COMMENT & RESPONSE

In Reply We thank Zhang et al and Goto for their interest in our recent article\(^1\) reporting the potential health benefits of an active lifestyle for cancer survivors. Cancer survival rates have substantially improved in past decades owing to early detection and advanced treatment, leading to a rapidly growing population of cancer survivors.\(^2\)\(^3\) Many cancer survivors live with increased risks of comorbidities and recurrence, poor quality of life, and shortened life expectancy.\(^4\) Therefore, it is urgent to ameliorate cancer survivorship through modifying lifestyle behavioral risks beyond clinical interventions. Our findings highlighted the association of a sedentary lifestyle with worsened survival after cancer.\(^1\)

As noted by Zhang et al and Goto, cancer survival rates varied between cancer sites, stages, and treatments.\(^2\)\(^7\) Unfortunately, the National Health and Nutrition Examination Survey (NHANES) did not collect such detailed clinical information. However, most NHANES cancer survivors belong to cancer types with good 5-year survival rates (details available in the original eTable in the Supplement) and had a comparatively long survival with a median of 8 years.\(^2\) Our weighted Cox regression models met the proportional hazards assumption and showed consistent results after adjusting for cancer sites. We classified cancer survivors into obesity-related and non-obesity-related cancers because previous studies on physical activity and sedentary behaviors had mainly focused on obesity-related cancers.\(^3\) Moreover, we were able to analyze the NHANES data with a weighted sample representing 14 million cancer survivors, which is in alignment with the estimation from the US cancer statistics.\(^3\) Despite the lack of clinical information, this cohort allows findings to be generalized to the overall US cancer survivor population, including sociodemographic subgroups that were underrepresented (eg, non-Hispanic Black individuals) in previous studies. Our research is an important step toward establishing evidence-based clinical practice and policy for the wider cancer survivorship population.

Goto noted that cancer survivors usually experience comorbidities, particularly chronic obstructive pulmonary disease (COPD), which affects both survival and activity levels. Chronic obstructive pulmonary disease was reported among 5.5% of our sample and was indeed associated with levels of physical activity but not with sitting time.\(^1\) It is critical to understand whether prolonged sitting was associated with adverse health outcomes among cancer survivors who were not able to maintain physical activity. The adjustment of COPD or excluding participants with COPD did not change the associations between sitting time, physical activity, and survival outcomes. Our analyses further demonstrated that prolonged sitting after cancer was consistently associated with higher mortality risks in a dose–response manner across population subgroups defined by sociodemographic and lifestyle characteristics (eg, smoking status) and chronic diseases.

With evidence from noncancer populations, reduction in sedentary behavior is recommended for cancer survivors by the 2020 World Health Organization Physical Activity and Sedentary Behavior Guidelines.\(^6\) However, strategies remain poorly defined to meet this goal. Priority should be placed on establishing definite causality by elucidating the biological pathways between sedentary behavior, physical activity, and cancer survival and by generating experimental evidence, which will lead to refining interventions to interrupt prolonged sitting and improve cancer survivorship, given that our society is facing an increasingly sedentary lifestyle.

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