

Original Article

Sleep and Quality of Life in Breast Cancer Patients

Barry V. Fortner, PhD,* Edward J. Stepanski, PhD, Stephanie C. Wang, MD, Sarah Kasprovicz, MD, and H. Heith Durrence, MS

Psychology and Cancer Symptom Research (B.V.F.), West Clinic, Memphis, Tennessee; Sleep Disorders Center (E.J.S.), and Department of Internal Medicine (S.C.W.), Rush Presbyterian-St. Luke's Medical Center, Chicago, Illinois; Rush Medical College (S.K.), Chicago, Illinois; and Department of Psychology (H.H.D.), West Clinic, Memphis, Tennessee, USA

Abstract

This study described sleep in a heterogeneous sample of breast cancer patients using the Pittsburgh Sleep Quality Index (PSQI) and examined the relation between sleep disturbance and health-related quality of life as measured by the Rand 36-Item Health Survey. Chemotherapy and radiation therapy were explored as predictors of sleep disturbance in breast cancer patients, and the sleep characteristics of breast cancer patients were compared to the sleep characteristics of a sample of medical patients with general medical conditions. Results showed that 61% of breast cancer patients had significant sleep problems. Sleep was characterized by reduced total sleep time with sleep frequently being disturbed by pain, nocturia, feeling too hot, and coughing or snoring loudly. Despite the frequency of significant sleep disturbance, pharmacological and cognitive-behavioral treatments of sleep problems were observed to be inadequate. Limited evidence was found for the role of chemotherapy and radiation therapy in the sleep disturbance of breast cancer patients, and the general pattern of sleep disturbance in breast cancer patients was not significantly different than that observed in medical patients with general medical conditions. Breast cancer patients having significant sleep problems had greater deficits in many areas of health-related quality of life. The implications of the findings and study limitations are discussed. J Pain Symptom Manage 2002;24:471-480. © U.S. Cancer Pain Relief Committee, 2002.

Key Words

Insomnia, sleep disturbance, quality of life, cancer, neoplasm, primary care

Introduction

Sleep disturbance has been noted to be a frequent clinical problem¹⁻³ for cancer patients that is often the target of pharmacological intervention.^{4,5} However, the type and severity of sleep

disturbance in this population is difficult to judge. Prevalence estimates of sleep disturbance vary widely, ranging from as low as 24%⁶ to as high as 95%,⁷ and there are many inconsistencies and potential inadequacies in the methodologies that have been used to study sleep in this area.

Table 1 shows published studies reporting some level of analyses of sleep in cancer patients and describes each study in terms of the type of cancer patient sampled, the type of comparison group employed, and the method used to measure sleep. Of note, many of these

*Address reprint requests to: Barry V. Fortner, PhD, Psychology and Cancer Symptom Research, West Cancer Clinic, 100 North Humphreys Blvd., Memphis, TN 38124, USA.

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Table 1
Measures of Sleep and Types of Comparison Groups in Cancer Patients

Study	Control	Measure
Bone Marrow Transplant		
Carpenter ⁸	None	Pittsburgh Sleep Quality Index
Jacobsen ³⁶	None	Pittsburgh Sleep Quality Index
Andrykowski ¹⁸	None	Symptom Experience Report
Andrykowski ¹⁹	None	Symptom Experience Report
Brain		
Matsuoka ³⁷	None	EEG
Breast		
Berger ¹⁰	None	Richard-Campbell Sleep Questionnaire
Berger ¹¹	None	Actigraphy
Berger ¹²	None	Actigraphy
Carpenter ⁸	None	Pittsburgh Sleep Quality Index
Knobf ²	Breast	Symptom Distress Scale
Mock ¹³	None	Symptom Assessment Scales
Mock ¹⁴	Breast	Symptom Assessment Scales
Silberfarb ⁹	Insomnia	Polysomnography
Cervical		
Lerman ³⁸	Healthy	Study questionnaire
Colorectal		
Mormont ³⁹	None	Actigraphy
Lung		
Sarna ⁶	None	Symptom Distress Scale
Silberfarb ⁴⁰	None	Polysomnography
Silberfarb ⁹	Insomnia	Polysomnography
Mixed		
Alley ⁴¹	None	Pittsburgh Sleep Quality Index
Beszterczey ⁴²	Medical	Study Questionnaire
	Surgical	
Derogatis ⁴	None	Review of Pharmacy Records
Engstrom ⁴³	None	Study Questionnaire
Fortner ⁴⁴	None	Pittsburgh Sleep Quality Index
Goldberg ⁵	None	Chart Review
Greenberg ⁴⁵	None	Study Questionnaire
Kaye ⁴⁶	Cardiac	Study Questionnaire
	Healthy	
Lamb ⁴⁷	None	Study Questionnaire
Miaskowski ⁴⁸	Healthy	Actigraphy
Nail ⁴⁹	None	Study Questionnaire
Plumb ⁵⁰	Psychiatric	Beck Depression Inventory
	Healthy	
Sheely ⁵¹	None	Verran and Snyder-Halpern Sleep Scale
Silberfarb ⁴⁰	None	Polysomnography
Strang ⁵²	None	Study Questionnaire
Thomas ⁷	None	Study Questionnaire
Yellen ³	None	Functional Assessment of Cancer Therapy
Prostate		
Greenberg ⁴⁵	None	Study Questionnaire

studies used questionnaires and interviews created specifically for the respective project. These instruments do not have established reliability and validity and produce idiosyncratic descriptions of sleep and definitions of sleep disturbance. It is also apparent that no group with any particular type of cancer has been studied extensively, and it is difficult to determine using the data provided if sleep disturbance is unique to cancer patients in comparison to other medical populations. Additionally, examination

of study findings reveals limited exploration of the relation between sleep disturbance and the many potential precipitants of sleep disturbance in cancer patients, as well as limited examination of the relation between sleep disturbance and the multiple aspects of cancer patients' lives affected by disease and treatment.

The sleep of breast cancer patients has been studied through systematic investigations of sleep disturbance,^{2,8,9} negative effects of chemotherapy and radiation therapy,¹⁰⁻¹² and the

positive effects of exercise programs during chemotherapy and radiation therapy.^{13,14} As a group these studies used better measures of sleep, including polysomnography, actigraphy, and the Pittsburgh Sleep Quality Index (PSQI¹⁵). However, other studies have used single items from the Symptoms Distress Scale (SDS¹⁶) and the Symptom Assessment Scale (SAS¹⁷), which does not provide a description of sleep problems or have established empirical definitions for determining significant decrements in sleep. Those studies using validated measures of sleep are described below.

Silberfarb and colleagues⁹ provide the most extensive and objective description of sleep in breast cancer patients, using polysomnography to produce data from two test nights following one adaptation night. Patients with infiltrating ductal carcinoma and patients with lung cancer were matched on sex and age with comparison samples of insomniacs and healthy individuals. On average, breast cancer patients had a sleep efficiency (time in bed divided by total sleep time) of 90.4%, total sleep time of 384 minutes (6.4 hours) and latency to sleep onset (from "lights out") of 21 minutes. Comparison of breast cancer patients to lung cancer patients showed that breast cancer patients had better overall sleep, with less time in bed, a shorter latency to persistent sleep (i.e., they fell asleep faster), less time awake after the first sleep epoch (i.e., they had more consolidated sleep), and less stage 1 sleep (i.e., they had less light sleep). Breast cancer patients were not significantly different than the healthy controls on any sleep characteristic and had better sleep efficiency than insomniacs.

In a sample of non-metastatic breast cancer patients being seen for routine follow-up exams, Carpenter and Andrykowski⁸ found that the average Global Sleep Quality Index score, a measure of global sleep quality from the PSQI, was above the cutoff established by the originators of the scale, indicating that on average breast cancer patients had significant sleep problems. This study was an attempt to examine the psychometric properties of the PSQI, and no attempt was made to describe specific aspects of sleep or compare sleep parameters in breast cancer patients to people with other medical conditions. In the process of evaluating the concurrent validity of the PSQI, sleep quality was shown to have positive relation with feeling

tired, weakness, nausea, vomiting, and change in taste as measured by the Symptoms Experience Report (SER^{18,19}). Furthermore, sleep quality was related to all of the scales of the Profile of Mood States (POMS²⁰) and the total score of the Center for Epidemiological Studies—Depression (CES-D²¹) and vitality as measured by the Rand 36-Item Health Survey (SF-36).²² Of importance to the present study, the relationship between the other scales of the SF-36, a measure of health-related quality of life, were not reported.

Berger and colleagues¹⁰⁻¹² studied fatigue in breast cancer patients receiving chemotherapy. In this study, actigraphy was used as an objective measure of sleep. Actigraphy consists of a wrist monitor that records the intensity and frequency of movements. These data can then be used to estimate the amount of sleep during the night. Nocturnal awakenings, measured by actigraphy, were more frequent during chemotherapy cycles than in between cycles, and the incidence of patients with significant awakenings increased through the first three chemotherapy cycles so that by the third cycle awakenings were pervasive for all patients with the average number of awakenings ranging from 22 to 36 per night. They also observed that sleep disturbance and daytime napping correlated with the experience of fatigue and other physical symptoms. Sleep disturbance did not vary with the use of doxorubicin as a component of the chemotherapy regimens.

Together, the limited studies of breast cancer patients to date suggest that breast cancer patients frequently are dissatisfied with their sleep^{2,8} and experience increasingly frequent awakenings during chemotherapy or radiation therapy.¹⁰⁻¹² While only one study⁸ correlated sleep problems to a measure of quality of life, one might conclude that the pattern of results regarding sleep disturbance and physical symptoms, anxiety, depression, and fatigue are evidence that sleep disturbance predicts decrements in the quality of life of breast cancer patients.⁸

The purpose of this study was to further describe the characteristics of sleep in breast cancer patients using a validated self-report measure of sleep that allows description of multiple aspects of sleep. Furthermore, the study compared sleep characteristics in breast cancer patients to patients with general medical conditions to determine if features of sleep disturbance are

unique to breast cancer. Finally, the study examined the relationship between the presence of chemotherapy and radiation therapy in breast cancer patients and examined the relation between global sleep disturbance and aspects of quality of life in breast cancer patients.

Methods

Design and Procedures

This study was an anonymous, single time point, cross-sectional survey of breast cancer patients and general medical patients approved by the institutional review board of Rush-Presbyterian-St.-Luke's Medical Center. Breast cancer patients presenting to an outpatient oncology clinic and female medical outpatients presenting to an internal medicine clinic were recruited in waiting rooms prior to regularly scheduled appointments and gave verbal consent to participate prior to completing questionnaires regarding socio-demographics, medical treatments, sleep patterns, and quality of life.

Measures

Personal and Medical Information. A personal and medical information form was created for this study that asked participants to provide information about their age, marital status, race, education, employment status, and whether they were currently receiving chemotherapy or radiation therapy. Patients were asked to list their current medications, prescription or nonprescription. Patients were asked to report any other methods used for sleep, such as behavior therapy. Finally, patients were provided the descriptions of the Eastern Cooperative Oncology Group Performance Status scale²³ and asked to choose one description that best described their ability to function. Patients were not asked about prior sleep problems and no attempt was made to determine if patients met criteria for a current or past sleep-related disorder.

Pittsburgh Sleep Quality Index (PSQI). The PSQI is a standardized measure of sleep quality that has been widely used in sleep research. It consists of 19 items that produce a global sleep quality index (GSQI) and 7 component scores reflecting sleep quality, sleep latency, sleep du-

ration, habitual sleep efficiency, sleep disturbance, use of sleeping medications, and daytime dysfunction. High scores on the GSQI and the sleep quality component score represent poorer sleep quality. High scores on the respective component scores represent greater degrees of sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleeping medications, and daytime dysfunction. Carpenter and Andrykowski⁸ observed Cronbach's alpha coefficients of 0.80 for the GSQI and 0.70 to 0.78 for the sleep disturbance component. Other component scores were not examined for internal consistency because they consist of one or two items. The scale as a whole had good convergent, divergent, and discriminate validity in a sample of bone marrow transplant patients, renal transplant patients, breast cancer patients, and patients with benign breast problems. Cronbach's alpha observed in this study for the GSQI was 0.75 and 0.73 for the sleep disturbance component.

Rand 36-Item Health Survey (SF-36). The SF-36²⁴ is a 36-item test designed to measure health related quality of life. Factor scores reflect the following domains: physical functioning, physical pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, general mental health, social functioning, energy/fatigue, and general health perceptions. Cronbach's alpha coefficients for these factors are reported in the manual to range from 0.78 to 0.93.²⁴ In this study Cronbach's alpha coefficients observed for the eight factors ranged from 0.73 to 0.94.

Analysis Plan

To determine if the sleep of breast cancer patients differed from that of general medical patients, we first examined potential covariates that might explain difference in sleep between the two groups. We used *t*-tests and χ^2 tests to check for differences on demographic characteristics between the two groups and determined if any of the significant factors were related to the Global Sleep Quality Index through Pearson correlation coefficients and *t*-tests. To examine differences in sleep between the two medical groups, we then conducted a MANOVA in which the subscales of the PSQI served as dependent variables and group (breast cancer ver-

sus general medical patients) served as the independent variable.

To explore the differences in sleep disturbance among recipients of chemotherapy vs. radiation therapy, we grouped breast cancer patients by whether or not they were receiving chemotherapy and/or radiation therapy at the time of the survey. We performed a MANOVA in which the component scores of the PSQI served as dependent variables and group (receiving treatment versus no treatment) served as the independent variable.

To examine differences in quality of life of breast cancer patients who were good and poor sleepers as defined by the PSQI, a MANOVA was performed in which the 8 scales of the SF-36 were used as dependent variables and global sleep quality was used as the independent variable.

Analysis of power suggests that the sample size used in this analysis is sufficient to detect a medium effect size ($d > .50$) with power of .80.²⁵

Results

Participants

Participants were 72 breast cancer patients (19 pre-cancer treatment, 29 receiving cancer treatment, 23 post-cancer treatment) and 50 female medical patients presenting for regular physical examinations for general medical conditions. As shown in Table 2, the average breast cancer patient was a middle aged, married, Caucasian female with some college education. Half of the cancer patients were working, and half were rated as fully functional by the Eastern Cooperative Oncology Group Performance Status (ECOG).²³ Frequency of treatment and the time since treatment was not gathered. No medical evaluation was performed and no data from the patients' chart regarding medical examination or medical history was collected.

Compared to the patients without cancer, the breast cancer patients were older ($t(119) = 5.65$, $P < 0.001$) and more likely to be Caucasian ($\chi^2(1) = 38.18$, $P < 0.001$), married ($\chi^2(1) = 5.94$, $P < 0.02$), $P < 0.05$), and more likely not to be employed ($\chi^2(1) = 6.13$, $P < 0.05$) (Table 2). However, none of the variables were significantly related to the GSQI, and were, therefore, not used as covariates in the subsequent comparison of breast cancer and general medical patients on sleep disturbance.

Table 2
Sample Characteristics

	Breast Cancer (<i>n</i> = 72)	General Medical (<i>n</i> = 50)	Total (<i>n</i> = 122)
Age, mean (SD)	51.33 (11.66) ^a	38.1 (13.92)	45.96 (14.15)
Married	68% ^b	46%	59%
Caucasian	82% ^b	26%	59%
College education	83%	72%	79%
Employed	53% ^b	75%	62%
Receiving chemotherapy or radiation	41%		
Fully functional ^c	53%		

^aCancer patients were different than general medical patients, $t(120)$, $P < 0.05$.

^bCancer patients were different than general medical patients, $\chi^2(1)$, $P < 0.05$.

^cReceiving a score of 0 on the ECOG Performance Rating Scale indicating normal functioning.

Sleep Disturbance in Breast Cancer Patients

Table 3 shows the PSQI global and component scores for the breast cancer patients and general medical patients. Examination of the GSQI revealed that 61% of breast cancer patients had scores greater than the cutoff score of 5 established by the scale originators, indicating significant decrements in sleep quality.¹⁵ Analysis of component scores and individual PSQI items for breast cancer patients revealed that the average time to sleep onset (sleep latency) was 21 minutes (SD = 22) with 40% of patients reporting sleep latency greater than 15 minutes. The average sleep duration was 6.9 hours per night (SD = 1.6) with 36% reporting sleep duration less than 6 hours. Forty-six percent (46%) of the breast cancer patients obtained habitual sleep efficiency scores less than 85%, and 29% described the quality of their sleep as "fairly" or "very" bad. Table 4 shows the percentages of breast cancer patients who reported experiencing sleep disturbance (defined as difficulty either falling or staying asleep) at least three times per week during the past month for various reasons. The need to use the bathroom and pain were the most frequent reasons for sleep disturbance, followed by feeling too hot, middle of the night or early morning awakening, and coughing or snoring loudly, respectively. Bad dreams, feeling too cold, and difficulty breathing were less frequently reported as disturbing sleep.

The MANOVA comparing breast cancer patients to general medical patients on sleep characteristics was not significant, indicating

Table 3
Sleep Quality in Breast Cancer Patients and General Medical Patients

PSQI Component Score ^a	Breast Cancer (n = 72) M(SD)	General Medical (n = 50) M(SD)	F (1,122)	P
Subjective sleep quality	1.2(0.8)	1.0(0.7)	1.31	0.26
Sleep latency	1.1(0.9)	1.2(0.9)	0.85	0.36
Sleep duration	1.1(1.1)	1.4(1.1)	2.61	0.11
Habitual sleep efficiency	0.8(1.1)	1.0(1.3)	0.35	0.56
Sleep disturbance	1.4(1.0)	1.3(0.6)	0.17	0.68
Sleep medication	0.9(1.2)	0.4(0.9)	5.09	0.03
Daytime dysfunction	0.9(0.7)	0.9(0.9)	0.01	0.94
Global sleep quality index	6.8(4.0)	6.7(4.5)	0.21	0.90

PSQI = Pittsburgh Sleep Quality Index.

^aHigher scores on the PSQI represent greater endorsement of the construct indicated by the component label.

that the sleep of breast cancer patients was not reliably different than those of general medical patients across the various sleep characteristics. For exploratory purposes, Table 3 shows the results of individual univariate tests performed on each of the PSQI subscales. Only the sleep medications component score showed a significant difference as breast cancer patients reported taking sleep medication more frequently than general medical patients.

Sleep Treatment

Regarding treatments for sleep problems, 42% of the breast cancer patients indicated that they had used medication for sleep in the past month with 21% reporting they had used sleep medication at least three times per week during the past month. Of those patients who were defined as bad sleepers by the cutoff score of the GSQI, 59% reported they had used medication for sleep in the past month with 30% reporting they had used sleep medication at least three times per week during the past month.

Table 4
Types of Sleep Disturbance Reported by Breast Cancer Patients

Type of Sleep Disturbance	Patients Experiencing ≥ 3 times per week (%)
Using the bathroom	50
Pain	22
Middle night or early morning awakening	17
Too hot	17
Coughing or snoring loudly	10
Difficulty breathing	4
Too cold	4
Bad dreams	3

No patients reported receiving any type of cognitive behavioral therapy for sleep.

Chemotherapy and Radiation Therapy

The MANOVA comparing breast cancer patients according to treatment status was not significant, indicating that the sleep parameters in breast cancer patients who were receiving chemotherapy or radiation therapy were not reliably different than patients not receiving treatment at the time of the survey across the various sleep characteristics. For exploratory purposes, we examined individual univariate tests performed on each of the PSQI subscales. None of the component scores was statistically significant at the 95% confidence level, but sleep disturbance and sleep latency showed trends toward significant differences. Breast cancer patients receiving chemotherapy or radiation therapy (mean = 1.52, SD = 0.64) tended to have greater sleep disturbance than breast cancer patients not receiving treatment (mean = 1.24, SD = 0.58) at the time of the survey, $F(1,69) = 3.71$, $P < 0.06$. Likewise, breast cancer patients receiving chemotherapy or radiation therapy (mean = 1.31, SD = 1.04) tended to have longer sleep latency than breast cancer patients not receiving treatment (mean = 0.93, SD = 0.84) at the time of the survey, $F(1,69) = 2.93$, $P < 0.10$.

Sleep Disturbance and Quality of Life

Table 5 shows the SF-36 quality of life scores for breast cancer patients dichotomized by sleep quality where bad sleepers were defined by GSQI scores (≥ 5). The MANOVA comparing good and bad sleepers on QOL scores was significant, $F(8, 55) = 3.74$, $P < 0.01$. To exam-

ine the nature of this difference, we performed univariate tests on each the eight scales of the SF-36 using sleep quality as a grouping variable. Bad sleepers had lower ability to function because of physical problems and less ability to function generally, more bodily pain, less vitality or energy in daily life, and more problems with mental health (Table 5). Bad sleepers also reported lower ability to function socially, but this effect was not statistically significant.

Discussion

This study finds that sleep is frequently problematic for breast cancer patients. In fact, 61% of the breast cancer patients sampled had significant sleep deficits as measured by the Pittsburgh Sleep Quality Index. The sleep of breast cancer patients in this sample was characterized by reduced total sleep time, with many attributing poor sleep to pain, nocturia, feeling too hot, and coughing or snoring loudly.

In addition to finding a high frequency of sleep disturbance, this study provides preliminary evidence that sleep problems predict deficits in the quality of life of breast cancer patients. Breast cancer patients with poor sleep reported deficits in their ability to perform work and daily tasks because of physical limitations, despite the fact that they were not more likely to report more profound problems with their general health or physical functioning than breast cancer patients with normal sleep. Breast cancer patients with poor sleep also reported lower levels of vigor or energy for daily activities, which is consistent with research showing that insomnia and fragmented sleep results in daytime sleepiness and fatigue in other medical populations.²⁶ Although daytime fatigue has been commonly observed in cancer populations,²⁷

little attention has been paid to the role that sleep disturbance may play in contributing to this symptom.

Despite a high frequency of sleep complaints and an association between sleep disturbance and decreased quality of life, treatment for sleep disturbance was not routinely provided. Many breast cancer patients with significant sleep disturbance had received no pharmacological treatment in the month prior to the survey. Further, no patients received behavioral treatment for sleep problems even though this approach has been shown to be effective in this population.²⁸

Another purpose of the present study was to investigate the variation of sleep disturbance in relation to chemotherapy and radiation therapy, and surprisingly our findings provided only limited support for the suggestion that sleep is more disturbed when patients are receiving radiation or chemotherapy. Breast cancer patients receiving radiation or chemotherapy showed a trend toward more sleep disturbance and greater sleep latency, but this effect was not profound or statistically significant. The PSQI may not be sensitive enough to detect the increases in sleep problems with chemotherapy and radiation, which have been observed by previous studies using objective measures.¹⁰⁻¹² Moreover, the design of the study does not allow exploration of differences that may exist between types of chemotherapy and radiation treatments or as a cumulative effect of these treatments. These findings suggest that the incidence of sleep problems is similar for breast cancer patients who are receiving cancer treatment than those who are not, but conclusions about the etiology of sleep problems cannot be determined. Although sleep may be disturbed at a similar incidence rate in breast cancer patients who are and are not receiving cancer

Table 5
Sleep Disturbance and Quality of Life in Breast Cancer Patients (n = 72)

SF-36 Scale	Good Sleepers (28) M(SD)	Bad Sleepers (44) M(SD)	F (1,62)	P
Physical functioning	76.54(21.39)	65.79(28.65)	2.65	>0.10
Role-functioning	72.12(44.90)	40.13(41.73)	8.53	<0.01
Bodily pain	79.15(25.30)	61.66(25.02)	7.48	<0.01
General health	65.81(20.84)	60.58(24.08)	0.81	>0.37
Vitality	68.46(16.42)	48.95(22.06)	14.73	<0.01
Social functioning	80.29(24.28)	68.42(24.79)	3.6	>0.06
Role-emotional	93.59(21.12)	71.93(38.38)	6.84	<0.02
Mental health	84.46(11.83)	72.05(15.41)	12	<0.01

Note: SF-36 scores range between 0 and 100 with higher scores representing better quality of life.

treatment, sleep in these groups may be disturbed for different reasons. Chemotherapy and radiation therapy may perturb sleep during treatment whereas other factors are active outside treatment to produce the same overall level of poor sleep quality.

Another interesting aspect of our findings is the equivalence of sleep problems between breast cancer patients and patients with general medical problems. Although the incidence of sleep problems is similar in these two populations, it does not mean that the etiologies of those problems are the same. It may be that breast cancer patients as a group have poor sleep but for different reasons than general medical patients. Furthermore, our study does not allow for the characterization of sleep across time, and it is not clear how sleep problems may differ temporally between breast cancer patients and general medical patients, especially those patients with acute medical conditions. Moreover, a previous study showed that lung cancer patients have more severe sleep disturbance than breast cancer patients, who are more likely to be on par with healthy individuals,⁹ highlighting the possibility that other cancer groups may have sleep disturbance that is distinct from general medical conditions.

Although not the focus of this study, the notable problems with sleep in the primary care group is consistent with previous findings²⁹ and is particularly important in light of recent reports showing that sleep is inadequately addressed by primary care physicians.^{30,31} Curiously, the only significant difference between the breast cancer group and the primary care patients in our study was that the general medical patients were even less likely to have taken sleep medication in the month prior to the survey. Many things may account for this difference, but one possibility that must be considered is that practitioners are reluctant to use hypnotic medication, perhaps because of the risk of side effects or dependence. Primary care practitioners may also not be familiar with alternative treatments, such as cognitive-behavioral treatments, or have access to these treatment approaches.

Breast cancer patients reporting poor sleep also reported worse emotional health and greater restriction in ability to perform work and daily tasks because of emotional problems. This study further establishes the relation be-

tween sleep disturbance and emotional aspects of quality of life. It is possible that the sample of cancer patients who exhibited poor sleep were also those who had the strongest negative reaction to the cancer diagnosis. Certainly those patients with clinical depression would be expected to have disturbed sleep because this is a cardinal symptom of this disorder,³² but it is also possible that having persistent insomnia may precipitate an episode of depression.³³ This latter possibility, if validated, would provide an additional rationale for treatment of insomnia in these patients.

Pain has been well documented as one of the most frequent negative symptoms experienced by cancer patients,³⁴ and our study showed that deficits in pain-related quality of life are correlated with poor sleep. In other words, breast cancer patients reporting worse pain-related quality of life were more likely to report problems with sleep. This relation is complex in that nocturnal pain may disturb sleep, but it has also been suggested that sleep disturbance may affect the experience of pain by exacerbating pain sensitivity.³⁵ This possibility is worthy of future study because these symptoms may interact in a cycle that perpetuates and exacerbates the experience of both symptoms. Attention to sleep disturbance may also need to be incorporated into the routine practice of pain management.

In conclusion, sleep problems appear to be a significant issue for breast cancer patients that may be inadequately addressed in routine oncology care. Future studies should continue to examine the nature of sleep disturbance with objective and standardized measurement methods and explore further the characteristics of breast cancer patients and cancer treatments that may be associated with elevated levels of sleep disturbance. Additionally, future investigations should examine the benefits of pharmacological and behavioral treatments for sleep problems in breast cancer patients and evaluate the effects of improvement in sleep on other aspects of quality of life.

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