









Health Care Contact Days Among Older Cancer Survivors

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ABSTRACT

PURPOSE Health care contact days—days spent receiving health care outside the home—represent an intuitive, practical, and person-centered measure of time consumed by health care.

METHODS We linked 2019 Medicare Current Beneficiary Survey and traditional Medicare claims data for community-dwelling older adults with a history of cancer. We identified contact days (ie, spent in a hospital, emergency department, skilled nursing facility, or inpatient hospice or receiving ambulatory care including an office visit, procedure, treatment, imaging, or test) and described patterns of total and ambulatory contact days. Using weighted Poisson regression models, we identified factors associated with contact days.

RESULTS We included 1,168 older adults representing 4.51 million cancer survivors (median age, 76.4 years, 52.8% women). The median (IQR) time from cancer diagnosis was 65 (27–126) months. In 2019, these adults had mean (standard deviation) total contact days of 28.4 (27.6) and ambulatory contact days of 24.2 (23.6). These included days for tests (8.0 [8.8]), imaging (3.6 [4.1]), visits with any clinicians (12.4 [11.5]), and visits with primary care clinicians (4.4 [4.7]), and nononcology specialists (7.1 [9.4]) specifically. Sixty-four percent of days with a nonvisit ambulatory service (eg, a test) were not on the same day as a clinician visit. Factors associated with more total contact days included younger age, lower income, more chronic conditions, poor self-rated health, and tendency to “go to doctor as soon as feel bad.”

CONCLUSION Older adult cancer survivors spent nearly 1 month of the year receiving health care outside the home. This care was largely ambulatory, often delivered by nononcologists, and varied by factors beyond clinical characteristics. These results highlight the need to recognize patient burdens and improve survivorship care delivery, including through care coordination.

ACCOMPANYING CONTENT

 Appendix

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INTRODUCTION

The number of older cancer survivors is rapidly increasing,¹ making it imperative to address their unique and significant health care needs. In January 2022, among an estimated 18.1 million US cancer survivors, two thirds were 65 years and older.¹ In 2040, of an estimated 26.0 million cancers, 73% will be in older adults.² Long-term cancer survivors can require maintenance cancer treatment; monitoring for cancer recurrence, progression, and secondary cancers; management of acute and chronic physical toxicities from cancer treatment; and attending to physical and psychosocial well-being.^{3,4} Older cancer survivors additionally face high comorbidity burden and functional limitations.^{2,4,5} Survivors' cancer-specific health care needs can persist for years, which is especially relevant since in 2022, 69% of cancer survivors were 5+ years out from diagnosis.^{1,3}

Cancer survivors have frequent interactions with the health care system, which can be burdensome, but this care is not always necessary or beneficial and needs to be better characterized.^{6–8} Survivorship care models are evolving, with the current oncology workforce underprepared and insufficient to care for cancer survivors, contributing to fragmented care.^{3,9,10} It is unclear which clinical specialties predominantly care for older cancer survivors. In addition, while some survivorship care is clearly warranted (eg, managing anthracycline-associated heart failure), survivors also face wasteful care (eg, too-frequent imaging surveillance for recurrence).^{10,11} Frequent trips to the clinic can be particularly burdensome for older adults; one in six US older adults reports trouble getting places like the doctor's office.¹² Understanding patterns of health care utilization among older cancer survivors is critical to improving care for this vulnerable and growing population.

CONTEXT

Key Objective

To characterize the patterns of and factors associated with the number of health care contact days—days spent receiving health care outside the home—that older cancer survivors experience.

Knowledge Generated

In a nationally representative sample of older adult cancer survivors enrolled in traditional Medicare, survivors experienced an average of 28 health care contact days in 2019. Most of these days were spent in the ambulatory setting, and survivors often received only a single type of service (eg, imaging) on an ambulatory contact day. Having more contact days was associated with younger age, lower income, more comorbidities, poor self-rated health, and tendency to “go to doctor as soon as feel bad.”

Relevance

Older cancer survivors spend almost 1 month in a calendar year receiving care outside of the home. These results point to opportunities for clinicians and leaders to recognize patient burdens and improve survivorship care delivery.

Health care contact days—the number of days spent receiving health care outside the home—represent an intuitive, practical, and patient-centered measure to understand how much of a person’s time is consumed by both inpatient and ambulatory interactions with the health care system.^{13,49,50} This concept builds on measures of home days and healthy days at home, which focus on the time away from inpatient or facility-based care alone.^{6,14,15} Previous work in the oncology literature has shown that persons with aggressive advanced/metastatic cancer can spend a fourth of their days alive with health care contact, but no study has examined contact days among longer-term cancer survivors.^{6,7,16–20} In this study, we sought to measure contact days among a nationally representative sample of older adult cancer survivors to characterize the extent of, sources of, variation in, and factors associated with contact days over a calendar year.

METHODS

Data Sources and Population

The Medicare Current Beneficiary Survey (MCBS) is a rotating panel survey that covers an annual statistical sample of Medicare beneficiaries residing in the continental United States.²¹ Among respondents to the 2019 survey, we linked survey responses to traditional Medicare claims data (physician, outpatient, inpatient, skilled nursing facility, and hospice files). The MCBS data include sampling weights that can be used to produce estimates that are generalizable to the Medicare population. These weights reflect the overall selection probability of each individual and account for survey nonresponse, coverage error, repeated observations, and poststratification elements related to sample entry, age, sex, race, region, and metropolitan area status.

Our cohort included community-dwelling older adults (age ≥ 65 years old as of January 1, 2019) with a diagnosis of

one of six cancers (primary site: breast, colorectal, endometrial, leukemia/lymphoma, lung, prostate) identified through the Centers for Medicare & Medicaid Services Chronic Conditions Data Warehouse. We chose these cancers as they had high numbers of cancer survivors in the United States in both men and women,²² on the basis of data availability, and to allow for sufficient sample sizes. We also required adults to be continuously enrolled in traditional Medicare for the calendar year or until death and to have completed the fall MCBS survey component. We excluded persons with end-stage renal disease since their unique prospective reimbursement system does not allow identification of service dates.

Variables

Patient-Specific Variables

Through a combination of claims and MCBS survey data, we extracted sociodemographic variables, clinical factors, care-seeking behaviors, and care access factors. Specific variable definitions and sources of data for each measure are presented in Appendix [Tables A1](#) and [A2](#) (online only). We linked each beneficiary to a hospital referral region (HRR) on the basis of the zip code of residence. We calculated the time since cancer diagnosis by subtracting the date of first claim for any cancer from July 1, 2019 (middle of the study period).

Outcomes

Building on the previously defined health care contact days measure,^{13,49,50} we identified health care contact days using a series of Healthcare Common Procedure Coding System codes, Revenue center codes, and the Restructured BETOS Classification System to crosswalk Part B codes to service types to identify and classify days with each type of health care contact.²³ Then, we classified each day as a contact day if the adult received any health care on that day. We

classified ambulatory contact days as days containing one or more clinician visits (which we further classified as visits with primary care, nononcology specialty care, or oncology specialty care using clinician ResDAC specialty codes), tests (eg, laboratory test, electrocardiogram, pulmonary function test), imaging studies (eg, radiograph, ultrasound, computed tomography scan), procedures (eg, endoscopy, transfusion, biopsy), or treatments (eg, chemotherapy or other injections/infusions including vaccination, radiation therapy, physical/occupational/speech therapy) (Appendix Table A1). We classified total contact days as ambulatory days plus institutional days (days in an emergency department, hospital, skilled nursing facility, or inpatient hospice). If a patient experienced contact in multiple care settings within a day, we applied the following hierarchy: inpatient > emergency department > skilled nursing facility > hospice > any ambulatory care. We did not count any ambulatory services on days when patients were in an institutional setting. We excluded virtual and home-based services given our focus on care received outside of the home.

Statistical Analyses

We used descriptive statistics to show baseline characteristics and distribution of contact day measures across the cohort in calendar year 2019. To assess patterns of ambulatory service use, we described the share of specific ambulatory services (ie, tests, imaging, procedures, and treatments) that occurred on the same day as a clinician visit and the share of clinician visit contact days with two or more clinician visits. We measured total and ambulatory contact days among relevant subgroups based on cancer site, functional impairment, trouble getting places, accompaniment to doctor's office, care-seeking behaviors, and self-rated health.

To identify factors associated with the receipt of total and ambulatory contact days, we built univariable and multivariable Poisson regression models with an offset for days alive, HRR random effects, and adjustment for overdispersion. We included variables that could conceivably

affect contact days, including sociodemographic factors (age, sex, race, ethnicity, rural-urban residence, income), clinical factors (self-reported health, functional impairment), and care-seeking behaviors (worry about health more than average, avoid going to doctor, go to doctor as soon as feel bad). We addressed small amounts of missingness using the indicator variable method.

To assess geographic variation in contact days, we calculated mean total and ambulatory contact days of patients in the 41 HRRs in which 10 or more beneficiaries resided and presented summary statistics. We used the MCBS cross-sectional survey weights in all analyses and used balanced repeated replication weights for variance estimation. We used SASv9.4 (SAS Institute) for analysis. The study followed Strengthening the Reporting of Observational Studies in Epidemiology reporting guidelines. The Mass General Brigham institutional review board waived review.

RESULTS

We identified 1,168 older adults representing 4.51 million cancer survivors (study flowchart in Fig 1). Table 1 presents population-weighted baseline characteristics. The median (IQR) age on December 31, 2019 (end of the study period) was 76.4 (71.7–82.5) years. The most common primary sites of cancer were breast (1.60 million, 35.8%) and prostate (1.51 million, 33.9%). The median (IQR) time from cancer diagnosis to the middle of the study period was 65 (27–126) months. The median (IQR) number of chronic conditions was 8 (6–11). Most beneficiaries resided in metropolitan areas (79.7%) and drove to the doctor's office (78.1%). Approximately 20% of survivors reported their health as poor and, separately, that they had trouble getting to places like the doctor's office.

The median (IQR) and mean (standard deviation [SD]) number of total contact days and ambulatory contact days in 2019 were 21 (12–38) and 28.4 (27.6) and 19 (10–34) and 24.2 (23.6), respectively. Table 2 and Figure 2 present the sources and distribution of contact days. Sources of ambulatory

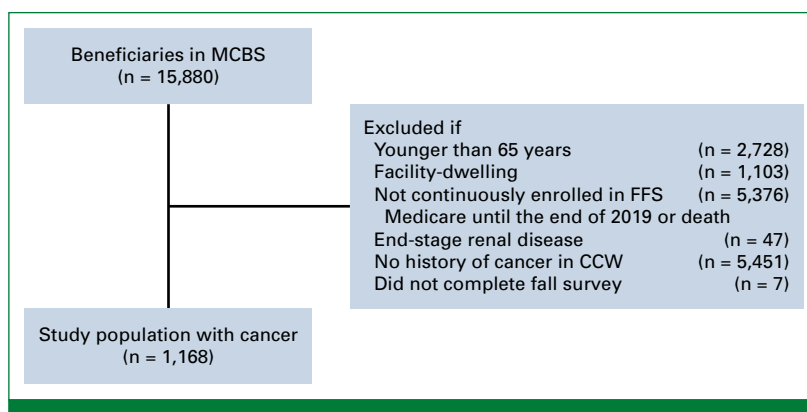


FIG 1. Study design flowchart. CCW, Chronic Conditions Data Warehouse; FFS, fee-for-service; MCBS, Medicare Current Beneficiary Survey.

TABLE 1. Sociodemographic, Clinical, Care-seeking Behavior, and Care Access Characteristics of Older Adult Cancer Survivors

Variable	Number (%) of Respondents
Overall cohort	4,513,974 (100)
Sociodemographic variables	
Age, years	
65-69	813,029 (18.0)
70-74	1,128,843 (25.0)
75-79	1,077,920 (23.9)
80-84	700,214 (15.5)
≥85	793,968 (17.6)
Sex	
Female	2,385,341 (52.8)
Male	2,128,633 (47.2)
Race ^a	
White	3,818,340 (85.6)
African American	363,696 (8.2)
Asian	143,884 (3.2)
American Indian or Alaska Native	27,166 (0.6)
More than one race	105,368 (2.4)
Ethnicity ^b	
Hispanic	194,886 (4.3)
Non-Hispanic	4,298,372 (95.7)
Residence ^c	
Metropolitan	3,594,115 (79.7)
Micropolitan	456,917 (10.1)
Small town	252,846 (5.6)
Rural	205,436 (4.6)
Dual eligibility in Medicaid	
Yes	331,865 (7.4)
No	4,182,108 (92.6)
Income	
≤100% FPL	322,927 (7.2)
>100%-200% FPL	925,414 (20.5)
>200% FPL	3,265,632 (72.3)
Area Deprivation Index (national quartiles) ^d	
First (least disadvantaged)	1,216,849 (28.7)
Second	1,070,321 (25.3)
Third	1,000,131 (23.6)
Fourth (most disadvantaged)	948,607 (22.4)
Education ^e	
Did not graduate high school	442,229 (9.8)
High school/some college	2,117,525 (47.1)
College or above	1,936,011 (43.1)
Has children ^f	
Yes	4,000,024 (89.0)
No	495,741 (11.0)
Lives alone	
Yes	1,426,827 (31.6)
No	3,087,146 (68.4)
Clinical factors	
Primary cancer site ^g	
Breast	1,599,968 (35.8)
Colorectal	630,683 (14.1)
Endometrial	251,586 (5.6)
Leukemia/lymphoma	550,751 (12.3)

(continued in next column)

TABLE 1. Sociodemographic, Clinical, Care-seeking Behavior, and Care Access Characteristics of Older Adult Cancer Survivors (continued)

Variable	Number (%) of Respondents
Lung	330,247 (7.4)
Prostate	1,511,626 (33.9)
No. of primary cancers	
One	4,079,030 (91.4)
Two	361,510 (8.1)
Three or more	23,039 (0.5)
Years since cancer diagnosis	
0-2	1,027,208 (22.8)
>2-4	865,833 (19.2)
>4	2,620,932 (58.0)
Poor self-rated health ^h	
Yes	889,587 (19.8)
No	3,606,449 (80.2)
No. of chronic conditions	
1-5	949,265 (21.0)
6-10	2,236,386 (49.5)
>10	1,328,323 (29.4)
Functional impairment ⁱ	
Yes	1,279,263 (28.4)
No	3,232,618 (71.6)
Care-seeking behaviors	
Worry about health more than average person your age ^j	
Yes	862,830 (19.6)
No	3,532,989 (80.4)
Avoid going to doctor ^k	
Yes	739,751 (16.5)
No	3,741,341 (83.5)
Never miss an appointment ^{l,m}	
Yes	3,626,482 (92.5)
No	292,212 (7.5)
Go to doctor as soon as feel bad ⁿ	
Yes	1,989,974 (44.4)
No	2,488,100 (55.6)
Care access factors	
Trouble getting places like the doctor's office	
Yes	934,300 (20.7)
No	3,579,674 (79.3)
Accompanied to doctor's office ^o	
Yes	1,539,017 (36.6)
No	2,669,016 (63.4)
How usually get to the doctor's office ^o	
Walking	52,806 (1.2)
Taxi	21,638 (0.5)
Driving	3,301,731 (78.1)
Public transportation	83,911 (2.0)
Being driven	723,747 (17.1)
Ambulance or other special vehicle	3,463 (0.1)
Doctor comes home	12,585 (0.3)
Other	25,403 (0.6)
Time it takes to get to the doctor's office ^q	
0-30 minutes	3,279,478 (73.1)
31-60 minutes	740,793 (16.5)
> 1 hour	171,220 (3.8)

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TABLE 1. Sociodemographic, Clinical, Care-seeking Behavior, and Care Access Characteristics of Older Adult Cancer Survivors (continued)

Variable	Number (%) of Respondents
Has a regular clinician ^a	
Yes	4,239,387 (94.6)
No	239,890 (5.4)
Specialty of the regular clinician ^{1a}	
Primary care	3,765,446 (93.0)
Other	283,047 (7.0)
Sex of the regular clinician ^{1b}	
Female	1,509,833 (36.7%)
Male	2,609,671 (63.3%)
Satisfied with care quality ^{1c}	
Yes	2,708,402 (60.2)
No	1,789,882 (39.8)

Abbreviations: ADL, activities of daily living; FPL, federal poverty level.

^aRace don't know or refused for 14 respondents.

^bHispanic ethnicity don't know or refused for five respondents.

^cResidence missing for two respondents.

^dArea Deprivation Index quartile missing for 80 respondents.

^eEducation don't know or refused for four respondents.

^fChildren don't know or refused for four respondents.

^gDoes not add up to 100% because a person with multiple cancers was considered in each cancer.

^hSelf-rated health, don't know or refused for four respondents.

ⁱFunctional impairment, don't know or refused for one respondent.

^jWorry about health more than average don't know or refused for 37 respondents.

^kAvoid going to the doctor don't know or refused for five respondents.

^lQuestions in the usual care survey segment which was asked to 911 participants in this cohort.

^mNever miss appointment missing or refused for 109 patients.

ⁿGo to doctor as soon as feels bad don't know or refused for 12 respondents.

^oAccompanied to doctor's office don't know, inapplicable or missing for 52 respondents.

^pHow usually gets to the doctor's office inapplicable or missing for 49 respondents.

^qTime to doctor's office don't know, inapplicable or missing for 62 respondents.

^rHas a regular clinician don't know or refused for two respondents.

^sSpecialty of the regular clinician don't know or refused for 90 respondents.

^tSex of the regular clinician don't know or refused for 74 respondents.

^uSatisfaction with care quality don't know or refused for four respondents.

contact days (mean [SD] in days) included visits with any clinician (12.4 [11.5]) and specifically with a primary care clinician (4.4 [4.7]), a nononcology specialist (7.1 [9.4]), and an oncologist (1.2 [3.7]). Additional sources of contact days included tests (8.0 [8.8]), imaging (3.6 [4.1]), procedures (3.4 [8.5]), and treatments (8.1 [15.7]). The range of contact days for chemotherapy was 0–24. The median number of contact days for all acute care/facility-based services was 0; the mean number of emergency department contact days was 0.6, and the mean number of hospital contact days was 2.1.

TABLE 2. Sources of Contact Days Among Older Cancer Survivors

Source of Contact days	Median (IQR) days	Mean (SD) days
Total contact days	21 (12-38)	28.4 (27.6)
Ambulatory contact days	19 (10-34)	24.2 (23.6)
Clinician visit contact days	11 (6-17)	12.4 (11.5)
Primary care clinician	4 (2-6)	4.4 (4.7)
Nononcology specialist	5 (3-10)	7.1 (9.4)
Oncologist	0 (0-1)	1.2 (3.7)
Tests	6 (3-10)	8.0 (8.8)
Imaging	3 (1-5)	3.6 (4.1)
Procedures	2 (0-4)	3.4 (8.5)
Treatments	2 (1-9)	8.1 (15.7)
Chemotherapy	0 (0-0)	0.5 (2.4)
Radiation	0 (0-0)	0.9 (7.0)
Emergency department days	0 (0-1)	0.6 (1.3)
Hospital days	0 (0-0)	2.1 (7.3)
Skilled nursing facility days	0 (0-0)	1.4 (7.7)
Inpatient hospice days	0 (0-0)	0.1 (4.8)

Abbreviations: IQR, interquartile range; SD, standard deviation.

Among all days with any nonclinician visit ambulatory service, 65% were not on the same day as a clinician visit. Among specific ambulatory services, all but tests were more likely than not to be on the same day as a clinician visit: tests (48%), imaging (54%), procedures (62%), and treatments (80%).

Table 3 presents contact days stratified by cancer site and patient characteristics, while Appendix Figure A1 shows variation in contact days by HRR. Among primary cancer sites, the highest median (IQR) total contact days were experienced by survivors of lung cancer (32 [16–53]) and leukemia/lymphoma (26 [14–46]). Survivors who reported trouble getting places like the doctor's office experienced more median total contact days and ambulatory contact days than those who did not (total: 32 v 19; ambulatory: 24 v 18). Survivors who reported worry about their health and poor self-rated health also experienced more total contact days than those who did not. Among the 41 HRRs with 10 or more beneficiaries, the range of median total contact days was 10–41 and the range of median ambulatory contact days was 8–37.

In the multivariable model (Fig 3), adults with more total contact days had younger age (age 65–69 years v older), lower income (≤100% of the federal poverty level v >200%), metropolitan residence (v micropolitan and rural residence), higher number of chronic conditions, poor self-rated health (v not), and greater propensity to seek care (“go to the doctor as soon as feel bad”). Avoiding the doctor (v not) was associated with fewer ambulatory contact days but not with more or fewer total contact days.

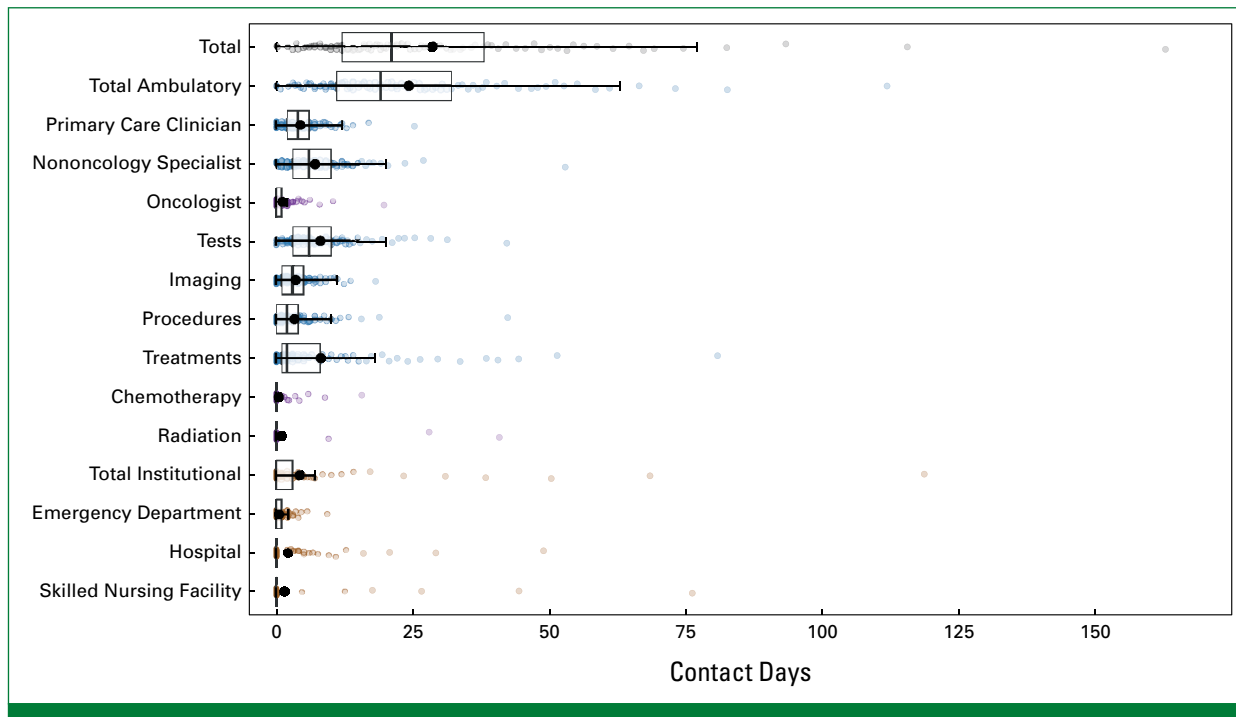


FIG 2. Box and whisker plot of the distribution of contact days for older cancer survivors by the source of contact days. Bars represent medians and IQRs. Dots indicate clusters of 13 adults, except for the dots representing the highest numbers of contact days, which indicate clusters of 11 adults. Clustered values are weighted means of the values for the individuals making up the cluster.

DISCUSSION

In this nationally representative study, community-dwelling, older cancer survivors spent an average of 28 days over a calendar year receiving health care outside of their homes. This care was mainly ambulatory and delivered by a range of specialties including primary care, oncology, and nononcology specialties. We found evidence of missed opportunities to coordinate care, for example, by coordinating clinician visits and other ambulatory services on the same days. Contact days varied by clinical factors such as comorbidities and self-rated health and by geographical factors, income, and care-seeking behaviors.

Our results show that cancer survivors continue to experience high levels of health care contact even years after cancer diagnosis, building on previous work. In previous measurements of health care interactions, clinician visits for cancer survivors plateaued after 6–7 years although they remained higher than patients without cancer for even 10–15 years after diagnosis.^{24,25} In a SEER–Medicare analysis of more than 160,000 individuals diagnosed with cancer between 2000 and 2014 who visited a medical oncologist, average annual visits numbered 12 in the first year after diagnosis, declined to the lowest level of four visits in the 5–15 year timeframe, and increased to 10–20 visits in the last year of life.²⁴ The mean 28 contact days over a year is more than 1.5 times the average contact days experienced by the general older adult population on the basis of a 2012 national

estimate¹⁵ and is comparable with annual contact days for older adults with multimorbidity or frailty.²⁶ These estimates provide an intuitive description of time costs, building on previous reports that the average annual time cost for older cancer survivors is 30.2 hours or \$913 in US dollars.^{27,28}

These results also help to illustrate the specific burdens faced by certain populations. Among primary cancer sites, contact days were highest for lung cancer and leukemia/lymphoma survivors. These represent cancers where screening is not available or not routinely implemented, resulting in more advanced disease at diagnosis, and where multimodality and complex treatments can have a long-lasting impact.^{29–31} In the multivariable model, several factors were associated with total contact days. First, survivors who were older (older than 75 years) and identified as of American Indian or Alaska Native race, or Asian race, or of Hispanic ethnicity had fewer contact days. It is critical to note that we do not judge the value of individual contact days in this study and that both underuse of appropriate care and overuse likely occur. Survivors residing in rural areas also had fewer contact days. This may represent either less access to care in general (which would be bad) or less unnecessary care (which would be good). Survivors with the lowest income had the most contact days, raising concerns regarding poor health status (incompletely adjusted for despite the multivariable model) and poor coordination of care. Second, poor self-reported health status and more comorbidities were associated with more contact days,

TABLE 3. Total and Ambulatory Contact Days Stratified by Cancer Site and Health Characteristics

Population	Total Contact Days, Median (IQR)	Ambulatory Contact Days, Median (IQR)
All cancer survivors	21 (12-38)	19 (10-34)
Primary cancer site		
Breast	20 (12-38)	19 (11-31)
Colorectal	23 (14-45)	20 (13-33)
Endometrial	23 (11-36)	17 (11-36)
Leukemia/lymphoma	26 (14-46)	21 (12-34)
Lung	32 (16-53)	27 (12-42)
Prostate	19 (11-36)	18 (10-34)
Functional impairment		
Yes	25 (13-48)	20 (10-36)
No	19 (11-35)	18 (10-32)
Trouble getting places like the doctor's office		
Yes	32 (16-52)	24 (13-39)
No	19 (11-34)	18 (10-31)
Accompanied to doctor's office		
Yes	24 (13-45)	20 (12-35)
No	21 (11-37)	20 (11-34)
Worry about health more		
Yes	27 (16-48)	24 (14-38)
No	19 (11-36)	18 (10-31)
Avoid going to the doctor		
Yes	20 (9 -34)	16 (8-27)
No	22 (12-39)	19 (12-34)
Go to doctor as soon as feel bad		
Yes	23 (13-42)	20 (12-36)
No	19 (10-35)	18 (9-31)
Self-rated health		
Fair or poor	30 (17-51)	24 (14-38)
Not fair or poor	19 (11-36)	17 (10-31)

Abbreviation: ADL, activities of daily living.

likely reflecting both access to needed care for high-need survivors and the effects of care fragmentation with increasing subspecialization.^{32,33} Finally, survivors who answered “yes” to the survey item, “I go to the doctor as soon as I feel bad,” also experienced higher contact days. Previous work has suggested that unique psychosocial issues among cancer survivors, such as fear of cancer recurrence, can influence health care utilization.^{34,35} While the MCBS survey did not specifically capture fear of cancer recurrence, we hypothesize that this survey item captures a similar theme. Survivors who avoided the doctor had fewer ambulatory days but not fewer total contact days, indicating that they might have delayed appropriate ambulatory care but then had to seek higher acuity care. Understanding and addressing survivors’ psychological health and care-seeking behaviors can help to right-size care.³⁶

The study findings also have important implications for survivorship care delivery. First, we found missed opportunities to coordinate care in the ambulatory

setting—where the majority of older cancer survivors spend their health care days. We found that 65% of ambulatory services such as bloodwork and scans were not on the same day as an ambulatory visit. This is particularly important given the previous research finding that 17% of older adults report trouble getting places like the doctor’s office, 19% report one-way travel times of over 30 minutes, and nearly one third report an accompanying care partner.¹² To decrease patient burdens, clinician teams can better coordinate care and reduce unnecessary ambulatory trips. Importantly, these efforts should account for individual patient preference—for example, some patients may prefer laboratory tests and systemic therapy infusions on the same day to minimize two trips, others may prefer laboratory tests a day before, so they do not have to wait for the laboratory tests to result before infusion.

Second, we found that older cancer survivors visited primary care clinicians and nononcology specialist clinicians a few times in the year, but the median patient did not visit an

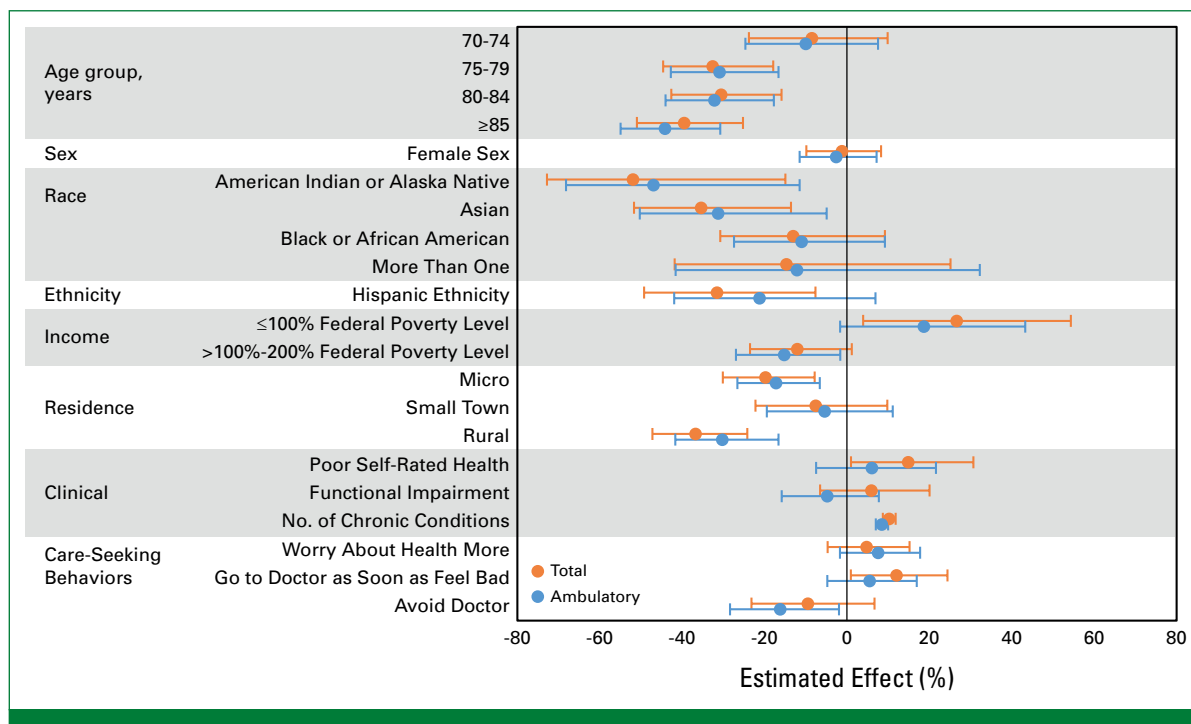


FIG 3. Forest plot for multivariable analysis of factors associated with total and ambulatory contact days among older cancer survivors. Dots represent effect size. Bars represent 95% CIs. Reference groups for categorical variables: Age: 65–69 years; Sex: Male; Race: White; Ethnicity: non-Hispanic; Income: >200% Federal Poverty Level; Rural/Urban commuting area: Metropolitan area; Poor self-rated health: not poor; Functional impairment: not impaired; Worry about health more: “No” response; Go to doctor as soon as feel bad: “No” response; Avoid doctor: “No” response. Number of chronic conditions was included as a continuous variable. Micro = Metropolitan.

oncologist. This follows evidence of the importance of primary care clinicians in delivering survivorship care:³⁷ nearly all cancer survivors had at least one annual primary care clinician visit and more than half had a primary care clinician as their main clinician.³⁸ Among older adults with multimorbidity, having a primary care clinician as the predominant clinician (v a specialist) was associated with higher continuity of care, lower spending, and similar clinical outcomes.³⁹ Patient preferences regarding the involvement and role of oncologists in survivorship can also dictate care patterns.^{40,41} There is a critical need for innovative models of survivorship care, on the basis of community context, to provide risk-stratified and personalized care to older adults while acknowledging workforce challenges in primary care, geriatrics, and oncology.^{3,4,9,42,43} Ongoing care delivery trials are testing telehealth interventions and leveraging a wide array of clinicians to provide appropriate services.⁴⁴ As new models are tested, it is critical to remember that cancer survivors are at high risk of care fragmentation,⁴⁵ and collaborative models should prioritize coordination.^{4,43}

This work has several limitations. First, although nationally representative, this study primarily captures the experiences of community-dwelling, longer-term cancer survivors who were not undergoing hemodialysis and may be healthier than all cancer survivors. Second, since we

analyzed claims in the 2019 calendar year, our results do not capture how care burdens evolve with time (although they are more stable in the more chronic survivorship phase)²⁴ and may not generalize to more recent years. Future work should address how contact days might have changed with the rapid adoption of telemedicine in more recent years, especially given the generally positive experience of patients and oncologists.^{46–48} Third, although we captured comorbidities, self-reported health, and functional limitations, we did not have sufficient clinical details on cancer-directed treatments, objective function, or the exact care provided to adjudicate the value of individual contact days. Future research should both benchmark ideal ranges of the number of contact days for various patient populations, taking into account the immense variation because of clinical and nonclinical factors, and seek to determine the quality of these days. Fourth, by pooling data across cancer sites, we improved the generalizability of our findings but lost some clinical nuance.

In conclusion, older, predominantly long-term cancer survivors spent an average of 28 days in 2019 obtaining care outside of their homes, most of which was outpatient and not delivered by oncologists. Outpatient services were often on separate days and uncoordinated. Contact days varied widely by factors such as geography and

care-seeking behavior. These results suggest ways to improve survivorship care, for example, through better care coordination and navigation in clinical practice;

proactively addressing psychosocial care preferences; and building, training, and uniting a diverse cancer survivorship workforce.

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Health Care Contact Days Among Older Cancer Survivors

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APPENDIX

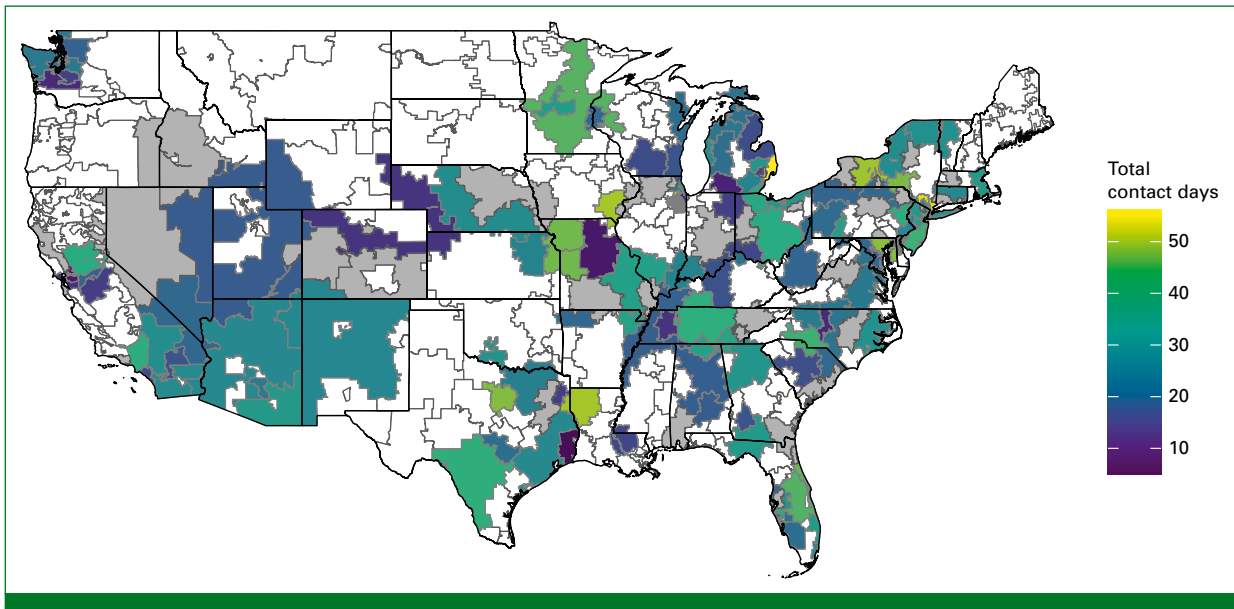


FIG A1. Heat map demonstrating median total contact days by hospital referral regions for the 41 regions with ≥ 10 beneficiaries. Blank regions—represented in the overall cohort but with < 10 beneficiaries per region.

TABLE A1. Contact Days Measures

Variable	Variable Name	Definition	Date(s) Definition	Category	File
Inpatient		Days in which patient is hospitalized in the inpatient setting	CLM_FROM_DT to CLM_THRU_DT	Binary	INP
ED visit	HCPCS; REV_CNTR	OTP/OTP Rev: HCPCS: any of 99281-99285 or 99291 AND REV_CNTR = 0450-0452,0456, 0459, 0981) OR ED Observation (defined as HCPCS G0378 or G0379) AND REV_CNTR = 0760, 0762 PHY: HCPCS_CD = 99281-5 or 99291 AND LINE_PLACE_OF_SRVC_CD = 23	CLM_FROM_DT to CLM_THRU_DT	Binary	OTPRev merged with OTP by CLAIM_ID and deduplicated, PHY file
SNF		Days in which the patient is in a skilled nursing facility	CLM_FROM_DT to CLM_THRU_DT	Binary	SNF
Hospice	CLM_SRVC_CLSFCTN_TYPE_CD	Days in which the patient is in a hospital-based hospice facility CLM_SRVC_CLSFCTN_TYPE_CD = 2	CLM_FROM_DT to CLM_THRU_DT	Binary	HSPRev merged with HSP by CLAIM_ID and deduplicated
Visit	RBCS_Cat_Subcat	RBCS_Cat_Sub = EB, EE, EV, or EX; Each day, count one visit per unique performing NPI (PHY: PRF_PHYSN_NPI, OTP/OTPrev: AT_PHYSN_NPI) across PHY and OTP/OTPrev files. If no NPI, do not count visit Includes evaluation and management visits for behavioral health services, ophthalmologic services, office/outpatient services, and miscellaneous Exclude visits for which claims only contain home place-of-service codes (PHY: LINE_PLACE_OF_SRVC_CD = 12, 13, 14, 33, or 55; OTP: REV_CNTR = 0821 or 0829)	PHY: LINE_1ST_EXPNS_DT; if missing, CLM_THRU_DT or else CLM_FRM_DT. OTP/OTPrev: REV_CNTR_DT	Count	PHY and OTP/OTPrev
Primary care visit ^a	RBCS_Cat, RBCS_Cat_Subcat, AT_PHYSN_SPCLTY_CD (OTP/OTPrev file), or PRVDR_SPCLTY (PHY file)	Unique visits with AT_PHYSN_SPCLTY_CD (OTP/OTPrev file) or PRVDR_SPCLTY (PHY file) = 1, 8, 11, 37, 38, 50, 84, 93	Same as visit	Count	PHY and OTP/OTPrev
Specialist visit ^a	RBCS_Cat, RBCS_Cat_Subcat, AT_PHYSN_SPCLTY_CD (OTP/OTPrev file), or PRVDR_SPCLTY (PHY file)	Unique visits with AT_PHYSN_SPCLTY_CD (OTP/OTPrev file) or PRVDR_SPCLTY (PHY file) = 2-7, 9-10, 13-14, 16-36, 39-49, 62, 64, 66, 68, 70-72, 74, 76-83, 85-86, 89-92, 94, 97-98, C0, C3, C5-9; D4	Same as visit	Count	PHY and OTP/OTPrev
Oncology specialist visit	RBCS_Cat, RBCS_Cat_Subcat, AT_PHYSN_SPCLTY_CD (OTP/OTPrev file), or PRVDR_SPCLTY (PHY file)	Visits with AT_PHYSN_SPCLTY_CD (OTP/OTPrev file) or PRVDR_SPCLTY (PHY file) = 82-83, 90-92, 98	Same as visit	Count	PHY and OTP/OTPrev
Tests	RBCS_Cat	RBCS_Cat = T; includes anatomic pathology, cardiology, general laboratory, molecular testing, neurologic, pulmonary function, and miscellaneous tests. Exclude tests for which claims only contain home place-of-service codes (PHY: LINE_PLACE_OF_SRVC_CD = 12, 13, 14, 33, or 55; OTP: REV_CNTR = 0821 or 0829)	Same as visit	Binary	PHY and OTP/OTPrev

(continued on following page)

TABLE A1. Contact Days Measures (continued)

Variable	Variable Name	Definition	Date(s) Definition	Category	File
Imaging	RBCS_Cat	RBCS_Cat = I; includes computed tomography (CT), magnetic resonance (MR), nuclear, ultrasound, standard x-ray, and miscellaneous imaging. Excludes imaging services for which claims only contain home place-of-service codes (PHY: LINE_PLACE_OF_SRVC_CD = 12, 13, 14, 33, or 55; OTP: REV_CNTR = 0821 or 0829)	Same as visit	Binary	PHY and OTP/OTPrev
Procedures	RBCS_Cat	RBCS_Cat = P or A; includes breast, cardiovascular, eye, digestive/gastrointestinal, hematology, musculoskeletal, other organ systems, skin, and vascular procedures, and anesthesia services. Excludes procedures for which claims only contain home place-of-service codes (PHY: LINE_PLACE_OF_SRVC_CD = 12, 13, 14, 33, or 55; OTP: REV_CNTR = 0821 or 0829)	Same as visit	Binary	PHY and OTP/OTPrev
Treatments	RBCS_Cat	RBCS_Cat = R or RBCS_Cat_SubCat = DG; includes chiropractic, dialysis, chemotherapy, injections and infusions (nononcologic), radiation oncology, physical, occupational, and speech therapy, and miscellaneous treatments, and drugs administered through Durable Medical Equipment. Excludes treatments for which claims only contain home place-of-service codes (PHY: LINE_PLACE_OF_SRVC_CD = 12, 13, 14, 33, or 55; OTP: REV_CNTR = 0821 or 0829)	Same as visit	Binary	PHY and OTP/OTPrev
Chemotherapy	RBCS_Cat_Subcat	RBCS_Cat_Subcat = RH. Excludes services for which claims only contain home place-of-service codes (PHY: LINE_PLACE_OF_SRVC_CD = 12, 13, 14, 33, or 55; OTP: REV_CNTR = 0821 or 0829)	Same as visit	Binary	PHY and OTP/OTPrev
Radiation therapy	RBCS_Cat_Subcat	RBCS_Cat_Subcat = RR. Excludes services for which claims only contain home place-of-service codes (PHY: LINE_PLACE_OF_SRVC_CD = 12, 13, 14, 33, or 55; OTP: REV_CNTR = 0821 or 0829)	Same as visit	Binary	PHY and OTP/OTPrev

NOTE. We used unique beneficiary identifiers (BASE_ID) to link survey data to research claims files (PHY, SNF, INP, HSP and HSP Rev, and OTP and OTPrev). We then identified the calendar days in which a beneficiary had a health care contact day as follows: “The RBCS is a taxonomy that allows researchers to group healthcare service codes for Medicare Part B services into clinically meaningful categories and subcategories. It is based on the original Berenson-Eggers Type of Service classification created in the 1980s, and includes notable updates such as Part B non-physician services. The first version of the RBCS was released in 2020 and covers healthcare services between 2014 and 2018.”

Abbreviations: ED, emergency department; HCPCS, Healthcare Common Procedure Coding System; NPI, National Provider Identifier; RBCS, Restructured BETOS Classification System; SNF, skilled nursing facility.

^aInfrequently, there were >1 of the above-listed specialty codes for the same NPI on the same day. In these cases, we applied the following decision rules to define the visit as primary care or specialty care: (1) If all but one of the specialty codes for a given NPI is for nurse practitioner (50) or physician assistant (97), identify the visit on the basis of the code that is not 50 or 97. (2) If one specialty code is primary care and one is specialist, pick specialist UNLESS the specialist code is obstetrics/gynecology (often used for family medicine) or another specialty that does not follow from primary care training (codes 02, 04, 05, 13, 16, 18, 20, 30, 34, 41, 48, 71, 77, 80) OR if the primary care code is family practice (08) AND the specialist code is a discipline that can be subsumed within family practice (06, 07, 10, 39, 83).

TABLE A2. Specific Question Wording for Survey-Derived Measures

Measure	Question
Hispanic origin	[Are you/Is (SP)] of Hispanic, (Latino/Latina), or Spanish origin?
Race	Looking at this card ^a , what [is/was] [your/(SP)'s] race?
Income ^b	Looking at this card ^c , which letter best represents [your and your spouse's/(SP's) and (his/her) spouse's/(your/(SP's))] total income before taxes during the past 12 months? Include income from jobs, Social Security, Railroad Retirement, other retirement income, and the other sources of income we just talked about [Supplemental Security Income (SSI), pensions, interest]
Education	What is the highest degree or level of school [you have/(SP) has] completed?
Self-rated health	In general, compared to other people [your/(SP's)] age, would you say that [your/his/her] health is... [excellent, very good, good, fair, poor]
Children	Including natural, adopted, and stepchildren, how many living children [did (SP)/does (SP)/do you] have?
Living alone	[Besides [you/(SP)], [is/was] there anyone else living or staying in the household [as of (DATE OF DEATH/DATE OF INSTITUTIONALIZATION)]? Remember to include people who[are/were] temporarily absent and any children who [may live/may have lived] in the household
Difficulty in performing activities of daily living	Binary, if yes to any of the following: Because of a physical, mental, emotional, or memory problem, [do you/does (SP)] have any difficulty... Bathing or showering? Dressing? Eating? Getting in or out of bed or chairs? Walking? Using the toilet, including getting up and down?
Whether has a regular clinician	Is there a particular doctor or other health professional, or a clinic [you/(SP)] usually [go/goes] to when [you are/he is/she is] sick or for advice about [your/his/her] health?
Accompaniment to doctor's office	[Do you/Does (SP)] usually have someone accompany [you/him/her] there?
How one gets to doctor's office	How [do you/does (SP)] usually get to [(US5A PROVIDER NAME)'S office/(US3A PROVIDER NAME)]?
Time to get to doctor's office	About how long does it usually take for [you/(SP)] to get there?
Specialty of the regular clinician	What is (US5A PROVIDER NAME)'s specialty?
Sex of the regular clinician	Is (US5A PROVIDER NAME) a male or female?
Never miss an appointment	People have busy lives and miss appointments for many reasons. Since (TODAY'S MONTH AND YEAR-12 MONTHS), how often did [you/(SP)] miss an appointment with [(US5A PROVIDER NAME)/(US3A PROVIDER NAME)]? Please tell me whether each of the following statements is true or false
Worry about health more than average person of age	[You/(SP)] (worry/worries) about (your/his/her) health more than other people (your/his/her) age
Avoid going to the doctor	[You/(SP)] will do just about anything to avoid going to the doctor
Go to doctor as soon as feel bad	Usually, [you/(SP)] (go/goes) to the doctor or other health professional as soon as (you/he/she) (start/starts) to feel bad
Satisfied with care quality	Please tell me how satisfied or dissatisfied you have been with the following: The overall quality of the health care [you have/(SP) has] received [over the past year/since (TODAY'S DATE - 12 MONTHS)]. Have you been very satisfied, satisfied, dissatisfied, or very dissatisfied?

Abbreviation: MCBS, Medicare Current Beneficiary Survey.

^aDisplaying categories American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or other Pacific Islander, White, Don't know, Refused.

^bIncome to poverty ratio calculated on the basis of reported income and household size by MCBS.

^cWith income ranges in increments of \$5,000 in US dollars.