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Recreational Physical Activity in Relation to Prostate Cancer-specific Mortality Among Men with Nonmetastatic Prostate Cancer

Ying Wang^{*}, Eric J. Jacobs, Susan M. Gapstur, Maret L. Maliniak, Ted Gansler, Marjorie L. McCullough, Victoria L. Stevens, Alpa V. Patel

Epidemiology Research Program, American Cancer Society, Atlanta, GA, USA

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Abstract

Background: Large prospective cohort studies need to confirm the associations between recreational physical activity (PA), including the most common type—walking, and prostate cancer-specific mortality (PCSM) among prostate cancer patients.

Objective: To investigate the associations of recreational PA, reported before and after diagnosis, with PCSM, overall and by tumor risk category.

Design, setting, and participants: In a prospective cohort study conducted in the USA, men diagnosed with nonmetastatic prostate cancer between 1992/1993 and June 2011 were followed for mortality until 2012. Patients were included in pre- ($n = 7328$) and/or postdiagnosis ($n = 5319$) analyses.

Outcome measurements and statistical analysis: Cox proportional hazards models were used to assess PCSM with recreational PA.

Results and limitations: A total of 454 and 261 prostate cancer deaths occurred during pre- and postdiagnosis follow-up, respectively. Prior to diagnosis, engaging in ≥ 17.5 metabolic equivalent hours per week (MET-h/wk) of recreational PA, compared with 3.5– <8.75 MET-h/wk, was associated with a significant 37% lower risk of PCSM (hazard ratio: 0.63, 95% confidence interval: 0.43–0.91, p trend = 0.03) only among men with lower-risk tumors (Gleason score 2–7 and T1–T2; p interaction = 0.02). A similar result was seen for walking but not for other recreational PA. After diagnosis, the same comparison (≥ 17.5 vs 3.5– <8.75 MET-h/wk) was associated with a significant 31% lower risk of overall PCSM (hazard ratio: 0.69, 95% confidence interval: 0.49–0.95, p trend = 0.006), which did not differ by tumor risk category. Postdiagnosis walking had a suggestive inverse association with PCSM (p trend = 0.07). These results were observational and may not be generalized to patients with metastatic prostate cancer. Residual confounding due to a higher screening rate among men with lower-risk tumors cannot be ruled out.

Conclusions: The findings provide additional evidence for prostate cancer survivors to adhere to PA recommendations, and support clinical trials of exercise among prostate cancer survivors with progression or mortality as outcomes.

Patient summary: In a large follow-up study of men diagnosed with nonmetastatic prostate cancer, those who exercise more after diagnosis had a lower risk of dying from prostate cancer.

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^{*} Corresponding author. Epidemiology Research Program, American Cancer Society, Inc., 250 Williams Street, 6D-334, Atlanta, GA 30303, USA. Tel. +1 404 329 4341; Fax: +1 404 321 4669. E-mail address: ying.wang@cancer.org (Y. Wang).

1. Introduction

Prostate cancer is the third leading cause of cancer death among US men [1]; there are approximately 3.3 million prostate cancer survivors, accounting for 21% of all cancer survivors [2].

Higher physical activity (PA) after diagnosis has consistently been associated with a lower risk of dying from breast cancer and colorectal cancer [3–12]. Four large prospective cohort studies suggest that postdiagnosis PA is also associated with a lower risk of prostate cancer progression or prostate cancer-specific mortality (PCSM) [13–16]. However, the strength of the evidence for PCSM is considered limited due to concerns about reverse causation and limited power in some of these studies [15,16]. Therefore, a larger cohort study with a design that minimizes bias from reverse causation is needed. In addition, physical inactivity prior to diagnosis may play a role in the development of tumor aggressiveness [17], but this has not been well studied in relation to PCSM.

The goal of this study was to examine the associations of pre- and postdiagnosis recreational PA with PCSM overall, and by tumor risk category. The Cancer Prevention Study (CPS)-II Nutrition Cohort is well suited for investigating these associations, given its large sample size, long-term follow-up, and detailed information on PA and important covariates measured before and after diagnosis.

2. Patients and methods

2.1. Participants

Participants were drawn from the 86 402 men enrolled in the CPS-II Nutrition Cohort, a prospective study of cancer incidence and mortality,

established by the American Cancer Society in 1992 as described in detail elsewhere [18]. We identified 10 864 men diagnosed with prostate cancer between 1992/1993 and June 30, 2011. After all exclusions (Fig. 1), 7328 and 5319 men were included in pre- and postdiagnosis analyses, respectively.

2.2. Assessment of recreational PA

The amount of recreational PA per week during the past year was self-reported on the baseline questionnaire and on biennial follow-up questionnaires beginning in 1999 (except on the 2003 questionnaire; available online: <https://www.cancer.org/research/we-conduct-cancer-research/epidemiology/cancer-prevention-questionnaires.html>). A metabolic equivalent of task (MET) was assigned to each of the seven activities as follows: 3.5 for walking, 3.5 for dancing, 4.0 for bicycling, 4.5 for aerobics, 6.0 for tennis or racquetball, 7.0 for jogging/running, and 7.0 for lap swimming [19]. Expert panels from organizations including the American Cancer Society and American College of Sports Medicine recommend that cancer survivors engage in a minimum of 150 min of moderate-intensity or 75 min of vigorous-intensity activity per week, or an equivalent combination [20,21]. Although strength training also is recommended for cancer survivors, it was not asked on every questionnaire; thus, we focused on aerobic exercise. We categorized the total recreational MET hours per week (MET-h/wk) into four groups: <3.5, 3.5–<8.75 (reference group), 8.75–<17.5, and ≥17.5. Category 3.5–<8.75 represents engaging in some recreational PA, equivalent to 1–<2.5 h of walking per week, but not meeting the minimum recommendation. This reference group was selected because it is larger than the lowest category, which means that the risk estimates are more stable with narrower 95% confidence intervals (CIs), and is less subject to reverse causation bias because men in the bottom category may have reduced their activity due to illness.

Prediagnosis PA was obtained from the last questionnaire completed at least 1 yr (median 3 yr) before prostate cancer diagnosis. Postdiagnosis PA was obtained from the first questionnaire completed at least 1 yr (median 3 yr) after diagnosis.

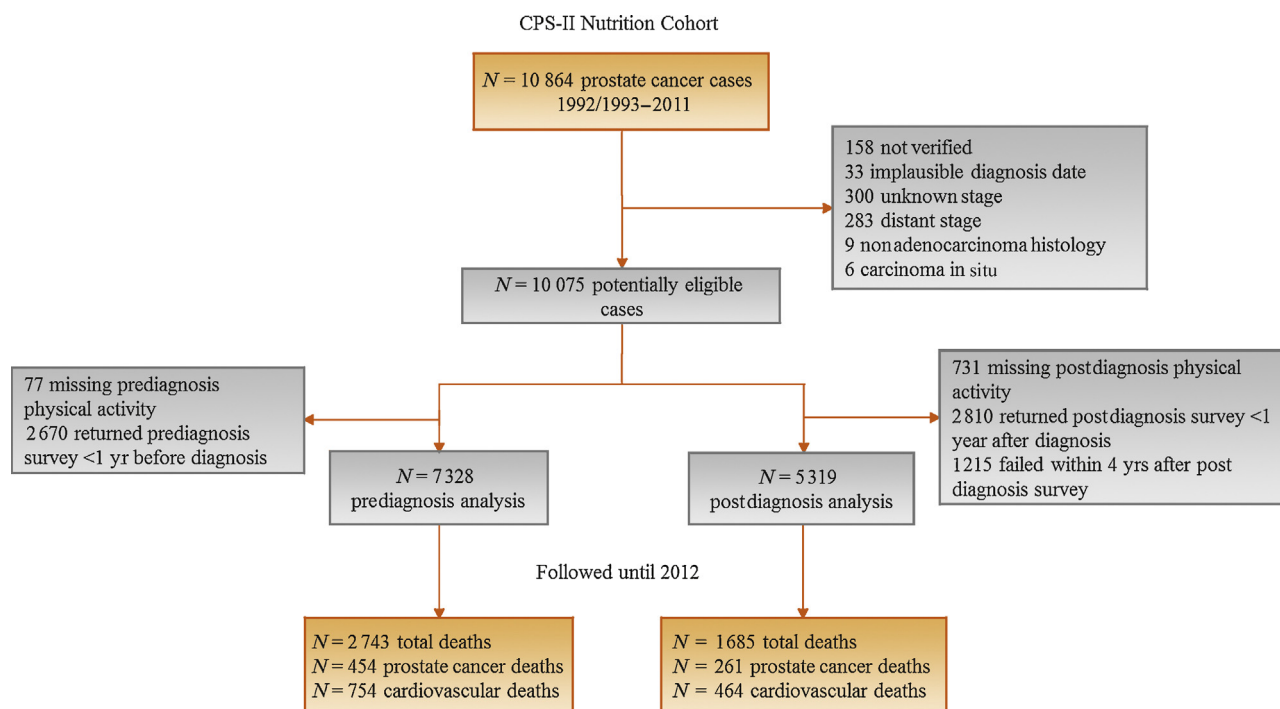


Fig. 1 – Prostate cancer cases drawn from the CPS-II Nutrition Cohort 1992/1993–2011, and number of deaths identified up to 2012. CPS = Cancer Prevention Study.

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