■ Article

A Self-Administered Sleep Intervention for Patients With Cancer Experiencing Insomnia

Nancy (Surya) A. Absolon, RN, BA, BScN, OCN®, Lynda G. Balneaves, RN, PhD, Tracy L.O. Truant, RN, MSN, Rosemary L. Cashman, RN, MA, MSc(A), NP(A), Margurite E. Wong, RN, MSN, Jeremy D. Hamm, MSc, and Manisha B. Witmans, MD, FRCPC, FAAP, FASM

© prudkov/iStock/Thinkstock

Background: Sleep-wake disturbances are experienced by as many as 75% of patients with cancer and are associated with poor symptom management, lower functionality, and decreased quality of life. Although promising sleep interventions exist, they require extensive resources and time.

Objectives: The objectives of this study were to develop a brief, self-administered sleep intervention and to evaluate the feasibility and potential efficacy of its implementation with adult patients with cancer who were about to receive, were receiving, or had received radiation therapy in an ambulatory cancer care setting.

Methods: Pre- and postintervention surveys and qualitative interviews were conducted with patients with cancer experiencing insomnia (N = 28) and receiving radiation treatment within the past six months. Patients received instruction on breathing, visualization, and intonation. Adherence and sleep quality were primary study outcomes. Analyses included descriptive statistics and repeated measure regression analysis. Thematic analysis was conducted on qualitative data.

Findings: Adherence to the sleep intervention was high (75%), and significant improvement was found in global sleep quality ($p < 0.0001$) regardless of level of adherence. Sleep onset latency ($p = 0.0005$), sleep duration ($p = 0.0016$), and sleep quality ($p < 0.0001$) were significantly improved. Age was significantly correlated with sleep quality ($p = 0.0094$), with older participants reporting greater benefit from the intervention. Participants reported that the intervention was easy to learn and implement and that it "calmed the mind."

Nancy (Surya) A. Absolon, RN, BA, BScN, OCN®, is a radiation oncology nurse at the British Columbia Cancer Agency (BCCA) in Vancouver; Lynda G. Balneaves, RN, PhD, is an associate professor and director of the Centre for Integrative Medicine, Faculty of Medicine, and Leslie Dan Faculty of Pharmacy at the University of Toronto; Tracy L.O. Truant, RN, MSN, is a doctoral candidate in the School of Nursing at the University of British Columbia in Vancouver; Rosemary L. Cashman, RN, MA, MSc(A), NP(A), is a nurse practitioner at the BCCA; Margurite E. Wong, RN, MSN, is a clinical system support educator in the Pacific Spirit Community Health Unit at Vancouver Coastal Health; Jeremy D. Hamm, MSc, is a biostatistician at the BCCA; and Manisha B. Witmans, MD, FRCPC, FAAP, FASM, is a clinical associate professor in the Faculty of Medicine and Dentistry at the University of Alberta in Edmonton, all in Canada. The authors take full responsibility for the content of the article. The study was supported, in part, with funding from the BCCA Radiation Therapy Program, the BCCA Vice President Research Office, and the University of British Columbia/BCCA Complementary Medicine Education and Outcomes Program. Absolon was supported by funding from the BCCA's Stephen Berg Oncology Nursing Education and Research Endowment Fund, John Jambor Knowledge Fund, Toronto Dominion (TD) Grants in Nursing Skills and Education for Doctoral Training in Nursing Oncology and Advanced Practice Nurses (TD Grant in Medical Excellence) Fund; Balneaves was supported by a Canadian Institutes of Health Research (CIHR) New Investigator Award; and Truant was supported by a CIHR Frederic Banting and Charles Best Canada Graduate Scholarship—Doctoral Award, Izaak Walton Killam Memorial Doctoral Fellowship, CIHR Psychosocial Oncology Research Training Fellowship, and University of British Columbia Four-Year Doctoral Fellowship. The content of this article has been reviewed by independent peer reviewers to ensure that it is balanced, objective, and free from commercial bias. No financial relationships relevant to the content of this article have been disclosed by the independent peer reviewers or editorial staff. Mention of specific products and opinions related to those products do not indicate or imply endorsement by the *Clinical Journal of Oncology Nursing* or the Oncology Nursing Society. Absolon can be reached at nabsolon@bccancer.bc.ca, with copy to editor at CJONEditor@ons.org. (Submitted July 2015. Revision submitted September 2015. Accepted for publication September 26, 2015.)

Key words: insomnia; mind-body therapy; behavioral therapy; cancer; sleep quality

Digital Object Identifier: 10.1188/16.CJON.289-297

Sleep-wake disturbances are experienced by as many as 75% of patients with cancer and are twice as common in those patients compared to the general population (Carlson & Garland, 2005; Savard & Morin, 2001). Sleep-wake disturbance is a term used to describe perceived or actual changes in nighttime sleep, resulting in daytime impairment, and it includes sleep-related breathing disorders, sleep-related movement disorders (e.g., restless leg syndrome), hypersomnia, and insomnia (Page, Berger, & Johnson, 2006). The most prevalent sleep-wake disturbance in patients with cancer is insomnia (Sateia & Lang, 2008), which is defined as "a heterogeneous complaint that may involve difficulties falling asleep (initial or sleep onset insomnia), trouble staying asleep with prolonged

nocturnal awakenings (middle or maintenance insomnia), or a complaint of non-restorative sleep" (Savard & Morin, 2001, p. 896).

Potential causes of insomnia in patients with cancer include physiologic perturbations (altered hormone regulation, including melatonin and cortisol), homeostatic processes, circadian rhythm changes caused by the cancer and related treatments (Vena, Parker, Cunningham, Clark, & McMillan, 2004), psychological distress associated with a life-threatening illness (Graci, 2005), and medications used to treat the side effects of cancer, such as corticosteroids, which can further contribute to hormone dysregulation (Vena et al., 2004). Patients with cancer may also be affected by more general causes of insomnia, including poor sleep habits, psychophysiologic activation (e.g., rumination, worry), and consumption of stimulants (e.g., caffeine) close to bedtime.

Healthcare providers are recognizing that sleep-wake disturbances occur as part of symptom clusters in cancer populations, with insomnia occurring concurrently and interacting with pain, fatigue, anxiety, and depression (Graci, 2005; Price et al., 2009). Sleep-related symptom clusters may exacerbate other symptoms and affect quality of life and functional status (Sarna, 1993). For example, Kozachik and Bandeen-Roche (2008) found that older adult patients who experienced persistent pain, fatigue, and insomnia at one year postdiagnosis reported an average of nine other cancer-related symptoms. Evidence also exists that symptom clusters, including fatigue and insomnia, may be a predictor of patient mortality (Jimenez et al., 2011; Kozachik & Bandeen-Roche, 2008). Although the pathophysiologic processes are not clearly understood, these associations suggest a complex interaction between sleep-related complaints and the cancer process. Therefore, effectively addressing insomnia in patients with cancer may have important implications for the management of a broad range of symptoms and improvements in quality and, possibly, length of life. Given the limited access to sleep resources in cancer care, the authors sought to identify an effective sleep intervention that could be easily administered within the ambulatory cancer care setting.

Literature Review

Cognitive behavioral therapies (CBTs) are well-validated interventions that have been shown to improve insomnia in the general population (Morin, 2004) and are effective treatment alternatives to sleep medications (Mitchell, Gehrman, Perlis, & Umscheid, 2012). Despite the limited evidence, CBTs have also been identified as potential sleep interventions in adult patients with cancer (Oncology Nursing Society, 2016). CBT is typically comprised of three components: (a) behavioral components, such as stimulus control (reassociating the bed/bedroom with sleep), sleep restriction (limiting time in bed to actual sleep time), and relaxation training (reducing arousal at bedtime); (b) cognitive components, such as cognitive reframing of unhelpful thoughts and expectations around sleep; and (c) an educational component focused on sleep hygiene (elimination of behaviors that interfere with sleep) (Langford, Lee, & Miaskowski, 2012). Berger's (2009) systematic review of sleep intervention studies in adult patients with cancer classified CBT as "likely to be effective" based on the results of four large intervention trials (Arving et al., 2007; Berger et al., 2009; Epstein & Dirksen, 2007; Espie et al., 2008) and nine quasiexperimental studies (Berger et al., 2002, 2003; Carpenter, Neal, Payne, Kimmick, & Storniolo, 2007; Cohen & Fried, 2007; Davidson, Waisberg, Brundage, & MacLean, 2001; Hunter, Coventry, Hamed, Fentiman, & Grunfeld, 2009; Quesnel, Savard, Simard, Ivers, & Morin, 2003; Savard et al., 2006; Savard, Simard, Ivers, & Morin, 2005). This evidence was limited by the heterogeneity of the studies and the diversity of interventions and sleep outcome measures used (Berger, 2009). In addition, the time commitment and professional expertise required for CBT limit the practical application of these interventions in busy ambulatory settings. Some patients may find it particularly challenging to engage in CBT interventions because of barriers like language or mobility.

Another promising therapy in managing sleep-wake disturbances in populations of patients with cancer is mindfulness-based stress reduction (MBSR). MBSR involves focusing the mind on the present moment and being aware of one's thoughts and actions without judgment (Carlson & Garland, 2005). MBSR is structured as a 6–10 week program that includes mindful meditation and breath and body work, as well as didactic material on stress and coping (Kabat-Zinn, 1990). The efficacy of MBSR in populations of patients with cancer with regard to mood, quality of life, and distress is well established (Cramer, Lauche, Paul, & Dobos, 2012). However, few studies have been done on the role of MBSR for sleep-wake disturbance, which is theorized to reduce the overall psychophysiologic arousal associated with cancer and its treatments (Garland et al., 2014). Three clinical trials have examined MBSR's effect on sleep (Andersen et al., 2013; Lengacher et al., 2012; Shapiro, Bootzin, Figueredo, Lopez, & Schwartz, 2003) and found significant improvements in sleep quality and reduced sleep disturbance, leading to MBSR being classified as "likely to be effective" in the management of sleep difficulties (Oncology Nursing Society, 2016).

Drawing on the tenets of MBSR and CBT, Singh (1998) developed a brief sleep intervention combining abdominal breathing, visualization, and intonation that could be easily taught to patients. Singh (1998) hypothesized that this approach could address the physical and emotional causes of insomnia by promoting the relaxation response, reducing anxiety, and stimulating the production of melatonin by the pineal gland, a hormone associated with faster sleep onset and improved sleep efficiency (Brzezinski et al., 2005; Zisapel, 2001). An increase in plasma melatonin levels may occur following meditation, and it has yet to be determined if this is from a direct effect on pineal physiology (Tooley, Armstrong, Norman, & Sali, 2000). Singh's (1998) sleep intervention has been anecdotally reported to improve sleep quality and promote a sense of well-being in a small sample of patients with cancer and healthy volunteers. Further research determining the potential efficacy of this intervention in a busy ambulatory cancer care setting is required.

The purpose of this study was to evaluate the feasibility and potential efficacy of a novel, self-administered sleep intervention for adult patients with cancer receiving outpatient

TABLE 1. Sample Characteristics (N = 28)

Characteristic	$\bar{X}$	SD	Range
Age (years)	54.14	11.3	30–78
Characteristic			**n**
Gender			
Female			24
Male			4
Type of cancer			
Breast			20
Gynecologic			2
Prostate			2
Rectal			2
Brain			1
Lymphoma			1
Treatment status[a]			
Surgery			21
Radiation therapy			18
Chemotherapy			11
Hormonal therapy			6
Time since diagnosis			
Less than one year			25
One year or greater			3
Sleep medication use			
No			15
Yes			13
History of insomnia prior to cancer			
Yes			24
No			4

[a] Some participants reported receiving more than one type of treatment.

radiation therapy. The main hypothesis was that the sleep intervention would decrease patients' sleep onset latency and reduce daytime dysfunction, sleep disturbances, and use of sleep medication, as well as improve sleep duration, subjective sleep quality, and habitual sleep efficiency. A related research question was to investigate whether the sleep intervention could be easily learned and implemented by patients with cancer in an ambulatory care setting.

Methods

Design

The potential efficacy of the innovative sleep intervention was evaluated using a descriptive, correlational design. To inform the feasibility of the intervention, a descriptive, qualitative substudy was undertaken. Qualitative data regarding the experience of learning about and using the intervention were also collected using a self-report sleep diary and interviews.

Setting and Sample

The study took place in an ambulatory radiation therapy program at Vancouver Centre–British Columbia Cancer Agency, a large urban cancer center in western Canada. Ethics approval was obtained from the appropriate ethics boards. Inclusion criteria were patients who were registered in the radiation therapy program, or were receiving or had received radiation therapy when enrolled in the study; a minimum age of 18 years; a diagnosis of cancer within the past six months; the ability to speak and read English; and the provision of written informed consent. Eligible patients had experienced insomnia within the past four weeks, with a global score of greater than 5 on the Pittsburgh Sleep Quality Index (PSQI) (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). A designated staff nurse assessed insomnia using the PSQI at the screening visit, and patients filled out the postintervention PSQI at home and mailed in the completed form. Individuals reporting a history of insomnia prior to their cancer diagnosis, as measured on the demographic form, were permitted to participate in the study. Insomnia was defined as difficulty initiating and maintaining sleep, sleep of shortened duration, sleep difficulty despite adequate circumstances for sleep, and/or poor quality of sleep that resulted in daytime impairment (e.g., mood disturbance), daytime sleepiness, or PSQI score of greater than 5. Exclusion criteria included dexamethasone (Decadron®) dosage greater than 4 mg per day, a preexisting sleep disorder (e.g., sleep apnea, narcolepsy), and a score of less than 24 on the Mini-Mental State Examination, indicating cognitive impairment (Folstein, Folstein, & McHugh, 1975).

Intervention

The sleep intervention was a brief, self-administered technique combining abdominal breathing, visualization, and intonation, which was modified from Singh's (1998) intervention. The intervention was delivered to all participants by the principal investigator, who is also a teacher of meditation. The principal investigator taught all participants the technique in a lighted clinical examination room with signage on the door that indicated that a study visit was in progress within the radiation therapy department (Absolon et al., 2014), followed by practice of the technique with the investigator. A pineal gland image was provided to assist participants with visualization. The total teaching time was about 10 minutes. Participants were given the script to

TABLE 2. Sleep Aids Used by Study Participants (N = 28)

Sleep Aid	n
Nonpharmacologic (N = 17)[a]	
Food and drinks (e.g., tea, warm milk)	10
Mind–body techniques	5
Natural health products (e.g., melatonin)	4
Environmental controls (e.g., room temperature)	8
Combination of nonpharmacologic sleep aids	1
Pharmacologic (N = 13)[a]	
Benzodiazepines	8
Non-benzodiazepines	5
Antidepressants	3
Combination of pharmacologic sleep aids	1
Combination of nonpharmacologic and pharmacologic	8

[a] Some participants reported receiving more than one type of treatment.

TABLE 3. Total PSQI Scores and Covariates (N = 28)

Covariate	Estimate	95% CI	p
Adherence	1.5693	[–0.3764, 3.5149]	0.1139
Age	–0.1137	[–0.1995, –0.0279]	0.0094
Medication	–0.0123	[–1.8575, –1.8328]	0.9895
Pre- versus postintervention	–3.6786	[–4.79, –2.5671]	< 0.0001
Sleep difficulty	1.8384	[–1.0134, 4.6902]	0.2064
Treatment	–2.2405	[–5.3834, –0.9024]	0.1623

CI—confidence interval; PSQI—Pittsburgh Sleep Quality Index
Note. Covariates are reporting beta coefficients.

reinforce their learning and to keep at the bedside for future reference.

Participants were instructed to practice the intervention daily before bedtime for 30 days. A telephone follow-up was conducted on day 7 to review the intervention and answer questions. The participants continued to receive standard care for sleep-wake disturbances (i.e., pharmacologic sleep aids and a sleep-management guideline offered by nurses in the institution).

Data Collection

Eligible participants completed the study instruments at baseline, which was before receiving instruction on the sleep intervention. All 28 participants were encouraged to use the intervention daily before bedtime. The script encouraged participants to first focus on keeping their breath smooth, followed by imagining themselves "lighting up" their pineal gland, and ending the intervention by making the sound "om." After one month, participants either mailed in the completed study instruments or were contacted by a research nurse and completed the survey via telephone. All participants completed a daily sleep diary documenting sleep challenges and use of the sleep intervention. The diary was returned to the research team at the end of the study.

To assess feasibility, field notes were kept regarding any difficulties participants disclosed about learning and implementing the intervention. Brief, semistructured interviews using an investigator-developed interview guide were conducted with all participants at study completion to explore their experiences. Recommendations from participants were sought regarding how the intervention and training could be improved and what additional support strategies were required to promote the long-term use of the intervention. The interviews were digitally recorded and transcribed verbatim.

Instruments

The PSQI is a self-report survey for insomnia and related sleep-wake disturbances in clinical populations (Buysse et al., 1989). Comprised of 19 items, the PSQI evaluates subjective sleep quality during the past month and is summarized into seven component scores: subjective sleep quality, sleep onset latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. These components range from 0 (no difficulty) to 3 (severe difficulty) and are added to obtain one global score, the sleep quality index (global PSQI), ranging from 0–21. The PSQI has good sensitivity and specificity, and a global score cutoff of greater than 5 has been found to accurately identify as many as 88.5% of controls and patients (Buysse et al., 1989). In the current study, the PSQI had a moderate test-retest reliability score of 0.66.

Participants completed a self-report diary daily for one month, recording sleep quality, environmental factors disturbing their sleep, ability to use the intervention, and any challenges faced. Adherence was determined using a cutoff of 80%; participants who reported using the intervention for less than 24 days during the month were identified as nonadherent. This value was based on previous sleep intervention studies in populations of patients with cancer (Berger et al., 2002, 2003).

A demographic form was completed at baseline to capture age, cancer diagnosis, cancer treatment received, sleep difficulties, and medication history, including pharmacologic and nonpharmacologic sleep aids. Information on environmental

TABLE 4. Descriptive Statistics for PSQI Components (N = 28)

	Preintervention			Postintervention		
Variable	$\bar{X}$	SD	Range	$\bar{X}$	SD	Range
Global PSQI score	13.53	3.305	7–18	9.86	4.01	3–17
Sleep duration	1.93	1.052	0–3	1.32	1.31	0–3
Sleep disturbance	1.96	0.637	1–3	1.75	0.52	1–3
Sleep onset latency	2.21	0.959	0–3	1.54	0.88	0–3
Daytime dysfunction	1.43	0.79	0–3	1.18	0.82	0–3
Sleep efficiency	2.25	0.928	0–3	1.54	1.32	0–3
Sleep quality	1.96	0.637	0–3	1.18	0.67	0–3
Sleep medication	1.79	1.343	0–3	1.36	1.37	0–3

PSQI—Pittsburgh Sleep Quality Index
Note. Except for the global score, PSQI component scores range from 0–3, with higher scores indicating worse results. Global PSQI scores range from 0–21, with higher scores indicating worse overall sleep quality.

TABLE 5. Total PSQI and Component Mean Scores (N = 28)

	Preintervention		Postintervention				
Variable	Score	SE	Score	SE	$\bar{X}$ Difference	95% CI	p
Global PSQI score	13.53	0.62	9.86	0.76	3.68	[2.49, 4.86]	< 0.0001*
Sleep duration	1.93	0.2	1.32	0.25	0.61	[0.25, 0.96]	0.0016*
Sleep disturbance	1.96	0.12	1.75	0.1	0.21	[–0.01, 0.43]	0.0561
Sleep onset latency	2.21	0.18	1.53	0.17	0.68	[0.33, 1.03]	0.0005*
Daytime dysfunction	1.43	0.15	1.18	0.15	0.25	[–0.02, 0.52]	0.0698
Sleep efficiency	2.25	0.18	1.54	0.25	0.71	[0.22, 1.21]	0.0062
Sleep quality	1.96	0.12	1.18	0.13	0.79	[0.48, 1.09]	< 0.0001*
Sleep medication	1.79	0.25	1.36	0.26	0.43	[0.09, 0.77]	0.0156

* Bonferroni correction factor = 0.0062

CI—confidence interval; PSQI—Pittsburgh Sleep Quality Index; SE—standard error

Note. Except for the global score, PSQI component scores range from 0–3, with higher scores indicating worse results. Global PSQI scores range from 0–21, with higher scores indicating worse overall sleep quality.

factors that could influence sleep quality (e.g., bed partner, children) was also collected.

Data Analysis

All statistical tests were two-sided, with an alpha of 0.05. Differences between pre- and postintervention PSQI scores were initially tested univariately with a two-sided, paired t test. A repeated measures regression analysis was also conducted with PSQI scores, with the dependent variables and the pre- and postintervention PSQI scores as constant covariates. Other covariates included in the model were adherence, history of sleep difficulties, use of sleep medication, whether the patient was currently receiving cancer treatment, and age. A posthoc power analysis for testing the difference between PSQI totals indicated a power of greater than 0.999. This analysis is based on the observed difference between the pre- and postintervention PSQI scores (–3.76) and its standard deviation (3.04).

Transcripts from the interviews were read line by line, and key ideas and concepts were identified. Codes were developed and used to organize the qualitative data. A descriptive qualitative analysis, informed by an interpretive descriptive approach (Thorne, 2008), was conducted to identify concepts associated with the perceived feasibility and participants' experience of using the intervention, including challenges. The field notes were also reviewed for themes specific to the feasibility and acceptability of the intervention. Given the focus on the feasibility of the intervention and the small sample size, thematic saturation was not sought in the qualitative analysis.

Results

The study included 28 participants, the majority being middle-aged women who had received treatment for breast cancer (see Table 1). A large proportion of the sample reported having a history of sleep difficulties prior to their cancer diagnosis, with almost half reporting current use of pharmacologic sleep aids to help them sleep (see Table 2). The majority of participants also reported using nonpharmacologic sleep aids, including specific food and drinks, mind–body techniques, and natural health products.

One-fourth of the sample failed to reach the 80% criteria for adherence; however, the average number of days participants adhered to the intervention was 25 of 30 (95% confidence interval [22, 27]). Adherence to the intervention declined during the study, but this decline was not significant, and it was not associated with any demographic or treatment variables.

Impact of Intervention on Sleep

A significant improvement in global PSQI was seen from baseline to follow-up in the 21 participants who were adherent to the sleep intervention, with the mean global PSQI decreasing from 13.53 to 9.86 ($p < 0.0001$), which is still indicative of significant sleep disturbance. No significant difference was seen between the pre- and postintervention global PSQI scores ($p < 0.71$) between those participants who adhered to the intervention and those who did not (–3.76 versus –3.43, respectively). As a consequence, subsequent analyses used the full sample of 28 participants.

The repeated measures regression analysis revealed that, as participants' ages increased, so did the difference in global PSQI between the pre- and postintervention time periods (see Table 3). Participants aged 60 years or older reported less sleep disturbance at the pre- and postintervention time points. At preintervention, the mean global PSQI score was 14.15 for participants aged younger than 60 years and 12 for patients aged 60 years or older ($p = 0.122$). At postintervention, the mean global PSQI score was 10.6 for patients aged younger than 60

TABLE 6. Participant Quotes Related to Feasibility and Efficacy of Intervention

Theme	Quotes
Feasibility • Easy to learn • Portable and convenient to practice	"[The nurse] just showed me, and I did it with her. It's pretty simple. It was nicer to see somebody doing it rather than read it. So, having somebody show me physically how to do it was nice. It was very easy from there."
Perceived effects • Calming • Increased sense of control	"[It] cleared and calmed down [my] mind and resulted in less thinking." "I found that I used the idea and the concept at other times without doing the full sleep intervention. Just focusing of the mind and the breath and energy, imagery . . . imagining the [pineal] gland and the glowing light, and then the energy flowing from the breath down into all the cells in my body and out. I found that imagery very good, and I use it when I'm not trying to do the sleep intervention."
Challenges • Getting in the habit to perform daily • Initial visualization of lighting up the pineal gland • Intonating the "om" sound	"I found that all I needed to do was level two [of the intervention], and sometimes just keeping at it was actually more relaxing and made me fall asleep more than going to do the third [level] with the 'om.' For some reason, having to make sound when you're really tired, I found it actually was waking me."
Participant recommendations • Verbal and written instructions helpful • Telephone follow-up found to be important • More teaching time to individualize technique	"I think it would be a great tool to introduce at some point early on in a person's cancer journey. . . . It might help with some of the stress management aspects of it, and maybe this tool can be used during periods to help with decreasing stress versus just sleep."

years and 8 for patients aged 60 years or older ($p = 0.123$). No other covariates (i.e., adherence, history of sleep difficulties, sleep medication use, or cancer treatment type) were significantly associated with the difference in global PSQI scores.

Descriptive statistics for the PSQI components are provided in Table 4. Statistically significant differences were found pre- and postintervention in all components of the PSQI, with the exception of sleep disturbance and daytime dysfunction (see Table 5). However, after applying the Bonferroni correction to adjust for multiple comparisons, only the global PSQI ($p < 0.0001$), sleep onset latency ($p = 0.0005$), sleep duration ($p = 0.0016$), and sleep quality ($p < 0.0001$) remained significant. In terms of sleep duration reported by participants, the mean amount of sleep was 5.03 hours before the intervention and 5.98 hours following the intervention, which was a statistically significant difference ($p = 0.0$).

Qualitative analysis of participant interviews, diary, and field note data indicated that the intervention was easy to learn, portable, and convenient to use. Participants reported feeling calmer and more in control, and some stated that they were able to reduce pharmacologic sleep aid use. Challenges included establishing the sleep technique as a regular part of one's bedtime routine, visualizing the pineal gland, and intonating the "om" sound. Participant recommendations included additional teaching time and tailoring of the intervention for specific individuals (e.g., those with "chemobrain"), reinforcement of sleep hygiene practices, and nurse-initiated telephone follow-ups. Supportive quotes from participant interviews are provided in Table 6.

Discussion

The study findings demonstrate the feasibility and potential efficacy of a sleep intervention taught by oncology nurses in a busy ambulatory clinic to be used at home by patients. About half of the patients approached agreed to participate, adherence to the intervention was high, and the intervention and study procedures were not burdensome. The general population experiencing insomnia is also highly motivated to participate in an intervention to improve sleep (Hubbling, Reilly-Spong, Kreitzer, & Gross, 2014). The feasibility and high uptake of self-help therapies for sleep have been found in other studies of patients with cancer (Kwekkeboom et al., 2012; Savard, Villa, Simard, Ivers, & Morin, 2011); however, these interventions required audiovisual aids that not all patients feel comfortable using or have access to. In contrast, participants in the current study commented on the portability and flexibility of the sleep intervention, which was easily implemented without devices or support.

Other sleep intervention studies using CBT or MBSR have varied findings with respect to necessary time commitment by participants and have required the engagement of specially trained healthcare professionals for the delivery of the intervention (Andersen et al., 2013; Garland et al., 2014). The current intervention required only a 10-minute instructional session with an oncology nurse and a brief telephone follow-up to consolidate patients' understanding of the intervention, with participants' time commitment being limited to 15 minutes daily.

A significant improvement in sleep outcomes was found at the one-month follow-up. Patients reported improved total sleep score, sleep duration, sleep onset latency, and quality of sleep. Given the small sample size, it is important to consider the clinical relevance of these findings. The reduction in total sleep score from baseline to follow-up was 3.76 on the PSQI scale, which, according to the instrument developer, is a clinically relevant finding (D.J. Buysse, personal communication, May 4, 2013). Subjectively, participants perceived the intervention as calming and noted that it had a positive effect on their quality of sleep and sense of control.

The lack of change in other assessed sleep outcomes may have been because of the limited duration of the study, with the use of sleep medications requiring a longer period of exposure for a statistically significant shift to occur. In addition, the intervention may have differential effects on sleep outcomes. Theoretically, the intervention is proposed

to work by promoting relaxation and stimulating the pineal gland and subsequent production of melatonin in the body. It is possible that the intervention was effective in stimulating melatonin production to a level that promoted the onset of sleep but was not sufficient to change the overall sleep-wake cycle. However, the authors were unable to measure pre- and postintervention melatonin levels in this study to test this hypothesis. Measuring melatonin prior to and in the context of undergoing this intervention is a recommendation for future research. Additional research is also needed to explore the long-term and possible differential effects of mindfulness-based sleep interventions.

Comparisons across sleep studies are difficult because of variation in populations, interventions, and outcome measures. A clinical trial comparing MBSR to CBT was conducted with Canadian patients with cancer and found a comparable reduction in total global PSQI scores in both study groups, with CBT demonstrating the greatest reduction at a two-month follow-up (Garland et al., 2014). Other studies examining the effect of mindfulness-based sleep interventions have used a variety of self-report tools, including sleep diaries, and have used follow-up time periods ranging from 2 weeks to 12 months (Andersen et al., 2013; Epstein & Dirksen, 2007; Kwekkeboom et al., 2012). Consensus and standardization of outcome measures are required to support future synthesis of findings of sleep intervention studies.

A unique finding in the current study was the impact of age on potential intervention efficacy, with older participants reporting significantly higher global PSQI scores than younger participants. This interaction has not been identified previously and raises questions regarding how age may affect the uptake and effectiveness of sleep interventions. This finding may reflect differences in intervention engagement, with older patients being more experienced in meditative practices or having more consistent bedtime routines. Alternatively, this result may have been a consequence of the associations between age, menopausal status, and degree of sleep disturbance. Exploration of this interaction and the impact of other demographic variables not performed in this study (e.g., gender, menopausal status, culture, socioeconomic status) are warranted.

This research was limited by its descriptive, correlational design, which prevents making definitive causal inferences regarding the impact of the intervention on sleep. Improvements in sleep may have been a result of maturation rather than the intervention itself. However, with 24 of the participants reporting a history of insomnia prior to the cancer diagnosis, the improvement may have been a result of the intervention.

Similar to other sleep intervention studies (Andersen et al., 2013; Garland et al., 2014; Savard et al., 2005), the sample in this study was primarily patients with breast cancer who had received radiation treatment, spoke English, and had self-selected to be part of this study. Beyond limiting the generalizability of the findings, the gender bias in this sample raises concerns because of the fact that sleep disturbances are more prevalent and severe in women, both with cancer (Garrett et al., 2011) and in the general population (Bixler et al., 2009). The gender differences in the physical and behavioral etiologies of sleep disturbances (Yoshioka et al., 2012) may affect the efficacy of the intervention. Future research with more diversity in gender may address this gap in knowledge. The small sample also precluded a covariate analysis of the effect of complementary therapies, including natural health products, on participants' overall sleep quality. With the growing body of research on the effect of melatonin and other herbal remedies on sleep management, the potential interaction between sleep interventions and natural health products needs to be explored further.

Recommendations for Practice and Research

The sleep intervention used in this study is a promising, inexpensive, and practical therapy that can be easily integrated by oncology nurses in ambulatory settings and used by patients with cancer in the community. A longitudinal intervention trial with a larger sample and a control group is needed to test the efficacy of the intervention across more diverse populations and to identify other variables related to the success of nonpharmacologic sleep interventions. Exploration of the physiologic mechanism of interventions using a mindfulness-based approach will also broaden the understanding of sleep dysfunction.

Implications for Nursing

The intervention may offer oncology nurses an effective management strategy for sleep issues that can be easily and quickly implemented in ambulatory settings with patients with cancer. This could be implemented not only in the busy clinical outpatient setting, but also on inpatient units, expanding the intervention's use across diverse clinical settings. Extensive educational preparation is not required to teach the intervention, which further increases opportunities for nurses to implement it in clinical settings. Sleep issues pose a significant burden in cancer care, and oncology nurses can play a leading role in addressing and managing this troubling symptom, as well as

British Columbia Cancer Agency
Strategies to Help With Sleep
http://bit.ly/1WDkXyH

Canadian Cancer Society
Complementary Therapies: A Guide for People With Cancer
http://bit.ly/1Nko8JI

National Center for Complementary and Integrative Health
Sleep Disorders and Complementary Health Approaches: What the Science Says
http://1.usa.gov/1WcQ0AY

Oncology Nursing Society
Putting Evidence Into Practice: Sleep-Wake Disturbances
www.ons.org/practice-resources/pep/sleep-wake-disturbances

FIGURE 1. Patient Resources for Sleep-Wake Disturbance

Implications for Practice

- Manage sleep issues with the sleep intervention described in the current article because it can be easily and quickly implemented at the bedside.
- Address and manage sleep issues to improve overall well-being and quality of care.
- Empower patients to manage their sleep issues at home with the use of the self-administered sleep intervention.

improving overall well-being and quality of care. Teaching this intervention to patients will also raise the awareness of this prevalent issue with other healthcare professionals. The self-administered nature of the sleep intervention also empowers patients to manage their own sleep issues at home. Figure 1 provides a list of resources for patients on sleep and complementary therapies that nurses may share in the clinical setting.

Conclusion

Sleep is a distressing issue faced by many patients with cancer. Given the financial and time constraints experienced by healthcare organizations and patients, the sleep intervention evaluated in this feasibility study is a highly practical, minimally invasive, and cost-effective alternative that can be easily implemented at the bedside and holds promise in addressing patients' insomnia and other sleep-wake disturbances.

The authors gratefully acknowledge John French, MSc, FCAMRT, CHE, and Frankie Goodwin, RN, BN, of the British Columbia Cancer Agency (BCCA) for providing the resources needed to complete this study. The authors also acknowledge Barb Chaulk, RN, BA, MA, and Beverly Hsiang, RN, who assisted with baseline visits, colleagues from the Vancouver Centre–BCCA who assisted with study recruitment, Kate Saunders, RN, BSc, BSN, and Jessica Collins-Lam, BA, who were research assistants and assisted with coding the interviews, and Maharishi Krishnananda Ishaya, who modified the sleep intervention and taught it to the first author, as well as the study participants.

References

Absolon, N.A., Truant, T.L., Balneaves, L.G., Goodwin, F., Cashman, R.L., . . . Witmans, M.B. (2014). "I can't sleep!": Gathering the evidence for an innovative intervention for insomnia in cancer patients. *Canadian Oncology Nursing Journal, 24,* 154–165.

Andersen, S.R., Würtzen, H., Steding-Jessen, M., Christensen, J., Andersen, K.K., Flyger, H., . . . Dalton, S.O. (2013). Effect of mindfulness-based stress reduction on sleep quality: Results of a randomized trial among Danish breast cancer patients. *Acta Oncologica, 52,* 336–344.

Arving, C., Sjödén, P.O., Bergh, J., Hellbom, M., Johansson, B., Glimelius, B., & Brandberg, Y. (2007). Individual psychosocial support for breast cancer patients: A randomized study of nurse versus psychologist interventions and standard care. *Cancer Nursing, 30*(3), E10–E19.

Berger, A.M. (2009). Update on the state of the science: Sleep-wake disturbances in adult patients with cancer [Online exclusive]. *Oncology Nursing Forum, 36,* E165–E177. doi:10.1188/09.ONF.E165-E177

Berger, A.M., Kuhn, B.R., Farr, L.A., Lynch, J.C., Agrawal, S., Chamberlain, J., & Von Essen, S.G. (2009). Behavioral therapy intervention trial to improve sleep quality and cancer-related fatigue. *Psycho-Oncology, 18,* 634–646. doi:10.1002/pon.1438

Berger, A.M., VonEssen, S., Kuhn, B.R., Piper, B.F., Farr, L., Agrawal, S., . . . Higginbotham, P. (2002). Feasibility of a sleep intervention during adjuvant breast cancer chemotherapy. *Oncology Nursing Forum, 29,* 1431–1441. doi:10.1188/02.ONF.1431-1441

Berger, A.M., VonEssen, S., Kuhn, B.R., Piper, B.F., Agrawal, S., Lynch, J.C., & Higginbotham, P. (2003). Adherence, sleep, and fatigue outcomes after adjuvant breast cancer chemotherapy: Results of a feasibility intervention study. *Oncology Nursing Forum, 30,* 513–522. doi:10.1188/03.ONF.501-511

Bixler, E.O., Papaliaga, M.N., Vgontzas, A.N., Lin, H.M., Pejovic, S., Karataraki, M., . . . Chrousos, G.P. (2009). Women sleep objectively better than men and the sleep of young women is more resilient to external stressors: Effects of age and menopause. *Journal of Sleep Research, 18,* 221–228. doi:10.1111/j.1365-2869.2008.00713.x

Brzezinski, A., Vangel, M.G., Wurtman, R.J., Norrie, G., Zhdanova, I., Ben-Shushan, A., & Ford, I. (2005). Effects of exogenous melatonin on sleep: A meta-analysis. *Sleep Medicine Reviews, 9,* 41–50. doi:10.1016/j.smrv.2004.06.004

Buysse, D.J., Reynolds, C.F., III, Monk, T.H., Berman, S.R., & Kupfer, D.J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research, 28*, 193–213.

Carlson, L.E., & Garland, S.N. (2005). Impact of mindfulness-based stress reduction (MBSR) on sleep, mood, stress and fatigue symptoms in cancer outpatients. *International Journal of Behavioral Medicine, 12,* 278–285. doi:10.1207/s15327558ijbm1204_9

Carpenter, J.S., Neal, J.G., Payne, J., Kimmick, G., & Storniolo, A.M. (2007). Cognitive-behavioral intervention for hot flashes [Online exclusive]. *Oncology Nursing Forum, 34,* E1–E8. doi:10.1188/07.ONF.E1-E8

Cohen, M., & Fried, G. (2007). Comparing relaxation training and cognitive-behavioral group therapy for women with breast cancer. *Research on Social Work Practice, 17,* 313–323.

Cramer, H., Lauche, R., Paul, A., & Dobos, G. (2012). Mindfulness-based stress reduction for breast cancer—A systematic review and meta-analysis. *Current Oncology, 19,* e343–e352. doi:10.3747/co.19.1016

Davidson, J.R., Waisberg, J.L., Brundage, M.D., & MacLean, A.W. (2001). Nonpharmacologic group treatment of insomnia: A preliminary study with cancer survivors. *Psycho-Oncology, 10,* 389–397.

Epstein, D.R., & Dirksen, S.R. (2007). Randomized trial of a cognitive-behavioral intervention for insomnia in breast cancer survivors [Online exclusive]. *Oncology Nursing Forum, 34,* E51–E59. doi:10.1188/07.ONF.E51-E59

Espie, C.A., Fleming, L., Cassidy, J., Samuel, L., Taylor, L.M., White, C.A., . . . Paul, J. (2008). Randomized controlled clinical effectiveness trial of cognitive behavior therapy compared with treatment as usual for persistent insomnia in patients with cancer. *Journal of Clinical Oncology, 26,* 4651–4658. doi:10.1200/JCO.2007.13.9006

Folstein, M., Folstein, S., & McHugh, P. (1975). "Mini-mental state": A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research, 12*, 189–198.

Garland, S.N., Carlson, L.E., Stephens, A.J., Antle, M.C., Samuels, C., & Campbell, T.S. (2014). Mindfulness-based stress reduction compared with cognitive behavioral therapy for the treatment of insomnia comorbid with cancer: A randomized, partially blinded, noninferiority trial. *Journal of Clinical Oncology, 32,* 449–457. doi:10.1200/JCO.2012.47.7265

Garrett, K., Dhruva, A., Koetters, T., West, C., Paul, S.M., Dunn, L.B., . . . Miaskowski, C. (2011). Differences in sleep disturbance and fatigue between patients with breast and prostate cancer at the initiation of radiation therapy. *Journal of Pain and Symptom Management, 42,* 239–250. doi:10.1016/j.jpainsymman.2010.11.010

Graci, G. (2005). Pathogenesis and management of cancer-related insomnia. *Journal of Supportive Oncology, 3,* 349–359.

Hubbling, A., Reilly-Spong, M., Kreitzer, M.J., & Gross, C.R. (2014). How mindfulness changed my sleep: Focus groups with chronic insomnia patients. *BMC Complementary and Alternative Medicine, 14,* 50. doi:10.1186/1472-6882-14-50

Hunter, M.S., Coventry, S., Hamed, H., Fentiman, I., & Grunfeld, E.A. (2009). Evaluation of a group cognitive behavioural intervention for women suffering from menopausal symptoms following breast cancer treatment. *Psycho-Oncology, 18,* 560–563. doi:10.1002/pon.1414

Jimenez, A., Madero, R., Alonso, A., Martinez-Marin, V., Vilches, Y., Martinez, B., . . . Feliu, J. (2011). Symptom clusters in advanced cancer. *Journal of Pain and Symptom Management, 42,* 24–31. doi:10.1016/j.jpainsymman.2010.10.266

Kabat-Zinn, J. (1990). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain and illness.* New York, NY: Delacorte Press.

Kozachik, S.L., & Bandeen-Roche, K. (2008). Predictors of patterns of pain, fatigue, and insomnia during the first year after a cancer diagnosis in the elderly. *Cancer Nursing, 31,* 334–344. doi:10.1097/01.NCC.0000305769.27227.67

Kwekkeboom, K.L., Abbott-Anderson, K., Cherwin, C., Roiland, R., Serlin, R.C., & Ward, S.E. (2012). Pilot randomized controlled trial of a patient-controlled cognitive-behavioral intervention for the pain, fatigue, and sleep disturbance symptom cluster in cancer. *Journal of Pain and Symptom Management, 44,* 810–822. doi:10.1016/j.jpainsymman.2011.12.281

Langford, D.J., Lee, K., & Miaskowski, C. (2012). Sleep disturbance interventions in oncology patients and family caregivers: A comprehensive review and meta-analysis. *Sleep Medicine Reviews, 16,* 397–414. doi:10.1016/j.smrv.2011.07.002

Lengacher, C., Jim, H., Reich, R., Ramesar, S., Carranza, I., Paterson, C., . . . Kip, K. (2012). Examination of objective sleep quality within an R01 mindfulness based stress reduction symptom cluster trial for breast cancer survivors. *Psycho-Oncology, 21*(Suppl. 1), 55–56. doi:10.1111/j.1099-1611.2011.03029_1.x

Mitchell, M.D., Gehrman, P., Perlis, M., & Umscheid, C.A. (2012). Comparative effectiveness of cognitive behavioral therapy for insomnia: A systematic review. *BMC Family Practice, 13*, 40. doi:10.1186/1471-2296-13-40

Morin, C.M. (2004). Cognitive-behavioral approaches to the treatment of insomnia. *Journal of Clinical Psychiatry, 65*(Suppl. 16), 33–40.

Oncology Nursing Society. (2016). Putting Evidence Into Practice: Sleep-wake disturbances: Cognitive behavioral interventions/approach. Retrieved from https://www.ons.org/intervention/cognitive-behavioral-interventionsapproach

Page, M.S., Berger, A.M., & Johnson, L.B. (2006). Putting Evidence Into Practice: Evidence-based interventions for sleep-wake disturbances. *Clinical Journal of Oncology Nursing, 10,* 753–767. doi:10.1188/06.CJON.753-767

Price, M.A., Zachariae, R., Butow, P.N., deFazio, A., Chauhan, D., Espie, C.A., . . . Webb, P.M. (2009). Prevalence and predictors of insomnia in women with invasive ovarian cancer: Anxiety a major factor. *European Journal of Cancer, 45,* 3262–3270. doi:10.1016/j.ejca.2009.05.030

Quesnel, C., Savard, J., Simard, S., Ivers, H., & Morin, C.M. (2003). Efficacy of cognitive-behavioral therapy for insomnia in women treated for nonmetastatic breast cancer. *Journal of Consulting and Clinical Psychology, 71,* 189–200.

Sarna, L. (1993). Correlates of symptom distress in women with lung cancer. *Cancer Practice, 1,* 21–28.

Sateia, M.J., & Lang, B.J. (2008). Sleep and cancer: Recent developments. *Current Oncology Reports, 10,* 309–318.

Savard, J., & Morin, C.M. (2001). Insomnia in the context of cancer: A review of a neglected problem. *Journal of Clinical Oncology, 19,* 895–908.

Savard, J., Simard, S., Giguère, I., Ivers, H., Morin, C.M., Maunsell, E., . . . Marceau, D. (2006). Randomized clinical trial on cognitive therapy for depression in women with metastatic breast cancer: Psychological and immunological effects. *Palliative and Supportive Care, 4,* 219–237.

Savard, J., Simard, S., Ivers, H., & Morin, C.M. (2005). Randomized study on the efficacy of cognitive-behavioral therapy for insomnia secondary to breast cancer, part I: Sleep and psychological effects. *Journal of Clinical Oncology, 23,* 6083–6096. doi:10.1200/JCO.2005.09.548

Savard, J., Villa, J., Simard, S., Ivers, H., & Morin, C.M. (2011). Feasibility of a self-help treatment for insomnia comorbid with cancer. *Psycho-Oncology, 20,* 1013–1019. doi:10.1002/pon.1818

Shapiro, S.L., Bootzin, R.R., Figueredo, A.J., Lopez, A.M., & Schwartz, G.E. (2003). The efficacy of mindfulness-based stress reduction in the treatment of sleep disturbance in women with breast cancer: An exploratory study. *Journal of Psychosomatic Research, 54,* 85–91.

Singh, R.N. (1998). *Self-healing: Powerful techniques.* London, Ontario, Canada: Health Psychology Associates.

Thorne, S. (2008). *Interpretive description.* Walnut Creek, CA: Left Coast Press.

Tooley, G.A., Armstrong, S.M., Norman, T.R., & Sali, A. (2000). Acute increases in night-time plasma melatonin levels following a period of meditation. *Biological Psychology, 53,* 69–78.

Vena, C., Parker, K., Cunningham, M., Clark, J., & McMillan, S. (2004). Sleep-wake disturbances in people with cancer part I: An overview of sleep, sleep regulation, and effects of disease and treatment. *Oncology Nursing Forum, 31,* 735–746. doi:10.1188/04.ONF.735-746

Yoshioka, E., Saijo, Y., Kita, T., Satoh, H., Kawaharada, M., Fukui, T., & Kishi, R. (2012). Gender differences in insomnia and the role of paid work and family responsibilities. *Social Psychiatry and Psychiatric Epidemiology, 47,* 651–662. doi:10.1007/s00127-011-0370-z

Zisapel, N. (2001). Circadian rhythm sleep disorders: Pathophysiology and potential approaches to management. *CNS Drugs, 15,* 311–328.