minus Nonparticipant‡ Rates		
			Target Population (n = 82)	Participants (n = 36)†	Nonparticipants (n = 16)‡	Difference (percentage-points)	Change Over Time (%)	Significance§ (*P* value)	Difference (percentage-points)	Magnitude (participant % versus nonparticipant)	Significance§ (*P* value)
Nonpharmacological	Standard	Planned napping	24.5% (30.7%)	53.8% (40.2%)	40.9% (36.0%)	29.3	**119.4% increase**	Yes (*P* < .0001)	12.8	**31.3% greater**	No (*P* > .05)
	Guideline	Timed light exposure	29.1% (34.8%)	59.1% (39.8%)	34.7% (33.7%)	30.0	**103.1% increase**	Yes (*P* < .0001)	24.5	**70.5% greater**	Yes (*P* < .05)
		Morning light restriction after night shift¶	20.4% (30.9%)	43.0% (38.9%)	16.9% (28.0%)	22.7	**111.3% increase**	Yes (*P* = .001)	26.1	**155.0% greater**	Yes (*P* < .03)
Pharmacological	Guideline	Administration of melatonin	38.9% (34.9%)#	37.9% (39.7%)	30.4% (25.1%)	-1.0	**2.6% decrease**	No (*P* > .05)	7.4	**24.4% greater**	No (*P* > .05)
		Modafinil [or armodafinil]**	38.9% (34.9%)#	46.5% (38.9%)	32.2% (14.2%)	7.6	**19.5% increase**	No (*P* > .05)	14.2	**44.2% greater**	No (*P* > .05)
	Option	Caffeine (stimulant)	28.3% (32.9%)	45.2% (39.7%)	32.2% (32.4%)	16.9	**59.7% increase**	Yes (*P* < .02)	13.0	**40.3% greater**	No (*P* > .05)
Summary Data											
Nonpharmacological: Summary		Mean use, all 3 strategies	29.7% (34.4%)	52.1% (39.8%)	31.1% (33.7%)	22.4	**75.5% increase**	Yes (*P* < .0001)	20.9	**67.2% greater**	Yes (*P* = .002)
Pharmacological: Summary		Mean use, all 3 strategies	33.6% (34.2%)††	43.2% (39.2%)	31.6% (30.4%)	9.6	**28.6% increase**	Yes (*P* < .05)	11.6	**36.6% greater**	No (*P* > .05)
Multimodal Treatment Summary: Mean use of all 6 treatment strategies			31.4% (34.3%)††	47.6% (39.7%)	31.4% (31.9%)	16.2	**51.6% increase**	Yes (*P* < .0001)	16.3	**51.8% greater**	Yes (*P* = .0005)

*CPAQ (n = 62) + interviews (n = 20).
†Participant follow-up: follow-up survey (15 months post, n = 18) + interviews (9 months post, n = 18).
‡Nonparticipant survey for outcomes comparison (15 months).
§Two-tailed *t*-test for independent samples.
¶Light restriction for night-shift workers, measured as "Recommend[ation of] using dark glasses during your patient's morning commute home after a night shift."
#CPAQ and pre-activity interview tools combined data-collection on use of all pharmacological treatment options except caffeine (or other over-the-counter stimulants) in one question, asking about "medical management with pharmacologic agents." Follow-up questions separated agents that promote sleep from agents that promote wakefulness.
**The agent armodafinil is related to modafinil; however, it was not available when practice parameters were developed.
††Because CPAQ and pre-activity interview tools gathered data on combined use of all noncaffeine pharmacotherapies, analysis of the resulting pre-activity dataset on combined medical management was appropriately counted once in comparison with the separate, post-activity datasets regarding sleep- and wakefulness-promoting agents.

patients. Conversely, just 10.0% of the 62 surveyed PCPs recommended pharmacotherapy. This group contrast was the opposite of that seen for caffeine: interviewed PCPs had recommended caffeine intake at far lower rates (65.0% recommended caffeine to zero patients) than surveyed PCPs had (27.0% to zero patients).

Again at baseline, interviewed PCPs had recommended that patients use AASM-aligned and non-aligned, sleep-promoting agents – melatonin, diphenhydramine, or nighttime-formulated acetaminophen – to help patients sleep far more often than they had been recommending evidence-based

wakefulness-promoting agents or caffeine to help a patient stay awake through a nonstandard shift. Follow-up interviews showed usage of guideline-recommended practices – the reverse of the baseline prescribing pattern – the percentage of wakefulness-promoting agents recommended was higher than the percentage of sleep-promoting agents, with 72.7% of all agents recommended at follow-up targeted at promoting wakefulness, or 134.6% higher levels. Survey group outcomes data also showed that the same percentage of PCPs were recommending wakefulness-promoting agents to over 80% of patients as were recommending sleep-promoting agents (with equivalent rate increases from a baseline of 9.7% by 19.7 percentage-points, or 203.9%). Surveyed PCPs also increased their rates of recommending caffeine to over 80% of patients, from a baseline of 9.7% by 13.9 percentage-points, or 143.1%.

Differing rates of treatment recommendations according to interviewed PCPs and their patients are reported in Table 5. Although planned napping is the only 1 of 6 evidence-based treatments with standard first-level evidence, this was the only therapy where fewer patients reported being recommended that therapy than the mean percentage of patients to whom PCPs reported they recommended that therapy – with a 21.4 percentage-point difference. According to patients, PCPs more often recommended the other nonpharmacological therapies, related to timed lighting (bright light exposure during the shift and light restriction in the morning after a night shift). Far more patients than PCPs reported recommendations of morning light restriction.

Patients reported that PCPs recommended pharmacotherapy with sleep-promoting agents such as melatonin, prescription wakefulness-promoting agents such as modafinil, and caffeine stimulants at universally higher rates than reported by interviewed PCPs. Melatonin showed a greater difference in reported rates between groups than wakefulness-promoting agents or caffeine showed.

Outcomes data in Table 6 showed that participants' rates of recommending all AASM-aligned treatment strategies for SWD improved over baseline, with the greatest increases occurring in the nonpharmacological strategies of planned napping and timed light exposure during the work shift. Participants significantly increased their overall use of nonpharmacological therapies, and increased it to a level that also significantly exceeded use of these therapies by surveyed nonparticipants; of the 3 nonpharmacological therapies, the higher usage rate of planned napping by participants over nonparticipants was not significantly different, while usage rates of timed light exposure and morning light restriction after the night shift were significantly different between groups.

Qualitative Context of Baseline Treatment Practices

In pre-activity interviews, 5 PCPs reported using these recommended non-pharmacological strategies: bright light exposure/light box during waking hours, napping during the night shift, fixed bedtime, darkened room at bedtime, and generalized "sleep hygiene." One physician recommended exercise, which is not an AASM-aligned therapy for SWD. Three PCPs discussed re-engineering work schedules, eg, changing jobs or avoiding shift work, to address the root causes of SWD, and also discussed implementing recommended nonpharmacological strategies to help patients with the circadian rhythm misalignment, or as one physician put it, to "reset their clock."

Seventeen of 20 PCPs reported that their initial approach to treatment included pharmacotherapy either alone or in conjunction with nonpharmacological strategies. Two PCPs noted that a patient's expressed desire for medication was sometimes a trigger for prescribing pharmacotherapy.

Patient Health Outcomes

Patients (n = 8) unanimously agreed that top goals were met: 100% stated that they know what SWD is and how their recommended treatments will help them manage SWD symptoms, and that they feel more in control of their sleep problems because they talked to their doctors about those problems. At least three quarters of patients of interviewed physicians were better in 6 of 7 measures of improved health outcomes (Table 7). At least half responded that they were better in terms of all 7 measures. Questioning on adherence to treatment showed that 37.5% of patients were still doing what their doctor recommended most or all of the time, and 62.5% were doing so about half of the time.

DISCUSSION

One of the strengths of this study is that several forms of assessment are used to extend learning while simultaneously gathering outcomes data on the effectiveness of the CME webcast activity. The mixed-methods assessment approach both incorporates quantitative data from surveys and qualitative and quantitative data from in-depth interviews based on structured discussion guides, along with patient-reported pilot data about PCP practices, patient understanding of SWD, and patient wellness with regard to sleepiness and shift work.

Quantitative and qualitative data show that excessively sleepy patients were more likely than before their PCPs participated in the CME webcast to receive accurate diagnoses, and patients diagnosed with SWD were more likely to feel better, have improved quality of life, and live more safely. This finding is consistent with PRO data submitted by patients of interviewed, participating PCPs. Using the mixed-methods approach provided the variety and contextual interpretation of quantitative data that informed development of follow-up outcomes tools for this study.

Considering quantitative data alone, the practical meaning of the education's effect-size correlation (0.23) shows that participation in this webcast activity was associated with improved primary care performance

in practice, reaching 16.7% more patients. Interpretation of the effect-size correlation shows what the statistician Cohen hesitantly defined as small – he stated that "there is a certain risk inherent in offering conventional operational definitions for those terms for use in power analysis in as diverse a field of inquiry as behavioral science" [16,17]. A more meaningful interpretation is provided by the percentage of nonoverlapping data before and after education; for this initiative, 16.7% more patients were managed with AASM-aligned strategies than were managed with these strategies at baseline. The measured effectiveness of this CME activity is supported by changes in the means of performance rates that were statistically significant for overall diagnosis and for the 2 individual diagnostic strategies that had larger samples. Changes in the means of performance rates were statistically significant for combined nonpharmacological and combined pharmacological therapies, and for 4 of 6 individual treatment strategies. CME participation changed PCP performance in using AASM-aligned care practices; it was also associated with greater use of these practices than use seen among nonparticipants.

Physicians in the interview group had shown lower baseline use of evidence-based practices than the broader CPAQ group, yet their interest had been high. Educational outcomes illustrate robust improvements that narrow this group's gaps: 95% of physicians agreed before participating that PCPs had lacked awareness about the availability both of diagnostic tools and of office tools or aids to appropriately treat SWD. One physician said of guidelines, "I have read them but I can't name them." Overall, data showed greater change in this group and self-selection for the more rigorous requirements of the study, with 2 interviews and required participation in the CME activity.

The interviews and surveys served as techniques to provide reminders and extend learning in the participant group. Both pre-activity and follow-up surveys provided timely reminders of clinical evidence and AASM-aligned approaches for managing SWD. This reinforcement was especially ensured for interviewed PCPs who received honoraria for completing several phases of participation in the webcast and interviews. The pre-activity interview, with AASM-recommended strategies incorporated in the discussion guide, predisposed interviewed physicians to learning even before the webcast incrementally introduced a case and thus predisposed all participating PCPs to problem-based learning. Because interviewed PCPs not only experienced follow-up interviews but also reviewed the PRO forms they were asked to distribute, exposure to outcomes tools further facilitated learning. Many interviewed PCPs said that this study had improved their care for patients with sleep complaints and that the regular follow-ups reinforced the education, and patients corroborated participants' self-assessed rates in using evidence-based practices in diagnosing and treating SWD.

One of the interviewed PCPs encapsulated the relevance of these educational outcomes to improving clinical competence and performance in the following comment: "I've used this experience to educate resident doctors and I'm teaching 8 new residents per year." The sharing of content with residents demonstrates how this CME activity's downstream educational benefits can improve patient health outcomes.

Educational Outcomes: Diagnostic Strategies

Evidence-based diagnostic strategies had low baseline usage, which led PCPs to inconsistent questioning and missed diagnoses. Further, although 1 in 4 physicians highlighted time as a barrier to recognizing and evaluating patients with suspected SWD, nonetheless these physicians reported using detailed and time-consuming sleep/occupational history questioning in their evaluation process, which ranged from conversational questioning (using a "checklist in my head") at one extreme to a formal, 6-page review that patients completed at home at the other. PCPs

Table 7. Patient-Reported Health Outcomes From Patients With Shift Work Disorder Treated by Interviewed Primary Care Physicians, Six Months After Those Physicians Participated in CME on Shift Work Disorder (n = 8)

Question Asked of Patient	Optimal Answer	Number of Optimal Responses	Percentage of Optimal Responses
Do you think that getting treatment [for shift work disorder] has helped you do a better job at work?	Yes	8	100.0%
Are you less sleepy at work?	Yes	7	88.0%
Do you fall asleep when you don't mean to?	No	4	50.0%
Do you FALL asleep more easily when it's time to sleep?	Yes	6	75.0%
Do you STAY asleep more easily when it's time to sleep?	Yes	7	88.0%
Do you think that your doctor's recommendations [for shift work disorder] have helped you get more sleep or better sleep?	Yes	8	100.0%
Would you say that your life is better overall because of your treatment [for shift work disorder]?	Yes	8	100.0%

using history-taking as their top baseline strategy often missed questions or diagnoses.

The low percentage of questioning about work shifts provided the stimulus for educational planners to omit questioning about the work shift in Visit 1 of the case scenario, with the relevance of the omission revealed in Visit 2. The unanimity of patients who reported being better after treatment shows that interviewed physicians likely made the correct diagnosis with these patients. It appears that these PCPs did so using the strategies of asking about work shifts and objectively assessing the patient's level of sleepiness with the *ESS*, rather than using a sleep diary that requires a second office visit for evaluation, which can delay diagnosis.

The *ESS* is recommended over baseline questioning strategies. Under-utilization of evidence-based diagnostic tools and reliance on strategies that lack validation undoubtedly pose barriers to eliciting core information in clinical practice. In contrast, using the evidence-based *ESS* systematizes lines of questioning that help identify a primary or secondary sleep disorder and whether findings meet diagnostic criteria for SWD. Because participants significantly increased their rate of using this tool by 125.9% over baseline, it is clear that they agreed with its usefulness in routine clinical practice. Ultimately, PCPs learned that they can save time and reach an accurate diagnosis by asking about work schedules and by adding the *ESS* and sleep diaries to their history-taking practices.

Educational Outcomes: Treatment Strategies

Pre-activity interviews showed that many PCPs did not know the AASM guideline-recommended therapies for SWD, yet most started pharmacotherapy at diagnosis, alone or in conjunction with nonpharmacological therapies. At follow-up, participating PCPs were using guideline-recommended strategies at higher rates.

Baseline interviews showed PCP preference for recommending sleep hygiene and schedule changes over pharmacotherapy, and outcomes data showed the great increases in recommendations of planned napping, timed bright lighting, and light restriction exceeded increased usage of pharmacotherapies and are probably also due to lower baseline usage of nonpharmacological therapies.

Use of pharmacological therapies also increased among participants. The decrease in recommendations of melatonin was not statistically significant and may be due to a questioning irregularity. Additionally, the slightly but not significantly higher recommendation of melatonin by participants than by nonparticipants suggests that change data in participants' usage of melatonin should be disregarded. All surveyed patients reported being recommended a sleep-promoting agent, suggesting that the interviewed PCP group had higher performance on this measure than others.

Among pharmacological therapies, participants recommended wakefulness-promoting agents such as modafinil most. The increase seen with these agents was not statistically significant, however, which again may be attributed to the same questioning irregularity reported for melatonin. The difference between participant and nonparticipant use of wakefulness-promoting agents was double that of the difference in use of sleep-promoting agents, suggesting that participants found wakefulness-promoting agents more efficacious than sleep-promoting agents for their patients. However, patient-reported data showed that interviewed PCPs recommended sleep-promoting agents to more patients than they recommended wakefulness-promoting agents. Further study of pharmacotherapy prescribing patterns in SWD is warranted to explore this discrepancy.

Patient-reported use of various SWD therapies provides insights into treatment efficacy and PCP treatment preference. Studying post-activity treatment preference of interviewed PCPs is particularly interesting because the pre-activity interview could itself influence practice. In post-activity assessments, with the notable exception of planned napping, interviewed PCPs reported recommending evidence-based therapies to lower numbers of patients than the patients themselves reported. This suggests that the interviewed physicians who treated these patients and who were enthusiastic about following evidence-based practices were also enthusiastic about distributing PRO questionnaires to patients.

Patient-reported data showed that interviewed PCPs recommended planned napping before the shift to only one third of patients – not more than half, as reported by these PCPs – and none recommended napping during the shift. One interpretation of patient-reported low recommendation of planned napping may be that PCPs perceive this behavioral modification as the hardest to implement in everyday life; nevertheless, the patients who were recommended planned napping adhered to this therapy. Patient-reported PCP recommendation of using bright lights during the shift corroborated participants' accounts of this recommendation, but many patients have difficulty implementing it, suggesting an increased need for pharmacological options. The high, patient-reported rates of PCP recommendations of pharmacotherapy suggest that interviewed PCPs viewed these agents as efficacious; pharmacotherapy may have been more attractive to interviewed PCPs than to PCPs overall.

Participants' self-reported use of 2 of 3 nonpharmacological therapies was significantly higher than nonparticipants' self-reported use of the same therapies. Moreover, despite the pre-activity attractiveness of efficacious pharmacotherapy to the interviewed PCP group, rates of nonpharmacological therapy in outcomes measurements were higher among participants than among nonparticipants. These findings indicate that CME satisfied a pre-activity educational need for multimodal therapy for SWD.

Surveyed patients, whose PCPs recommended evidence-based treatment for SWD, reported being satisfied with their

care. Two thirds of all patients returning an outcomes questionnaire reported that their PCPs had recommended 5 of 6 evidence-based treatment strategies – all except planned napping. Physician recommendations for multimodal treatment of SWD were useful to patients, a finding that helps explain patient-reported adherence to treatment, which in turn resulted in improved health-related outcomes during waking and sleeping hours.

Study Limitations

The lack of statistically significant change in history-taking to assess the work shift was probably due to a small sample of only interviewed PCPs because the limited number of questions for the final performance survey was focused on the diagnostic tools in the AASM practice parameters – although these omit questioning strategies, including the important assessment of work shifts. Although an item on performance rates in questioning the work shift was included in the longer pre-activity CPAQ and both interviews, the omission of this question in the final outcomes survey led us to omit CPAQ data from the analysis of participant practice change over time; it also prevented comparison of participant and nonparticipant performance data for this practice. Different phrasing in the pre-activity interview question – asking a yes/no question to determine whether physicians "routinely" ask their patients about their work shift – was too subjective and prevented direct calculation of performance change. To allow comparison with the less subjective phrasing used in the follow-up interview question, "yes" responses in the pre-activity interview were transformed to a reflect the informed interpretation of "routine" as a range of 80%-100%. This approach was deemed better than introducing an inconsistent data format within the affected columns of Table 4. The "yes" value of 80.0% was selected to balance concerns of overestimating clinicians' judgment of the word "routine," and for having a high enough value to make significant change a more difficult standard to reach; indeed, the change was not found to be significant, suggesting an appropriate transformation of data.

Sampling was broader for surveys than for interviews; interviews included only physicians, while survey populations also included PAs and ANPs. Outcomes surveys had small response counts among participants and controls, which also necessitated a long date range for final performance data collection. Patient responses were blinded to the interviewed PCPs who treated them, so it is unknown whether motivated physicians may have used more evidence-based practices and had different patient outcomes than physicians whose patients did not return PRO questionnaires. Methods used to gather PRO data while maintaining anonymity of patients should be changed in future research to allow tracking of individual patients and their treating physicians; counting of participating physicians for whom patient data is received; and individual incentives for patients and their treating PCPs, to improve response rates. Because the patient sample in this study is small, current PRO results should be considered pilot data.

The study did not control for participants' possible use of available, downloadable content that reinforced the content of the case-based CME by providing clinicians with documentation of evidence and AASM guidelines. Use of content in this neuroscienceCME.com SmartMobile Reference Guide was not considered a study variable, but the educational reinforcement conferred by its use would have increased the intervention's effectiveness for select participants.

Future Educational and Research Needs

This study showed that appropriate care of patients with SWD requires sustained CME interventions to improve awareness among health care professionals, as recommended by the Institute of Medicine [8]. Future research should study the effectiveness of specific education on planned napping as a standard treatment approach with first-level evidence and pharmacotherapies having second-level evidence in the AASM guidelines. These priorities and educational needs are recommended for better routine care – multimodal therapy is the optimal choice for SWD, and gaps and barriers hinder patients' use of planned napping and timed lighting. Educational research and future CME initiatives should also address gaps in the evidence-based selection of therapy to address the excessive sleepiness component of SWD because of its effects on patient safety and quality of life.

CONCLUSIONS

The use of mixed methods to collect in-depth data about PCP approaches to the diagnosis and treatment of patients with SWD resulted in a clearer understanding of the trends seen in this study. Quarterly participant surveys and in-depth interviews extended PCP learning by reinforcing content from the case-based webcast and by encouraging clinician assessment of current practices, which influenced change over time. Interviewed participants that started the interventions earlier showed larger change over time, in part because few (10.0%) had known of the existence of AASM guidelines for the diagnosis and treatment of SWD at baseline; this preliminary interaction exposed these PCPs to case-based learning within the interview before the instructional benefits of case-based learning within the CME webcast started.

The quantitative and qualitative data obtained by the mixed-methods approach were used to inform and refine assessments of the educational needs of PCPs during webcast activity-planning. Furthermore, the needs identified here for future CME are more evidence-based because we included patient-reported pilot data on interviewed PCPs' performance in practice.

Future CME using these approaches should increase the use of evidence-based care practices for patients with SWD, especially with respect to planning the recommended therapies for the right hours of the shift worker's life, where PCPs continue to show practice gaps. Future CME using similar methods to educate PCPs about SWD will, this study's effect-size correlation indicates, lead to practice changes that PCPs can then apply to improve management of other CRSDs.

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