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Prevalence of self-reported falls, balance or walking problems in older cancer survivors from Surveillance, Epidemiology and End Results—Medicare Health Outcomes Survey

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ABSTRACT

Objective: To determine the prevalence of falls and balance/walking problems in the past 12 months among older cancer survivors before and after cancer diagnosis.
Materials and Methods: We analyzed cross-sectional data from individuals aged ≥65 years with first primary cancer from the Surveillance, Epidemiology, and End Results and Medicare Health Outcomes Survey (SEER-MHOS) linkage (n = 12,659). The first MHOS completed by each survivor from 0 to 2 years before cancer diagnosis to 1–4 years after cancer diagnosis were included. We estimated unadjusted and demographic-adjusted prevalence of falls and balance/walking problems for each type of cancer during five one-year time periods before and after cancer diagnosis.
Results: Adjusted prevalence of falls was significantly higher post-diagnosis than pre-diagnosis in prostate (12% during years 1–2 pre-diagnosis vs. 17%–20% during years 1–4 post-diagnosis)($p = 0.01$) and lung cancer (17% during years 1–2 pre-diagnosis vs. 28% during years 1–2 post-diagnosis)($p = 0.019$). Adjusted prevalence of balance/walking problems were significantly higher post-diagnosis than pre-diagnosis in non-Hodgkin's lymphoma (26% during years 1–2 pre-diagnosis vs. 45% during years 1–2 post-diagnosis)($p = 0.012$), breast (32% during years 1–2 pre-diagnosis vs. 41% during years 3–4 post-diagnosis)($p = 0.001$), prostate (22% during years 1–2 pre-diagnosis vs. 28%–29% during years 1–4 post-diagnosis)($p = 0.012$), and lung cancer (33% during years 1–2 pre-diagnosis vs. 40% during year 0–1 pre-diagnosis and 46% during years 1–2 post-diagnosis)($p = 0.018$). Prevalence did not differ across time periods in other cancers.
Conclusions: Falls and balance/walking problems may become more frequent after the diagnosis of some cancers. Screening, surveillance, and interventions need to consider functional deficits and cancer diagnosis.

1. Introduction

Cancer is a chronic condition of older adults. About 53% of new cancers are diagnosed in people 65 years and older [1,2]. With recent advances in medical care, people are living longer after cancer treatments. The 5-year survival rate after the age of 65 years is 59% [3]. The number of cancer survivors is projected to reach 19 million by 2024 [4]. National expenditures for cancer care totaled nearly $125 billion in 2010, and are estimated to cost $156 billion in 2020 [5]. In light of the aging population and the increasing cost of care, developing strategies to optimize function along the trajectory of survivorship for older cancer survivors has become a significant challenge [6–9].

In older adults, falls are common occurrences with serious consequences, including increased cost of health care, mortality, poor quality of life, fears of falling, and restricted mobility [10–17]. Additionally, difficulty with balance or walking is associated with falls, dependence in activities of daily living, and lower quality of life [18–22]. A loss of balance contributed to more than 50% of falls among cancer survivors receiving neurotoxic chemotherapy [23]. Slow walking speed and impaired ability to walk 1/4 mile have been linked to heightened mortality and disability among older cancer survivors [24,25]. Cancer and its treatment impact multiple body systems and present unique health risks [4,23,26–29]. Accelerated aging is evidenced by greater declines in health outcomes over time after cancer diagnosis [30–33]. Significantly higher fall rates among older cancer survivors compared to those without cancer have been documented in population-based studies, with one reporting 33% vs. 30% (OR = 1.16, 95%CI, 1.01 to 1.33, n = 9481) [34] and another reporting 26% vs. 22% (OR = 1.17, 95%CI, 1.04 to 1.32, n = 12,480) [35]. Fall rates of older cancer survivors from previous studies ranged from 20% to 30% over 3 to 12 months

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across different practice settings [29]. Difficulty with balance and walking were identified by cancer survivors as the most frequent functional problems, with prevalence of 19% and 24%, respectively [36]. While the sequelae vary with time and type of cancer [4,23,26–29], whether the prevalence of falls and balance/walking problems vary with time post-cancer diagnosis remains poorly understood. Such information is key for developing survivorship care plans to improve health outcomes and costs, satisfaction with treatment, and caregiver burden.

The aims of this study were to (1) determine unadjusted and demographic-adjusted prevalence of self-reported falls and balance/walking problems in the past 12 months among older cancer survivors from pre- to post-cancer diagnosis, and (2) investigate whether prevalence during initial and later time periods post-cancer diagnosis may be higher in comparison with prevalence during 1–2 years pre-cancer diagnosis. Using population-based data and a cross-sectional design, prevalence among survivors during five one-year time periods before and after cancer diagnosis were estimated for each of the eight common cancers.

2. Materials and Methods

2.1. Design

This was a cross-sectional study analyzing 2006–2013 data from the Surveillance, Epidemiology and End Results Program and the Medicare Health Outcomes Survey (SEER-MHOS) linkage [37]. The SEER collects information about all newly diagnosed cancer cases from 16 cancer registries that cover about 26% of the U.S. population. The SEER-MHOS linkage includes data from 14 cancer registries, including cancer type, stage, time of diagnosis, cancer histology, initial cancer treatment, such as surgery and radiation, survival time, and cause of death [37]. The MHOS is a 95-item questionnaire that gathers valid, reliable, clinically meaningful, and patient-reported outcomes, including demographics, socioeconomic status, health habits and problems, chronic conditions, functional status, symptoms, health-related quality of life, and respondent characteristics, to monitor the quality of care of Medicare Advantage organizations [37,38]. Beneficiaries in participating Medicare Advantage organizations (managed care health plans) are randomly sampled annually by mail or telephone, and then resurveyed 2 years later [37,38]. The response rates of the baseline survey ranged from 64.1% in 1998 to 71.6% in 2000 [37]. The follow-up response rates ranged from 76.3% to 84.9% [37]. The extent of potential nonresponse bias of the MHOS was reported to be minimal and does not adversely affect estimates of health status for this population [39].

2.2. Setting

Population-based.

2.3. Participants

Fig. 1 shows the inclusion of the study sample. The sample was comprised of individuals age ≥65 years from SEER-MHOS cohort 9–14, beginning on January 1st in 2006 and ending on December 31st in 2013. Data from survivors of non-Hodgkin's lymphoma (NHL), breast, prostate, colorectal, lung, kidney, bladder, or uterine cancers were extracted. These cancers are highly prevalent in older adults [1,40]. Inclusion criteria were: first primary cancer, availability of cancer staging information, and MHOS administered from years 0–2 before cancer diagnosis to years 1–4 after diagnosis. Because the MHOS asked about falls and balance/walking problems in the past 12 months, survivors completing the MHOS within the first year after cancer diagnosis could have fallen or experienced balance/walking problems before diagnosis. Therefore, these survivors were excluded. We included the first MHOS completed by each individual in the analyses.

2.4. Main Outcomes and Measures

Primary outcomes were falls and balance/walking problems based on two MHOS questions with responses of "yes" (coded as 1) or "no" (coded as 2): (1) "A fall is when your body goes to the ground without being pushed. Did you fall in the past 12 months?" (2) "In the past 12 months, have you had a problem with balance or walking?" The prevalence estimates of falls or balance/walking problems, respectively, were defined as the number of survivors responding "yes" to these two questions.

The difference in time from MHOS administration to cancer diagnosis was calculated to create a categorical "time period" variable (coded as 1: >1 year and ≤2 years pre-diagnosis, 2: ≤1 year pre-diagnosis, 3: >1 year and ≤2 years post-diagnosis, 4: >2 years and ≤3 years post-diagnosis, and 5: >3 years and ≤4 years post-diagnosis). Survivors were classified into these five "time period groups" within each cancer diagnosis based on when they completed the MHOS relative to the time of cancer diagnosis. We compared the prevalence estimates between different time periods for each cancer.

Demographics variables included age at MHOS survey, gender (male, female), race (white, black, other/unknown), marital status (married, not married), education (<high school, high school or some college, ≥4-year college), and household income (<$30,000, $30,000–$50,000, >$50,000, unknown).

Health-related variables included calculated body mass index (BMI) and comorbidity index. Thirteen chronic conditions were identified from the MHOS (arthritis, osteoporosis, chronic obstructive pulmonary condition, angina, congestive heart failure, myocardial infarct, stroke, hypertension, diabetes types I and II, visual impairment, hearing impairment, low back pain, and depression). Each was scored as 1 (with the condition) or 0 (without the condition). The sum of scores from all conditions was the comorbidity index.

Cancer-related variables included age at diagnosis, type of cancer, stage of cancer (in situ, localized, regional, distant) [41], time to diagnosis, radiation (yes, no/unknown), surgery (yes, no/unknown), and surgery with radiation (yes, no/unknown). The SEER-MHOS does not include chemotherapy or hormonal therapy information.

2.5. Statistical Analysis

Descriptive statistics were calculated for sample characteristics. Using Poisson regression with robust error variance [42–44], we included the "time period" variable as covariate to estimate the unadjusted and adjusted prevalence of falls and balance/walking problems during each of the five time periods from pre- to post-cancer diagnosis. Separate regression models were constructed for each cancer. In the adjusted analyses, an a priori selection of demographic variables (age at survey, race, marital status, education, and household income) was added to the models as covariates based on previous research evidence [45,46]. Gender was also included in these models, except in breast, prostate, and uterine cancer. We used simple contrast coding for the "time period" variable to compare the prevalence during a time period with the prevalence during 1–2 years pre-diagnosis, i.e. the reference prevalence. Bonferroni adjustments were applied for post-hoc comparisons of the prevalence during each time period with the reference prevalence. All analyses were performed with IBM-SPSS® Version 22 (Armonk, NY). All tests were 2-sided. The level of significance was set at 0.05.

3. Results

3.1. Sample Characteristics

As shown in Table 1, the mean age at the administration of MHOS ranged from 74.2 (SD = 5.8) years in prostate cancer to 77.5 (SD = 6.6) years in bladder cancer. The majority were white, married, and

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