BACKGROUND: The objective of this study was to investigate associations between earlier caregiving experience and the development of physical impairments over the subsequent 6 years among family caregivers of patients with cancer. METHODS: Family caregivers of cancer survivors participated in a nationwide survey 2 years after their relative’s cancer diagnosis (T1) (N = 1517) with follow-up at 5 years (T2) and 8 years (T3) post-diagnosis. Caregivers self-reported their demographics and levels of caregiving stress at T1. Caregiving status (“former” for those whose patient was remission, “bereaved” for those whose patient had died, and “current”) and the presence of 3 physical impairments (arthritis, chronic back pain, and heart-related diseases) at the time of assessment were measured at T1 through T3. RESULTS: Caregiving stress was significantly related to concurrent presence of the 3 impairment markers at T1. Stressed caregivers also were more likely to develop heart diseases, and spousal caregivers were more likely than other caregivers to develop arthritis and chronic back pain several years after the initial caregiving experience (at T2 and T3). These effects were independent of age, sex, education, and income at T1, and they were also independent of caregiving status at each assessment. CONCLUSIONS: The current findings suggest that the adverse long-term health effects of earlier caregiving stress and of being a spousal caregiver should be acknowledged and that caregiving-related stress management programs should be incorporated into routine health care for family caregivers of cancer patients. Cancer 2015;121:302-10. © 2014 American Cancer Society.

KEYWORDS: cancer caregivers, caregiving stress, arthritis, chronic back pain, heart diseases, longitudinal study.

INTRODUCTION
Providing informal care to relatives with chronic illnesses has been linked to poor physical health. Compared with age-matched and sex-matched noncaregivers, caregivers report more physical distress and infectious illness episodes, exhibit slower healing for small standardized wounds, and are at greater risk for coronary heart disease.1-3 All-cause mortality of caregivers, compared with noncaregivers, was higher in 2 studies,4,5 although it was lower in another.6 Caregiving strain, however, has been consistently related to poor physical health, including elevated risk for stroke7 and higher mortality.5,8

These findings come mainly from spousal caregivers of individuals with dementia or cardiovascular disorders. Unknown is the generalizability of these findings to caregivers of patients with cancer, which is a large and fast-growing population, because approximately 13.7 million Americans with a history of cancer are alive today9-11; and, as this number continues to rise, more family members will become cancer caregivers.11-13 Cancer caregiving differs from other caregiving, because it is acute yet intensive.14 For example, approximately 66% of cancer caregivers provide care for less than 1 year, whereas dementia caregivers typically do so for 4 years. However, both cancer and dementia caregivers provide approximately 30 hours per week when they are engaging in caregiving.14 Whether such unique stress characteristics of cancer caregiving—acute yet intense—have a substantial impact on caregivers’ physical health warrants investigation.

Cancer caregivers’ increased risk of poor physical health has recently been recognized by a large epidemiological study using Swedish registries. The study demonstrated that spouses of patients with cancer, compared with unaffected spouses, were more vulnerable to poor cardiovascular health, including risks of coronary heart disease (13% increase) and stroke (26% increase), up to 20 years after their spouse’s cancer diagnosis.15 Unknown, however, is the role in caregiver health outcomes of the caregiver’s subjective experience of the caregiving situation versus the role of being a spouse of the
cancer patient or the patient’s objective health status (cancer severity). Evidence from a meta-analysis of diverse kinds of caregivers indicates that subjective appraisal of caregiving stress plays as great a role as those other factors in predicting caregivers’ physical health. Thus, separating the independent contributions of subjective appraisals of caregiving stress, versus being a spouse and the patients’ cancer severity, will provide a more nuanced understanding of the relation of cancer caregiving to caregivers’ health.

Another important aspect of cancer caregiving is the great variation in its trajectory. Cancer caregivers often move in and out of caregiving, because the cancer can remit and recur (rendering the family members caregivers again). Others change status when their care recipients go into long remissions (leading them to become former caregivers) or die (leading them to become bereaved caregivers). These variations in caregiving status may also play a role in cancer caregivers’ health.

Health conditions of caregivers other than cardiovascular disorders have not been examined individually, because studies typically report the number of chronic morbid conditions instead of reporting each condition. For example, all of the 27 studies reviewed by Pinquart and Sorensen that examined medical or chronic conditions reported the number of conditions as objective indicators of caregivers’ physical health. However, specific health conditions, such as arthritis and chronic back pain, are especially likely to be induced or exacerbated by the physical strain from assisting patients with activities of daily living (eg, bathing, dressing) and instrumental activities of daily living (eg, shopping for groceries, household work). Although patients with cancer often need these types of help for only relatively short periods, these forms of caregiving tend to involve long hours and demand intensive physical assistance. Being exposed to such daily caregiving activities may increase the incidence or severity of some types of arthritis and chronic back pain.

Three health conditions that commonly cause disability, according to the Centers for Disease Control and Prevention, are heart disease, arthritis, and chronic back pain. Thus, the objective of this study was to identify characteristics that act as either vulnerability or resource factors in relation to the presence of the specific health problems (physical impairment) of arthritis, chronic back pain, and heart diseases. Our first objective was to identify these associations cross-sectionally 2 years after the relative’s initial cancer diagnosis. The election of predictors was guided by a conceptual model of caregiving stress and health.

Our second and third objectives were to examine prediction over a longer period. The second objective was to investigate associations between caregiving status (current, former, and bereaved) and these impairments at 5 years and 8 years after the relative’s initial cancer diagnosis. The third objective was to longitudinally examine the distinct predictive roles played by earlier subjective caregiving stress, being a spouse of the patient, and the patients’ initial cancer severity—above and beyond by the significant correlates among demographic characteristics (age, sex, education, and income) in developing new physical impairments as time proceeded. A prospective longitudinal design was used to investigate this objective, because the development of physical impairments takes years.

MATERIALS AND METHODS

Participants and Procedures

The National Quality of Life Survey for Caregivers longitudinally assessed the impact of cancer on the quality of life of family members who were caring for cancer survivors. Family caregivers were nominated by cancer survivors (1 per survivor) who were identified through state cancer registries as having 1 of the 10 most common cancers (bladder, breast, colorectal, kidney, lung, non-Hodgkin lymphoma, ovarian, prostate, skin, and uterine cancers). In total, 1634 caregivers from 2 independent samples (738 in sample 1 [collected in 2003] and 896 in sample 2 [collected in 2004]; response rate, 64.5%) completed the initial survey at 2 years (mean ± standard deviation, 2.1 ± 0.6 years) after the patients’ initial cancer diagnosis (T1), as indicated in Figure 1. Of those, 1517 caregivers (683 from sample 1 and 834 from sample 2) provided valid information for the study variables and had information available to calculate the patients’ cancer severity, which takes into consideration the types and stages of cancer.

The first follow-up was 5 years postdiagnosis (T2), and 1108 caregivers returned the survey. The second follow-up was 8 years postdiagnosis (T3), and 720 caregivers returned the survey. Follow-up data collection involved 3 surveys at each assessment time: 1) for caregivers whose index patient was in remission (main survey), 2) for caregivers who were actively providing cancer-related care to the index case at the time of follow-up survey completion (current caregiver survey), and 2) for caregivers whose index patient had died by the time of follow-up survey completion (bereaved caregiver survey).

Family caregivers who provided complete information for the study variables at all 3 time points (N=619)
did not differ from those who provided the data at T1 but not at T2 or T3 ($P > .27$), with 4 exceptions: Caregivers who had complete information were older and more likely to be the spouse of the cancer survivor ($P < .001$) and were less likely to have arthritis and more likely to have back pain at T2 and T3 than caregivers who had incomplete information ($P < .01$).

This study was conducted in compliance with the regulations of the Emory University Institutional Review Board. An introductory letter, survey, self-addressed stamped envelope, and incentives (a prepaid calling card at T1; $10 gift cards at T2 and T3) were mailed to nominated family caregivers. Returning the completed survey or completing the survey over the telephone served as evidence of informed consent to participate.

**Measures**

**Demographic characteristics**
Self-reported caregivers’ familial relationship to the care recipient, age, sex, education, and household income were measured at T1.

**Caregiving stress**
Two indicators were used to assess caregiving stress at T1, referencing the time when they were providing cancer care. First, subjective caregiving stress (the extent to which caregivers felt overwhelmed by care tasks and responsibilities) was measured using the 4-item Stress Overload subscale from the Pearlin Stress Scale (eg, “I work hard as a caregiver but never seem to make any progress,” with responses ranging from 1 [not at all] to 4 [completely]). The mean of the responses defined caregiving stress, with higher scores reflecting a greater perceived level of caregiving stress. The subscale had good internal consistency ($x = .79$).

Second, a cancer severity index was created based on mortality rates calculated by cancer type (the 10 cancers studied) and stage (localized, regional, distant) and the time since diagnosis at T1, for which we obtained information from the state cancer registry. This index ranges from 0 to 1, with higher scores reflecting more severe cancer diagnosis and, thus, greater objective caregiving strain. For example, the cancer severity index is 0 for localized prostate cancer diagnosed 2 years ago, 0.40 for localized lung cancer diagnosed 2 years ago, and 0.94 for distant lung cancer diagnosed 2 years ago.

**Caregiving status**
Current caregiving status indicated whether or not the caregiver was actively providing help to manage cancer-related concerns of the index patient at the time of completing the survey at each assessment. Status as a current caregiver was independent of the status at previous assessment. Bereaved caregiver status indicated that the index care recipient had died at the time of completing the survey at each assessment. Bereaved caregiver status was carried over to the subsequent assessment.

**Markers of physical impairment**
At each assessment, arthritis, chronic back pain, and heart-related diseases were measured using the Morbidities Index for Caregivers of Chronic Illnesses. Caregivers indicated whether they had ever received a physician’s care or taken prescription medication for a list of medical conditions at each assessment. Arthritis and heart diseases were measured in both caregiver samples, whereas chronic back pain was measured only in sample 2. Heart-related diseases included angina, coronary heart disease, cardiac arrest, congestive heart failure, heart attack, heart murmur, irregular heartbeat, and pacemaker. It has been demonstrated that the Morbidities Index for Caregivers of Chronic Illnesses is a reliable tool for measuring physical impairments.

**Analytic Plans**
Means, standard deviations, and ranges of study variables were computed. The first objective concerned associations of caregivers’ demographic and psychosocial characteristics with caregiver physical impairments at T1 (person-level effects). The second and third objectives were to test time-varying factors from T1 through T3 (time-level effects), such as caregiving status and assessment time, which are nested within each caregiver. Thus, logistic (for dichotomous outcomes) multilevel modeling with
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TABLE 1. Logit Multilevel Modeling Testing Correlates and Predictors of Physical Impairments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Arthritis</th>
<th>Chronic Back Pain</th>
<th>Heart Diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exp(B)</td>
<td>95%CI</td>
<td>P</td>
</tr>
<tr>
<td>Person effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>1.05</td>
<td>1.04-1.06</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Sex</td>
<td>1.41</td>
<td>1.08-1.85</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Education</td>
<td>1.03</td>
<td>0.79-1.34</td>
<td>&lt;.82</td>
</tr>
<tr>
<td>Income</td>
<td>0.68</td>
<td>0.53-0.88</td>
<td>&lt;.003</td>
</tr>
<tr>
<td>Spouse</td>
<td>0.84</td>
<td>0.64-1.11</td>
<td>&lt;.22</td>
</tr>
<tr>
<td>Patient cancer severity</td>
<td>1.27</td>
<td>0.74-2.19</td>
<td>&lt;.39</td>
</tr>
<tr>
<td>Subjective Cg stress</td>
<td>1.31</td>
<td>1.08-1.59</td>
<td>&lt;.006</td>
</tr>
<tr>
<td>Time-varying effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC</td>
<td>1.10</td>
<td>0.99-1.22</td>
<td>&lt;.07</td>
</tr>
<tr>
<td>BC</td>
<td>1.22</td>
<td>1.02-1.47</td>
<td>&lt;.03</td>
</tr>
<tr>
<td>Time</td>
<td>1.27</td>
<td>1.11-1.46</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Person×time effects</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>1.00</td>
<td>0.99-1.00</td>
<td>&lt;.57</td>
</tr>
<tr>
<td>Sex</td>
<td>1.00</td>
<td>0.96-1.15</td>
<td>&lt;.25</td>
</tr>
<tr>
<td>Education</td>
<td>0.93</td>
<td>0.85-1.02</td>
<td>&lt;.13</td>
</tr>
<tr>
<td>Income</td>
<td>1.01</td>
<td>0.95-1.10</td>
<td>&lt;.78</td>
</tr>
<tr>
<td>Spouse</td>
<td>1.10</td>
<td>0.99-1.20</td>
<td>&lt;.04</td>
</tr>
<tr>
<td>Patient cancer severity</td>
<td>0.95</td>
<td>0.80-1.14</td>
<td>&lt;.59</td>
</tr>
<tr>
<td>Subjective Cg stress</td>
<td>0.98</td>
<td>0.91-1.05</td>
<td>&lt;.48</td>
</tr>
</tbody>
</table>

Abbreviations: BC, bereaved caregivers; CC, Current caregivers; Cg, caregivers.

*Presence of the physical impairment was predicted by the following equation:

\[
\text{Prob}(\text{Impairment\ Risk\ Factor}) = q_1 \times q_2 \times \log \left( \frac{q_3}{1-q_3} \right) = \beta_0 + \beta_1 \times \text{Age} + \beta_2 \times \text{Sex} + \beta_3 \times \text{Education} + \beta_4 \times \text{Income} + \beta_5 \times \text{Spouse} + \beta_6 \times \text{Patient\ cancer\ severity} + \beta_7 \times \text{Subjective\ Cg\ stress} + \beta_8 \times \text{Time} + \beta_9 \times \text{Current\ caregiver} + \beta_{10} \times \text{Bereaved} + \beta_{11} \times \text{Time\ interaction} + \beta_{12} \times \text{Cg\ age} + \beta_{13} \times \text{Cg\ sex} + \beta_{14} \times \text{Cg\ education} + \beta_{15} \times \text{Cg\ income}.
\]

where sex (gender) was coded 1 for women and 0 for men; education was coded as 1 for greater than high school graduate and 0 for high school or less; income was coded as 1 for $40,000 and 0 for $40,000; spouse was coded as 1 for spousal caregivers to care recipient and 0 for nonspousal caregivers; CC was coded as 1 for actively providing cancer care to the index patient at the time of survey completion and 0 for not actively caregiving; and BC was coded as 1 for death of the index patient at the time of survey completion and 0 for not bereaved. Time was coded 0 for T1 (2 years postdiagnosis), 1 for T2 (5 years postdiagnosis), and 2 for T3 (8 years postdiagnosis). These dichotomous variables were not centered, whereas age, patient cancer severity, and subjective caregiving stress scores were centered to the sample’s mean.

Hierarchical linear modeling was used separately for each of the 3 physical impairment markers. Presence of the physical impairment was predicted by caregiver’s individual characteristics, caregiving status at each time, and interaction between caregiver’s individual characteristics and time. Thus, a significant interaction effect indicates that the association between an individual characteristic and physical impairment is strengthened or weakened over time.

For these models, missing values at the individual (person) level are deleted when the multivariate data matrix file is created. Because we included 1517 caregivers who provided valid data at T1, when the person-level data (eg, age, sex, education, income, spousal status, patient cancer severity, and subjective caregiving stress) were assessed, there were no missing values at that level in our analysis. Missing data at the time level (eg, caregiver status, time, and person×time interaction effects) likewise are deleted at the analysis stage. “Current caregiver” status at each assessment had to be indicated as such by the respondent (that is, it was independent of the value of the caretaker’s prior assessment), whereas “bereaved caregiver” status was carried to the next assessment. Thus, at T3, bereaved caregivers included those who were newly bereaved between T2 and T3 as well as those who already were bereaved at T2. Missing values of the caregiver status variable, other than bereaved status, were imputed as 0, indicating neither current nor bereaved caregiver status at each time of assessment. Missing values of outcomes (physical impairment markers) at T2 and T3 were imputed to be the value of the caregiver’s prior assessment (T1 and T2, respectively), thus assuming continuation of any morbid condition, instead of imputing the missing values using a statistical algorithm.

Our first study objective, to identify demographic and psychological factors related to physical impairments, was addressed by testing the significance of $\beta_{10}$ through in $\beta_{11}$ in the model (Table 1). The second study objective, to...
examine the associations between caregiving status and physical impairments, was examined by testing the significance of $b_{10}$, $b_{20}$, and $b_{30}$. The third study objective, to investigate the effects of subjective caregiving stress, being a spouse, and the patient’s initial cancer severity on development of new physical impairments as time proceeded, was examined by testing the significance of $b_{31}$ through $b_{37}$. The significance level in all analyses was set at $P < .05$, and significance at $P < .07$ was interpreted with caution but not was discussed as a meaningful finding.

RESULTS

The caregivers were mostly middle-aged, relatively educated and affluent, non-Hispanic white, and usually the spouse of the cancer patient, as indicated in Table 2. Most patients had cancer types and stages associated with relatively high survival rates, and caregivers reported mild levels of subjective caregiving stress. Table 3 indicates that, although all family members were identified as caregivers at the time of study enrollment, approximately 50% of the caregivers were actively providing care 2 years postdiagnosis (T1), whereas only 1 in 13 was providing care at 5 years (T2) or 8 years postdiagnosis (T3). This relative prevalence of active caregiving across 8 years since the patient’s diagnosis reflects that cancer caregiving is acute and critically needed at around the time of diagnosis and treatment, but less so later on. None of the care recipients had died at T1, but 1 in 10 had died at T2, and 1 in 9 had died at T3.

The prevalence of the physical impairments studied among caregivers is reported in Table 3 (raw percentages are listed in the columns headed T1, T2, and T3). Age-adjusted, sex-adjusted, and race/ethnicity-adjusted prevalence rates based on the 2000 US Census were also provided in Table 3 (see Adjusted T1). Prevalence rates reported by both the 2003 National Health Interview Survey (NHIS) and the 2003/2004 National Health and Nutrition Examination Survey (NHANES) were also adjusted for age, sex, and race/ethnicity based on the 2000 US Census and standardized rate ratios, which were used for comparisons with our caregiver data. Table 3 indicates that caregivers at T1 had levels of arthritis and certain types of heart diseases (such as angina and coronary heart disease) similar to the age-matched, sex-matched, and race/ethnicity-matched US population rates. Caregivers were less likely to have some types of heart diseases (such as cardiac arrest, congestive heart
failure, and heart attack) compared with the matched US population.25-27

Association Between Demographics and Caregiving Stress With Physical Impairments at T1

Several caregiver demographic factors were related to having physical impairments at T1 (Table 1, Person Effects). At T1, older age was a consistent correlate of all 3 physical impairments. Caregivers who were women were more likely to have arthritis, whereas caregivers who were men were more likely to have heart diseases. Having a high school education or less was related to reported treatment for chronic back pain. An annual household income <$40,000 was associated with having received treatment for arthritis and chronic back pain. Being a spouse of the care recipient (P<.05) and providing care to a relative whose cancer type and stage were more severe (P<.06) were related to a lower likelihood of having received treatment for heart diseases. Subjective appraisal of caregiving as having been and/or currently being overwhelming was consistently and strongly associated with having received treatment for all 3 physical impairments.

Predicting the Presence of Physical Impairments as Time Proceeds

Factors that varied from 1 assessment to the next (time-varying) were also related to physical impairments at the concurrent assessment time (Table 1, Time-Varying Effects). Addressing our second study objective, actively providing care to cancer survivors at any assessment time was associated with having received treatment for heart diseases (P<.01) and arthritis (P<.07) at that same time. Being bereaved at T2 or T3 was related to having had arthritis and heart disease at that same time. Finally, as assessment time proceeded, caregivers were more likely to have had arthritis (P<.06) and chronic back pain (P<.06).

Addressing our third study objective, demographic and caregiving stress factors also predicted the differential presence of physical impairments as time proceeded (Table 1, Person×Time Effects). At later assessments, caregivers who were women were more likely to develop heart disease than caregivers who were men (P<.06). In addition, as time proceeded, spousal caregivers were more likely than nonspousal caregivers to develop arthritis and chronic back pain, with annual increased risks of 7.4% and 5.2%, respectively, versus 5.3% and 3%, respectively (P<.05). Caregivers who had reported greater levels of caregiving stress at T1 (1 standard deviation above the mean caregiving stress score) were more likely to develop heart diseases as time proceeded at an increased risk of 3.8% per annum, whereas the increased risk for caregivers who reported lower levels of caregiving stress at T1 (1 standard deviation below the mean caregiving stress score) was 2.3% per annum (P<.03).
DISCUSSION

Physical Impairments of Cancer Caregivers in Early Caregivership

Physical impairments among caregivers were related to several demographic factors, such as age, sex, education, and income, 2 years after their relative’s initial cancer diagnosis. These findings replicate those of existing studies and meta-analyses. One unique contribution of our findings is that it was the caregivers’ subjective appraisal of their caregiving role as overwhelming, rather than the care recipient’s objective disease severity, that was associated with medical impairments. Directionality of the effect cannot be concluded from this cross-sectional portion of the analysis. Nonetheless, the finding has significant implications. Most programs for family cancer caregivers focus on how to manage symptoms of the significant implications. Most programs for family cancer caregivers focus on how to manage symptoms of the disease. However, this study separated the spousal role from caregiving stress. Thus, to our knowledge, this is the first study to test a measure of subjective stress per se and, indeed, to delineate the impact of different sources of stress on heart disease among cancer caregivers. Subjective appraisals of caregiving stress, rather than the severity of the care recipient’s cancer, had an aggravating effect on caregivers’ subsequent physical health.

How does this happen? We can only speculate that feeling overwhelmed by the caregiver role, yet feeling guilty when engaging in activities for self-care, are both likely to lead caregivers to disengage from healthy lifestyle behaviors. Stressed caregivers are also vulnerable to developing depression and other psychiatric disorders that increase disease susceptibility. The caregiver role often disrupts daily schedules, which itself predicts caregiver depression. Such potential pathways from subjective cancer caregiving stress to the development of heart disease should be investigated. Existing interventions designed to reduce dementia caregivers’ subjective stress as a means of reducing its adverse health effects can help guide the development of interventions for cancer caregivers by addressing their sources of caregiving stress and unmet needs. To increase awareness of their health risks, caregivers also would benefit from understanding the correlation between their caregiver duties and stress and their physical health.

Our study findings also expand current knowledge about the greater impact of caregiving burden for spousal caregivers than for nonspousal caregivers on health conditions other than heart diseases, such as arthritis and chronic back pain. Spousal caregivers are more likely than other caregivers to be assisting the care recipient with activities of daily living and instrumental activities of daily living. This assistance appears to be manifested in arthritis and chronic back pain years later, which, in our study,
were independent of the effects of age, sex, and socioeconomic status. Programs should educate spousal caregivers regarding how to avoid situations that might impose excessive physical strain and to find alternative ways to effectively provide the best care to the patients, such as rearranging household items, sharing duties of instrumental activities of daily living with other family members or close friends, and seeking services from their community.

Limitations and Directions for Future Studies
This study has limitations that should be noted. All variables except cancer severity were self-reported and may have been affected by social desirability reactions. Our earliest assessment was 2 years after the relative’s diagnosis. By that time, some morbidities that were caused by caregiving stress already may have occurred. Caregivers’ medical records before their relative’s cancer diagnosis could help establish causality. Although our 6-year follow-up period is the longest among large-scale caregiver studies, it likely was not sufficient for the manifestation of some markers of physical impairment. Broader arrays of individual-varying and time-varying factors and of impairments also need to be investigated. For example, difficulties with sleep have been commonly reported by family cancer caregivers not only during the active caregiving periods but years afterward and can debilitate their daily functioning.35,36 Future studies that identify psychosocial predictors of developing sleep difficulties among cancer caregivers will be fruitful for improving their quality of life and preventing premature health declines.

Generalizability of the current findings may be limited by the characteristics of our participants (who were predominantly Caucasian, relatively educated and affluent, low in certain types of heart disease compared with national norms, and had care recipients who were mostly diagnosed with less severe types and stages of cancer), and it will be important to replicate them in more diverse populations. Our data were more representative of older, spousal caregivers and those who were less likely to have arthritis and more likely to have back pain 5 years and 8 years after their relative’s cancer diagnosis. Thus, our findings cannot be generalized to those who did not provide complete information on the study variables. Although the 3 physical impairment conditions we studied are the most common medical conditions to cause disability, disability is not the same as mortality. Whether early caregiving stress and being a spousal caregiver would also predict mortality needs to be examined.

The degree to which care recipients are bothered by the symptoms of cancer, the side effects of its treatment, and the associations of these variables with caregivers’ stress should be investigated in future studies. Future studies should also examine additional caregiving factors, such as types of care provided, difficulty providing certain care, hours spent for caregiving, the presence of other caregiving help and care network, existing social roles (being employed, being a parent, etc), coping skills, and personality or genetic factors, that lead caregivers to be more vulnerable or resilient to caregiving stress.

Conclusion
To our knowledge, this study provides the first evidence that subjective caregiving stress is related to the presence of physical impairments after 2 years of cancer caregiving and to the additional emergence of these impairments during subsequent years. Spousal caregivers were more likely to have arthritis and chronic back pain and highly stressed caregivers were more likely to have heart diseases years after the initial caregiving experience. Caregivers who returned to the caregiving role over time and those who were bereaved over the follow-up period were also more likely to develop arthritis and heart diseases.

Thus, as the US population ages and more individuals are involved in caregiving for a family member with cancer, the associated adverse health effects of cancer caregiving and their impact on individuals and society should be acknowledged. Policies and strategies to minimize such effects should be implemented. Research findings should guide the design of caregiving-related stress-management programs for family cancer caregivers and guidelines for referral to health care services.

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Conflict of Interest Disclosures
The authors made no disclosures.

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