Association between Time since Cancer Diagnosis and Health-Related Quality of Life: A Population-Level Analysis

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A B S T R A C T

Objectives: To examine the association between time since cancer diagnosis and health-related quality of life (HRQOL) among cancer survivors in remission. **Methods:** Analyzing data from 3,610 cancer survivors and 59,539 individuals without cancer in the Medical Expenditure Panel Survey, we examined the relationship between time since cancer diagnosis and HRQOL, taking remission status into account and controlling for patients' demographic characteristics and comorbidities. HRQOL measurements included the six-dimensional health state short form (derived from 36-item short form health survey) (SF-6D) utility scores, the physical component summary score, and the mental component summary score. **Results:** The relationship between time since cancer diagnosis and HRQOL varied substantially across cancer types. Compared with individuals without cancer, survivors of breast, prostate, or poor-prognosis cancer had statistically lower SF-6D scores within 2 years of diagnosis (−0.044, −0.062, and −0.088, respectively). Breast cancer survivors had SF-6D scores similar to those of individuals without cancer

after 2 years, as did patients with poor-prognosis cancer after 5 years. Nevertheless, even after a period of 10 years, survivors of prostate or cervical cancer had a lower level of SF-6D scores (−0.027 and −0.042, respectively). The comparisons of physical health between cancer survivors and individuals without cancer were similar to those of SF-6D. In contrast, most cancer survivors did not experience poorer mental health; survivors of prostate or cervical cancer, however, had lower mental component summary scores after 10 years of diagnosis. **Conclusions:** The level of HRQOL among cancer survivors depends on time since cancer diagnosis and cancer type. Some cancer survivors have lower HRQOL after a decade of diagnosis, even in remission.
Keywords: cancer survivors, health-related quality of life (HRQOL), SF-6D, time-sensitive differences.

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Introduction

In 2014, approximately 14.5 million individuals in the United States were alive with a history of cancer [1]. The 2005 Institute of Medicine report, "From Cancer Patient to Cancer Survivor: Lost in Transition," emphasized the necessity of additional research on cancer survivorship [2]. One of the critical issues in survivorship care is to maintain and improve survivors' health-related quality of life (HRQOL).

Many population-based studies have examined the effect of cancer and its treatment on HRQOL [3–15]. Extant research,

however, has not reached consensus on whether the HRQOL of cancer survivors in remission after a long period of time returns to the same level of that of those who have not had cancer [3,9–11,16,17]. Few studies have simultaneously accounted for cancer type and time since diagnosis; thus, the interplay between these two factors and HRQOL may be masked. Furthermore, previous research did not control for remission status. A recurrence event can conceivably lead to a decrease in HRQOL [16], which could influence the relationship between time since cancer diagnosis and HRQOL. Finally, most research measured scores for individual health domains, such as pain and physical or mental health.

Few studies examined an overall preference-based HRQOL score among cancer survivors [4,6,11]. Such a single health index concerning multiple domains could be incorporated in a cost-effectiveness analysis (CEA) for economic evaluation of cancer care [18]. As more people are surviving cancer, their preference-based HRQOL is urgently needed to help providers and policy-makers appropriately allocate resources.

To address these knowledge gaps, we analyzed data from a large-scale national survey, the Medical Expenditure Panel Survey (MEPS), to examine the relationship between time since cancer diagnosis and HRQOL among cancer survivors, taking remission status into account. Using a validated multiattribute health state classification system, we aimed to develop a nationally representative "off-the-shelf" catalog of preference-based HRQOL scores. We also reported the HRQOL scores of physical and mental health.

Methods

Design and Data

We conducted a cross-sectional study using the MEPS data. The MEPS, a nationally representative survey of the US civilian non-institutionalized population, is considered to be a comprehensive and reliable data source to evaluate national estimates of health expenditures and health status. It provides information for a 2-year reference period with an overlapping panel survey, in which a new cohort ("panel") is initiated each year and consists of individuals who are interviewed in person 5 times ("round") over 2.5 consecutive years. To avoid duplicate observations from the same panel and to maximize our sample size, we used MEPS data from years 2008, 2010, and 2012, selecting observations from six survey panels entering between 2007 and 2012.

Sample

We identified cancer survivors on the basis of the response to the survey. The MEPS includes a series of questions about cancer diagnosis for adults aged 18 years and older. Adult cancer survivors were identified on the basis of their response to a question about whether a doctor or other health professional had ever told them that they had cancer or a malignancy of any kind. Anyone who answered "yes" is further asked about "what kind of cancer" and "age of diagnosis." In the data years we selected, the MEPS included variables that indicated whether each reported cancer was in remission. Specifically, the MEPS asked individuals whether the condition of cancer is "in remission, that is, the condition (cancer) is under control," allowing us to identify cancer survivors who were or were not in remission. Individuals diagnosed solely with nonmelanoma skin cancer were not classified as cancer survivors. To limit the effect of multiple cancers on the estimated relationship between time since cancer diagnosis and HRQOL, we selected adult cancer survivors who had only one cancer diagnosis. We included respondents with no cancer history as our comparison group, and excluded respondents who were younger than 18 years or who did not have complete data. Acknowledging that cancer survivors might interpret "in remission" incorrectly, we also excluded cancer survivors in remission who had cancer for more than 2 years but received chemotherapy or radiotherapy in the survey year. We included cancer survivors in remission who had cancer for less than 2 years but received chemotherapy or radiotherapy in the survey year because cancer survivors may receive these treatments as an adjuvant therapy to prevent recurrence events. Including the respondents whom we thought not to be in remission, approximately 2.5% of our sample of cancer survivors, gave similar results. Review by an institutional review board was not required because data are publicly available.

HRQOL Measures

HRQOL was assessed by the Medical Outcomes Study short form 12-item health status survey version 2 instrument, with data collected via the self-administered questionnaire to adults aged 18 years or older participating in the MEPS. Our primary HRQOL measure was the six-dimensional health state short form (SF-6D) score, a preference-based single index. The SF-6D score is generated by converting the elements of the short form 12-item health status survey version 2 with a validated utility-based algorithm [19]. The MEPS also imputes HRQOL scores in physical and mental health domains, the physical component summary (PCS) and the mental component summary (MCS). The PCS and MCS scores have been rescaled with averages of 50 and SDs of 10 with respect to a proprietary US national data set [20].

Covariates

To examine the association between HRQOL and time since cancer diagnosis among cancer survivors in remission, we classified time since cancer diagnosis into four groups: less than 2 years, 2 to 4 years, 5 to 9 years, and 10 years or older. Survivors who were not in remission were placed in one group. We did not classify this group on the basis of time since cancer diagnosis for two reasons: first, the sample size was small, and second, survivors who were not in remission may have an advanced disease or a recurrence event (either of which could have a substantial impact on HRQOL). Such an impact on HRQOL among not-in-remission survivors may mask the association between time since cancer diagnosis and HRQOL. Patient cancer type was categorized as breast, prostate, colorectal, melanoma, cervical, hematologic, poor-prognosis, or nonspecified cancer. Consistent with previous literature [11], *poor-prognosis cancer* is defined as cancer of the liver, lung, pancreas, esophagus, or stomach. Survivors diagnosed with cancer at sites other than those classified were combined into a single category of nonspecified cancer because of a small sample size for each cancer site. Covariates included an individual's demographic characteristics, such as age, sex, race/ethnicity (white, black, Asian, Hispanic, and others), education, marital status, income level, insurance coverage, metropolitan residence, and geographic region (Northwest, Midwest, South, and West) [4,21]. We also controlled for each respondent's comorbidity on the basis of the response to a series of questions in the MEPS, including hypertension, stroke, emphysema, asthma, diabetes, arthritis, vision problems, and hearing problems. Individuals with a history of coronary artery disease, angina, heart attack, or "other heart disease" were classified as having a history of heart disease.

Analyses

We described cancer survivors by cancer type and time since cancer diagnosis. We calculated unadjusted HRQOLs for cancer survivors as well as for individuals without cancer. Descriptive statistics were stratified by history of cancer and were compared using chi-square statistics. All estimates were weighted to account for the MEPS complex survey design and survey non-response.

For each HRQOL measure, we conducted a multivariate linear regression with the key independent variables of both time since cancer diagnosis and cancer type, and the covariates. In short, we created 32 dummy variables for cancer survivors in remission indicating eight cancer types and four categories of time since cancer diagnosis. For cancer survivors who were not in remission, we also created 8 dummy variables by cancer type. The estimated