



# COVID-19's Impact on Cancer Care: Increased Emotional Stress in Patients and High Risk of Provider Burnout

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## Abstract

**Background** COVID-19's precise impact on cancer patients and their oncologic care providers remains poorly understood. This study aims at comparatively analyzing COVID-19's effect on cancer care from both patient and provider perspectives.

**Methods** A multi-institutional survey was developed to assess COVID-19-specific concerns regarding treatment, safety, and emotional stress through 5-point Likert-type prompts and open-ended questions before and during the pandemic. Wilcoxon signed-rank and rank-sum tests were used to analyze before/during answers for providers and patients independently. Open-ended responses were assessed using inductive thematic analysis.

**Results** The survey was completed by 104 (69.3%) patients and 50 (50%) providers. Patients demonstrated a significant change in only 1 of 15 Likert prompts. Most significant were increased concern regarding susceptibility to infection [ $z = 2.536$ ,  $p = 0.011$ ] and concerns regarding their cancer outcome [ $z = 4.572$ ,  $p < 0.001$ ]. Non-physician providers demonstrated significant change in 8 of 13 Likert prompts, whereas physicians had all 13 Likert prompts change in the COVID-19 setting. Physicians believed care to be more poorly planned [ $z = -3.857$ ,  $p \leq 0.001$ ], availability of protective personal equipment to be more limited [ $z = -4.082$ ,  $p < 0.001$ ], and were significantly concerned infecting family members [ $z = 4.965$ ,  $p < 0.001$ ].

**Conclusions** While patients had more difficulty coping with their cancer, they did not perceive significant differences in their actual treatment. This suggests the need for a renewed focus on patients coping with cancer. Among providers, physicians more than any other provider group had a strong negative perception of COVID-19's impact on healthcare, suggesting the need for novel approaches to target physician burnout.

**Keywords** COVID-19 · Surveys and questionnaires · Professional burnout · Psychological stress · Cancer care

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## Introduction

The novel coronavirus disease 2019 (COVID-19), identified on December 2019 in Wuhan, China, has rapidly become a pandemic with ~160 million cases and ~3.32 million deaths confirmed worldwide and ~32.8 million cases and ~582,000 deaths in the USA alone as of May 2021.<sup>1,2</sup> This magnitude of disease is unprecedented in the last 100 years; thusly, COVID-19 has had a unique impact on healthcare systems. As a result, new approaches were rapidly implemented such as restructuring clinics, utilizing telemedicine/remote networking, delaying elective surgeries and follow-ups, limiting personnel/visitors, and creating more sanitary conditions, affecting providers and patients alike.<sup>3</sup>

The burden of COVID-19 on healthcare systems is magnified in cancer care. Studies have shown that cancer patients are over-represented in the COVID-19 cohort compared to the general population with 20% of patients dying from COVID-19 having had active cancer.<sup>1</sup> They are more likely than non-cancer patients to contract COVID-19 and more rapidly experience severe complications. Moreover, cancer patients undergoing active cancer treatment are immunocompromised, leading to an increased risk of adverse outcomes if infected.<sup>4</sup> Furthermore, cancer patients require multidisciplinary treatment approaches, which has become more challenging to achieve due to social distancing policies.

Cancer care providers and their work are affected as well. During the peak of the pandemic, patients were triaged based on disease stage and goals of therapy (curative versus palliative), treatment strategies were altered (intravenous to oral/subcutaneous administration), non-urgent treatments and follow-ups were delayed, limited personnel were available to run clinics, and personal protective equipment (PPE) was rationed.<sup>5–7</sup>

To date, no study has been conducted to assess both oncology patient and provider-level concerns surrounding the COVID-19 state-mandated lockdown. Understanding these concerns and the precise impact on cancer care may help with future lockdowns. This survey aims at understanding how the COVID-19 pandemic impacts the cancer community and offering guidance for resource prioritization.

## Materials and Methods

### Study Population

The study protocol and surveys were approved by the Institutional Review Board of St. Elizabeth's Medical Center and the Dana-Farber Cancer Institute.

The surveys were distributed to 150 patients and 100 providers with the goal of accruing at least 100 patients and 50 provider responses. Surveys were completed from March 26, 2020, to June 3, 2020, coinciding with the implementation of significant COVID-19 policy changes in Massachusetts. This pertains to state quarantine measures as well as hospital-level

changes such as restructuring of clinics, visitor restrictions, patient limitations regarding surveillance visits, cancelling of elective and delaying semi-elective surgeries, creating more sanitary conditions, and increasing utilization of telemedicine and remote multidisciplinary boards respectively.

Patients and providers were accrued through outpatient- and inpatient settings within a multi-institutional single network system (Steward) comprising 3 community-level hospitals (Good Samaritan Medical Center, Holy Family Hospital, St Anne's Hospital) and 1 tertiary care center (Saint Elizabeth's Medical Center) from Massachusetts, USA. This network of hospitals covers much of Massachusetts, thus allowing this study to assess a wide range of patients of various socioeconomic, insurance status, and racial/ethnic backgrounds.

Patients' inclusion criteria were adult patients with cancer diagnosis; patients being worked up without a definitive cancer diagnosis were excluded. Patients in surveillance who have infrequent clinic follow-ups were included to provide perspective contrasting patients undergoing active treatment with frequent hospital visits to multiple departments. Recruitment of patients was done in person in clinic waiting rooms, wherein hard copy surveys were distributed with pre-clinic appointment paperwork. Providers were approached via email with surveys attached in a secure Google form link; the email outlined the voluntary nature of completing the survey, and 100 providers were needed to be contacted to reach the goal of at least 50 providers accrued (50% response rate). Randomization and blinding of participants are not relevant to the study. Patient demographics of age, sex, race, cancer type, stage, current management strategy, and years since diagnosis were collected. Provider demographics of age, sex, race, cancer specialty, years of experience, and occupational role were also collected.

### Study Design

A convergent mixed methods design was used in this study, where quantitative data and qualitative data were collected simultaneously, analyzed separately and then merged to answer the research question. Including both types of data aims at gaining deeper understanding of COVID-19's impact on cancer patients and providers.

Thusly, two separate surveys (patient and provider versions) were developed with 5-point Likert scale and open-ended responses to questions measuring concerns about treatment management, safety, communication, and emotional stress.

The patient and provider surveys contained 15 and 13 Likert scale prompts respectively regarding the aforementioned topics; examples include "Cancer care was well planned and organized," "I felt safe coming to the clinic or hospital," and "I was afraid of getting infections like COVID-19." These prompts were contextualized to two settings, before the COVID-19 pandemic and during the COVID-19 pandemic. Open-ended questions included (Q1) "How has COVID-19 affected your life with respect to

your cancer diagnosis” and (Q2) “What has changed in your treatment and visits to the hospital?” for patients, and (Q3) “Do you look differently at your department and treatment facility?” and (Q4) “How has COVID-19 affected your life with respect to work?” for providers.

Demographics and clinical characteristics were also collected in the questionnaire. Patient factors included: sex, race, age, cancer type, cancer stage, cancer status, current cancer management phase, type of cancer treatment, and years since diagnosis. Provider factors included sex, race, age, occupation, training level, cancer specialty, and years of experience working in oncology.

The a priori hypothesis was that COVID-19 would influence patient and provider views on the hospital in terms of more negative clinic experiences, less attention from staff, and feeling less safe. Furthermore, it was hypothesized that patients would be worried less about their cancer and more about COVID-19 and its impact on their families.

### Statistical Analysis

For Likert-type quantitative data, Wilcoxon signed-rank test was used to analyze differences between before and during pandemic answers for providers and patients independently; Wilcoxon rank-sum test was used to compare provider and patient answers for similar questions. Remaining results were quantified using descriptive and stratified subgroup analyses;

subgroup analyses for determining risk factors for patient concern about cancer were performed with Wilcoxon signed-rank test for every patient factor listed in Table 1.

Qualitative data from open-ended responses were de-identified and analyzed using inductive thematic analysis. Initially, 25% of answers were randomly selected and open-coded by two independent researchers (OS and SVA), and a codebook was developed. Each open-ended response prompt (two patients, two providers) was analyzed separately by the two researchers (OS and SVA). An initial round of coding was conducted independently by both researchers to the complete dataset where some additional codes were added to the codebook. Two other rounds were performed by the researchers; in case of disagreement in code application, it was resolved by consensus or by third researchers (EV and CC). The coded data was then examined, and a list of central themes was extrapolated. Additionally, frequency application for every code was determined.

A *p*-value of  $\leq 0.05$  (2-sided) was considered significant. Statistical analyses were performed using STATA®, version 14.0 (StataCorp LP, College Station, TX, USA).

### Results

The survey was completed by 104 (69.3%) patients and 50 (50%) providers. Mean age of patients was 66.8 years, most

**Table 1** Patient demographics and characteristics for COVID-19 impact questionnaire

Demographics	Patients ( <i>n</i> = 104)	Demographics	Providers ( <i>n</i> = 50)
Age, mean (range)	66.8 (27–97)	Age, mean (range)	46.2 (23–69)
Sex, male	58 (55.8)	Sex, male	26 (52)
Race		Race	
White	86 (82.7)	White	33 (66)
Black/African American	9 (8.7)	Black/African American	3 (6)
Asian/Pacific Islander	3 (2.9)	Asian/Pacific Islander	8 (16)
Hispanic Latino	3 (2.9)	Hispanic Latino	3 (6)
5 most common cancers		Occupation	
Colorectal	19 (18.3)	Medical oncologist	13 (26)
Pancreatic	17 (16.3)	Surgical oncologist	6 (12)
Lung	11 (10.5)	Radiation oncologist	1 (2)
Lymphoma/leukemia or blood malignancies	10 (9.6)	Radiologist	4 (8)
Prostate	10 (9.6)	Pathologist	2 (4)
Stage		Resident/fellow	6 (12)
Early (Stage 1 & 2)	22 (21.2)	Nurse	9 (18)
Locally advanced (Stage 3)	30 (28.8)	Nurse practitioner/physician assistant	4 (8)
Metastatic (Stage 4)	43 (41.3)	6 most common cancer specialties	
Unsure	9 (8.7)	Lung	20 (40)
Current management		Bladder	16 (32)
Recently diagnosed	19 (18.3)	Prostate	15 (30)
Active therapy	72 (69.2)	Breast	14 (28)
Follow-up	13 (12.5)	Colorectal	14 (28)
Years since diagnosis		Pancreatic	13 (26)
<1 year	63 (60.6)	Years working in oncology	
1–3 years	23 (22.1)	<1 year	6 (12)
3–5 years	9 (8.7)	1–5 years	12 (24)
>5 years	9 (8.7)	5–10 years	8 (16)
		>10 years	24 (48)

were male (55.8%) and white (82.7%). Mean age of healthcare providers was 46.2 years; most were male (52%) and white (66%). Demographics for patients and providers are shown in Table 1.

### Patient Demographics and Likert Responses

The most common cancers observed were colorectal (19%), pancreatic (17%), and lung cancer (11%) with the majority having advanced stage (70.1%) and undergoing active treatment (69.2%). Responses to the surveys can be seen in Fig. 1 and Fig. 2. As seen in Table 2, of the 15 Likert-type questions, only concerns regarding patients’ susceptibility to infection were significantly different between before and during the COVID-19 pandemic, with increased concern during [ $z = 2.536, p = 0.011$ ]. No difference was seen in any other response, including how patients’ perceived cancer care planning, delays and ease of receiving therapy, staff focus and communication, and facility cleanliness and safety before and during COVID-19. Patients are more worried about their cancer during the COVID-19 pandemic compared to before COVID-19 [ $z = 4.572, p < 0.001$ ]. Risk factors for increased concern about their cancer included colorectal cancer diagnosis, white race, stages 3 and 4 disease, those receiving active treatment, and less than 1 year from diagnosis (Table 6).

### Provider Demographics and Likert Responses

The most common provider occupations were medical oncologists (26%), nurses (18%), surgical oncologists (12%), and residents/fellows (12%). Responses to the surveys can be seen in Fig. 3 and

Fig. 4. As seen in Table 3, of the 13 Likert-type questions, all responses demonstrated significant difference between before COVID-19 and during COVID-19 responses, including believing cancer care is more poorly planned [ $z = -3.857, p = <0.001$ ], not having enough protective personal equipment [ $z = -4.082, p < 0.001$ ], and increased concern about infecting family members with hospital acquired infection including COVID-19 [ $z = 4.965, p < 0.001$ ]. In addition, COVID-19 has caused providers to think that care is more difficult to modify [ $z = -4.051, p < 0.001$ ], to have poorer communication with patients and staff [ $z = -2.443, p = 0.015$ ], to feel less safe coming to clinic [ $z = -5.6, p < 0.001$ ], to think staff is less focused [ $z = 5.188, p < 0.001$ ], and to have less confidence in the hospital [ $z = -4.84, p < 0.001$ ].

### Subgroup Analysis and Comparison of Patient and Provider Responses

Subgroup analysis was conducted including stratification by time of survey completion (first half “early” vs second half “late”) and between physicians (MD/DO degree) and other hospital staff (non-MD/DO) in the provider responses. For context, the first and second half analyzed coincided with the rise/peak and slow decline of COVID-19 in Massachusetts respectively. For providers, comparing the early and late time period responders did not reveal any difference in response. However, for patients, late responders differed from early responders in having increased concern about infection susceptibility and decreased confidence in management and treatments plans (Tables 7, 8, 9, and 10).

Non-physician providers did not perceive cancer care planning, communication, staff focus, facility cleanliness, or PPE availability to be different before and during COVID-19,

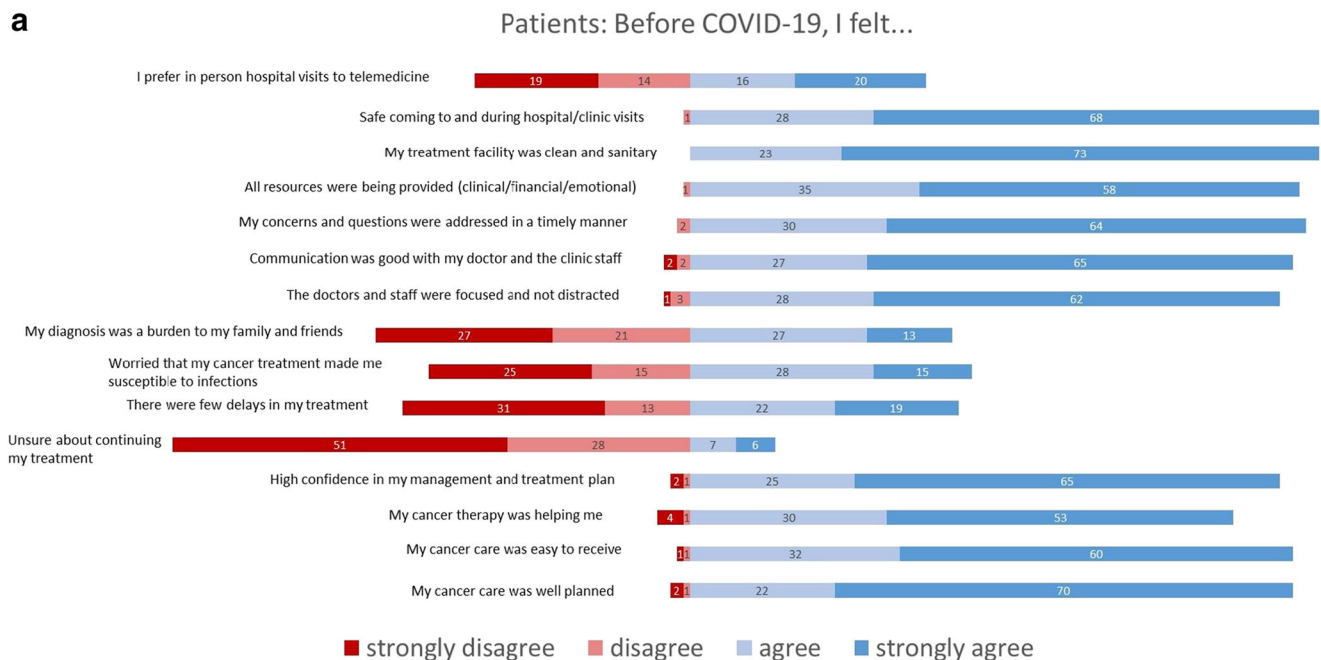
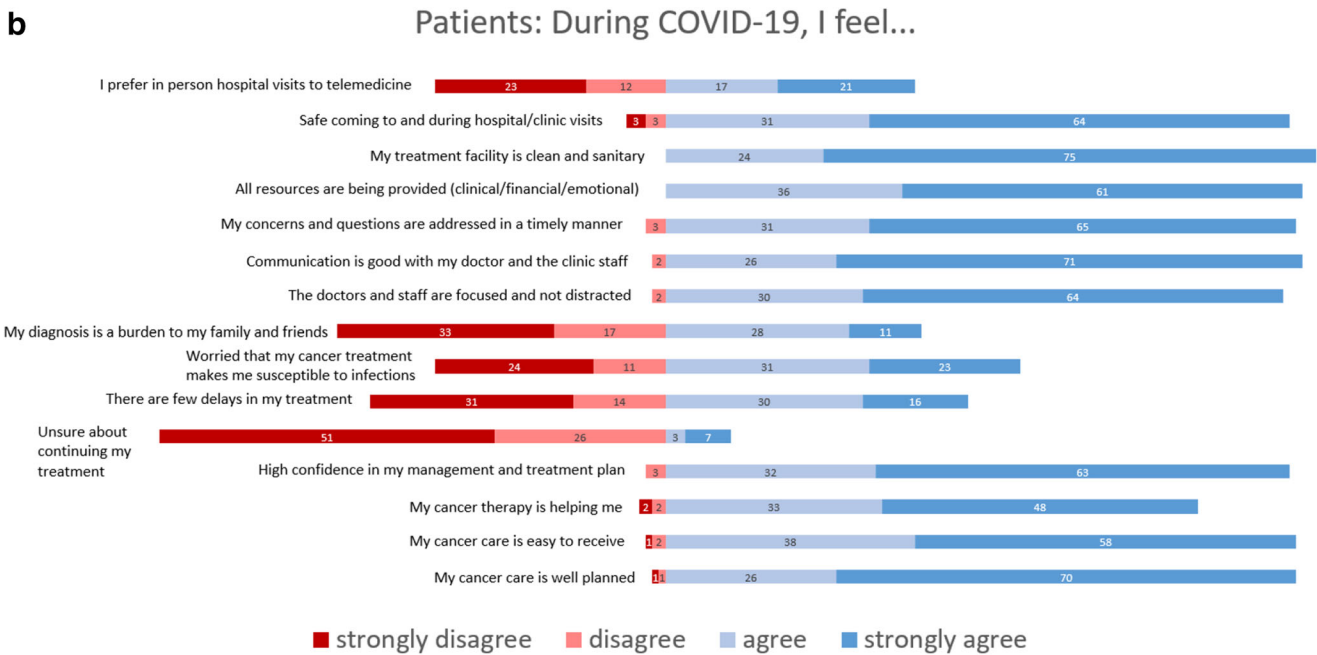


Fig. 1 Survey responses to Likert-type prompts for patients in the before COVID-19 setting



**Fig. 2** Survey responses to Likert-type prompts for patients in the during COVID-19 setting

whereas physicians strongly did. In this context, patients reported 1 of 15 (6.7%) care metrics to be impacted by COVID-19 compared to 8 of 13 (61.5%) in non-physician staff and 13 of 13 (100%) in physicians.

Patient and provider responses were compared in the before COVID-19 and during COVID-19 settings separately, as seen in Tables 4 and 5 respectively. Providers felt care planning and communication were worse than patient perception before COVID-19; patients were more worried about

contracting infection than providers were about themselves contracting infection before COVID 19. During COVID 19, providers feel less safe in the clinic, have more concern about cancer patients contracting infection, feel facilities are less sanitary, and have less confidence in the hospital compared to patients. In addition, providers now feel more concern about contracting COVID-19 themselves and, in addition, are more concerned for patients contracting infections including COVID-19 than patients themselves.

**Table 2** Patient responses to Likert-type prompts for COVID-19 impact questionnaire, before COVID-19 compared to during COVID-19 by Wilcoxon signed-rank test<sup>a</sup>

Questions	Before COVID		During COVID		z <sup>b</sup>	p
	Mean	Median	Mean	Median		
My cancer care was/is well-planned.	4.51	5	4.57	5	0.387	0.699
My cancer care was/is easy to receive.	4.43	5	4.44	5	0.255	0.798
My cancer therapy was/is helping me.	4.22	5	4.18	4	-1.363	0.173
I had/have high confidence in my management and treatment plan.	4.44	5	4.49	5	-0.543	0.587
I felt/feel unsure about continuing my treatment.	1.93	2	1.93	2	-0.009	0.993
There were/are few delays in my treatment.	2.86	3	2.87	3	-0.117	0.907
I was/am worried my cancer treatment makes me susceptible to infection.	2.93	3	3.17	4	2.536	<b>0.011</b>
My diagnosis was/is a burden to my family and friends.	2.79	3	2.68	3	-1.486	0.137
The doctors and staff were/are focused and not distracted.	4.41	5	4.5	5	-0.109	0.913
Communication was/is good with my doctor and clinic staff.	4.45	5	4.60	5	1.562	0.118
My concerns/questions were/are addressed in a timely manner.	4.49	5	4.52	5	0.290	0.772
All resources were/are being provided (clinical/financial/emotional).	4.44	5	4.52	5	0.379	0.705
My treatment facility was/is clean and sanitary.	4.63	5	4.67	5	0.621	0.535
I felt/feel safe coming to and during clinic/hospital visits.	4.57	5	4.44	5	-1.055	0.292
I preferred/prefer in-person hospital/clinic visits to telemedicine.	3.04	3	3.01	3	-0.071	0.944

Bold p-value = significant

<sup>a</sup> Likert-type question scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree; 104 patient responses to each question for both before and during COVID-19 scenarios

<sup>b</sup> Z-value: negative value indicates trend towards disagree; positive value indicates trend towards agree

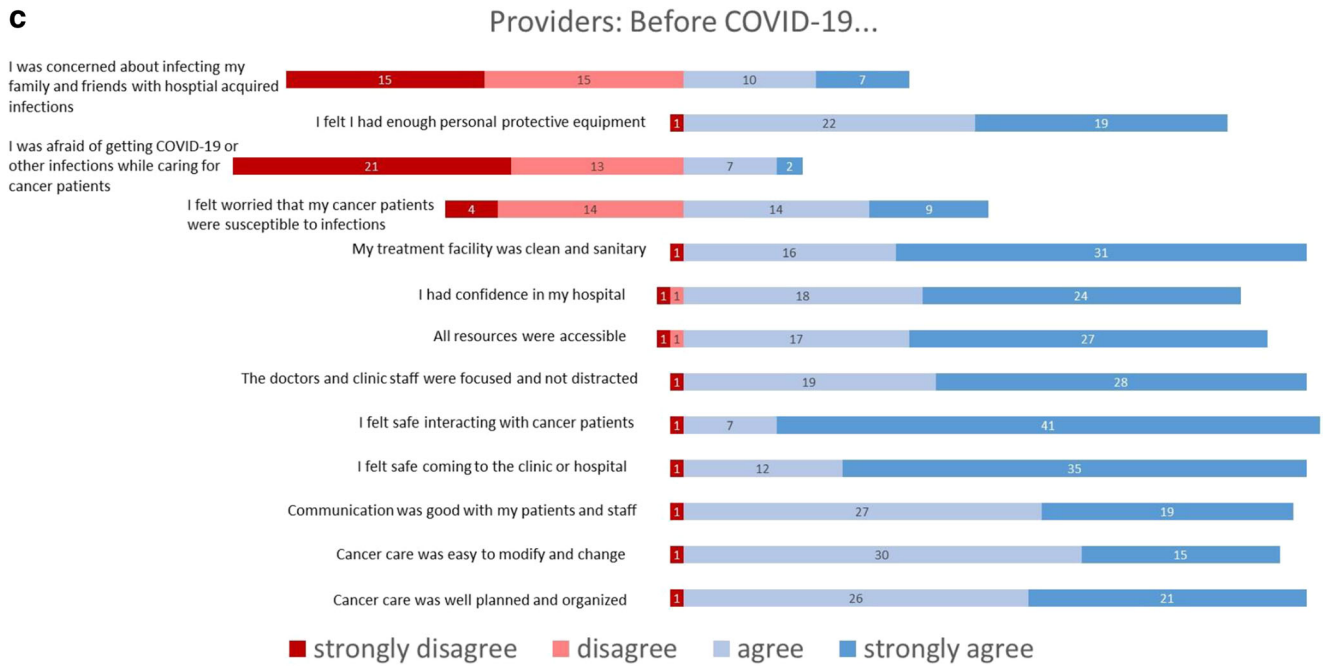


Fig. 3 Survey responses to Likert-type prompts for providers in the before COVID-19 setting

**Open-ended Response Thematic Analysis**

Open-ended responses were completed by 96 (92.3%) and 97 (93.3%) patients for Q1 and Q2 respectively; they were completed by 45 (90%) and 24 providers (48%) for Q3 and Q4 respectively. Coding and review of the open-ended responses yielded 8 major codes: mental/psychological stress, support (e.g., not allowed to have family come to clinic), hospital/clinic (e.g., restrictions, staff unfocused), social distancing, infection control (e.g., precautions,

PPE), personal health (e.g., cancer progression, COVID-19 infection), treatment plan (e.g., delays, changes to treatment, telehealth), and personal life (e.g., financial issues, work). The codes of support and social distancing were combined for provider analysis as they had significant overlap. Interobserver agreement after initial theme coding ranged from 67 to 85% across the 4 groups, and kappa values ranged from 0.62 to 0.796.

The thematic analysis is summarized in Supplementary Tables 1 and 2. The qualitative analysis of patient open-

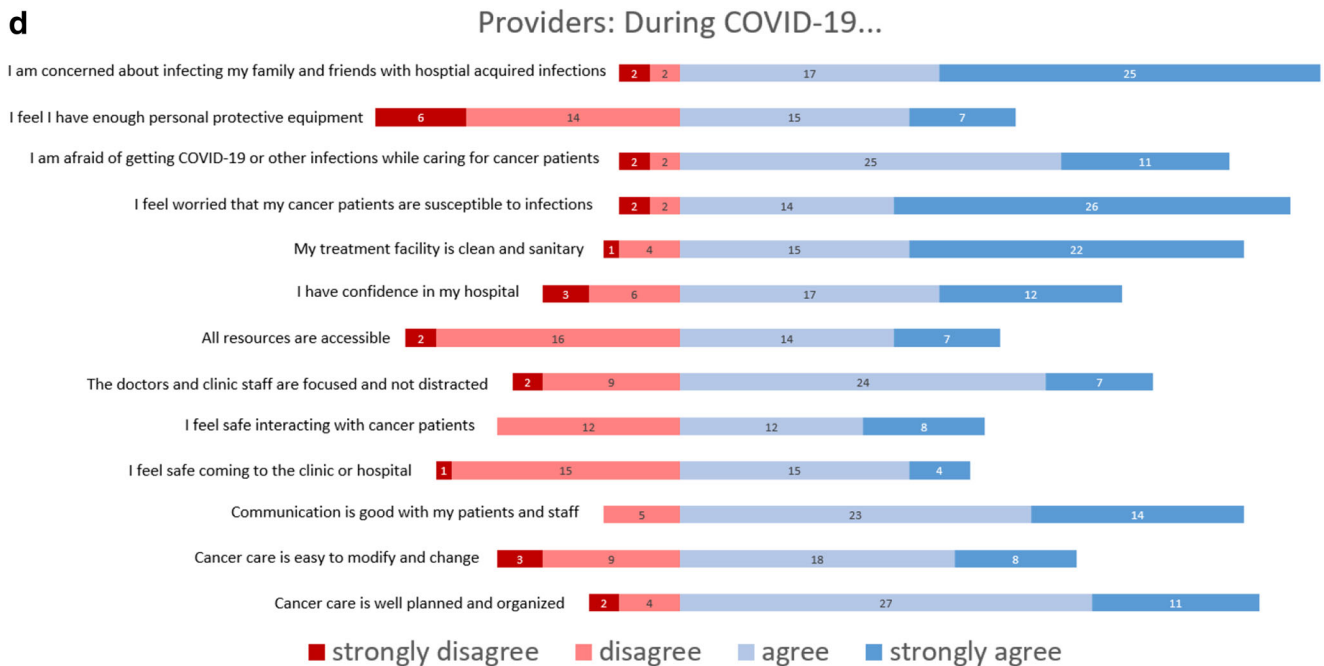


Fig. 4 Survey responses to Likert-type prompts for providers in the during COVID-19 setting

**Table 3** Provider responses to Likert-type prompts for COVID-19 impact questionnaire, before COVID-19 compared to during COVID-19 by Wilcoxon signed-rank test<sup>a</sup>

Questions	Before COVID		During COVID		z <sup>b</sup>	p
	Mean	Median	Mean	Median		
Cancer care was/is well-planned and organized.	4.35	4	3.84	4	-3.857	<b>&lt;0.001</b>
Cancer care was/is easy to modify and change.	4.18	4	3.39	4	-4.051	<0.001
Communication was/is good with my patients and clinic staff.	4.29	4	3.94	4	-2.443	<b>0.015</b>
I felt/feel safe coming to the clinic and hospital.	4.63	5	3.12	3	-5.600	<0.001
I felt/feel safe interacting with cancer patients.	4.78	5	3.33	3	-5.758	<0.001
The doctors and staff were/are focused and not distracted.	4.49	5	3.51	4	-5.188	<b>&lt;0.001</b>
All resources were/are accessible.	2.93	3	3.17	4	-5.447	<0.001
I had/have confidence in my hospital.	4.29	4	3.59	4	-4.84	<0.001
My treatment facility was/is clean and sanitary.	4.55	5	4.08	4	-3.258	<b>0.001</b>
I was/am worried my cancer treatment patients were/are susceptible to infection.	3.20	3	4.22	5	4.688	<0.001
I was/am afraid of getting COVID-19 or other infection while caring for cancer patients.	2.10	2	3.84	4	5.368	<0.001
I felt/feel I had/have enough personal protective equipment.	4.18	4	3.06	3	-4.082	<b>&lt;0.001</b>
I was/am concerned about infecting my family from hospital acquired infection.	2.57	2	4.24	5	4.965	<0.001

Bold p-value = significant only for MD providers (all p-values significant for MD, non-bold significant for both non-MD and MD)

<sup>a</sup> Likert-type question scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree; 50 provider responses to each question for both before and during COVID-19 scenarios

<sup>b</sup> Z-value: negative value indicates trend towards disagree; positive value indicates trend towards agree

ended responses revealed that 53% and 36% of patients were affected by COVID-19 in their personal lives and hospital experience respectively. The most common codes present in open-ended responses to Q1 were mental/psychological stress (23%), support (22%), and social distancing (20%); the most common codes for Q2 were support (21%), hospital/clinic (20%), and treatment plan (12%).

Provider open-ended responses demonstrated that 93% and 79% of providers were affected by COVID-19 in their work and in their view of the hospital respectively. The most common codes present in open-ended responses to Q3 were treatment plan (42%), mental/psychological stress (36%), and

hospital/clinic (33%); the most common codes for Q4 were hospital/clinic (42%), infection risk/personal health (21%), and infection control (17%).

The abovementioned codes were then combined into 2 central themes: impact on self, personal well-being, and life (theme 1) versus impact on cancer treatment, health, and hospital (theme 2). For all patient responses (Q1 and Q2 responses combined), themes 1 and 2 were present in ~38% of responses, whereas for provider responses (Q3 and Q4 combined), theme 1 and 2 were present in 20% and 78% of responses respectively (Supplementary Tables 1 and 2). This supports our quantitative data in that patients have moderate COVID-19 concern for both

**Table 4** Patient and provider responses to similar before COVID-19 Likert-type prompts, compared by Wilcoxon-Mann-Whitney rank-sum test

Questions	Z <sup>a</sup>	p
Cancer care was well-planned and organized.	2.211	<b>0.027</b>
I had confidence in the hospital, cancer plan, and management.	1.368	0.171
I was worried that cancer patients were susceptible to infection.	-1.118	0.263
The doctors and staff were focused and not distracted.	-0.167	0.867
Communication was good between patients and clinic staff.	2.129	<b>0.033</b>
All resources were accessible.	0.088	0.930
My treatment facility was clean and sanitary.	0.667	0.505
I was afraid of getting COVID-19 or other infection in the hospital.	3.382	<b>&lt;0.001</b>
I felt safe coming to the clinic and hospital.	-0.810	0.418

Bold p-value = significant

<sup>a</sup> Z-value: negative value indicates providers agreed more with question than patients; positive value indicates providers disagreed more with question than patients

**Table 5** Patient and provider responses to similar during COVID-19 Likert-type prompts, compared by Wilcoxon-Mann-Whitney rank-sum test

Questions	Z <sup>a</sup>	p
Cancer care is well-planned and organized.	5.171	<0.001
I have confidence in the hospital, cancer plan, and management.	5.003	<0.001
I am worried that cancer patients are susceptible to infection.	-4.327	<0.001
The doctors and staff are focused and not distracted.	5.892	<0.001
Communication is good between patients and clinic staff.	4.791	<0.001
All resources are accessible.	6.892	<0.001
My treatment facility is clean and sanitary.	3.723	<0.001
I am afraid of getting COVID-19 or other infection in the hospital.	-2.321	0.020
I feel safe coming to the clinic and hospital.	7.155	<0.001

Bold *p*-value = significant

<sup>a</sup> Z-value: negative value indicates providers agreed more with question than patients; positive value indicates providers disagreed more with question than patients

personal and health issues equally, while providers have low concern for personal issues and high concern for hospital and patient care issues. The most impactful open-ended responses are summarized in Supplementary Table 3.

## Discussion

In this study, cancer patients had more difficulty coping with their cancer diagnosis during the COVID-19 pandemic but did not perceive significant differences in their cancer treatment. This starkly contrasts oncology providers, especially physicians, who had major concerns regarding their ability to provide optimal cancer care; they felt unprepared independent of practice setting and had significant concerns regarding both hospital infrastructure and personal safety. To our knowledge, this study is the first cross-sectional survey in both oncology patients and providers to comparatively assess the impact of the COVID-19 pandemic.

The COVID-19 pandemic has led to increased depression and anxiety in cancer patients, with many needing increased mental support.<sup>8</sup> Those undergoing active cancer therapy have been more likely to report significant concerns about acquiring COVID-19.<sup>9</sup> Similarly, in this study, some patients reported more difficulty coping with their cancer diagnosis and had increased worry about infection during COVID-19, with active cancer therapy, advanced cancer stages, and recent cancer diagnosis as risk factors for increased concern. Additionally, patients' most commonly perceived delays were in chemotherapy infusions, appointments, and imaging.<sup>9</sup> However, the vast majority of patients in this study remained confident in their treatment plan, had good communication with their providers, and did not perceive significant differences in care delays during the pandemic; the significance of these findings may be that patient triaging and less patient volume has helped providers care efficiently for those still coming to clinics.

Open-ended responses from patients revolved around several similar ideas to above, such as social distancing, infectious risk, and emotional stress. This is evident in reports of having to “go to all appointments alone” due to hospital-mandated social distancing restrictions, feeling concerned that they will not “get some

good times with family and friends” before they succumb to their disease, feeling “nervous about getting COVID-19 because I will have a tougher time fighting it,” and reporting “I feel defeated, like I am in a losing battle and at times second guessing whether or not I should even remove my tumor during a pandemic.” In addition, social distancing has had a synergistic effect on stress, as patients reported lack of emotional support from family and healthcare providers due to social distancing while undergoing cancer care. These findings suggest that cancer patients already struggling with their cancer diagnosis, particularly new diagnoses and those with advanced stage disease, are at an increased need for emotional support independent of their confidence in their cancer care.

The most common COVID-19-related concerns for healthcare providers include shortage of PPE, and personal risk of contracting COVID-19 and transmitting it to their patients/families.<sup>10,11</sup> In this study, providers had similar concerns and additionally felt cancer care was difficult to plan, modify, and communicate. Studies show unprecedented challenges to professional and personal life put healthcare providers at greater risk of depression and anxiety during the COVID-19 crisis.<sup>12</sup> Oncologists have experienced anxiety, depression, or hopelessness during the COVID-19 pandemic.<sup>4</sup> Interestingly, perception of PPE availability was associated with reduced anxiety and depression.<sup>13</sup> This may indicate that personal and patient safety is central to provider attitudes concerning the pandemic. As hospitals strain to provide resources/PPE and providers recognize these infrastructural inadequacies, providers' concerns for both safety and adequate care result in provider burnout. This is supported by the qualitative data reported here: providers reported they are “pressed to re-use PPE”; they are “concerned for patients and hope they feel taken care of and unafraid,” feel the “care process has slowed considerably... social distancing is hard when patient are emotional and need your time and presence,” and now need to “risk-stratify cancer”; thus, equal care to all patients was felt to be unachievable. Thus, providing optimal care and patient/personal safety seem to be conflicting and magnify provider stress more than each factor would by itself.

In subgroup analysis, COVID-19 had a higher impact on physicians compared to non-MD oncology providers.



Furthermore, this study found that there is a hierarchy-dependent (i.e., patient → nurse/nurse practitioner/physician assistant → physician) correlation of the negative perception of the COVID-19 pandemic on care.

Several oncology societies including American Society of Clinical Oncology (ASCO), National Comprehensive Cancer Network, and American Society of Hematology have developed COVID-19 specific guidelines to help healthcare workers overcome the negative impact of the pandemic.<sup>14,15</sup> The European Society of Medical Oncology also created a brief guide for cancer patients.<sup>16</sup> ASCO stresses the importance of continuing patient support services, providing remote access resources, and educating patients on the health and safety measures at every visit.<sup>14</sup> In addition to these recommendations, based on this study, we suggest specifically (1) maintaining good patient-provider communication, (2) providing information about infection risk-reduction strategies during COVID-19, and (3) providing cancer-coping strategies through online tools and/or telehealth visits (e.g., social worker, psychologist, palliative care, chaplain) for cancer-related stress and symptom management, targeting high-risk groups such as advanced stage, new diagnosis, and active therapy.

Additionally, the impact of COVID-19 on healthcare providers suggests a need for specifically targeted interventions to decrease the risk of provider burnout. Based on the data shown here, we recommend (1) developing institution-specific infection-control guidelines for both inpatient and outpatient settings, (2) patient triage guidelines based on oncologic disease severity, overall survival, and quality of life, (3) strategies to resume cancer therapy safely for COVID-19-positive patients, (4) treatment guidelines for dose modifications and switching intravenous to oral therapies, (5) multidisciplinary meetings via virtual conferencing to discuss patient cancer care, and (6) provider advocacy with outreach programs, mental health solutions, and coping strategies to prevent burnout, targeting those at most risk (physicians).

This analysis has some limitations to consider. First, sampling bias may exist. Most patients who completed the survey had advanced disease and/or were undergoing active cancer treatment. Therefore, patients with less severe disease and long-term follow-up were underrepresented. Nonetheless, this study aimed at investigating COVID-19's effect on the active treatment setting. Second, non-responder bias may exist; patients with poor performance status, disease progression, or those emotionally overwhelmed may have been unable or unwilling to participate. However, a relatively high patient response rate was achieved suggesting a representative sample. Only 50% of healthcare providers participated in the survey. A potential reason for survey non-completion could be provider burnout and fatigue during the COVID-19 pandemic. This may lead to underestimating the already significant negative effect of COVID-19 on burnout. Third, recall bias can impact the results. Given that all surveys were distributed and completed during the pandemic, no true pre-pandemic survey or evaluation of perception exists for either

patients or providers, solely relying on the memory of the healthcare and hospital infrastructure from a few weeks/months prior. Therefore, recall bias may have contributed to confounding. While it would be ideal to have a pre- versus during versus post-pandemic survey structure, given the unexpected nature of a pandemic, unfortunately, it was impossible to predict such an event to prepare surveys to be given in the pre-pandemic setting. Therefore, to minimize confounding due to recall bias patient, the survey was administered just after the pandemic had started. In this context, the timeframe of this study captures the early pandemic response of the first wave and is reflective of the sentiments from March to June 2020. This accounts for the first wave of COVID-19 with the unprecedented active implementation period of state-level and hospital-level containment measures. Continued assessment of evolving patient and provider perceptions with serial surveys during and eventually post-pandemic may be an area of future research.

## Conclusion

The data shown here suggests that emotional support infrastructure for cancer patients regarding their cancer diagnosis is needed in addition to minimizing infectious risks surrounding COVID-19. This is contrasted by the bleak assessment of providers regarding effectiveness of providing cancer treatment and concerns for their personal safety. These concerns strongly suggest the need for novel, targeted interventions to combat provider burnout.

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Sylvia V. Alarcon, MD: Conception/design of the work, data collection, data analysis/interpretation, drafting article, revision of article, and final approval

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## Declarations

**Conflict of Interest** The authors declare no competing interests.

## Appendix

**Table 6** Subgroup analysis of patient factors for increased concern about cancer during COVID-19 pandemic by Wilcoxon signed-rank test<sup>a</sup>

Patient factors	Before COVID		During COVID		$z^b$	$p$
	Mean	Median	Mean	Median		
Males only	5.5	5.5	6.3	6.5	3.188	<b>0.001</b>
Females only	5.4	5	5.8	5.5	3.296	<b>0.001</b>
Colorectal cancer patients	5.6	5	6.6	8	2.078	<b>0.038</b>
Pancreatic cancer patients	6.9	7	7.4	9	1.711	0.087
Lung cancer patients	5.4	4	5.4	5	0.816	0.414
White patients	5.2	5	5.9	6	4.613	<b>&lt;0.001</b>
Black patients	5.9	5	5.8	7	0.431	0.666
Stage 1–2 cancer	4.6	5	5.4	5.5	1.838	0.066
Stage 3 cancer	5.8	6.5	6.2	7	2.125	<b>0.034</b>
Stage 4 cancer	5.8	5	6.4	6	3.236	<b>0.001</b>
Recently diagnosed	6.2	7	6.6	8	1.033	0.302
Active treatment	5.5	5	6.3	7	4.991	<b>&lt;0.001</b>
Follow-up only	4.1	4	3.5	2	−0.090	0.930
<1 year since diagnosis	6	7	6.7	7	3.750	<b>&lt;0.001</b>
1–3 years since diagnosis	4.5	5	4.7	5	1.440	0.150
3–5 years since diagnosis	4.7	5	5.3	5	1.987	<b>0.047</b>
>5 years since diagnosis	4.3	4.5	4.9	5	1.411	0.160

Bold  $p$ -value = significant

<sup>a</sup> Scale 1–10, 1 = lowest concern, 10 = highest concern

<sup>b</sup>  $Z$ -value: negative value indicates trend towards less concern; positive value indicates trend towards more concern

**Table 7** First half of patient responses (early timeframe) to Likert-type prompts, before COVID-19 compared to during COVID-19 by Wilcoxon signed-rank test<sup>a</sup>

Questions	Before COVID		During COVID		$z^b$	$p$
	Mean	Median	Mean	Median		
My cancer care was/is well-planned.	4.4	5	4.6	5	1.665	0.096
My cancer care was/is easy to receive.	4	4.4	4.5	5	1.630	0.103
My cancer therapy was/is helping me.	4.1	4	4.2	4	−0.205	0.838
I had/have high confidence in my management and treatment plan.	4.4	5	4.6	5	1.349	0.177
I felt/feel unsure about continuing my treatment.	2.1	2	2	1.5	−1.030	0.303
There were/are few delays in my treatment.	3.1	3	3	3	−0.385	0.700
I was/am worried my cancer treatment makes me susceptible to infection.	3.3	3	3.5	4	1.024	0.306
My diagnosis was/is a burden to my family and friends.	2.8	3	2.8	3	−0.612	0.541
The doctors and staff were/are focused and not distracted.	4.3	5	4.5	5	0.493	0.622
Communication was/is good with my doctor and clinic staff.	4.3	5	4.6	5	1.500	0.134
My concerns/questions were/are addressed in a timely manner.	4.5	5	4.6	5	1.082	0.279
All resources were/are being provided (clinical/financial/emotional).	4.4	5	4.4	5	1.103	0.270
My treatment facility was/is clean and sanitary	4.5	5	4.7	5	0.980	0.327
I felt/feel safe coming to and during clinic/hospital visits.	4.5	5	4.5	5	−0.277	0.782
I preferred/prefer in-person hospital/clinic visits to telemedicine.	3.3	3	3.4	3	0.265	0.791

Bold  $p$ -value = significant

<sup>a</sup> Likert-type question scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree

<sup>b</sup>  $Z$ -value: negative value indicates trend towards disagree; positive value indicates trend towards agree

**Table 8** Second half of patient responses (late timeframe) to Likert-type prompts, before COVID-19 compared to during COVID-19 by Wilcoxon signed-rank test<sup>a</sup>

Questions	Before COVID		During COVID		z <sup>b</sup>	p
	Mean	Median	Mean	Median		
My cancer care was/is well-planned.	4.6	5	4.6	5	-1.732	0.083
My cancer care was/is easy to receive.	4.5	5	4.4	5	-1.633	0.103
My cancer therapy was/is helping me.	4.3	5	4.2	4	-1.912	0.056
I had/have high confidence in my management and treatment plan.	4.5	5	4.4	5	-2.333	<b>0.020</b>
I felt/feel unsure about continuing my treatment.	1.8	1	1.9	2	1.376	0.169
There were/are few delays in my treatment.	2.7	2	2.8	3	0.185	0.854
I was/am worried my cancer treatment makes me susceptible to infection.	2.6	2	2.8	3	2.694	<b>0.007</b>
My diagnosis was/is a burden to my family and friends.	2.7	3	2.6	2	-1.624	0.104
The doctors and staff were/are focused and not distracted.	4.5	5	4.5	5	-0.970	0.332
Communication was/is good with my doctor and clinic staff.	4.6	5	4.6	5	0.577	0.564
My concerns/questions were/are addressed in a timely manner.	4.5	5	4.4	5	-0.849	0.396
All resources were/are being provided (clinical/financial/emotional).	4.5	5	4.6	54.6	-0.970	0.332
My treatment facility was/is clean and sanitary.	4.7	5	4.7	5	-1.000	0.317
I felt/feel safe coming to and during clinic/hospital visits.	4.6	5	4.4	5	-1.227	0.220
I preferred/prefer in-person hospital/clinic visits to telemedicine.	2.8	3	2.6	3	-0.416	0.677

Bold p-value = significant

<sup>a</sup> Likert-type question scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree

<sup>b</sup> Z-value: negative value indicates trend towards disagree; positive value indicates trend towards agree

**Table 9** First half of provider responses (early timeframe) to Likert-type prompts, before COVID-19 compared to during COVID-19 by Wilcoxon signed-rank test<sup>a</sup>

Questions	Before COVID		During COVID		z <sup>b</sup>	p
	Mean	Median	Mean	Median		
Cancer care was/is well-planned and organized.	4.2	4	3.6	4	-2.981	<b>0.003</b>
Cancer care was/is easy to modify and change.	4.1	4	3.2	4	-3.282	<b>0.001</b>
Communication was/is good with my patients and clinic staff.	4.3	4	3.9	4	-1.582	0.114
I felt/feel safe coming to the clinic and hospital.	4.6	5	2.8	3	-4.008	<b>&lt;0.001</b>
I felt/feel safe interacting with cancer patients.	4.7	5	3.1	3	-4.121	<b>&lt;0.001</b>
The doctors and staff were/are focused and not distracted.	4.4	5	3.3	4	-3.628	<b>&lt;0.001</b>
All resources were/are accessible.	4.4	5	2.9	3	-3.950	<b>&lt;0.001</b>
I had/have confidence in my hospital.	4.1	4	3.2	4	-3.673	<b>&lt;0.001</b>
My treatment facility was/is clean and sanitary.	4.4	5	3.8	4	-2.458	<b>0.014</b>
I was/am worried my cancer treatment patients were/are susceptible to infection.	3.2	4	4.4	5	3.533	<b>&lt;0.001</b>
I was/am afraid of getting COVID-19 or other infection while caring for cancer patients.	2.2	2	4.1	4	4.124	<b>&lt;0.001</b>
I felt/feel I had/have enough personal protective equipment.	4	4	2.8	2	-3.218	<b>0.001</b>
I was/am concerned about infecting my family from hospital acquired infection.	2.5	2	4.4	5	3.567	<b>&lt;0.001</b>

Bold p-value = significant

<sup>a</sup> Likert-type question scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree

<sup>b</sup> Z-value: negative value indicates trend towards disagree; positive value indicates trend towards agree

**Table 10** Second half of provider responses (late timeframe) to Likert-type prompts, before COVID-19 compared to during COVID-19 by Wilcoxon signed-rank test<sup>a</sup>

Questions	Before COVID		During COVID		$z^b$	$p$
	Mean	Median	Mean	Median		
Cancer care was/is well-planned and organized.	4.5	4	4.1	4	-2.444	<b>0.015</b>
Cancer care was/is easy to modify and change.	4.3	4	3.5	4	-2.461	<b>0.014</b>
Communication was/is good with my patients and clinic staff.	4.3	4	4	4	-1.924	0.054
I felt/feel safe coming to the clinic and hospital.	4.7	5	3.5	4	-4.005	<b>&lt;0.001</b>
I felt/feel safe interacting with cancer patients.	4.9	5	3.5	3	-4.051	<b>&lt;0.001</b>
The doctors and staff were/are focused and not distracted.	4.6	5	3.8	4	-3.725	<b>&lt;0.001</b>
All resources were/are accessible.	4.4	5	3.4	4	-3.775	<b>&lt;0.001</b>
I had/have confidence in my hospital.	4.5	5	4	4	-3.146	<b>0.002</b>
My treatment facility was/is clean and sanitary.	4.7	5	4.3	5	-2.163	<b>0.031</b>
I was/am worried my cancer treatment patients were/are susceptible to infection.	3.2	3	4.1	4	3.088	<b>0.002</b>
I was/am afraid of getting COVID-19 or other infection while caring for cancer patients.	2	2	3.6	4	3.485	<b>0.001</b>
I felt/feel I had/have enough personal protective equipment.	4.4	4	3.3	4	-2.518	<b>0.012</b>
I was/am concerned about infecting my family from hospital acquired infection.	2.6	2	4.1	4	3.478	<b>0.001</b>

Bold  $p$ -value = significant

<sup>a</sup> Likert-type question scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree

<sup>b</sup> Z-value: negative value indicates trend towards disagree; positive value indicates trend towards agree

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