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## Endometrial cancer survivors' sleep patterns before and after a physical activity intervention: A retrospective cohort analysis

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### HIGHLIGHTS

- Most endometrial cancer survivors have poor sleep quality.
- Increased exercise is related to improved sleep during an exercise intervention.
- Obese survivors have more sleep disturbances than normal weight survivors.

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### ABSTRACT

**Objective.** To identify the baseline sleep patterns of endometrial cancer survivors and examine the impact of a physical activity intervention on their sleep quality via retrospective secondary analysis.

**Methods.** Early-stage endometrial cancer survivors participated in a 6-month single-arm exercise intervention using printed materials, telephone-based counseling, and pedometers to encourage adherence to exercise guidelines. Participants completed questionnaires evaluating their sleep (PSQI), physical activity (CHAMPS), quality of life (SF-36), and stress (PSS) at baseline and study completion.

**Results.** Ninety-five survivors had PSQI data at both time points. Mean age was 57.1 years (range, 25–76). Mean body mass index was 34.3 kg/m<sup>2</sup>. The majority were non-Hispanic white (75%) and had stage I disease (80%). At baseline, most survivors (61%) had poor sleep quality (PSQI > 5), with 24% reporting fairly or very bad sleep. The majority (63%) slept <7 h/night. At least once during the preceding month, 83% had an episode of daytime dysfunction. A pairwise comparison showed that obese survivors had more sleep disturbances than normal weight survivors ( $p = 0.029$ ). No other clinicodemographic factors were associated with sleep. In unadjusted analyses, sleep quality significantly improved in women who increased weekly total or moderate/vigorous physical activity ( $p = 0.004$  and  $p < 0.050$ , respectively). This association persisted after adjusting for the potential covariates of age, time since diagnosis, obesity status, disease stage, and treatment ( $p = 0.026$ ).

**Conclusions.** Our data demonstrated that poor sleep is common and detrimental to endometrial cancer survivors. Increasing exercise may improve this dysfunction and should be investigated as part of a prospective study.

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### 1. Introduction

Endometrial cancer is the most common gynecologic malignancy in the United States, affecting 1 in 36 women [1]. As the incidence of endometrial cancer continues to rise, related closely to the increasing number of women in the United States who are overweight or obese [1–3], the number of survivors is projected to increase from 620,000 to

750,000 by 2024 [4]. After being cured of their disease, these survivors face a plethora of poorly defined issues that are detrimental to their quality of life.

The high prevalence of sleep dysfunction in all cancer survivors (30–50%) [5,6] and general gynecologic cancer survivors (40–55%) [7,8] is known and is higher than the prevalence of sleep disorders/complaints in the general population (4–33%) [9]. However, research defining the sleep patterns of endometrial cancer survivors is limited. Data demonstrate a higher rate of insomnia in endometrial cancer survivors than in the general population [10]. However, beyond those for insomnia, no further reports of sleep characterizations exist for this population. The sleep health of endometrial cancer survivors may be

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impacted by obesity given the association of excess adiposity with poor sleep observed in the general population [11] and survivors of breast cancer [5,12], another obesity-related disease. Poor sleep has been associated with decreased metabolism [13], insulin resistance [14], possibly even leading to obesity [15]. Additionally, sleep disturbances are more common in obese individuals, even those without sleep-disordered breathing [16]. Regardless, sleep disruption may be associated with poor quality of life, as demonstrated in ovarian cancer patients [17]. However, this association has yet to be investigated in the endometrial cancer population.

One strategy to address poor sleep is to increase physical activity, which has been shown to improve total sleep time, efficiency, onset latency, and quality [18]. A randomized controlled trial of gynecologic cancer survivors using a physical activity intervention demonstrated an initial but not persistent sleep benefit in the exercise group when compared to the control group [19]. Although the researchers included endometrial cancer survivors in that study, they did not perform a subgroup analysis.

Given the paucity of data on the sleeping patterns of endometrial cancer survivors, we performed the present study to 1) describe the baseline sleep characteristics of endometrial cancer survivors, 2) determine the impact of clinicodemographic and treatment characteristics on sleep quality, 3) investigate the association of sleep quality with quality of life and stress level, and 4) describe the impact of a physical activity intervention on sleep. We hypothesized that endometrial cancer survivors would frequently experience sleep dysfunction, especially those who are overweight or obese; that poor sleep would be associated with poor quality of life and high stress levels; and that increased physical activity would be related to improvement in overall sleep quality.

## 2. Methods

### 2.1. Study design and participants

This study is a secondary analysis of Steps to Health, a single-arm prospective cohort study, the detailed methodology for which was published previously [20,21]. Concisely, all participants had stage I–IIIa endometrial cancer, had completed treatment at least 6 months prior to the study, and were without evidence of disease. Also, participants had not met the American College of Sports Medicine physical activity guidelines within the preceding 6 months. These guidelines require at least 30 min of moderate-intensity exercise 5 or more days a week or at least 20 min of vigorous exercise 3 or more days a week [22]. Finally, medical clearance was required for study inclusion.

Recruitment occurred from January 2007 to September 2011. Potential participants at the main campus of The University of Texas MD Anderson Cancer Center in Houston, TX, were contacted via e-mail, telephone, or clinic visits. Survivors obtaining care at a private gynecologic oncology office in Houston were initially approached by their health care providers and, if interested, contacted by a research team member. The MD Anderson Institutional Review Board approved the study procedures.

Six-hundred forty-three survivors were considered for the study. Of those, 39 failed eligibility screening, and 270 were incompletely screened (for example, did not respond to letters and phone calls, or did not have appointments within the recruitment window). Of the remaining 334 survivors, 192 were not interested in the study and 42 were initially interested but did not follow through with study enrollment.

### 2.2. Procedures

Evaluations of the frequency and duration of physical activity occurred at baseline (T0) and 2 (T1), 4 (T2), and 6 (T3) months after enrollment, at MD Anderson. Additionally, at T0 and the T3 time point, sleep, quality of life, and stress were assessed using the measures

described below. Demographic and treatment information were collected at baseline.

#### 2.2.1. Sleep, quality of life, and stress assessment measures

**2.2.1.1. Sleep.** Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), which has seven components: sleep quality, sleep onset latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction [23]. Each component is scored on a scale of 0, indicating the item was “not occurring in the past 4 weeks” or “not a problem,” to 3, indicating that the issue occurred “3 or more times per week” or was a “very big problem.” Taken together, the seven components have high internal consistency (Cronbach  $\alpha$  of 0.83) [23]. Lower scores indicate better sleep quality, whereas higher scores represent more dysfunction, with composite scores ranging from 0 to 21. A composite score  $>5$  indicates poor sleep quality [23]. The PSQI has high test-retest reliability over time and can discriminate between individuals with sleep disorders and controls with no such disorders [23]. Internal consistency and construct validity are supported in a cancer patients [24].

**2.2.1.2. Physical activity.** Data on the patients' amount, intensity, and frequency of physical activity were collected using the Community Health Activities Model Program for Seniors (CHAMPS) questionnaire [25]. The CHAMPS questionnaire for older adults that examines the frequency, duration, and intensity of weekly exercise over the past 4 weeks. Activities are classified as part of “all-exercise related activities,” while a subgroup of these activities are classified as moderate-vigorous intensity physical activities (MVPA). Activities were considered MVPA if their metabolic equivalent (MET) was  $>$  or  $=$  3. During the questionnaire's development, its test-retest reliability ranged from 0.58 to 0.67, and the CHAMPS scores were sensitive to intervention-related changes [25].

**2.2.1.3. Quality of life.** Quality-of-life data were obtained using the 36-item Short Form Survey, a questionnaire comprising eight components: physical function, social function, pain, mental health, energy and fatigue, general health perceptions, role limitations caused by physical problems, and role limitations caused by emotional problems [26].

**Table 1**  
Participant characteristics at baseline (n = 95).

Characteristic	
Mean age, years (range)	57.1 (25.0–76.0)
Mean weight, kg (range)	90.6 (47.9–185.3)
Mean BMI, kg/m <sup>2</sup> (range)	34.3 (18.7–69.3)
Mean time from diagnosis to enrollment, years (range)	2.2 (0.5–5.2)
BMI category, n (%)	
Normal weight	14 (15)
Overweight	20 (21)
Obese	61 (64)
Race, n (%)	
Non-Hispanic white	71 (75)
Hispanic white	12 (13)
Non-Hispanic black	6 (6)
Asian	5 (5)
American Indian/non-Hispanic	1 (1)
Education, n (%)	
Some high school/high school diploma/GED	14 (15)
Technical/vocational degree	8 (8)
Some college/2-year degree	34 (36)
At least 4-year degree	39 (41)
Marital status, n (%)	
Married/living with significant other	71 (75)
Single/divorced/widowed/separated	24 (25)
Disease stage, n (%)	
I	76 (80)
II or IIIa	19 (20)
Treatment, n (%)	
Surgery only	54 (57)
Surgery + radiotherapy	41 (43)

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