

Cancer survivors' cancellations of healthcare appointments during the COVID-19 pandemic: Associations with anxiety and depression

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Funding information

National Institute of Health/National Cancer Institute; National Institute of Health/National Institute of Nursing Research

Abstract

Objective: Though it is well-documented that cancer survivors experienced healthcare delays during the COVID-19 pandemic, who initiated those delays has not been examined. This longitudinal study distinguishes rates of patient- from provider-cancelled healthcare appointments at three timepoints during the pandemic, and examines psychosocial factors associated with patient-cancelled appointments.

Methods: Cancer survivors ($N = 147$) in the United States completed psychosocial and health behavior measures three times between May and December 2020. We examined rates of patient- and provider-cancelled healthcare appointments, including cancer screening appointments, at each timepoint and change between timepoints. Logistic regression was used to determine if anxiety symptoms, depression symptoms, and COVID-19 fears were associated with self-cancelled healthcare appointments.

Results: In May 2020, one third (33.79%) of participants reported one or more self-cancelled appointments within the prior 2 months and nearly half (45.89%) reported one or more provider-cancelled appointments. Rates of provider-cancelled appointments decreased to 35.71% in June/July 2020 and to 9.24% in November/December 2020 (both reflected $p < 0.05$ reductions compared to the previous timepoint). Rates of self-cancelled appointments, however, remained more stable ($ps > 0.144$). In June/July and November/December 2020, higher depression and anxiety symptoms, but not COVID-19 fears, were associated with greater likelihood of self-cancelled appointments.

Conclusions: Cancer survivors cancelled their healthcare appointments at a stable rate even as provider-cancelled appointments declined. Depression and anxiety symptoms, but not COVID-19 concerns, were associated with patient cancellations. Interventions that address anxiety and depression symptoms may help to promote adherence to cancer survivorship care during the pandemic.

KEYWORDS

anxiety, cancer, cancer survivorship, COVID-19, depression, oncology, psycho-oncology, treatment adherence and compliance

1 | INTRODUCTION

The COVID-19 pandemic has had a myriad of implications for the healthcare of cancer survivors. Research within the context of this pandemic reveals that contact between cancer survivors and their healthcare professionals was less frequent than pre-pandemic levels.¹⁻³ Further, many cancer survivors experienced delays in cancer-related care,^{4,5} including postponing or cancelling follow-up appointments and delaying routine surveillance appointments (e.g., mammograms).⁶ These trends are concerning because healthcare appointment attendance and diagnostic screening are widely recommended to reduce the risk of recurrence, improve early detection of recurrence, and enhance the likelihood of long-term survival.^{7,8}

Although extant studies identified critical delays in cancer care during the COVID-19 pandemic,⁴⁻⁶ the reasons for these delays have not been fully elucidated. Additionally, much of the literature on cancer populations during the pandemic focuses on adults with actively treated cancer rather than on post-treatment cancer survivors. The latter, however, comprises a large and important group with significant healthcare needs and time-sensitive cancer screening/scanning needs, and thus are the focus of the current investigation. An important question is whether delays in care were initiated by healthcare providers, or by patients themselves. Further, despite evidence of a link between psychosocial variables and nonadherence to cancer prevention care among cancer survivors more broadly (e.g., Mausbach et al.⁹), to our knowledge there has been no examination of psychosocial predictors of cancer survivor-cancelled appointments during the pandemic. These questions remain critical for elucidating the full range of reasons for healthcare disruptions among cancer survivors during the pandemic. As several predictors examined here offer relevance beyond the pandemic context (e.g., anxiety and depression symptoms), addressing these questions has implications for understanding predictors of healthcare disruptions beyond the pandemic as well. The present study thus expands upon existing research during the COVID-19 pandemic by distinguishing cancer survivor-cancelled from provider-cancelled healthcare appointments and by examining psychosocial predictors of patient-cancelled appointments.

Several studies suggest that cancer survivors have experienced a deterioration in their quality of life and well-being during the COVID-19 pandemic.^{1,10-12} Immunosuppression in many people with cancer, caused by their illness and treatments, makes them more likely to experience serious complications and death if infected with COVID-19,¹³⁻¹⁵ a potential source of distress for cancer survivors. Even cancer survivors who have already completed primary cancer treatment may perceive themselves to be at increased risk for serious consequences of COVID-19 due to their cancer survivor status.¹⁶ Research conducted prior to the COVID-19 pandemic has shown that anxiety and depression are associated with greater non-adherence to treatment among cancer survivors.^{9,17} However, the extent to which anxiety and depression symptoms, as well as fear of COVID-19, are associated with cancer survivors' adherence to healthcare appointments (including cancer surveillance appointments), during the COVID-19 pandemic remains unknown.

To address the paucity of knowledge on the initiation and predictors of post-treatment cancer survivor appointment cancellations, the aims of this longitudinal study were threefold: (1) to characterize the presence and types of patient- and provider-cancelled or delayed healthcare appointments in a sample of cancer survivors during a critical 7-month window in the first year of the COVID-19 pandemic in the U.S.; (2) to examine the extent to which the portions of patient and provider-cancelled healthcare appointments changed over this period; and (3) to examine psychosocial correlates (i.e., anxiety, depression, COVID-related fears) of patient-cancelled healthcare appointments. We hypothesized that greater anxiety and depression symptoms, and COVID-related fears, would be positively associated with patient-cancelled healthcare appointments.

2 | METHODS

2.1 | Participants

Study participants ($N = 147$) were recruited from a larger pool of post-treatment cancer survivors previously enrolled in one of two completed randomized controlled trials (RCTs) who consented to being re-contacted for future research studies ($N = 200$). This study was initiated on an urgent basis in response to the pandemic. We aimed to recruit as many participants as possible from this recruitment pool. We did not conduct an a priori power analysis given the novelty of the research context and lack of a basis for expected effect sizes. The RCTs evaluated psychosocial interventions for cancer survivors, and were conducted within the same oncology practice network. Briefly, these interventions included mindfulness, acceptance, values, and/or medical education components and were targeted at improving anti-hormonal medication adherence or anxiety symptoms. The medication adherence trial did not target the mental health variables assessed currently and the anxiety-focused intervention occurred on average several years prior to the current data collection, and the benefits were shown to no longer endure during the current data collection period.¹⁸ See Arch¹⁹ and Arch et al.²⁰ for further details of each RCT. To be eligible for the RCTs, participants had to be age 21 or older, report English fluency, have completed primary cancer treatment, and either screened positive for elevated anxiety symptoms or reported at least one risk factor for anti-hormonal medication nonadherence. Additional eligibility criteria for the current study included access to a computer, tablet, or smartphone with data or Wi-Fi connectivity (all potential participants met this criteria). See Table 1 for participant sociodemographic and medical characteristics.

2.2 | Procedures

This study was approved by the University of Colorado Boulder Institutional Review Board (protocol #20-0163). We sent prior RCT participants who had consented to being recontacted for future

TABLE 1 Sociodemographic and medical characteristics

Category	Full sample (N = 145)
Female	94.48% (137)
Age: Mean in years (SD)	56.34 (11.09)
Race/ethnicity	
White, not Latinx	88.28% (128)
Hispanic/Latinx	6.21% (9)
Other	5.52% (8)
Education (median)	Bachelor's degree
Household income (median)	\$75,000–\$99,000
Relationship status	
Married or partnered	71.72% (104)
Other	28.28% (41)
Cancer treatment history	
Surgery	88.28% (128)
Chemotherapy	54.48% (79)
Radiation	57.93% (84)
Months between end of active cancer treatment and study enrollment – M (SD)	34.95 (16.19) ^a
Primary cancer type	
Breast	79.86% (115) ^a
Gastrointestinal	5.56% (8) ^a
Lymphoma	4.86% (7) ^a
Other	9.72% (14) ^a
Cancer stage at diagnosis (solid tumor cancers only)	
0	2.96% (4) ^b
I	60.74% (82) ^b
II	22.96% (31) ^b
III	11.85% (16) ^b
IV	1.48% (2) ^b

Note: Two participants did not provide demographic data. Values in parentheses represent counts in each category or standard deviations as noted. N's reflect N = 145 unless otherwise noted.

^aN = 144.

^bN = 135.

studies an email inviting them to participate in the current study, with a REDCap^{21,22} hyperlink to complete the consent form and the first survey. All participants who consented (N = 147; 74% of initial recruitment pool) completed the first survey (T1) between May 6 and 28 May 2020. Participants completed the second survey (T2) four to 6 weeks after completion of T1, between June 17 and 15 July 2020 (completed by N = 142; 97% of those consented). They completed

the final survey (T3) between November 19 and 3 December 2020 (completed by N = 122; 83% of those consented). On average, participants completed the second survey 6.18 weeks (SD = 0.64 weeks) after completing their first survey. Thus, some participants' reported cancelled appointments at the second survey may have also been counted during the first survey given that we inquired about cancellations over the past 2 months. Because we did not ask participants about the timing of their cancelled appointments, we were unable to correct for any double-counted cancelled appointments. We note this limitation below. Given this assessment timeline, participants completed surveys starting within the first 8 weeks of major U.S. shutdowns as a result of the pandemic, and again at all-time low and high (pre-Omicron variant) statewide COVID-19 prevalence rates.²³ Figure 1 illustrates the timeline relative to statewide COVID-19 prevalence rates. For each survey, participants were compensated with a \$15 gift card and, if they completed the survey within 48 h of receipt, a \$5 bonus. Participants received up to three reminder notifications per timepoint to complete the survey, including at least one phone call from the research team.

2.3 | Measures

2.3.1 | Appointment and screening cancellations

At each of the three timepoints, participants completed a survey that included questions about appointments that they or their providers cancelled ('Over the last 2 months, have you cancelled or postponed scheduled visits or services for physical health or mental health?' and 'Over the last 2 months, have any of your healthcare providers cancelled or postponed scheduled visits or services for physical health or mental health?'). They also were asked specifically about cancellations of cancer screenings ('Over the last 2 months, have you or your healthcare provider cancelled or postponed getting routine cancer screening [breast cancer mammography, colonoscopy, pap smear, etc.]?' If yes: 'Who postponed or cancelled your routine cancer screening?'). We coded participants as having had a 'self-cancelled appointment' if they reported that they themselves had cancelled or postponed scheduled visits, services for physical or mental health, or routine cancer screening. Similarly, we coded participants as having had a 'provider-cancelled appointment' if they reported that their provider had cancelled or postponed scheduled visits, services for physical or mental health, or routine cancer screening. In addition to examining overall rates of self- and provider-cancelled appointments, we separately examined rates of self- and provider-cancelled cancer screenings.

2.3.2 | Anxiety and depression symptoms

The surveys used validated, widely-used measures to assess anxiety and depression symptoms—the Generalized Anxiety Disorder-7 scale

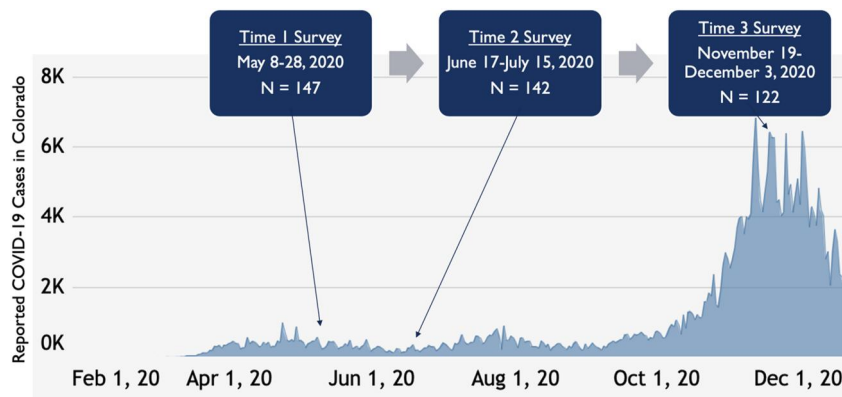


FIGURE 1 Study timeline in relation to statewide COVID-19 prevalence. Graph reflects COVID-19 cases reported by day in Colorado. The density plot of cases by timepoint was generated from the Colorado Department of Public Health and Environment COVID-19 case count interactive online dashboard.²³ We overlaid the density plot with additional current study-specific information.

(GAD-7; baseline $\alpha = 0.92$)²⁴ and the Patient Health Questionnaire-8 (PHQ-8; baseline $\alpha = 0.88$),²⁵ respectively.

2.3.3 | COVID-19-related distress measures

Fear, concern, and prevention behaviors associated with the COVID-19 pandemic were measured using the Coronavirus Fear Inventory (CFI; baseline $\alpha = 0.83$),¹⁶ a 7-item measure adapted from the Ebola Fear Inventory,²⁶ as well as a cancer survivor-specific version of the CFI, consisting of three items from the CFI that assessed COVID-19 fears specific to cancer survivorship status (baseline $\alpha = 0.95$; e.g., 'As a cancer survivor, to what extent do you believe you have a higher chance of dying from COVID-19? (compared to others your age)').¹⁶ We included these measures to differentiate the effects of mental health symptoms from fears/concerns about the pandemic specifically.

2.4 | Statistical methods

To address Aim 1, at each timepoint we examined the proportion of participants reporting: (a) one or more self- or provider-cancelled healthcare appointments (inclusive of cancer screenings and any other type of medical or mental health appointment); and (b) one or more self- or provider-cancelled cancer screenings (a specific subgroup of group (a)). Then, addressing Aim 2, we conducted McNemar's tests comparing proportions of cancelled appointments across the three study timepoints (see Supplemental Tables S1–S6). For Aim 3, the associations between self-cancelled healthcare appointments (as an outcome) and psychosocial variables were examined within logistic regression models for each timepoint; see Table 2. To maximize statistical power and reduce Type I error, we limited Aim 3 analyses to self-cancelled healthcare appointments broadly, which represented the largest category of cancellations. First, we estimated

univariate models with self-cancelled appointments regressed separately on each psychosocial variable at each of the three timepoints. Next, to examine the unique contribution of each psychosocial variable, we estimated multivariate models with self-cancelled appointments regressed on depression or anxiety symptoms and both COVID-19 concern variables. We observed high collinearity between the anxiety and depression symptom variables and thus did not include them both in the same multiple predictor models. Instead, we estimated two separate multiple predictor models at each timepoint: one including anxiety symptoms and both COVID-19 fear variables as covariates, and the other including depression symptoms and both COVID-19 fear variables as covariates. Statistical analyses were conducted in R using the 'stats' package.²⁷

3 | RESULTS

3.1 | Participant characteristics

Our final sample was predominately female (94.48%), non-Latinx White (88.28%), and survivors of breast cancer (79.86%; Table 1). Based on 2020 Colorado census data,²⁸ our sample was similarly resourced compared to the rest of the state with regard to household income and educational attainment, but less ethnically diverse. Participants were recruited from a community oncology care network rather than academic medical centers.

3.2 | Health appointment cancellations

Overall rates of participants with one or more appointment cancellations—whether patient- or provider-cancelled—were 60.96% in May 2020, 53.57% in June/July 2020, and 29.17% in November/December 2020. During the first timepoint in May 2020, one third (33.79%) of cancer survivor participants reported that they had

TABLE 2 Logistic regression parameter estimates of self-cancelled appointment likelihood

Predictor	Unadjusted OR from single predictor models			Adjusted OR from multiple predictor models		
	OR	95% CI	<i>p</i>	OR	95% CI	<i>p</i>
May 2020						
Anxiety	1.04	[0.97, 1.11]	0.293	1.02	[0.95, 1.10]	0.549
Depression	1.04	[0.98, 1.11]	0.209	1.03	[0.96, 1.11]	0.403
Cancer-related COVID fear	1.18	[0.89, 1.57]	0.258	1.10	[0.78, 1.57]	0.575
General COVID fear	1.30	[0.80, 2.17]	0.298	1.11	[0.61, 2.07]	0.733
June/July 2020						
Anxiety	1.12	[1.04, 1.20]	0.002	1.13	[1.04, 1.22]	0.003
Depression	1.11	[1.04, 1.20]	0.005	1.12	[1.03, 1.21]	0.007
Cancer-related COVID fear	1.14	[0.84, 1.57]	0.401	0.98	[0.66, 1.46]	0.915
General COVID fear	1.22	[0.73, 2.11]	0.450	0.92	[0.48, 1.80]	0.810
November/December 2020						
Anxiety	1.11	[1.03, 1.21]	0.009	1.12	[1.03, 1.23]	0.012
Depression	1.11	[1.02, 1.21]	0.017	1.10	[1.01, 1.21]	0.037
Cancer-related COVID fear	1.23	[0.86, 1.79]	0.260	1.21	[0.76, 1.98]	0.430
General COVID fear	0.88	[0.50, 1.61]	0.672	0.58	[0.28, 1.20]	0.141

Note: The single predictor models' columns reflect univariate logistic regression models with each participant's self-cancelled appointment status (true or false) at each timepoint regressed on each univariate predictor score at that same timepoint. Separate models were estimated for data collected at each timepoint. High correlations between depression and anxiety precluded including both anxiety and depression together in the same multiple predictor model. Consequently, we computed separate multiple predictor models with both COVID fear variables and either anxiety or depression as predictors. That is, estimates in the multiple predictor model columns for the anxiety and COVID fear variables are derived from the multiple predictor models including anxiety (but not depression) as predictors; the estimates for the cancer-related COVID and general COVID fear predictors were also nonsignificant in multiple predictor models including depression (but not anxiety) as a predictor.

cancelled one or more healthcare appointment(s) within the previous 2 months (Figure 2). A similar proportion of participants cancelled appointments in June/July 2020 (32.14%), which did not differ from the proportion in May 2020 ($\chi^2[1] = 0.30, p = 0.584$). Finally, in November/December 2020, nearly one-quarter (22.50%) of participants cancelled one or more healthcare appointment, which did not differ from the proportion in June/July 2020 ($\chi^2[1] = 2.13, p = 0.145$), though did differ from the proportion in May 2020 (i.e., from the first to last timepoint; $\chi^2[1] = 4.69, p = 0.030$). The percentage of participants reporting self-cancelled cancer screenings out of all participants was 10.34% in May, 5.00% in June/July, and 2.52% in November/December 2020.

In May 2020, nearly half (45.89%) of participants reported that one or more of their health-related appointments in the previous 2 months had been cancelled by their provider, and this proportion significantly declined at each timepoint thereafter (Figure 2): The proportion of participants reporting provider cancellations in June/July 2020 (35.71%) represented a significant decrease in cancellations from May 2020 ($\chi^2[1] = 4.02, p = 0.045$), and the proportion in November/December 2020 (9.24%) represented a further significant decrease from June/July 2020 ($\chi^2[1] = 25.26, p < 0.001$). The percentage of participants reporting provider-cancelled cancer screenings in particular was 11.03% in May, 7.86% in June/July, and 1.68% in November/December 2020.

3.3 | Psychosocial predictors of self-cancelled health appointments

We examined anxiety symptoms, depression symptoms, and general and cancer survivor-specific COVID-19 fears as predictors of self-cancellation of appointment(s) at each timepoint. See Supplemental Table S7 for predictor descriptive statistics and Table 2 for regression results. In both univariate and multivariable models, anxiety and depression symptoms were not significantly associated with healthcare appointment self-cancellation in May 2020 ($ps > 0.209$), but they were both positively associated with appointment cancellation in June/July 2020 ($ps < 0.007$) and November/December 2020 ($ps < 0.037$). A one-unit increase in anxiety or depression score was associated with an approximately 10%–13% increase in likelihood of reporting a self-cancelled appointment at the June/July and November/December timepoints (ORs = 1.10–1.13). By contrast, neither general or cancer-related COVID-19 fear was significantly associated with appointment self-cancellation at any time point in univariate or multivariable models ($ps > 0.141$). Given that our sample is overwhelmingly (94.48%) female, we also ran these logistic regression models excluding the 8 men as a sensitivity check. We observed no meaningful differences in model results obtained when examining $n = 137$ female participants compared to the full sample. Only full sample results, which include men, are presented in this manuscript.

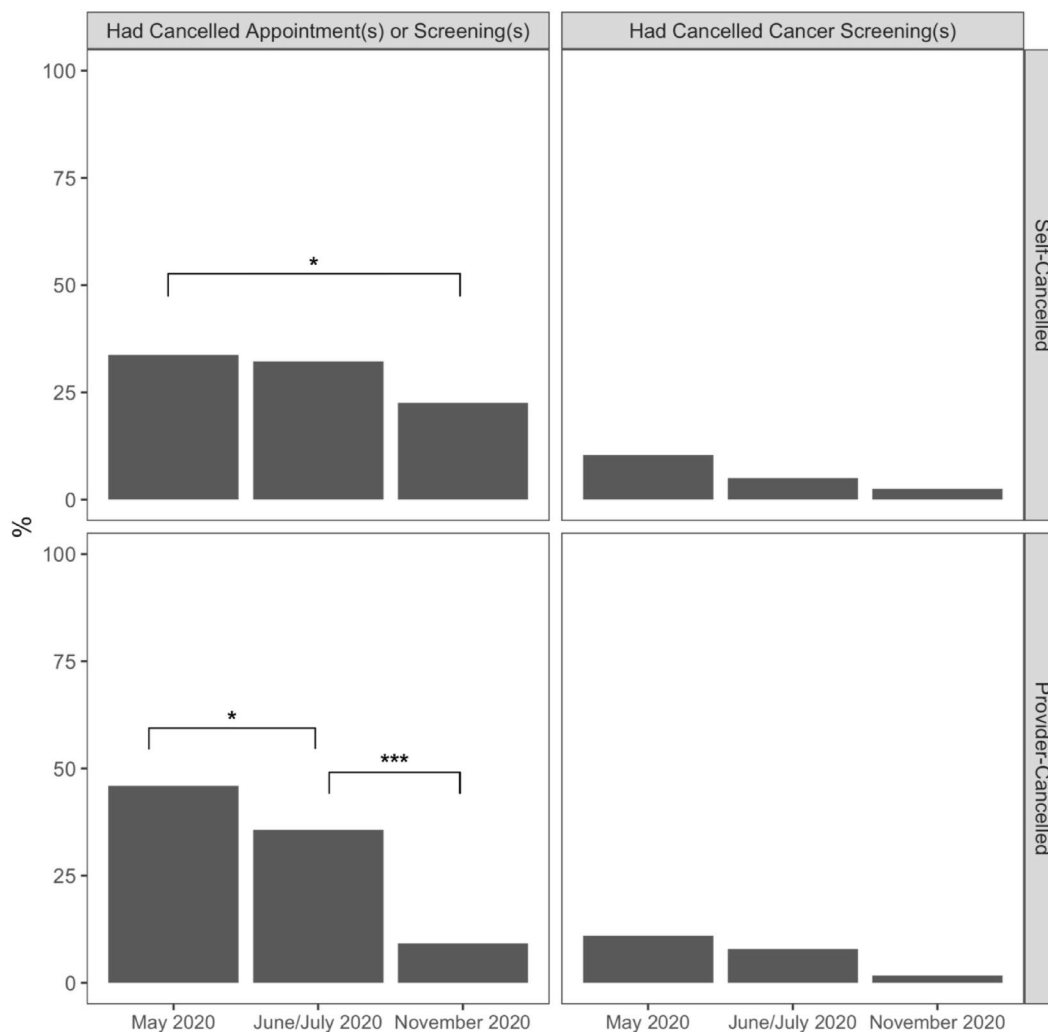


FIGURE 2 Percentages of participants with self- and provider-cancelled appointments. Percentages reflect the number of participants who reported self-cancelled (top row) or provider-cancelled (bottom row) appointments of any kind (including cancer screenings; left column) or cancer screenings specifically (right column). Significant differences between timepoints are denoted for 'had cancelled appointment(s) or screening(s)'. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

4 | DISCUSSION

This study characterized the portion of patient- and provider-cancelled healthcare appointments in a sample of post-treatment cancer survivors during a critical window in the first year of the COVID-19 pandemic—including periods of to-date low and high statewide COVID prevalence rates²³—as well as changes in cancellation rates over time within this window. This is the first known study of cancer survivors to elucidate who initiated delays in care during the COVID-19 pandemic, a vital missing link in understanding the decline in cancer survivorship care during the early pandemic. Approximately one third of participants reported self-cancelling a healthcare appointment in the 2 months prior to May 2020, while nearly half reported that a provider had cancelled an appointment during this same period. Rates of provider-cancelled healthcare appointments declined over time, whereas rates of self-cancelled appointments did not change significantly

between adjacent timepoints. Though self-cancelled appointments declined significantly from May to December 2020 (the first to last study timepoint), the rate and extent of decline during this period was lower than that of providers. This suggests that despite adjustments in the healthcare system as COVID-19 continued, some cancer survivors remained reticent to resume healthcare appointments.

This study also evaluated psychosocial predictors of patient-cancelled healthcare appointments. The current hypotheses regarding the positive expected association between anxiety and depression symptoms and self-cancelled appointments were supported in participants' responses at the second and third timepoints, but not the first. Furthermore, contrary to the study hypotheses, COVID-19 fears were not associated with appointment self-cancellation. These findings indicate that broader psychological symptoms, but not COVID-19-specific concerns, were associated with cancer survivors cancelling healthcare appointments.

The current findings are consistent with research indicating decreased contact between cancer survivors and their healthcare providers during the first year of the COVID-19 pandemic compared to pre-pandemic levels.¹⁻³ The current study suggests that the sustained decrease in contact with providers was increasingly driven by cancer survivors, rather than clinicians, as the pandemic progressed. The substantial rates of cancelled healthcare appointments including cancer-related care is particularly concerning in this cancer survivor sample because declines in care have been linked to substantial decreases in cancer diagnoses.²⁹ While rates of cancer screening cancellations were lower in the current study compared to those reported in some other publications,²⁹ this may be explained by the temporal specificity of behavior in the context of the pandemic and the fact that the current sample is relatively far along in the survivorship trajectory, on average, and therefore may have few cancer screenings overall. COVID-19-related delays in cancer screenings have led to cancers being diagnosed at later stages, which is associated with greater mortality risk.³⁰ It is thus critical to understand and intervene on factors associated with patient cancellation of healthcare appointments and screening in cancer survivorship.

The overall pattern of patients continuing to cancel appointments at the same rate throughout the pandemic, even as provider-cancelled appointments consistently decreased, suggests that cancellations did not track with COVID-19 risk and patients may be assessing risk differently than providers or experiencing other barriers to resuming healthcare utilization. We observed that anxiety and depression symptoms were associated with cancer survivors self-cancelling appointments starting in June/July 2020. To contextualize, the findings predict that a participant with a GAD-7 score of 10, the widely-used cutoff for moderate generalized anxiety symptoms,²⁴ would have been about 60% more likely to report a self-cancelled appointment than a participant with a GAD-7 score of 5, the cutoff for mild symptoms. The pandemic has led to widespread increases in anxiety and depression symptoms,³¹ and thus this legacy of the pandemic may have enduringly impacted health appointment cancellations rather than fear of COVID-19 per se. Thus, anxiety and depression symptoms represent important therapeutic targets among cancer survivors during the pandemic, due to their direct impacts on wellbeing as well as their negative association with adhering to healthcare appointments. Furthermore, the present study findings are consonant with and contribute to a larger literature on the association between depression symptoms, medical nonadherence, and suboptimal oncological treatment outcomes.^{9,17}

4.1 | Study limitations

A few features of this study limit the conclusions that can be drawn. Our sample was predominantly female, white, and non-Latinx, so our findings did not capture the effects of the pandemic among the full diversity of cancer survivors and should be considered to predominantly reflect the experiences of white female cancer survivors. Partnering with organizations that work with communities historically

underrepresented in research, among other strategies,³² will be important for increasing representation in future research. Participants were predominantly breast cancer survivors and recruited from a pool of previous research participants, and thus may differ in important ways from survivors of other cancer types and who had not taken part in previous research. We also note that some appointment cancellations (during a <2 week window) may have been counted at both the first and second surveys, possibly to a small degree inflating the number of cancellations at the second timepoint. However, the appointments counted at the final timepoint are distinct from those counted at previous timepoints, and findings from regression models for Aim 3 were similar at the second and third timepoints, suggesting that this slight overlap was unlikely to significantly affect the findings.

4.2 | Clinical implications

This research demonstrated relatively high and stable rates of patient-cancelled healthcare appointments during an early 7 month window of the pandemic. Given that anxiety and depression symptoms but not COVID-19 concerns predicted patient-cancelled appointments, our findings indicate that unmet mental healthcare needs in this population may influence self-cancellation more than concerns about the pandemic (on average). If replicated, these findings offer mental health intervention targets that may improve cancer survivorship healthcare adherence, and suggest that integrating supportive care services and referrals for cancer survivors should remain a priority during the pandemic and beyond.

5 | CONCLUSIONS

In a sample of post-treatment cancer survivors surveyed during a critical window of the first year of the COVID-19 pandemic, we observed substantial rates of patient- and provider-cancelled healthcare appointments, with patient-initiated cancellations exhibiting more endurance over time than provider cancellations. Notably, anxiety and depression symptoms, but not concerns about COVID-19, were associated with patient cancellations. During the early COVID-19 pandemic, anxiety and depression symptoms were elevated in cancer survivor and general populations, and it may have been the continuation of these symptoms in the context of the pandemic—rather than COVID concerns specifically—that predicted the greater endurance of patient-cancelled (relative to provider-cancelled) appointments. Given anxiety and depression symptom's associations with cancelled healthcare appointments, as well as their medical and mental health impacts,^{33,34} cancer survivors would benefit from additional supportive care that targets these symptoms.

AUTHOR CONTRIBUTIONS

Lauren B. Finkelstein: Conceptualization; Software; Formal analysis; Writing – Original Draft; Writing – Review & Editing. **Joel N. Fishbein:** Conceptualization; Software; Formal analysis; Writing – Original

Draft; Writing – Review & Editing; Visualization. **Emma E. Bright:** Conceptualization; Writing – Original Draft; Writing – Review & Editing. **Madeline Nealis:** Conceptualization; Writing – Original Draft; Writing – Review & Editing; Data Curation; Project administration. **Sarah J. Schmiede:** Conceptualization; Writing – Review & Editing; Supervision. **Joanna J. Arch:** Conceptualization; Resources; Writing – Review & Editing; Supervision; Funding acquisition.

ACKNOWLEDGEMENTS

This project was supported by NIH/NCI R21CA218723 and NIH/NINR R01NR018479.

CONFLICTS OF INTEREST

Joanna J. Arch has received research grants from the National Institutes of Health and the National Comprehensive Cancer Network/AstraZeneca during the time of this study. Sarah J. Schmiede has received research grants from the National Institutes of Health during this study. All other authors report no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

This study has been approved by the University of Colorado Boulder institutional review board (protocol #20–0163). All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Written informed consent was obtained from all individual participants included in the study.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Finkelstein LB, Fishbein JN, Bright EE, Nealis M, Schmiede SJ, Arch JJ. Cancer survivors' cancellations of healthcare appointments during the COVID-19 pandemic: associations with anxiety and depression. *Psychooncology*. 2022;31(12):2104-2112. <https://doi.org/10.1002/pon.6044>