Systematic review of sleep disorders in cancer patients: can the prevalence of sleep disorders be ascertained?

Julie L. Otte¹, Janet S. Carpenter¹, Shalini Manchanda², Kevin L. Rand³, Todd C. Skaar², Michael Weaver¹, Yelena Chernyak², Xin Zhong², Christele Igega¹ & Carol Landis⁴

¹Indiana University School of Nursing, Indianapolis, Indiana
²Indiana University School of Medicine, Indianapolis, Indiana
³Indianapolis Department of Psychology, Indiana University-Purdue University, Indianapolis, Indiana
⁴University of Washington School of Nursing, Seattle, Washington

Keywords
Cancer, review, sleep, sleep disorder, symptom assessment

Correspondence
Julie L. Otte, 1111 Middle Drive NU W401, Indianapolis, IN 46202.
Tel: 317-274-0886;
Fax: 317-278-1856;
E-mail: jlelam@iu.edu

Funding Information
This study was supported by National Center for Advancing Translational Sciences, National Institutes of Health KL2RR025760. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Cancer Institute, National Center for Research Resources, or the National Institutes of Health.

Received: 23 July 2014; Revised: 26 August 2014; Accepted: 7 September 2014

Cancer Medicine 2015, 4(2):183–200
doi: 10.1002/cam.356

Abstract

Although sleep is vital to all human functioning and poor sleep is a known problem in cancer, it is unclear whether the overall prevalence of the various types of sleep disorders in cancer is known. The purpose of this systematic literature review was to evaluate if the prevalence of sleep disorders could be ascertained from the current body of literature regarding sleep in cancer. This was a critical and systematic review of peer-reviewed, English-language, original articles published from 1980 through 15 October 2013, identified using electronic search engines, a set of keywords, and prespecified inclusion and exclusion criteria. Information from 254 full-text, English-language articles was abstracted onto a paper checklist by one reviewer, with a second reviewer randomly verifying 50% (k = 99%). All abstracted data were entered into an electronic database, verified for accuracy, and analyzed using descriptive statistics and frequencies in SPSS (v.20) (North Castle, NY). Studies of sleep and cancer focus on specific types of symptoms of poor sleep, and there are no published prevalence studies that focus on underlying sleep disorders. Challenging the current paradigm of the way sleep is studied in cancer could produce better clinical screening tools for use in oncology clinics leading to better triaging of patients with sleep complaints to sleep specialists, and overall improvement in sleep quality.

Introduction

Sleep is vital to all human functioning and encompasses a complex set of physiological and behavioral processes; disruption in one or more of these processes can lead to many different types of symptoms of poor sleep that can occur singly or in combination. In cancer patients, disturbed sleep is rated the second most bothersome symptom based on cancer and treatment status [1]. Sleep problems are known to cause poor healing, increase chances of cancer recurrence, decreased cognitive functioning, decreased work productivity, increased safety issues, medication misuse and abuse, poor relationships, and increased health care costs [2–20].

Poor sleep is a known problem in cancer patients along the treatment trajectory from the point of diagnosis to end of life [21, 22]. In the United States in 2013, estimates were that there are over 13.7 million people living as cancer survivors, another 1.66 million will be diagnosed with cancer, and more than 580,000 will die of
cancer. Poor sleep is known to affect up to 75% of these individuals [23, 24]. Because of the importance of sleep and the high prevalence of poor sleep in cancer, sleep-related research, and symptom management have been designated as research priorities by the Oncology Nursing Society [25] and National Institute of Nursing Research [26].

Poor sleep in cancer patients and survivors could be attributed to the presence of one or more underlying sleep disorders. Sleep disorders can be classified using two main classification systems, the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) [27] or the International Classification of Sleep Disorders (ICSD) [28], and they can directly impact health-related quality of life. Sleep disorders can occur singly or in combination and include insomnia, sleep-related breathing disorders, hypersomnia, circadian rhythm disorders, parasomnias, sleep-related movement disorders, isolated symptoms, and other nonspecified disorders [29]. Diagnosing specific sleep disorders usually requires a detailed and specialized evaluation, sometimes requiring overnight evaluation of objective measures of sleep. However, it has been reported that cancer patients often do not get referrals to sleep specialists when presenting with chronic sleep complaints. In a recent study of 78 patients with serious insomnia complaints, only four (5%) received a recommendation for formal follow-up or reassessment of the sleep problem [20].

Details of specific sleep disorders should guide intervention(s) since each type of sleep disorder may require a different type of treatment. It is also pertinent to examine how treatment of such sleep disorders fits within the scope of practice for specialty clinics such as oncology. However, the extent to which sleep disorders have been studied in cancer is unclear, even though this information is vital to appropriate assessment and intervention. Therefore, the purpose of this systematic literature review was to evaluate if the prevalence of various types of sleep disorders could be ascertained from the current body of literature regarding sleep in cancer.

Methods
This was a critical and systematic review over a 2-year time frame of peer-reviewed, English-language, original articles published from 1980 through October 2013. We used PubMed, PsychINFO, CINAHL, and OVID search engines. Key words used for the search included; sleep, sleep disturbances, sleep problems, insomnia, circadian rhythm, restless leg syndrome, sleep apnea, narcolepsy, daytime dysfunction, daytime sleepiness, cancer, breast cancer. Breast cancer was specifically added as a search term to capture the large body of literature from this population on sleep. Limits were human, English language, and adults. Articles were included if: (1) sleep was identified as a primary outcome, a secondary outcome, or a covariable of interest; and (2) articles were focused on cancer diagnosis, treatment, survivorship, or end of life (not prevention). Excluded were review articles, case studies, and abstracts.

Article titles and abstracts were reviewed and screened for the following keywords; sleep, cancer, symptom cluster, menopausal symptoms, correlates of sleep, narcolepsy, circadian, restless leg syndrome, apnea, disturbance, and daytime dysfunction. If the title seemed to fit review criteria, the full-text article was pulled and read to determine relevance to the review. If the article was deemed relevant, information about the article was abstracted onto a paper checklist. Once the final article list was identified, references were checked against the available systematic reviews in the literature to ensure all relevant articles were captured. One reviewer completed data abstraction for all selected articles. A second reviewer randomly checked 50% of the articles for data abstraction accuracy. A kappa statistic was calculated and indicated good agreement between the raters (k = 99%), confirming the accuracy of the data abstraction. All abstracted data from the paper checklists were entered into an electronic database. All data entry was double checked for accuracy. Data were analyzed using SPSS (v.20) (North Castle, NY). Descriptive statistics and frequencies were obtained to synthesize the major points of this review.

Results
The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [30] format was used as a guide to develop a search diagram showing the flow for the article retrieval process (Fig. 1). A total of 2620 article titles were reviewed. This process resulted in identifying 339 full-text articles that were reviewed.

Of these, 254 articles met criteria to be included in this review. The 254 articles were mainly from the United States (n = 145, 57.5%) [3–7, 10–12, 14, 31–162], United Kingdom/Europe (n = 43, 16.9%) [8, 163–186], and Canada (n = 25, 9.8%) [16, 187–228]. Very few were published during the 1980s (n = 4, 1.6%) [78, 82, 128, 135] or 1990s (n = 16, 7.1%) [10, 14, 43, 46, 50, 56, 95, 104, 110, 115, 121, 189, 199, 208, 212, 229], with most published in 2000 or later (n = 233, 91.3%) [3–8, 11, 12, 15, 16, 31–42, 44–49, 51–55, 57–75, 77, 79–81, 83–85, 87–94, 96–103, 105–109, 111–114, 116–120, 122–127, 129–134, 136–188, 190–198, 200–207, 209–211, 213–228, 230–269]. Quantitative descriptive studies were most common (n = 186, 73.6%), [3–8, 11, 12, 14–16, 31, 32, 34, 37, 38, 40, 43–46, 48–50, 54–63, 67–76, 78, 80, 82, 84–101, 103–
108, 110–116, 118–123, 126, 129, 130, 132, 133, 135–140, 142–146, 148, 150, 151, 154, 155, 158–160, 162, 163, 165, 168–171, 173–177, 181–185, 188, 191, 194–199, 202–209, 211, 213–215, 217–221, 223, 224, 227–233, 235, 237, 239–243, 245–249, 251–255, 257, 259, 260, 263, 265–269] followed by intervention studies \((n = 58, 22.8\%)\) \([35, 36, 38, 39, 41, 42, 47, 51–53, 64, 65, 77, 81, 83, 102, 109, 113, 117, 124, 127, 128, 131, 134, 141, 147, 149, 153, 156, 157, 161, 164, 167, 172, 178–180, 186, 187, 189, 190, 193, 201, 210, 216, 222, 225, 226, 234, 238, 244, 250, 256, 258, 261, 262, 264]\) qualitative studies \((n = 7, 2.8\%)\) \([66, 79, 152, 166, 192, 200, 212]\), and mixed-methods studies \((n = 2, 0.8\%)\) \([10, 33]\).

**Description of studies**

Study samples primarily included patients with a mix of different types of cancers \((n = 104, 40.9\%)\) \([3, 4, 8, 10, 14, 35, 36, 45, 47, 48, 50, 52, 58, 62, 66, 68, 69, 72, 75, 78, 80–82, 84, 88, 89, 93, 95, 98–100, 103–105, 111, 113, 115–117, 120–122, 127–130, 143, 145, 149, 161, 162, 164–170, 174, 181, 182, 184, 187, 189–192, 194–196, 198, 203, 206, 208, 212, 215, 216, 218, 221, 223, 224, 227–229, 231, 232, 234, 236, 238, 240–243, 245, 247, 248, 253, 254, 259, 261, 264, 266–268]\) or patients with breast cancer \((n = 102, 40.2\%)\) \([5–7, 11, 12, 15, 16, 31, 32, 34, 37–44, 46, 49, 51, 55–57, 59, 61, 63–65, 73, 76, 77, 79, 83, 85–87, 91, 92, 94, 96, 97, 101, 102, 106, 108, 112, 118, 119, 123–126, 131, 132, 134, 136–141, 148, 151, 154–160, 163, 172, 173, 175, 176, 178–180, 183, 186, 188, 193, 200–202, 210, 214, 220, 222, 225, 226, 230, 233, 239, 249–251, 256, 263, 265]\) with fewer studies focused on another single cancer diagnosis \((n = 102, 40.2\%)\) \([33, 38, 53, 54, 67, 70, 71, 74, 107, 109, 110, 114, 133, 135, 142, 144, 146, 147, 150, 152, 153, 171, 185, 197, 199, 204, 205, 207, 209, 211, 213, 217, 219, 235, 237, 244, 246, 252, 255, 257, 258, 260, 262, 269]\). Of the latter, studies focusing on lung cancer were most common \((n = 14)\) \([70, 71, 74, 109, 110, 135, 144, 152, 197, 204, 205, 235, 246, 257]\). The total number of participants with cancer appeared as high as 3343,
although there was duplication where data were reported in more than one manuscript. The number of participants in the control groups (including cancer and noncancer) evaluated in studies was 1607. Only 90 studies (35%) [3, 7, 11, 34–36, 38, 39, 43, 46, 48, 50–53, 58, 63–65, 69–71, 74, 77, 78, 85, 93–95, 101, 102, 106, 109, 113, 115, 117, 122, 125, 128, 129, 132–135, 137, 141, 145–147, 149, 153–157, 161, 163, 178, 179, 187, 188, 190, 191, 193, 194, 204, 214–217, 219, 224, 225, 229, 234, 236, 237, 240, 244, 245, 247, 250, 255, 256, 258, 261, 262, 264] included a comparison group in the study design, with most comparison groups being subjects with cancer.

### Sleep-specific characteristics of studies

Methodological characteristics of the 254 articles are shown in Table 1. The time points for assessing sleep were varied but mainly focus on accessing sleep problems during and postcancer treatment. Most articles reviewed focused on sleep as a concurrently occurring or clustered variable with either fatigue or one or more other symptoms (59%). [3, 5–7, 12, 14–16, 32, 33, 35, 37–49, 51–54, 56–62, 67–69, 71, 73–77, 79–86, 88, 89, 92, 93, 96, 97, 101, 102, 104–108, 110–114, 116, 118, 122, 124–127, 129–131, 133, 134, 136–150, 154–160, 162–164, 167–170, 173, 178, 179, 183, 185, 188, 191, 193, 195, 198, 200–203, 207, 208, 212, 214–216, 218, 220–230, 234, 241, 243–245, 247, 248, 250–254, 256–259, 261, 263–269].

When selecting participants for studies, potentially important inclusion and exclusion criteria for sleep were rarely addressed. For example, only 19.7% (n = 50) [35–41, 48, 49, 61, 63, 69, 77, 87, 90, 91, 99, 108, 109, 115, 122, 129, 136, 138, 140, 141, 151, 160, 161, 163, 172–174, 178–181, 187, 189, 192, 204, 217, 221, 233–235, 255, 266] of the studies reviewed excluded for previous sleep disorder or current treatment of sleep disorders.

The majority of studies did not include a definition of sleep or sleep problems, did not classify sleep disorders, and did not discuss the etiology of the sleep problems studied. Only 26 (10.2%) [8, 36, 40, 58, 64, 65, 77, 97, 98, 108, 109, 115, 161, 172, 173, 176, 178, 179, 182, 190, 192, 209, 210, 216, 231, 240] studies used a formal diagnostic classification system within the study design. Thirteen of these 26 studies used the DSM-IV (n = 13) [36, 65, 97, 108, 109, 161, 176, 190, 192, 210, 216, 231, 240]. The remaining 13 articles used a combination of the DSM and ICSD (n = 8), ICSD alone (n = 4), or a classification used by the American Society of Dentist Anesthesiologists (n = 1). Those using diagnostic classification systems used them as a mechanism to verify eligibility for studies specifically looking for primary insomnia. No other specific details from these studies were provided.

### Table 1. Methodological characteristics of reviewed articles.

| Characteristic | n (%) |
|---------------|-------|
| Type of cancer |       |
| Mixed          | 104 (40.9) |
| Breast         | 102 (40.2) |
| Other          | 48 (18.9)  |
| Time point     |       |
| Pretreatment   | 25 (9.8)  |
| During treatment | 76 (29.9) |
| Posttreatment  | 72 (28.3) |
| Palliative care| 17 (6.7)  |
| Mixed          | 49 (19.3) |
| Type of study design |       |
| Descriptive    | 187 (73.6) |
| Intervention   | 58 (22.8) |
| Qualitative    | 7 (2.8)   |
| Mixed methods  | 2 (0.8)   |
| Priority of sleep |       |
| Primary alone  | 83 (32.7) |
| Concurrent with fatigue | 23 (9.1) |
| Concurrent with cluster | 147 (57.9) |
| Sleep term defined |       |
| Yes            | 50 (19.7) |
| No             | 204 (80.3) |
| Formal classifications of sleep disorders used |       |
| Yes            | 26 (10.2) |
| No             | 228 (89.8) |
| Etiology of sleep problem provided |       |
| Yes            | 64 (25.2) |
| No             | 190 (74.8) |
| Subjective measure of sleep |       |
| PSQI           | 81 (31.9) |
| Single item from standardized form | 46 (18.1) |
| No subjective measure | 28 (11.0) |
| Other          | 99 (39.0) |
| Objective measure of sleep |       |
| Actigraphy     | 5 (20.9) |
| Polysomnography | 16 (6.3) |
| None           | 185 (72.8) |
| Included biomarkers of sleep |       |
| Yes            | 18 (7.1) |
| No             | 236 (92.9) |
| Assessed medication use (prescription and over-the-counter) |       |
| Yes            | 64 (25.2) |
| No             | 190 (74.8) |
| Body mass index reported |       |
| Yes            | 44 (17.3) |
| No             | 213 (82.7) |
| Noncancer comorbidities reported |       |
| Yes            | 41 (16.1) |
| No             | 213 (83.9) |
| Discipline of author(s) |       |
| Nursing        | 62 (24.4) |
| Mixed          | 99 (39.0) |
| Medicine       | 48 (18.8) |
| Psychology     | 25 (9.8)  |
| Other or not listed | 20 (8.0)  |
such as frequency of other possible sleep findings that could be used to establish some prevalence information.

In addition, sleep was primarily assessed using self-report and not objective measures. The most common standardized measure used was the Pittsburgh Sleep Quality Index (N = 81), a valid and reliable instrument. The most common approach was a single item or multiple items from a larger standardized or investigator-generated questionnaire. For objective measures, wrist actigraphy was the most common. Wrist actigraphy was typically used more often due to the expense of polysomnography, which often requires an overnight stay in a hospital or clinic for evaluation.

Few studies reported assessing biomarkers such as ferritin, which plays a role in the etiology of restless leg syndrome. In addition, few studies reported concurrent medication use, particularly medications that could help or hinder sleep. Finally, few studies reported body mass index (important to diagnosing the potential for sleep apnea) or noncancer comorbidities that could hinder sleep. Potentially important exclusion criteria such as poor performance status, psychiatric illnesses, cognitive impairment, and anemia were also often not reported or not used.

Interventions were a part of only 33, or 13%, of the total studies reviewed. The most common interventions tested were formal or investigator-generated behavioral treatments for insomnia. Other interventions included mostly nonpharmacotherapy interventions such as acupuncture, yoga, relaxation, and exercise. Only five studies tested pharmacotherapy for treatment. The efficacy of these interventions for cancer patients has been assessed and can be found on the Oncology Nursing Society Putting Evidence into Practice website (www.ons.org).

Discussion

The major conclusion of this review is that the prevalence of overall particular types of sleep disorders in cancer cannot be ascertained using currently available literature. This is true across studies using mixed cancer samples and larger studies that focus specifically on populations of breast and lung cancer patients and survivors.

The main reason we cannot ascertain prevalence of specific sleep disorders relates to the conceptualization and operationalization of poor sleep. Our review indicates that studies have focused on measuring general symptoms of poor sleep rather than on the underlying sleep disorders. Symptoms of poor sleep include a decreased number of hours of sleep (sleep duration), increased number of minutes to fall asleep (sleep latency), nighttime awakenings (sleep disruptions), and inability to function fully during the day without naps (daytime dysfunction) [14, 270]. These symptoms are consistent with insomnia and can occur singly or in combination, affecting overall sleep quality and daytime function [271–274]. These symptoms help to define poor sleep but are common to more than one sleep disorder [21]. In the reviewed literature, we found that the terminology for symptoms of poor sleep is often used interchangeably with that for specific sleep disorders which therefore are not fully assessed.

This imprecise conceptualization of sleep has led to narrowly focused interventions being diffusely targeted to symptoms, rather than focused and specific to one or more sleep disorders underlying those symptoms. Although some interventions for sleep in cancer have shown possible efficacy [25], the majority of these studies are too targeted to undefined subtypes of insomnia and therefore are not generalizable to the many patients who may have other types of sleep disorders [113, 178]. This makes translating these interventions into oncology practice difficult.

To ascertain prevalence of the various types of disorders, we must change the current method for studying sleep in persons with cancer, which has focused on using single- or multi-item scales to assess and classify symptoms of poor sleep [17, 21, 275]. A total of 33 different subjective sleep measures were used across studies, with little consistency among those measures although the Pittsburgh Sleep Quality Index, used in 32% of the studies, was the most common. These measures neglect the larger issue of assessing specific types of sleep disorders underlying symptoms (e.g., trouble falling asleep and
staying asleep, nighttime disturbances) that are common to several different sleep disorders. Particular types of sleep disorders require different interventions, yet most intervention studies target undefined subtypes of insomnia as a single, underlying sleep disorder. This is problematic because there are 11 different subtypes of insomnia and not all are responsive to the same intervention [28].

Based on reports from clinical practice, patients can experience more than one type of sleep disorder concurrently, which influences how sleep is treated. For example, one seminal study found that 40% of breast cancer survivors had symptoms suggestive of both insomnia (undeclared subtypes) and a sleep-related movement disorder (e.g., restless leg syndrome) [8]. In addition, although sleep apnea has long been assumed to be relatively uncommon in women (<9%), one study of midlife women without cancer who reported symptoms of poor sleep found that 53% met criteria for sleep apnea [276]. This supports the finding that postmenopausal women have sleep apnea at the same prevalence rate as men [277]. These findings also suggest that the next logical step in sleep research for cancer patients is to correctly identify the prevalence of distinct types of sleep disorders in patients reporting symptoms of poor sleep so that appropriate clinical assessment tools and interventions can be developed and tested by oncology and general health-care providers. Perhaps this type of clinical assessment could be started in relation to one type of cancer such as in breast cancer patients and then translated to other cancer diagnoses or other chronic illnesses for testing.

Limitations of this review

Conclusions from this systematic review should be tempered in light of some limitations. First, our review focused on English-language articles, which may have excluded some important information about sleep disorders in cancer. Second, although every attempt was made to identify all pertinent articles, it is possible that some were missed, which also might have affected our conclusions.

Implications for practice

Sleep disorder prevalence data would be helpful for future intervention development. One place to begin is determining how symptoms are being addressed in the clinic visit. The role of oncology health practitioners in delineating complaints of sleep problems remains a challenge. With several formal practice guidelines available, the reality of clinic visits is that addressing symptoms is determined by a multitude of variables. During treatment there are sometimes other cancer-specific symptoms that are obvious contributing factors to acute sleep problems. For example, patients with end-stage lung cancer often have breathing problems that mimic sleep apnea or metastatic pain that is not controlled, and in this context pharmacological approaches may be appropriate. However, if such obvious problems are not present during survivorship it is unclear if oncology practitioners have the appropriate assessment tools to decide whether to make referrals to sleep specialists who could formally diagnose sleep disorders. Although practice guidelines can provide a global understanding of how to treat a patient with sleep complaints, future interventions for sleep need to involve educating about and implementing the use of short assessment tools for oncology patients and their providers as a basis for more effective treatments in the clinic setting and/or appropriate referrals for further testing. An assessment tool would need to be brief and target the common sleep disorders such as restless leg syndrome, sleep apnea, and possibly narcolepsy (although less frequently found in the general population). This tool would need to be sensitive enough to warrant appropriate referral to sleep medicine specialists for further diagnostic evaluation. Integrating into practice could be in the form of a screening tool that integrates into the electronic medical record to reflect current clinic practices. Future interventions should also be transferrable to smaller community settings where specialized oncology clinics are not readily available.

For research there are several considerations moving forward. Revising common inclusion and exclusion criteria used in research studies is required to better reflect the complexity of sleep. Although specific inclusion and exclusion criteria for studies is largely dependent on the type of research question(s) being addressed, specific questions that identify possible symptoms of common sleep disorders for both descriptive and intervention research would better reflect the influence the fact that people tend to have more than one type of sleep problem. For behavioral intervention work this is especially crucial because having undiagnosed sleep disorders can have a negative impact on the efficacy findings of those studies. In addition, refining current measurements of sleep that better assist in detangling the common sleep complaint is required. Specifically, screening all research subjects using a brief screening form for sleep disorders would better identify the prevalence of specific sleep disorders across the cancer trajectory. Providing this type of information would better inform if different questionnaires were needed based on the type of cancer being studied based on the prevalence in that population.

Conclusion

Although the literature, especially in the past 10 years, has raised awareness that poor sleep is problematic
throughout the cancer trajectory, the prevalence of particular types of sleep disorders in cancer remains unclear. This is likely due to the primary focus on studying symptoms of poor sleep and not characterizing the underlying sleep disorders in cancer patients and survivors. This review indicates that little is known about the prevalence of specific sleep disorders in cancer, which hampers the ability to fully understand (1) how to triage clinical assessments of sleep complaints by all levels and types of health-care practitioners that have contact with cancer patients and survivors and (2) how best to intervene for patients presenting in specialty clinics such as oncology with sleep complaints. Future studies should challenge the current research paradigm that focuses on describing and intervening narrowly on symptoms of poor sleep. Sleep screenings are needed that are tailored to facilitate better triage, referral for further assessment when appropriate, and more effective interventions that take into account the multiple types of sleep disorders.

**Conflict of Interest**

None declared.

**References**

1. Cleeland, C. S., F. Zhao, V. T. Chang, J. A. Sloan, A. M. O’Mara, P. B. Gilman, et al. 2013. The symptom burden of cancer: evidence for a core set of cancer-related and treatment-related symptoms from the Eastern Cooperative Oncology Group Symptom Outcomes and Practice Patterns study. Cancer 119:4333–4340.
2. Ancoli-Israel, S., P. J. Moore, and V. Jones. 2001. The relationship between fatigue and sleep in cancer patients: a review. Eur. J. Cancer Care 10:245–255.
3. Anderson, K. O., C. J. Getto, T. R. Mendoza, S. N. Palmer, X. S. Wang, C. C. Reyes-Gibby, et al. 2003. Fatigue and sleep disturbance in patients with cancer, patients with clinical depression, and community-dwelling adults. J. Pain Symptom Manage. 25:307–318.
4. Beck, S. L., A. L. Schwartz, G. Towsley, W. Dudley, and A. Barsevick. 2004. Psychometric evaluation of the Pittsburgh Sleep Quality Index in cancer patients. J. Pain Symptom Manage. 27:140–148.
5. Berger, A. M., and P. Higginbotham. 2000. Correlates of fatigue during and following adjuvant breast cancer chemotherapy: a pilot study. Oncol. Nurs. Forum 27:1443–1448.
6. Bower, J. E., P. A. Ganz, K. A. Desmond, J. H. Rowland, B. E. Meyerowitz, and T. R. Belin. 2000. Fatigue in breast cancer survivors: occurrence, correlates, and impact on quality of life. J. Clin. Oncol. 18:743–753.
7. Carpenter, J. S., J. Elam, S. Ridner, P. Carney, G. Cherry, and H. Cucullu. 2004. Sleep, fatigue, and depressive symptoms in breast cancer survivors and matched healthy women experiencing hot flashes. Oncol. Nurs. Forum 31:591–598.
8. Davidson, J. R., A. W. MacLean, M. D. Brundage, and K. Schulze. 2002. Sleep disturbance in cancer patients. Soc. Sci. Med. 54:1309–1321.
9. Dow, K. H., B. R. Ferrell, S. Leigh, J. Ly, and P. Gulasekaram. 1996. An evaluation of the quality of life among long-term survivors of breast cancer. Breast Cancer Res. Treat. 39:261–273.
10. Engstrom, C. A., R. A. Strohl, L. Rose, L. Lewandowski, and M. E. Stefanek. 1999. Sleep alterations in cancer patients. Cancer Nurs. 22:143–148.
11. Fortner, B. V., E. J. Stepanski, S. C. Wang, S. Kasprowicz, D. Butler, M. H. Bachmann, et al. 2002. Sleep disturbances in women with metastatic breast cancer. Breast J. 8:362–370.
12. Koopman, C., B. Nouriani, V. Erickson, R. Anupindi, L. D. Butler, M. H. Bachmann, et al. 2002. Sleep and quality of life in breast cancer patients. J. Pain Symptom Manage. 24:471–480.
13. Lee, K., M. Cho, C. Miaskowski, and M. Dodd. 2004. Impaired sleep and rhythms in persons with cancer. Sleep Med. Rev. 8:199–212.
14. Miaskowski, C., and K. A. Lee. 1999. Pain, fatigue, and sleep disturbances in oncology outpatients receiving radiation therapy for bone metastasis: a pilot study. J. Pain Symptom Manage. 17:320–332.
15. Okuyama, T., T. Akechi, A. Kugaya, H. Okamura, S. Imoto, T. Nakano, et al. 2000. Factors correlated with fatigue in disease-free breast cancer patients: application of the Cancer Fatigue Scale. Support. Care Cancer 8:215–222.
16. Roscoe, J. A., G. R. Morrow, J. T. Hickok, P. Bushunow, S. Matteson, D. Rakita, et al. 2002. Temporal interrelationships among fatigue, circadian rhythm and depression in breast cancer patients undergoing chemotherapy treatment. Support. Care Cancer 10:329–336.
17. Savard, J., and C. M. Morin. 2001. Insomnia in the context of cancer: a review of a neglected problem. J. Clin. Oncol. 19:895–908.
18. Deimling, G. T., B. Kahana, K. F. Bowman, and M. L. Schaefer. 2002. Cancer survivorship and psychological distress in later life. Psychooncology 11:479–494.
19. Ganz, P. A., K. A. Desmond, B. Leedham, J. H. Rowland, B. E. Meyerowitz, and T. R. Belin. 2002. Quality of life in long-term, disease-free survivors of breast cancer: a follow-up study. J. Natl. Cancer Inst. 94:39–49.
20. Siefert, M. L., F. Hong, B. Valcarce, and D. L. Berry. 2013. Patient and clinician communication of self-reported insomnia during ambulatory cancer care clinic visits. Cancer Nurs. 37:E51–E59.
21. Berger, A. M., K. P. Parker, S. Young-McCaughan, G. A. Mallory, A. M. Barsevick, S. L. Beck, et al. 2005. Sleep...
wake disturbances in people with cancer and their caregivers: state of the science. Oncol. Nurs. Forum 32: E98–E126.
22. Vena, C., K. Parker, M. Cunningham, J. Clark, and S. McMillan. 2004. Continuing education: sleep-wake disturbances in people with cancer part I: an overview of sleep, sleep regulation, and effects of disease and treatment. Oncol. Nurs. Forum 31:735–746.
23. Institute NC. SEER Stat Fact Sheet: all cancer sites. Available at: http://seer.cancer.gov/statfacts/html/all.html (accessed 10 January 2014).
24. Institute NC. Survivorship-related statistics and graphs. Available at: http://cancercontrol.cancer.gov/ocs/prevalence/ (accessed 10 January 2014).
25. Oncology Nursing Society. Oncology nursing society 2009-2013 research Agenda. Available at: www.ons.org (accessed 21 January 2014).
26. Department of Health and Human Services. 2011. Bringing science to life-NINR strategic plan. In Research NIO. National Institutes of Health, Bethesda.
27. American Psychiatric Association. 1994. Diagnostic and statistical manual of mental disorders: DSM-IV. 4th ed. American Psychiatric Association, Washington, DC.
28. American Academy of Sleep Medicine. 2005. The international classification of sleep disorders: diagnostic and coding manual. 2nd ed. American Academy of Sleep Medicine, Westchester, IL.
29. Golbin, A. Z., H. M. Kravitz, L. G. Keith, and R. L. Barkin. 2004. Sleep psychiatry. Taylor & Francis, New York, NY.
30. Moher, D., A. Liberati, J. Tetzlaff, and D. G. Altman. 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. J. Clin. Epidemiol. 62:1006–1012.
31. Alfano, C. M., K. L. Lichstein, G. S. Vander Wal, A. W. Smith, B. B. Reeve, A. McTiean, et al. 2011. Sleep duration change across breast cancer survivorship: associations with symptoms and health-related quality of life. Breast Cancer Res. Treat. 130:243–254.
32. Ancoli-Israel, S., L. Liu, M. R. Marler, B. A. Parker, V. Jones, G. R. Sarler, et al. 2006. Fatigue, sleep, and circadian rhythms prior to chemotherapy for breast cancer. Support. Care Cancer 14:201–209.
33. Baldwin, C. M., M. Grant, C. Wendel, M. C. Hornbrook, L. J. Herrington, C. McMullen, et al. 2009. Gender differences in sleep disruption and fatigue on quality of life among persons with ostomies. J. Clin. Sleep Med. 5:335–343.
34. Bardwell, W. A., J. Profant, D. R. Casden, J. E. Dimsdale, S. Ancoli-Israel, L. Natarajan, et al. 2008. The relative importance of specific risk factors for insomnia in women treated for early-stage breast cancer. Psychooncology 17:9–18.
35. Barsevick, A., S. L. Beck, W. N. Dudley, B. Wong, A. M. Berger, K. Whitmer, et al. 2010. Efficacy of an intervention for fatigue and sleep disturbance during cancer chemotherapy. J. Pain Symptom Manage. 40:200–216.
36. Barton, D. L., P. J. Atherton, B. A. Bauer, D. F. Moore Jr., B. I. Mattar, B. I. Lavasseur, et al. 2011. The use of Valeriana officinalis (Valerian) in improving sleep in patients who are undergoing treatment for cancer: a phase III randomized, placebo-controlled, double-blind study (NCCTG Trial, N01C5). J. Support. Oncol. 9:24–31.
37. Berger, A. M., L. A. Farr, B. R. Kuhn, P. Fischer, and S. Agrawal. 2007. Values of sleep/wake, activity/rest, circadian rhythms, and fatigue prior to adjuvant breast cancer chemotherapy. J. Pain Symptom Manage. 33:398–409.
38. Berger, A. M., B. R. Kuhn, L. A. Farr, J. C. Lynch, S. Agrawal, J. Chamberlain, et al. 2009. Behavioral therapy intervention trial to improve sleep quality and cancer-related fatigue. Psychooncology 18:634–646.
39. Berger, A. M., B. R. Kuhn, L. A. Farr, S. G. Von Essen, J. Chamberlain, J. C. Lynch, et al. 2009. One-year outcomes of a behavioral therapy intervention trial on sleep quality and cancer-related fatigue. J. Clin. Oncol. 27:6033–6040.
40. Berger, A. M., H. A. Treat Marunda, and S. Agrawal. 2009. Influence of menopausal status on sleep and hot flashes throughout breast cancer adjuvant chemotherapy. J. Obstet. Gynecol. Neonatal. Nurs. 38:353–366.
41. Berger, A. M., S. VonEssen, B. R. Khun, B. F. Piper, L. Farr, S. Agrawal, et al. 2002. Feasibility of a sleep intervention during adjuvant breast cancer chemotherapy. Oncol. Nurs. Forum. 29:1431–1441.
42. Berger, A. M., S. VonEssen, B. R. Kuhn, B. F. Piper, S. Agrawal, J. C. Lynch, et al. 2003. Adherence, sleep, and fatigue outcomes after adjuvant breast cancer chemotherapy: results of a feasibility intervention study. Oncol. Nurs. Forum. 30:513–522.
43. Berger, A. M., and L. Farr. 1999. The influence of daytime inactivity and nighttime restlessness on cancer-related fatigue. Oncol. Nurs. Forum. 26:1663–1671.
44. Bower, J. E., P. A. Ganz, M. R. Irwin, L. Kwan, E. C. Breen, and S. W. Cole. 2011. Inflammation and behavioral symptoms after breast cancer treatment: do fatigue, depression, and sleep disturbance share a common underlying mechanism? J. Clin. Oncol. 29:3517–3522.
45. Breen, S. J., C. M. Baravelli, P. E. Schofield, M. Jef ford, P. M. Yates, and S. K. Aranda. 2009. Is symptom burden a predictor of anxiety and depression in patients with cancer about to commence chemotherapy? Med. J. Aust. 190(Suppl. 7):S99–S104.
46. Broeckel, J. A., P. B. Jacobsen, J. Horton, L. Balducci, and G. H. Lyman. 1998. Characteristics and correlates of fatigue after adjuvant chemotherapy for breast cancer. J. Clin. Oncol. 16:1689–1696.
47. Bruera, E., F. Strasser, L. Shen, J. L. Palmer, J. Willey, L. C. Driver, et al. 2003. The effect of donepezil on sedation and other symptoms in patients receiving opioids for cancer pain: a pilot study. J. Pain Symptom Manage. 26:1049–1054.
48. Buffum, D., T. Koetters, M. Cho, L. Macera, S. M. Paul, C. West, et al. 2011. The effects of pain, gender, and age on sleep/wake and circadian rhythm parameters in oncology patients at the initiation of radiation therapy. J. Pain 12:390–400.
49. Byar, K. L., A. M. Berger, S. L. Bakken, and M. A. Cetak. 1998.
50. Carpenter, J. S., and M. A. Andrykowski. 1998.
51. Carson, J. W., K. M. Carson, L. S. Porter, F. J. Keefe, and L. S. Seewaldt. 2009. Yoga of Awareness program for menopausal symptoms in breast cancer survivors: results from a randomized trial. Support. Care Cancer 17:1301–1309.
52. Cleeland, C. S., X. S. Wang, Q. Shi, T. R. Mendoza, S. L. Wright, M. D. Berry, et al. 2011. Automated symptom alerts reduce postoperative symptom severity after cancer surgery: a randomized controlled clinical trial. J. Clin. Oncol. 29:994–1000.
53. Cohen, L., C. Warneke, R. T. Fouladi, M. A. Rodriguez, and A. Chaoul-Reich. 2004. Psychological adjustment and sleep quality in a randomized trial of the effects of a Tibetan yoga intervention in patients with lymphoma. Cancer 100:2253–2260.
54. Coleman, E. A., J. A. Goodwin, S. K. Coon, K. Richards, C. Enderlin, R. Kennedy, et al. 2011. Fatigue, sleep, pain, mood, and performance status in patients with multiple myeloma. Cancer Nurs. 34:219–227.
55. Costantini, C., A. Ale-Ali, and T. Helsten. 2011. Sleep aid prescribing practices during neoadjuvant or adjuvant chemotherapy for breast cancer. J. Palliat. Med. 14:563–566.
56. Couzi, R. J., K. J. Helzlsouer, and J. H. Fetting. 1995. Prevalence of menopausal symptoms among women with a history of breast cancer and attitudes toward estrogen replacement therapy. J. Clin. Oncol. 13:2737–2744.
57. Crandall, C., L. Petersen, P. A. Ganz, and G. A. Greendale. 2004. Association of breast cancer and its therapy with menopause-related symptoms. Menopause 11:519–530.
58. Delgado-Guay, M., S. Yennurajalingam, H. Parsons, J. L. Palmer, and E. Bruera. 2011. Association between self-reported sleep disturbance and other symptoms in patients with advanced cancer. J. Pain Symptom Manage. 41:819–827.
59. Dirksen, S. R., M. J. Belyea, and D. R. Epstein. 2009. Fatigue-based subgroups of breast cancer survivors with insomnia. Cancer Nurs. 32:404–411.
60. Dirksen, S. R., D. R. Epstein, and M. A. Hoyt. 2009. Insomnia, depression, and distress among outpatients with prostate cancer. Appl. Nurs. Res. 22:154–158.
61. Dodd, M. J., M. H. Cho, B. A. Cooper, and C. Miaskowski. 2010. The effect of symptom clusters on functional status and quality of life in women with breast cancer. Eur. J. Oncol. Nurs. 14:101–110.
62. Dodd, M. J., C. Miaskowski, and S. M. Paul. 2001. Symptom clusters and their effect on the functional status of patients with cancer. Oncol. Nurs. Forum 28:465–470.
63. Enderlin, C. A., E. A. Coleman, C. Cole, K. C. Richards, R. L. Kennedy, J. A. Goodwin, et al. 2011. Subjective sleep quality, objective sleep characteristics, insomnia symptom severity, and daytime sleepiness in women aged 50 and older with nonmetastatic breast cancer. Oncol. Nurs. Forum 38:E314–E325.
64. Epstein, D. R., and S. R. Dirksen. 2007. Randomized trial of a cognitive-behavioral intervention for insomnia in breast cancer survivors. Oncol. Nurs. Forum 34:E51–E59.
65. Fiorentino, L., J. R. McQuaid, L. Liu, L. Natarajan, F. He, M. Cornejo, et al. 2010. Individual cognitive behavioral therapy for insomnia in breast cancer survivors: a randomized controlled crossover pilot study. Nat. Sci. Sleep 2:1–8.
66. Flynn, K. E., R. A. Shelby, S. A. Mitchell, M. R. Fawzy, N. C. Hardy, A. M. Husain, et al. 2010. Sleep-wake functioning along the cancer continuum: focus group results from the Patient-Reported Outcomes Measurement Information System (PROMIS(R)). Psychooncology 19:1086–1093.
67. Fox, S. W., D. Lyon, and E. Farace. 2007. Symptom clusters in patients with high-grade glioma. J. Nurs. Scholarsh. 39:61–67.
68. Francoeur, R. B. 2005. The relationship of cancer symptom clusters to depressive affect in the initial phase of palliative radiation. J. Pain Symptom Manage. 29:130–155.
69. Garrett, K., A. Dhruba, T. Koetters, C. West, S. M. Paul, L. B. Dunn, et al. 2011. Differences in sleep disturbance and fatigue between patients with breast and prostate cancer at the initiation of radiation therapy. J. Pain Symptom Manage. 42:239–250.
70. Gooneratne, N. S., G. E. Dean, A. E. Rogers, J. E. Nkwozo, J. C. Coyne, and L. R. Kaiser. 2007. Sleep and quality of life in long-term lung cancer survivors. Lung Cancer 58:403–410.
71. Grutsch, J. F., C. Ferrans, P. A. Wood, J. Du-Quiton, D. F. Quiton, J. L. Reynolds, et al. 2011. The association of quality of life with potentially remediable disruptions of circadian sleep/activity rhythms in patients with advanced lung cancer. BMC Cancer 11:1–13.
72. Hanisch, L. J., N. S. Gooneratne, K. Soin, P. R. Gehman, D. J. Vaughn, and J. C. Coyn. 2011. Sleep and daily functioning during androgen deprivation therapy for prostate cancer. Eur. J. Cancer Care (Engl.) 20:549–554.
73. Hickey, M., L. I. Emery, J. Gregson, D. A. Doherty, and C. M. Saunders. 2010. The multidisciplinary management of menopausal symptoms after breast cancer: a unique model of care. Menopause 17:727–733.
74. Hoffman, A. J., B. A. Given, A. von Eye, A. G. Gift, and Hoyt, M. A., K. S. Thomas, D. R. Epstein, and S. R. Janz, N. K., M. Mujahid, L. K. Chung, P. M. Lantz, S. T. Joffe, H., A. Partridge, A. Giobbie-Hurder, X. Li, K. Kaye, J., K. Kaye, and L. Madow. 1983. Sleep patterns in cancer. Ann. Behav. Med. 37:88–93.
75. Janz, N. K., M. Mujahid, L. K. Chung, P. M. Lantz, S. T. Hawley, M. Morrow, et al. 2007. Symptom experience and quality of life of women following breast cancer treatment. J. Womens Health 16:1348–1361.
76. Joffe, H., A. Partridge, A. Giobbie-Hurder, X. Li, K. Habin, P. Goss, et al. 2010. Augmentation of venlafaxine and selective serotonin reuptake inhibitors with zolpidem improves sleep and quality of life in breast cancer patients with hot flashes: a randomized, double-blind, placebo-controlled trial. Menopause 17:908–916.
77. Kaye, J., K. Kaye, and L. Madow. 1983. Sleep patterns in patients with cancer and patients with cardiac disease. J. Psychol. 114(1st Half):107–113.
78. Knobf, M. T. 2001. The menopausal symptom experience in young mid-life women with breast cancer. Cancer Nurs. 24:201–210.
79. Kozachik, S. L., and K. Bandeen-Roche. 2008. Predictors of patterns of pain, fatigue, and insomnia during the first year after a cancer diagnosis in the elderly. Cancer Nurs. 31:334–344.
80. Kwekkeboom, K. L., K. Abbott-Anderson, and B. Wanta. 2010. Feasibility of a patient-controlled cognitive-behavioral intervention for pain, fatigue, and sleep disturbance in cancer. Oncol. Nurs. Forum 37:E151–E159.
81. Lamb, M. A. 1982. The sleeping patterns of patients with malignant and nonmalignant diseases. Cancer Nurs. 5:389–396.
82. Lipov, E. G., J. R. Joshi, S. Sanders, K. Wilcox, S. Lipov, H. Xie, et al. 2008. Effects of stellate-ganglion block on hot flushes and night awakenings in survivors of breast cancer: a pilot study. Lancet Oncol. 9:523–532.
83. Lis, C. G., D. Gupta, and J. F. Grutsch. 2008. The relationship between insomnia and patient satisfaction with quality of life in cancer. Support. Care Cancer 16:261–266.
84. Liu, L., L. Fiorentino, L. Natarajan, B. A. Parker, P. J. Mills, G. R. Sadler, et al. 2009. Pre-treatment symptom cluster in breast cancer patients is associated with worse sleep, fatigue and depression during chemotheraphy. Psychooncology 18:187–194.
85. Matthews, E. E., S. J. Schmiege, P. F. Cook, and K. H. Sousa. 2012. Breast cancer and symptom clusters during radiotherapy. Cancer Nurs. 35:E1–E11.
86. McChargue, D. E., J. Sankaranarayanan, C. G. Visovsky, E. E. Matthews, K. B. Highland, and A. M. Berger. 2012. Predictors of adherence to a behavioral therapy sleep intervention during breast cancer chemotherapy. Support. Care Cancer 20:245–252.
87. McMillan, S. C., M. Tittle, S. Hagan, and J. Laughlin. 2000. Management of pain and pain-related symptoms in hospitalized veterans with cancer. Cancer Nurs. 23:327–336.
88. McMillan, S. C., C. Toft Hansen, and M. A. Morgan. 2008. Relationships among pain, sleep disturbances, and depressive symptoms in outpatients from a comprehensive cancer center. Oncol. Nurs. Forum 35:603–611.
89. Miaskowski, C., S. M. Paul, B. A. Cooper, K. Lee, M. Dodd, C. West, et al. 2011. Predictors of the trajectories of self-reported sleep disturbance in men with prostate cancer during and following radiation therapy. Sleep 34:171–179.
90. Moore, T. A., A. M. Berger, and P. Dizona. 2011. Sleep aid use during and following breast cancer adjuvant chemotherapy. Psychooncology 20:321–325.
91. Mosher, C. E., and K. N. Duhamel. 2012. An examination of distress, sleep, and fatigue in metastatic breast cancer patients. Psychooncology 21:100–107.
92. Mulrooney, D. A., K. K. Ness, J. P. Neglia, J. A. Whitton, D. M. Green, L. K. Zeltzer, et al. 2008. Fatigue and sleep disturbance in adult survivors of childhood cancer: a report from the childhood cancer survivor study (CCSS). Sleep 31:271–281.
93. Otte, J. L., J. S. Carpenter, K. M. Russell, S. Bigatti, and V. L. Champion. 2010. Prevalence, severity, and correlates of sleep-wake disturbances in long-term breast cancer survivors. J. Pain Symptom Manage. 39:535–547.
94. Owen, D. C., K. P. Parker, and D. B. McGuire. 1999. Comparison of subjective sleep quality in patients with cancer and healthy subjects. Oncol. Nurs. Forum 26:1649–1651.
95. Palesh, O., J. M. Zeitzer, A. Conrad, J. Giese-Davis, K. M. Mustian, V. Popek, et al. 2008. Vagal regulation, cortisol, and sleep disruption in women with metastatic breast cancer. J. Clin. Sleep Med. 4:441–449.
96. Palesh, O. G., K. Collie, D. Batiuchok, J. Tilston, C. Koopman, M. L. Perlis, et al. 2007. A longitudinal study of depression, pain, and stress as predictors of sleep disturbance among women with metastatic breast cancer. Biol. Psychol. 75:37–44.
97. Palesh, O. G., J. A. Roscoe, K. M. Mustian, T. Roth, J. Savard, S. Ancoli-Israel, et al. 2010. Prevalence,
demographics, and psychological associations of sleep disruption in patients with cancer: University of Rochester Cancer Center-Community Clinical Oncology Program. J. Clin. Oncol. 28:292–298.

99. Parker, K. P., D. L. Blwise, M. Ribeiro, S. R. Jain, C. I. Vena, M. K. Kohles-Baker, et al. 2008. Sleep/wake patterns of individuals with advanced cancer measured by ambulatory polysomnography. J. Clin. Oncol. 26:2464–2472.

100. Passik, S. D., L. A. Whitcomb, K. L. Kirsh, and D. E. Theobald. 2003. An unsuccessful attempt to develop a single-item screen for insomnia in cancer patients. J. Pain Symptom Manage. 25:284–287.

101. Payne, J., B. Piper, I. Rabinowitz, and B. Zimmerman. 2006. Biomarkers, fatigue, sleep, and depressive symptoms in women with breast cancer: a pilot study. Oncol. Nurs. Forum 33:775–783.

102. Payne, J. K., J. Held, J. Thorpe, and H. Shaw. 2008. Effect of exercise on biomarkers, fatigue, sleep disturbances, and depressive symptoms in older women with breast cancer receiving hormonal therapy. Oncol. Nurs. Forum 35:635–642.

103. Phillips, K. M., H. S. Jim, K. A. Donovan, M. C. Pinder-Schenck, and P. B. Jacobsen. 2012. Characteristics and correlates of sleep disturbances in cancer patients. Support. Care Cancer 20:357–365.

104. Portenoy, R. K., H. T. Thaler, A. B. Kornblith, J. M. Lepore, H. Friedlander-Klar, N. Coyle, et al. 1994. Symptom prevalence, characteristics and distress in a cancer population. Qual. Life Res. 3:183–189.

105. Redeker, N. S., E. L. Lev, and J. Ruggiero. 2000. Insomnia, fatigue, anxiety, depression, and quality of life of cancer patients undergoing chemotherapy. Sch. Inq. Nurs. Pract. 14:275–290; discussion 91-8.

106. Rissling, M. B., L. Liu, L. Natarajan, F. He, and S. Ancoli-Israel. 2011. Relationship of menopausal status and climacteric symptoms to sleep in women undergoing chemotherapy. Support. Care Cancer 19:1107–1115.

107. Rogers, L. Q., K. S. Courneya, K. T. Robbins, K. Rao, J. Malone, A. Seiz, et al. 2008. Factors associated with fatigue, sleep, and cognitive function among patients with head and neck cancer. Head Neck 30:1310–1317.

108. Rumble, M. E., F. J. Keefe, J. D. Edinger, G. Affleck, P. K. Marcom, and H. S. Shaw. 2010. Contribution of cancer symptoms, dysfunctional sleep related thoughts, and sleep inhibitory behaviors to the insomnia process in breast cancer survivors: a daily process analysis. Sleep 33:1501–1509.

109. Rumble, M. E., F. J. Keefe, J. D. Edinger, L. S. Porter, and J. L. Garst. 2005. A pilot study investigating the utility of the cognitive-behavioral model of insomnia in early-stage lung cancer patients. J. Pain Symptom Manage. 30:160–169.

110. Sarna, L. 1993. Correlates of symptom distress in women with lung cancer. Cancer Pract. 1:21–28.

111. Schlairet, M. C. 2011. Needs of older cancer survivors in a community cancer care setting. J. Gerontol. Nurs. 37:36–41.

112. Schultz, P. N., M. J. Klein, M. L. Beck, C. Stava, and R. V. Sellin. 2005. Breast cancer: relationship between menopausal symptoms, physiologic health effects of cancer treatment and physical constraints on quality of life in long-term survivors. J. Clin. Nurs. 14:204–211.

113. Sherwood, P., B. A. Given, C. W. Given, V. L. Champion, A. Z. Doorenbos, F. Azzouz, et al. 2005. A cognitive behavioral intervention for symptom management in patients with advanced cancer. Oncol. Nurs. Forum 32:1190–1198.

114. Shuman, A. G., S. A. Duffy, D. L. Ronis, S. L. Garetz, S. A. McLean, K. E. Fowler, et al. 2010. Predictors of poor sleep quality among head and neck cancer patients. Laryngoscope 120:1166–1172.

115. Silberfarb, P. M., P. J. Hauri, T. E. Oxman, and P. Schnurr. 1993. Assessment of sleep in patients with lung cancer and breast cancer. J. Clin. Oncol. 11:997–1004.

116. Snyder, C. F., E. Garrett-Mayer, J. R. Brahmer, M. A. Carducci, R. Pili, V. Stearns, et al. 2008. Symptoms, supportive care needs, and function in cancer patients: how are they related? Qual. Life Res. 17:665–677.

117. Sprod, L. K., O. G. Palesh, M. C. Janelsins, L. J. Peppone, C. E. Heckler, M. J. Adams, et al. 2010. Exercise, sleep quality, and mediators of sleep in breast and prostate cancer patients receiving radiation therapy. Community Oncol. 7:463–471.

118. Tatro, K., G. H. Montgomery, M. Avellino, and D. H. Bovbjerg. 2004. Activity and sleep contribute to levels of anticipatory distress in breast surgery patients. Behav. Med. 30:85–91.

119. Taylor, T. R., E. D. Huntley, K. Makamb, J. Sween, L. L. Adams-Campbell, W. Frederick, et al. 2012. Understanding sleep disturbances in African-American breast cancer survivors: a pilot study. Psychooncology 21:896–902.

120. Thomas, K. S., J. Bower, M. A. Hoyt, and S. Sepah. 2010. Disrupted sleep in breast and prostate cancer patients undergoing radiation therapy: the role of coping processes. Psychooncology 19:767–776.

121. Sheely, L. C. 1996. Sleep disturbances in hospitalized patients with cancer. Oncol. Nurs. Forum 23:109–111.

122. Van Onselen, C., L. B. Dunn, K. Lee, M. Dodd, T. Koetters, C. West, et al. 2010. Relationship between mood disturbance and sleep quality in oncology outpatients at the initiation of radiation therapy. Eur. J. Oncol. Nurs. 14:373–379.

123. Vargas, S., W. K. Wohlgemuth, M. H. Antoni, S. C. Lechner, H. A. Holley, and C. S. Carver. 2010. Sleep dysfunction and psychosocial adaptation among women
undergoing treatment for non-metastatic breast cancer. Psychooncology 19:669–673.

124. Weitzner, M. A., J. Moncello, P. B. Jacobsen, and S. Minton. 2002. A pilot trial of paroxetine for the treatment of hot flashes and associated symptoms in women with breast cancer. J. Pain Symptom Manage. 23:337–345.

125. Williams, S. A., and A. M. Schreier. 2005. The role of education in managing fatigue, anxiety, and sleep disorders in women undergoing chemotherapy for breast cancer. Appl. Nurs. Res. 18:138–147.

126. Wright, C. E., D. H. Bovbjerg, G. H. Montgomery, C. Weltz, A. Goldfarb, B. Pace, et al. 2009. Disrupted sleep the night before breast surgery is associated with increased postoperative pain. J. Pain Symptom Manage. 37:352–362.

127. Young-McCaughan, S., M. Z. Mays, S. M. Arzola, L. H. Yoder, S. A. Dramiga, K. M. Leclere, et al. 2003. Research and commentary: change in exercise tolerance, activity and sleep patterns, and quality of life in patients with cancer participating in a structured exercise program. Oncol. Nurs. Forum 30:441–454.

128. Cannici, J., R. Malcolm, and L. A. Peek. 1983. Treatment of insomnia in cancer patients using muscle relaxation training. J. Behav. Ther. Exp. Psychiatry 14:251–256.

129. Merriman, J. D., M. Dodd, K. Lee, S. M. Paul, B. A. Cooper, B. E. Aouizerat, et al. 2011. Differences in self-reported attentional fatigue between patients with breast and prostate cancer at the initiation of radiation therapy. Cancer Nurs. 34:345–353.

130. Miaskowski, C., K. Lee, L. Dunn, M. Dodd, B. E. Aouizerat, C. West, et al. 2011. Sleep-wake circadian activity rhythm parameters and fatigue in oncology patients before the initiation of radiation therapy. Cancer Nurs. 34:255–268.

131. Otte, J. L., J. S. Carpenter, X. Zhong, and P. A. Johnstone. 2011. Feasibility study of acupuncture for reducing sleep disturbances and hot flashes in postmenopausal breast cancer survivors. J. Nurs. Spec. 25:228–236.

132. Otte, J. L., J. K. Payne, and J. S. Carpenter. 2011. Nighttime variability in wrist actigraphy. J. Nurs. Meas. 19:105–114.

133. Sandadi, S., H. E. Frasure, M. J. Broderick, S. E. Waggonier, J. A. Miller, and V. E. von Gruenigen. 2011. The effect of sleep disturbance on quality of life in women with ovarian cancer. Gynecol. Oncol. 123:351–355.

134. Shapiro, S. L., R. R. Bootzin, A. J. Figueredo, A. M. Lopez, and G. E. Schwartz. 2003. The efficacy of mindfulness-based stress reduction in the treatment of sleep disturbance in women with breast cancer: an exploratory study. J. Psychosom. Res. 54:85–91.

135. Silberfarb, P. M., P. J. Hauri, T. E. Oxman, and S. Lash. 1985. Insomnia in cancer patients. Soc. Sci. Med. 20:849–850.

136. Wright, C. E., J. B. Schnur, G. H. Montgomery, and D. H. Bovbjerg. 2010. Psychological factors associated with poor sleep prior to breast surgery: an exploratory study. Behav. Med. 36:85–91.

137. Wu, H. S., J. E. Davis, J. P. Padiyar, and H. Yarandi. 2011. A comparison of disrupted sleep patterns in women with cancer-related fatigue and postmenopausal women without cancer. Eur. J. Oncol. Nurs. 15:318–324.

138. Berger, A. M., M. Hertzog, C. R. Geary, P. Fischer, and L. Farr. 2012. Circadian rhythms, symptoms, physical functioning, and body mass index in breast cancer survivors. J. Cancer Surviv. 6:305–314.

139. Berger, A. M., C. Visovsky, M. Hertzog, S. Holtz, and F. R. Loberiza Jr. 2012. Usual and worst symptom severity and interference with function in breast cancer survivors. J. Support. Oncol. 10:112–118.

140. Berger, A. M., K. Wielgus, M. Hertzog, P. Fischer, and L. Farr. 2010. Patterns of circadian activity rhythms and their relationships with fatigue and anxiety/depression in women treated with breast cancer adjuvant chemotherapy. J. Support. Oncol. 18:105–114.

141. Bower, J. E., D. Garet, B. Sternlieb, P. A. Ganz, M. R. Irwin, R. Olmstead, et al. 2012. Yoga for persistent fatigue in breast cancer survivors: a randomized controlled trial. Cancer 118:3766–3775.

142. Boyd, A. D., D. Brown, C. Henrickson, J. Hampton, B. Zhu, F. Almani, et al. 2012. Screening for depression, sleep-related disturbances, and anxiety in patients with adenocarcinoma of the pancreas: a preliminary study. ScientificWorldJournal 2012:1–6.

143. Brant, J. M., S. L. Beck, W. N. Dudley, P. Cobb, G. Pepper, and C. Miaskowski. 2011. Symptom trajectories during chemotherapy in outpatients with lung cancer colorectal cancer, or lymphoma. Eur. J. Oncol. Nurs. 15:470–477.

144. Brown, J. K., M. E. Cooley, C. Chernecky, and L. Sarna. 2011. A symptom cluster and sentinel symptom experienced by women with lung cancer. Oncol. Nurs. Forum 38:E425–E435.

145. Cho, M. H., M. J. Dodd, B. A. Cooper, and C. Miaskowski. 2012. Comparisons of exercise dose and symptom severity between exercisers and nonexercisers in women during and after cancer treatment. J. Pain Symptom Manage. 43:842–854.

146. Clevenger, L., A. Schrepf, D. Christensen, K. DeGeest, D. Bender, A. Ahmed, et al. 2012. Sleep disturbance, cytokines, and fatigue in women with ovarian cancer. Brain Behav. Immun. 26:1037–1044.

147. Coleman, E. A., J. A. Goodwin, R. Kennedy, S. K. Coon, K. Richards, C. Enderlin, et al. 2012. Effects of exercise
on fatigue, sleep, and performance: a randomized trial. Oncol. Nurs. Forum 39:468–477.

148. Dedert, E., E. Lush, A. Chagpar, F. S. Dhabhar, S. C. Segerstrom, D. Spiegel, et al. 2012. Stress, coping, and circadian disruption among women awaiting breast cancer surgery. Ann. Behav. Med. 44:10–20.

149. Dhruva, A., C. Miaskowski, D. Abrams, M. Acree, B. Cooper, S. Goodman, et al. 2012. Yoga breathing for cancer chemotherapy-associated symptoms and quality of life: results of a pilot randomized controlled trial. J. Altern. Complement. Med. 18:473–479.

150. Jim, H. S., B. Small, L. A. Faul, J. Franzen, S. Apte, and P. B. Jacobsen. 2011. Fatigue, depression, sleep, and activity during chemotherapy: daily and intraday variation and relationships among symptom changes. Ann. Behav. Med. 42:321–333.

151. Dhruva, A., S. M. Paul, B. A. Cooper, K. Lee, C. West, B. E. Aouizerat, et al. 2012. A longitudinal study of measures of objective and subjective sleep disturbance in patients with breast cancer before, during, and after radiation therapy. J. Pain Symptom Manage. 44:215–228.

152. Dickerson, S. S., E. A. Sabbah, P. Ziegler, H. Chen, L. M. Steinbrenner, and G. Dean. 2012. The experience of a diagnosis of advanced lung cancer: sleep is not a priority when living my life. Oncol. Nurs. Forum 39:492–499.

153.Dimsdale, J. E., E. D. Ball, E. Carrier, M. Wallace, P. Holman, C. Mulroney, et al. 2011. Effect of esopipram on sleep, fatigue, and pain in patients with mucositis associated with hematologic malignancies. Support. Care Cancer 19:2015–2020.

154. Gallicchio, L., R. MacDonald, B. Wood, E. Rushovich, and K. J. Helzlsouer. 2012. Menopausal-type symptoms among breast cancer patients on aromatase inhibitor therapy. Climacteric 15:339–349.

155. Gerber, L. H., N. Stout, C. McGarvey, B. Natarajan, J. E. Dimsdale, et al. 2012. The longitudinal relationship between fatigue and sleep in breast cancer patients undergoing chemotherapy. Sleep 35:237–243.

156. Matthews, E. E., S. J. Schmiege, P. F. Cook, A. M. Berger, and M. S. Aloia. 2012. Adherence to cognitive behavioral therapy for insomnia (CBTI) among women following primary breast cancer treatment: a pilot study. Behav. Sleep Med. 10:217–229.

157. Ritterband, L. M., E. T. Bailey, F. P. Thorne, H. R. Lord, L. Farrell-Carnahan, and L. D. Baum. 2012. Initial evaluation of an Internet intervention to improve the sleep of cancer survivors with insomnia. Psychooncology 21:695–705.

158. Roscoe, J. A., M. L. Perlis, W. R. Pigeon, K. H. O’Neill, C. E. Heckler, S. E. Matteson-Rusby, et al. 2011. Few changes observed in polysomnographic-assessed sleep before and after completion of chemotherapy. J. Psychosom. Res. 71:423–428.

159. Carlson, L. E., T. S. Campbell, S. N. Garland, and P. Grossman. 2007. Associations among salivary cortisol, melatonin, catecholamines, sleep quality and stress in women with breast cancer and healthy controls. J. Behav. Med. 30:45–58.

160. Carlson, L. E., M. Speca, K. D. Patel, and E. Goody. 2004. Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress and levels of cortisol, dehydroepiandrosterone sulfate (DHEAS) and melatonin in breast and prostate cancer outpatients. Psychoneuroendocrinology 29:448–474.

161. Casault, L., J. Savard, H. Ivers, M. H. Savard, and S. Simard. 2012. Utilization of hypnotic medication in the context of cancer: predictors and frequency of use. Support. Care Cancer 20:1203–1210.

162. Davidson, J. R., D. Feldman-Stewart, S. Biren, and S. Ram. 2007. How to provide insomnia interventions to people with cancer: insights from patients. Psychooncology 16:1028–1038.

163. Davidson, J. R., J. L. Waisberg, M. D. Brundage, and A. W. MacLean. 2001. Nonpharmacologic group treatment of insomnia: a preliminary study with cancer survivors. Psychooncology 10:389–397.

164. Hadi, S., L. Zhang, A. Hird, A. Kirou-Mauro, L. A. Filipczak, and E. Chow. 2008. Symptom clusters in patients with cancer with metastatic bone pain. J. Palliat. Med. 11:591–600.

165. Jensen, M. P., J. R. Gralow, A. Braden, K. J. Gertz, J. R. Fann, and K. L. Syrjala. 2012. Hypnosis for symptom management in women with breast cancer: a pilot study. Int. J. Clin. Exp. Hypn. 60:135–159.

166. Liu, L., P. J. Mills, M. Risling, L. Fiorentino, L. Natarajan, J. E. Dimsdale, et al. 2012. Fatigue and sleep quality are associated with changes in inflammatory markers in breast cancer patients undergoing chemotherapy. Brain Behav. Immun. 26:706–713.
171. Payne, R. J., M. P. Hier, K. M. Kost, M. J. Black, A. G. Zeitouni, S. Frenkel, et al. 2005. High prevalence of obstructive sleep apnea among patients with head and neck cancer. J. Otolaryngol. 34:304–311.

172. Quesnel, C., J. Savard, S. Simard, H. Ivers, and C. M. Morin. 2003. Efficacy of cognitive-behavioral therapy for insomnia in women treated for nonmetastatic breast cancer. J. Consult. Clin. Psychol. 71:189–200.

173. Savard, J., S. L. Liu, L. Natarajan, M. B. Risling, A. B. Neikrug, F. He, et al. 2009. Breast cancer patients have progressively impaired sleep-wake activity rhythms during chemotherapy. Sleep 32:1155–1160.

174. Savard, J., S. Simard, J. Blanchet, H. Ivers, and C. M. Morin. 2001. Prevalence, clinical characteristics, and risk factors for insomnia in the context of breast cancer. Sleep 24:583–590.

175. Savard, J., S. Simard, S. Hervouet, H. Ivers, L. Lacombe, and Y. Fradet. 2005. Insomnia in men treated with radical prostatectomy for prostate cancer. Psychooncology 14:147–156.

176. Savard, J., S. Simard, H. Ivers, and C. M. Morin. 2005. Randomized study on the efficacy of cognitive-behavioral therapy for insomnia secondary to breast cancer, part II: immunologic effects. J. Clin. Oncol. 23:6097–6106.

177. Savard, J., S. Simard, H. Ivers, and C. M. Morin. 2005. Randomized study on the efficacy of cognitive-behavioral therapy for insomnia secondary to breast cancer, part I: sleep and psychological effects. J. Clin. Oncol. 23:6083–6096.

178. Savard, J., J. Villa, H. Ivers, S. Simard, and C. M. Morin. 2009. Prevalence, natural course, and risk factors of insomnia comorbid with cancer over a 2-month period. J. Clin. Oncol. 27:5233–5239.

179. Savard, J., J. Villa, S. Simard, H. Ivers, and C. M. Morin. 2011. Feasibility of a self-help treatment for insomnia comorbid with cancer. Psychooncology 20:1013–1019.

180. Savard, M. H., J. Savard, S. Simard, and H. Ivers. 2004. Empirical validation of the Insomnia Severity Index in cancer patients. Psychooncology 14:429–441.

181. Sela, R. A., S. Watanabe, and C. L. Nekolaichuk. 2005. Sleep disturbances in palliative cancer patients attending a pain and symptom control clinic. Palliat. Support. Care 3:23–31.

182. Stevinson, C., H. Steed, W. Faught, K. Tonkin, J. K. Vallance, A. B. Ladha, et al. 2009. Physical activity in ovarian cancer survivors: associations with fatigue, sleep, and psychosocial functioning. Int. J. Gynecol. Cancer 19:73–78.

183. Tremblay, V., J. Savard, and H. Ivers. 2009. Predictors of the effect of cognitive behavioral therapy for chronic insomnia comorbid with breast cancer. J. Consult. Clin. Psychol. 77:742–750.

184. Cerrone, R., L. Gianì, B. Galbiati, G. Messina, M. Casiraghi, E. Proserpio, et al. 2008. Efficacy of HT 7 point acupuncture stimulation in the treatment of insomnia in cancer patients and in patients suffering from disorders other than cancer. Minerva Med. 99:535–537.

185. Dahl, A. A., I. L. Nesvold, K. V. Reinertsen, and S. D. Fossa. 2011. Arm/shoulder problems and insomnia symptoms in breast cancer survivors: cross-sectional, controlled and longitudinal observations. Sleep Med. 12:584–590.

186. Dominguez-Ortega, L., R. Cubedo-Cervera, H. Cortes-Funes, and E. Diaz-Gallego. 1996. Sleep protects against chemotherapy induced emesis. Cancer 77:1566–1570.

187. Espie, C. A., L. Fleming, J. Cassidy, L. Samuel, L. M. Taylor, C. A. White, et al. 2008. Randomized controlled clinical effectiveness trial of cognitive behavior therapy compared with treatment as usual for persistent insomnia in patients with cancer. J. Clin. Oncol. 26:1–9.

188. Fernandes, R., P. Stone, P. Andrews, R. Morgan, and S. Sharma. 2006. Comparison between fatigue, sleep disturbance, and circadian rhythm in cancer inpatients and healthy volunteers: evaluation of diagnostic criteria for cancer-related fatigue. J. Pain Symptom Manage. 32:245–254.

189. Fleming, L., S. Gillespie, and C. A. Espie. 2010. The development and impact of insomnia on cancer survivors: a qualitative analysis. Psychooncology 19:991–996.

190. Frisk, J., A. C. Kallstrom, N. Wall, M. Fredrikson, and M. Hammar. 2012. Acupuncture improves health-related quality-of-life (HRQoL) and sleep in women with breast cancer and hot flushes. Support Care Cancer 20:715–724.

191. Gibbins, J., R. McCoubrie, A. H. Kendrick, G. Senior-Smith, A. N. Davies, and G. W. Hanks. 2009. Sleep-wake disturbances in patients with advanced cancer and their family carers. J. Pain Symptom Manage. 38:860–870.

192. Goedendorp, M. M., M. F. Gielissen, C. A. Verhagen, M. E. Peters, and G. Bleijenberg. 2008. Severe fatigue and related factors in cancer patients before the initiation of treatment. Br. J. Cancer 99:1408–1414.

193. Gogenur, I., G. Wildschiotz, and J. Rosenberg. 2008. Circadian distribution of sleep phases after major abdominal surgery. Br. J. Anaesth. 100:45–49.
197. Henoch, L. A. Ploner, and C. Tishelman. 2009. Increasing stringency in symptom cluster research: a methodological exploration of symptom clusters in patients with inoperable lung cancer. Oncol. Nurs. Forum 36:E282–E292.

198. Hoekstra, J., M. J. Vernooij-Dassen, R. de Vos, and P. J. Bindels. 2007. The added value of assessing the ‘most troublesome’ symptom among patients with cancer in the palliative phase. Patient Educ. Couns. 65:223–229.

199. Hoijer, U., H. Ejnell, and J. Hedner. 1992. Obstructive sleep apnea in patients with pharyngeal tumours. Acta Otolaryngol. 112:138–143.

200. Hunter, M. S., S. Coventry, N. Mendes, and E. A. Grunfeld. 2009. Evaluation of a group cognitive behavioural intervention for women suffering from menopausal symptoms following breast cancer treatment. Psychooncology 18:560–563.

201. Hunter, M. S., S. Coventry, N. Mendes, and E. A. Grunfeld. 2009. Menopausal symptoms following breast cancer treatment: a qualitative investigation of cognitive and behavioural responses. Maturitas 63:336–340.

202. Hunter, M. S., E. A. Grunfeld, S. Mittal, P. Sikka, A. J. Ramirez, I. Fentiman, et al. 2004. Menopausal symptoms in women with breast cancer: prevalence and treatment preferences. Psychooncology 13:769–778.

203. Jimenez, A., R. Madero, A. Alonso, V. Martinez-Marin, Y. Vilches, B. Martinez, et al. 2011. Symptom clusters in advanced cancer. J. Pain Symptom Manage. 42:24–31.

204. Le Guen, Y., F. Gagnadoux, J. Hureaux, T. Jeanfaivre, N. Vilches, B. Martinez, et al. 2011. Symptom clusters in advanced cancer. J. Pain Symptom Manage. 42:24–31.

205. Levin, R. D., M. A. Daehler, J. F. Grutsch, J. Quiton, C. G. Lis, C. Peterson, et al. 2005. Circadian function in patients with advanced non-small-cell lung cancer. Br. J. Cancer 93:1202–1208.

206. Mercadante, S., D. Girelli, and A. Casuccio. 2004. Sleep disorders in advanced cancer patients: prevalence and factors associated. Support. Care Cancer 12:355–359.

207. Mormont, M. C., J. Waterhouse, P. Bleuzen, S. Giacchetti, A. Jami, A. Bogdan, et al. 2000. Marked 24-h rest/activity rhythms are associated with better quality of life, better response, and longer survival in patients with metastatic colorectal cancer and good performance status. Clin. Cancer Res. 6:3038–3045.

208. Munro, A. I., and S. Potter. 1996. A quantitative approach to the distress caused by symptoms in patients treated with radical radiotherapy. Br. J. Cancer 74:640–647.

209. Nesse, W., A. Hoekema, B. Stegenga, J. H. van der Hoeven, L. G. de Bont, and J. L. Roodenburg. 2006. Prevalence of obstructive sleep apnoea following head and neck cancer treatment: a cross-sectional study. Oral Oncol. 42:108–114.

210. Pasquini, M., A. Speca, and M. Biondi. 2009. Quetiapine for tamoxifen-induced insomnia in women with breast cancer. Psychosomatics 50:159–161.

211. Pollak, L., I. Shiprer, J. M. Rabey, C. Klein, and J. Schiffer. 2004. Polysomnography in patients with intracranial tumors before and after operation. Acta Neurol. Scand. 109:56–60.

212. Richardson, A., and E. Ream. 1996. The experience of fatigue and other symptoms in patients receiving chemotherapy. Eur. J. Cancer Care (Engl.) 5(Suppl. 2):24–30.

213. Rischer, J., A. Schervath, A. R. Zander, U. Koch, and F. Schulz-Kindermann. 2009. Sleep disturbances and emotional distress in the acute course of hematopoietic stem cell transplantation. Bone Marrow Transplant. 44:121–128.

214. Sjøvaag, P., S. Verhagen, and G. Bleijenberg. 2002. Determinants of chronic fatigue in disease-free breast cancer patients: a cross-sectional study. Ann. Oncol. 13:589–598.

215. Grog, E. K., S. D. Fossa, and A. A. Dahl. 2011. Insomnia in elderly cancer survivors—a population-based controlled study of associations with lifestyle, morbidity, and psychosocial factors. Results from the Health Survey of North-Trondelag County (HUNT-2). Insomnia in elderly cancer survivors. Support. Care Cancer 19:1319–1326.

216. Simeit, R., R. Deck, and B. Conta-Marx. 2004. Sleep management training for cancer patients with insomnia. Support. Care Cancer 12:176–183.

217. Steffen, A., H. Graefe, E. Gehring, I. R. Konig, and B. Wollenberg. 2009. Sleep apnoea in patients after treatment of head neck cancer. Acta Otolaryngol. 129:1300–1305.

218. Thulin, H., U. Kreibergs, H. Wijkstrom, G. Steineck, and L. Henningssohn. 2010. Sleep disturbances decrease self-assessed quality of life in individuals who have undergone cystectomy. J. Urol. 184:198–202.

219. van der Klauw, A. A., O. M. Dekkers, A. M. Pereira, K. W. van Kralingen, and J. A. Romijn. 2007. Increased daytime somnolence despite normal sleep patterns in patients treated for nonfunctioning pituitary macroadenoma. J. Clin. Endocrinol. Metab. 92:3898–3903.

220. Verkasalo, P. K., K. Lillberg, R. G. Stevens, C. Hublin, M. Partinen, M. Koskenvuo, et al. 2005. Sleep duration and breast cancer: a prospective cohort study. Cancer Res. 65:9595–9600.

221. Wilcock, A., R. England, B. El Khoury, J. Frisby, P. Howard, S. Bell, et al. 2008. The prevalence of nocturnal hypoxemia in advanced cancer. J. Pain Symptom Manage. 36:351–357.

222. Haest, K., A. Kumar, B. Van Calster, K. Leunen, A. Smets, F. Amant, et al. 2012. Stellate ganglion block for the management of hot flashes and sleep disturbances in...
breast cancer survivors: an uncontrolled experimental study with 24 weeks of follow-up. Ann. Oncol. 23:1449–1454.

223. Laugsand, E. A., G. Jakobsen, S. Kaasa, and P. Klepstad. 2011. Inadequate symptom control in advanced cancer patients across Europe. Support. Care Cancer 19:2005–2014.

224. Manas, A., J. P. Ciria, M. C. Fernandez, M. L. Gonzalez, V. Morillo, M. Perez, et al. 2011. Post hoc analysis of pregabalin vs. non-pregabalin treatment in patients with cancer-related neuropathic pain: better pain relief, sleep and physical health. Clin. Transl. Oncol. 13:656–663.

225. Mann, E., M. J. Smith, J. Hellier, J. A. Balabanovic, H. Hamed, E. A. Grunfeld, et al. 2012. Cognitive behavioural treatment for women who have menopausal symptoms after breast cancer treatment (MENOS 1): a randomised controlled trial. Lancet Oncol. 13:309–318.

226. Rostock, M., J. Fischer, A. Mumm, U. Stammwitz, R. Saller, and H. H. Bartsch. 2011. Black cohosh (Cimicifuga racemosa) in tamoxifen-treated breast cancer patients with climacteric complaints—a prospective observational study. Gynecol. Endocrinol. 27:844–848.

227. Sharma, N., C. H. Hansen, M. O’Connor, P. Thekkumpurath, J. Walker, A. Kleiboer, et al. 2012. Sleep problems in cancer patients: prevalence and association with distress and pain. Psychooncology 21:1003–1009.

228. Taskila, T., A. G. de Boer, F. J. van Dijk, and J. H. Verbeek. 2011. Fatigue and its correlates in cancer patients who had returned to work: a cohort study. Psychooncology 20:1236–1241.

229. Malone, M., A. L. Harris, and D. K. Luscombe. 1994. Assessment of the impact of cancer on work, recreation, home management and sleep using a general health status measure. J. R. Soc. Med. 87:386–389.

230. Bonthia, R., V. L. Malcarne, C. M. Ko, J. W. Varni, and G. R. Sadler. 2009. Fatigued breast cancer survivors: the role of sleep quality, depressed mood, stage and age. Psychol. Health 24:965–980.

231. Akechi, T., T. Okuyama, N. Akizuki, K. Shimizu, M. Inagaki, M. Fujimori, et al. 2007. Associated and predictive factors of sleep disturbance in advanced cancer patients. Psychooncology 16:888–894.

232. Barichello, E., N. O. Sawada, H. M. Sonobe, and M. M. Zago. 2009. Quality of sleep in postoperative surgical oncologic patients. Rev. Lat. Am. Enfermagem 17:481–488.

233. Beck, S. L., A. M. Berger, A. M. Barsevick, B. Wong, K. A. Stewart, and W. N. Dudley. 2010. Sleep quality after initial chemotherapy for breast cancer. Support. Care Cancer 18:679–689.

234. Cankurtaran, E. S., E. Ozalp, H. Soygur, D. I. Akbiyik, L. Turhan, and N. Alkis. 2008. Mirtazapine improves sleep and lowers anxiety and depression in cancer patients: superiority over imipramine. Support. Care Cancer 16:1291–1298.

235. Chen, M. L., C. T. Yu, and C. H. Yang. 2008. Sleep disturbances and quality of life in lung cancer patients undergoing chemotherapy. Lung Cancer 62:391–400.

236. Furlani, R., and M. F. Ceolino. 2006. Sleep quality of women with gynecological and breast cancer. Rev. Lat. Am. Enfermagem 14:872–878.

237. Israel, Y., O. Cervantes, M. Abrahao, F. P. Cecon, M. F. Marques Filho, L. A. Nascimento, et al. 2006. Obstructive sleep apnea in patients undergoing supraccricoid horizontal or frontolateral vertical partial laryngectomy. Otolaryngol. Head Neck Surg. 135:911–916.

238. Kim, S. W., I. S. Shin, J. M. Kim, Y. C. Kim, K. S. Kim, K. M. Kim, et al. 2008. Effectiveness of mirtazapine for nausea and insomnia in cancer patients with depression. Psychiatry Clin. Neurosci. 62:75–83.

239. Kuo, H. H., M. J. Chiu, W. C. Liao, and S. L. Hwang. 2007. Investigation of flunitrazepam for primary insomnia in terminally ill patients with depression, hopelessness, and sleep in cancer patients’ desire for death. Int. J. Psychiatry Clin. Pract. 10:201–211.

240. Mistakidou, K., E. Parpa, E. Tsiliki, M. Pathiaki, A. Galanos, and L. Vlahos. 2007. Depression, hopelessness, and sleep in cancer patients’ desire for death. Int. J. Psychiatry Med. 37:201–211.

241. Mistakidou, K., E. Parpa, E. Tsiliki, M. Pathiaki, K. Gennatas, V. Smyrniotis, et al. 2007. The relationship of subjective sleep quality, pain, and quality of life in advanced cancer patients. Sleep 30:737–742.

242. Mistakidou, K., E. Parpa, E. Tsiliki, M. Pathiaki, E. Patiraki, A. Galanos, et al. 2007. Sleep quality in advanced cancer patients. J. Psychosom. Res. 62:527–533.

243. Taguchi, T., M. Yano, and Y. Kido. 2007. Influence of bright light therapy on postoperative patients: a pilot study. Intensive Crit. Care Nurs. 23:289–297.

244. Wang, R. C., S. J. Wang, Y. C. Chang, and C. C. Lin. 2007. Mood state and quality of sleep in cancer patients with depression, hopelessness, and sleep in cancer patients’ desire for death. Int. J. Psychiatry Med. 37:201–211.

245. Wang, R. C., S. J. Wang, Y. C. Chang, and C. C. Lin. 2007. Mood state and quality of sleep in cancer patients with depression, hopelessness, and sleep in cancer patients’ desire for death. Int. J. Psychiatry Med. 37:201–211.

246. Chong, Y. S., L. Wang, T. C. Lin, and C. C. Lin. 2008. Symptom clusters and relationships to distress and pain. J. Pain Symptom Manage. 34:266–269.

247. Zhao, Y., X. S. Wang, and P. P. Li. 2007. Investigation of common symptoms of cancer and reliability analysis. Chin. J. Integr. Med. 13:195–199.
status and quality of life of elderly patients with cancer. Crit. Rev. Oncol. Hematol. 78:127–137.

249. Colagiuri, B., S. Christensen, A. B. Jensen, M. A. Price, P. N. Butow, and R. Zachariae. 2011. Prevalence and predictors of sleep difficulty in a national cohort of women with primary breast cancer three to four months postsurgery. J. Pain Symptom Manage. 42:710–720.

250. Demiralp, M., F. Oflaz, and S. Komurcu. 2010. Effects of relaxation training on sleep quality and fatigue in patients with breast cancer undergoing adjuvant chemotherapy. J. Clin. Nurs. 19:1073–1083.

251. Evangelista, A. L., and E. M. Santos. 2012. Cluster of symptoms in women with breast cancer treated with curative intent. Support. Care Cancer 20:1499–1506.

252. Huang, T. W., and C. C. Lin. 2009. The mediating effects of depression on sleep disturbance and fatigue: symptom clusters in patients with hepatocellular carcinoma. Cancer Nurs. 32:398–403.

253. Humpel, N., and D. C. Iverson. 2010. Sleep quality, fatigue and physical activity following a cancer diagnosis. Eur. J. Cancer Care (Engl.) 19:761–768.

254. Mystakidou, K., E. Parpa, E. Tsilika, C. Gennatas, A. Galanos, and L. Vlahos. 2009. How is sleep quality affected by the psychological and symptom distress of advanced cancer patients? Palliat. Med. 23:46–53.

255. Qian, W., J. Haight, I. Poon, D. Enepekides, and K. M. Higgins. 2010. Sleep apnea in patients with oral cavity and oropharyngeal cancer after surgery and chemoradiation therapy. Otolaryngol. Head Neck Surg. 143:248–252.

256. Vadiraja, S. H., M. R. Rao, R. H. Nagendra, R. Nagarathna, M. Rekha, N. Vanitha, et al. 2009. Effects of yoga on symptom management in breast cancer patients: a randomized controlled trial. Int. J. Yoga 2:73–79.

257. Wang, S. Y., H. J. Chang, and C. C. Lin. 2010. Sleep disturbances among patients with non-small cell lung cancer in Taiwan: congruence between sleep log and actigraphy. Cancer Nurs. 33:E11–E17.

258. Yang, H. L., X. P. Chen, K. C. Lee, F. F. Fang, and Y. F. Chao. 2010. The effects of warm-water footbath on relieving fatigue and insomnia of the gynecologic cancer patients on chemotherapy. Cancer Nurs. 33:454–460.

259. Tzeng, J. I., Y. W. Fu, and C. C. Lin. 2012. Validity and reliability of the Taiwanese version of the Pittsburgh Sleep Quality Index in cancer patients. Int. J. Nurs. Stud. 49:102–108.

260. Chu, T. L., W. P. Yu, S. C. Chen, H. L. Peng, and M. J. Wu. 2011. Comparison of differences and determinants between presence and absence of sleep disturbance in hepatocellular carcinoma patients. Cancer Nurs. 34:354–360.

261. Feng, Y., X. Y. Wang, S. D. Li, Y. Zhang, H. M. Wang, M. Li, et al. 2011. Clinical research of acupuncture on malignant tumor patients for improving depression and sleep quality. J. Tradit. Chin. Med. 31:199–202.

262. Courneya, K. S., C. M. Sellar, L. Trinh, C. C. Forbes, C. Stevinson, M. L. McNeely, et al. 2012. A randomized trial of aerobic exercise and sleep quality in lymphoma patients receiving chemotherapy or no treatments. Cancer Epidemiol. Biomarkers Prev. 21:887–894.

263. Hofo, K., C. Miaskowski, K. Bjordal, B. A. Cooper, and T. Rustoen. 2012. Previous chemotherapy influences the symptom experience and quality of life of women with breast cancer prior to radiation therapy. Cancer Nurs. 35:167–177.

264. Jane, S. W., S. L. Chen, D. J. Wilkie, Y. C. Lin, S. W. Foreman, R. D. Beaton, et al. 2011. Effects of massage on pain, mood status, relaxation, and sleep in Taiwanese patients with metastatic bone pain: a randomized clinical trial. Pain 152:2432–2442.

265. Kim, H. J., A. M. Barsevick, S. L. Beck, and W. Dudley. 2012. Clinical subgroups of a psychoneurologic symptom cluster in women receiving treatment for breast cancer: a secondary analysis. Oncol. Nurs. Forum 39:E20–E30.

266. Kotronoulas, G. C., C. N. Papadopoulou, A. Papapatrou, and E. Patiraki. 2011. Psychometric evaluation and feasibility of the Greek Pittsburgh Sleep Quality Index (GR-PSQI) in patients with cancer receiving chemotherapy. Support. Care Cancer 19:1831–1840.

267. Liu, Y., Q. S. Xi, S. Xia, L. Zhuang, W. Zheng, and S. Yu. 2011. Association between symptoms and their severity with survival time in hospitalized patients with far advanced cancer. J. Palliat. Med. 25:682–690.

268. Monas, L., S. Csorba, M. Kovalyo, Y. F. Dror, and C. F. Musgrave. 2012. The relationship of sleep disturbance and symptom severity, symptom interference, and hospitalization among Israeli inpatients with cancer. Oncol. Nurs. Forum 39:E361–E372.

269. Mota, D. D., C. A. Pimenta, and R. Caponero. 2012. Fatigue in colorectal cancer patients: prevalence and associated factors. Rev. Lat. Am. Enfermagem 20:495–503.

270. Berger, A. M. 1998. Patterns of fatigue and activity and rest during adjuvant breast cancer chemotherapy. Oncol. Nurs. Forum 25:51–62.

271. Ancoli-Israel, S., R. Cole, C. Alessi, M. Chambers, W. Moorcroft, and C. P. Pollak. 2003. The role of actigraphy in the study of sleep and circadian rhythms. Sleep 26:342–392.

272. Buysse, D. J., C. F. Reynolds III, T. H. Monk, S. R. Berman, and D. J. Kupfer. 1989. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 28:193–213.

273. Espie, C. A. 2002. Insomnia: conceptual issues in the development, persistence, and treatment of sleep disorder in adults. Annu. Rev. Psychol. 53:215–243.

274. Fry, J. M. 1987. Sleep disorders. Med. Clin. North Am. 71:95–110.

275. Vena, C., K. Parker, R. Allen, D. Blwise, S. Jain, and L. Kimble. 2006. Sleep-wake disturbances and quality of life
in patients with advanced lung cancer. Oncol. Nurs. Forum 33:761–769.

276. Freedman, R. R., and T. A. Roehrs. 2007. Sleep disturbance in menopause. Menopause 14:826–829.

277. Dzaja, A., S. Arber, J. Hislop, M. Kerkhofs, C. Kopp, T. Pollmacher, et al. 2005. Women’s sleep in health and disease. J. Psychiatr. Res. 39:55–76.