Telemedicine Adoption in an NCI-Designated Cancer Center During the COVID-19 Pandemic: A Report on Patient Experience of Care

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ABSTRACT

Background: Patients with cancer require timely access to care so that healthcare providers can prepare an optimal treatment plan with significant implications for quality of life and mortality. The COVID-19 pandemic spurred rapid adoption of telemedicine in oncology, but study of patient experience of care with telemedicine in this population has been limited. We assessed overall patient experience of care with telemedicine at an NCI-designated Comprehensive Cancer Center during the COVID-19 pandemic and examined changes in patient experience over time. **Patients and Methods:** This was a retrospective study of outpatient oncology patients who received treatment at Moffitt Cancer Center. Press Ganey surveys were used to assess patient experience. Data from patients with appointments between April 1, 2020, and June 30, 2021, were analyzed. Patient experience was compared between telemedicine and in-person visits, and patient experience with telemedicine over time was described. **Results:** A total of 33,318 patients reported Press Ganey data for in-person visits, and 5,950 reported Press Ganey data for telemedicine visits. Relative to patients with in-person visits, more patients with telemedicine visits gave higher satisfaction ratings for access (62.5% vs 75.8%, respectively) and care provider concern (84.2% vs 90.7%, respectively) ($P<.001$). When adjusted for age, race/ethnicity, sex, insurance, and clinic type, telemedicine visits consistently outperformed in-person visits over time regarding access and care provider concern ($P<.001$). There were no significant changes over time in satisfaction with telemedicine visits regarding access, care provider concern, telemedicine technology, or overall assessment ($P>.05$). **Conclusions:** In this study, a large oncology dataset showed that telemedicine resulted in better patient experience of care in terms of access and care provider concern compared with in-person visits. Patient experience of care with telemedicine visits did not change over time, suggesting that implementing telemedicine was effective.

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Background

The onset of the COVID-19 pandemic presented a significant challenge in delivering timely and value-based care to patients with cancer. Patients with cancer are at increased risk for COVID-19–related morbidity and mortality[1]; thus, to minimize risk of COVID-19 exposure among these patients, many healthcare systems were forced to rapidly adopt models for delivering telemedicine visits across the cancer continuum (eg, screening, diagnosis, treatment, and survivorship).[2,3] Before the COVID-19 pandemic, telemedicine was not commonly used to deliver cancer care. As we continue to navigate the COVID-19 pandemic and consider the likelihood of future pandemics, telemedicine will continue to be an integral part of cancer care delivery.[4–7]

The Department of Virtual Health was established within Moffitt Cancer Center (MCC) early in the pandemic in response to cancer center restrictions that forced a dramatic shift in cancer care delivery. This allowed for a coordinated and sustained effort to support implementation of telemedicine through the cancer center. Prior studies suggest that patients were highly satisfied with telemedicine during the COVID-19 pandemic across a wide range of specialties,[8–11] and studies have assessed clinicians' experiences with rapid teleoncology delivery.[12] However, there has been limited study of the experiences with teleoncology

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among patients with cancer, given that telemedicine uptake has historically been limited.[13–16] Moreover, the prior studies focusing on oncology have been snapshots of patient experience of care (PEC) early in the pandemic. The current study sought to address these limitations by assessing the experience with telemedicine and in-person visits among individuals with cancer using Press Ganey outpatient and telemedicine surveys of patients seen at an NCI-designated Comprehensive Cancer Center, MCC, from April 2020 to June 2021, during the COVID-19 pandemic. Information from this study may inform future interventions aimed at improving teleoncology delivery.

Patients and Methods

Design and Participants

This was a retrospective study of patients seen at MCC. Starting in April 2020, MCC instituted a synchronous video telemedicine platform (Zoom) for outpatient telemedicine visits. All patients were offered telemedicine if deemed appropriate by the clinical team. Telemedicine visits were not offered to patients who needed physical examinations beyond what can be assessed during a telemedicine visit. Patients who presented in person for chemotherapy infusion and/or radiation treatment were excluded from the analysis. This study was deemed exempt from Institutional Review Board review with a waiver of informed consent from patients under protocol MCC 21557.

Instrument and Survey Administration

The Press Ganey (www.pressganey.com) Outpatient Medical Practice Survey and Telemedicine Survey were used to assess PEC for in-person and telemedicine visits. The survey data were obtained from patient visits at MCC between April 1, 2020, and June 30, 2021. The data contained deidentified patient-level data with the following variables: date of survey, visit type, clinic type, age, gender, insurance, first visit (yes vs no), and Press Ganey PEC scores. Patients were asked to rate each question (listed in eAppendices 1 and 2, available with this article at JNCCN.org) on a scale from 1 to 5 (1 = very poor; 2 = poor; 3 = fair; 4 = good; 5 = very good). Visit type was defined as the following: new patients were completely new to MCC, established patients had received care at MCC previously but were referred to a new subspecialty for consultation, and follow-up patients were being seen for follow-up care by providers within the same subspecialty. Clinic type was defined as the disease site clinic where the patients were seen. Press Ganey sent the surveys to patients 2 to 3 days after they completed their in-person or telemedicine visit. All new/established patients with a valid mobile telephone number or an email address were eligible to receive the surveys, and then were eligible to receive the same survey type once every 60 days. Patients were first contacted via text; if they did not complete the survey, they received an email 2 days later. If they did not complete the survey after 5 days from that email, they received a second email, which was the final attempt to request they complete the survey.

To assess the differences in PEC between telemedicine and in-person visits, select questions were used in the access and care provider categories as surrogates for patient experience (see eAppendix 1, available with this article at JNCCN.org). To compare PEC with telemedicine visits versus in-person visits, we divided the study period into 4 time intervals (April 1, 2020–June 30, 2020; July 1, 2020–October 31, 2020; November 1, 2020–February 28, 2021; March 1, 2021–June 30, 2021). PEC with telemedicine visits over time was also assessed (see eAppendix 2 for questions) by dividing the study period into the same 4 time intervals.

Statistical Analyses

Patient characteristics were summarized using descriptive statistics, including median and range for continuous measures and proportions and frequencies for categorical measures. Associations between continuous variables and patient groups were assessed using the Wilcoxon test. Associations between categorical variables and 2 endpoints were evaluated using chi-square or Fisher exact tests. To compare PEC between telemedicine and in-person visits for access and care provider concern categories in the Press Ganey survey, mean score for each category from the survey questions was calculated and comparisons were based on dichotomized score (5 vs < 5). To facilitate comparisons between the in-person visits and telemedicine across different settings, the estimated marginal means (EMMs) of survey outcomes (such as access, care provider concern, telemedicine technology, and overall assessment) were estimated using the R package version 1.8.2 "emmeans" (R Foundation for Statistical Computing). The covariates adjusted in estimating EMMs include age, sex, race/ethnicity, insurance, clinic type, and visit type. Pairwise comparisons of EMMs were performed between telemedicine and in-person visits at each time interval, as well as between the adjusted scores over time for each category. Tukey's multiple comparisons were used for adjusting multiple pairwise comparison between groups. All statistical associations were evaluated at a significance level of $P<.05$. R was used for statistical analysis (R Foundation for Statistical Computing).

Results

Patient Characteristics

A total of 540,184 patients were seen in the outpatient clinical setting for in-person visits, and 50,945 patients were seen for telemedicine visits from April 1, 2020, to June 30, 2021. Press Ganey survey response data were

available for 33,318 in-person visits and 5,950 telemedicine visits (eAppendix 3).

Table 1 shows respondent characteristics and group differences between patients who had telemedicine versus in-person visits (eAppendix 3). Survey response rates were 20.3% for in-person visits versus 25.9% for telemedicine visits. Statistically significant differences between groups were noted in the following categories: a higher percentage of females in the telemedicine group (50.2%) and a higher percentage of males in the in-person group (51.6%); a higher percentage of white non-Hispanic patients in the telemedicine group versus the in-person group (85.4% vs 82.6%, respectively); a higher percentage of Medicare patients in the telemedicine group (65.6% vs 63.2%); and a higher percentage of follow-up patients in the telemedicine group (78.7% vs 66.6%). Differences were also noted in the percentage of patient visits in the breast, cutaneous, and endocrine clinics between in-person and telemedicine groups.

PEC With Access and Care Provider Concern

Press Ganey scores were compared between telemedicine versus in-person visits for 2 categories: access and care provider concern (eAppendix 4, Figure 1). Compared with in-person visits, telemedicine visits were associated with better experience of care regarding both access (62.5% vs 75.8%; $P<.001$) and care provider concern (84.2% vs 90.7%; $P<.001$), respectively.

PEC Over Time

Experience of care scores were compared between telemedicine and in-person visits over each time interval (April–June 30, 2020; July 1–October 30, 2020; November 1, 2020–February 28, 2021; March 1–June 30, 2021). Mean scores were adjusted for age, sex, race/ethnicity, insurance, clinic type, and visit type (eAppendix 5, Figure 2). For the access category, telemedicine consistently outperformed in-person visits throughout all 4 time intervals (adjusted mean scores ranging from 4.64–4.66 across time intervals for in-person vs 4.71–4.73 for telemedicine visits; $P<.001$). When the patients were asked to rate about care provider concern, telemedicine once again consistently outperformed in-person visits across all 4 time intervals (adjusted mean scores ranging from 4.70–4.78 across time intervals for in-person vs 4.85–4.86 for telemedicine visits; $P<.001$).

Adjusted mean scores for telemedicine visits for access, care provider concern, telemedicine technology, and overall assessment scores were then compared between the 4 intervals (eAppendices 6 and 7, Figure 3). For all categories, no statistically significant differences (eAppendix 8) were seen between each of the time intervals, suggesting that the telemedicine experience was consistent across different time intervals.

Table 1. Patient Visit Characteristics

Characteristic	In-Person n (%)	Telemedicine n (%)	*P* Value
Total patient visits	540,184	50,945	
Surveys sent out	163,850	22,988	
Respondents	33,318 (20.3)	5,950 (25.9)	
Median age (range), y	68.0 (18.0–101)	69.0 (18.0–98.0)	<.001
Sex			<.05
Female	16,136 (48.4)	2,987 (50.2)	
Male	17,179 (51.6)	2,963 (49.8)	
Race/Ethnicity			<.001
White non-Hispanic	27,514 (82.6)	4,772 (85.4)	
White Hispanic	1,550 (4.65)	217 (3.88)	
Black	1,574 (4.72)	222 (3.97)	
Other	2,679 (8.04)	380 (6.80)	
Insurance			<.001
Private	10,011 (30.0)	1,727 (29.0)	
Medicare	21,065 (63.2)	3,905 (65.6)	
Medicaid	463 (1.39)	56 (0.94)	
Other	1,779 (5.34)	262 (4.40)	
Visit type			<.001
NP/EP	9,209 (27.63)	1,225 (21.3)	
FU	22,200 (66.6)	4,680 (78.7)	
Clinic type			>.05
Blood and marrow transplant	683 (2.05)	199 (3.34)	
Breast	4,420 (13.3)	330 (5.55)	
Cutaneous	4,299 (12.9)	145 (2.44)	
Endocrine	1,211 (3.63)	411 (6.91)	
Gastroenterology	3,701 (11.1)	660 (11.1)	
Genitourinary	4,344 (13.0)	794 (13.3)	
Hematology	5,434 (16.3)	894 (15.0)	
Radiation therapy	3,788 (11.4)	572 (9.61)	
Sarcoma	1,322 (3.97)	250 (4.20)	
Thoracic	2,274 (6.83)	431 (7.24)	
Other	1,842 (5.53)	1,264 (21.23)	

Abbreviations: EP, existing patients; FU, follow-up patients; NP, new patients.

Discussion

Telemedicine has now been established as an essential component of care delivery, and thus, it is important to assess patients' experience with the care they receive through teleoncology to ensure value-based care is delivered. The current study draws on the experience reported by almost 6,000 oncology patients who completed telemedicine visits—a large cohort for measuring patient experience of care over time with telemedicine—and contrasted their

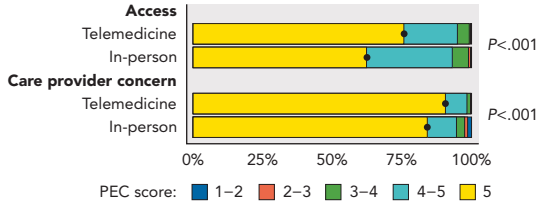

Figure 1. Patient experience with access and care provider concerns with telemedicine consultation over the study period of April 1, 2020, through June 30, 2021. Patient experience for access and care provider concern with telemedicine consistently outranked in-person visits (*P* value represents proportional differences in patients who rated 5 for each category).
Abbreviation: PEC, patient experience of care.

experiences with those who completed in-person visits, as measured by the Press Ganey survey results. In this study, patients reported consistently better experience of care scores with telemedicine compared with in-person visits over the entire study period, both in access and with care provider concern. Although results were statistically significant for both categories, the actual differences were relatively modest given the large sample size. Although previous studies have compared PEC with telemedicine, the current study additionally assessed telemedicine experience of care over time and showed that results did not differ over time, suggesting that telemedicine implementation was excellent and is sustainable.

At MCC, telemedicine usage includes virtual visits (ie, videoconferencing) between providers and patients in oncology. Telemedicine was used throughout the cancer care continuum, including screening, diagnosis and follow-up, surveillance, supportive care, procedure preparation and follow-up, and survivorship care. In previous

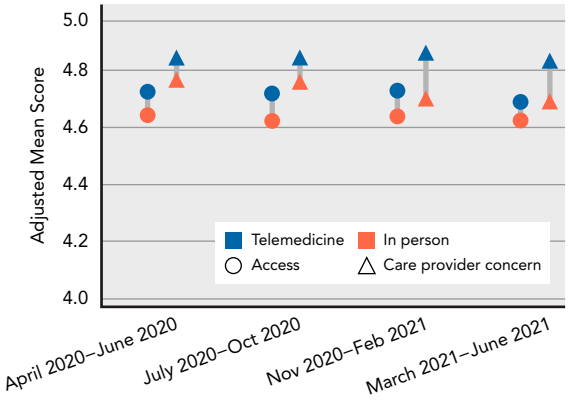

Figure 2. Adjusted mean patient experience scores with in-person versus telemedicine visits over time. Mean scores were adjusted for age, sex, race/ethnicity, insurance, clinic type, and visit type. Patient experience for access and care provider concern with telemedicine consistently outranked in-person visits across all 4 time intervals. Differences between telemedicine versus in-person visits were statistically significant for each category.

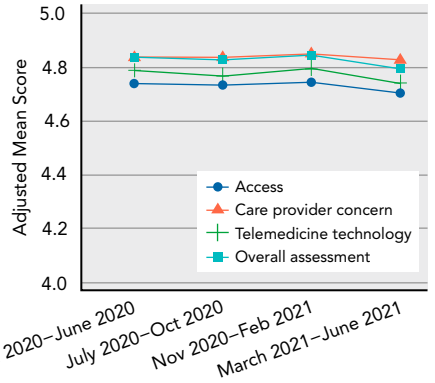

Figure 3. Adjusted mean scores of patient experience with telemedicine over time. Mean scores (of 5) were adjusted for age, sex, race/ethnicity, insurance, clinic type, and visit type. No statistical differences between mean scores for access, care provider concern, telemedicine technology, and overall assessment were noted across any of the 4 time intervals.

studies, patients have reported higher experience of care scores with telemedicine than with in-person visits for several aspects of care: access, patient selection, support for the patients and providers, ability to interact face-to-face, and travel-time savings.[17,18]

Patients with cancer require timely care so that healthcare providers can prepare an optimized treatment plan with significant implications for the patient's quality of life and mortality; however, the COVID-19 pandemic has affected patients' ability to access care. Patients with cancer are at increased risk for COVID-19–related morbidity and mortality.[1,19] Delays in cancer care have been noted during the COVID-19 pandemic,[20] with telemedicine proving to be an important aspect of care delivery.[21] As evidenced by our results, patients in the telemedicine group reported higher PEC scores when asked about access compared with the in-person group. Appropriate triaging, the ability of family members to join the appointment, provision of interpreter services, and clinician and patient support for telemedicine may have contributed to patients in the telemedicine group reporting higher scores when asked about care provider concern compared with the in-person group.

Rather than using an on-demand telemedicine model in which patients log in to a portal and request a consultation when needed, at MCC, providers determined the appropriateness of telemedicine consultation and scheduled the appointments virtually. This allowed patients to be triaged, as providers could deliver an appropriate level of care and reduce the number of in-person visits required after a telemedicine appointment. A family member or an informal caregiver could still be meaningfully engaged in treatment decisions even when they were unable to join the in-person visit due to visitor restrictions during the pandemic, geographic distance, or inconvenience. During the most extensive pandemic restrictions, hybrid visits

were established at MCC to minimize transmission risk. During these visits, the patient was seen in the clinic and caregivers joined from a nonclinic but on-campus location. Interpreter services were also added to the telemedicine visits to provide an equitable experience to both English-speaking and non–English-speaking patients. Finally, for select patients who required an evaluation by multiple subspecialty clinicians, a multidisciplinary consultation was performed during a single appointment, replicating the experience offered to our patients during in-person visits.

We previously reported clinicians' perspectives on using telemedicine for oncology.[12] For clinicians, educational materials were developed to support technological assistance, equipment, and template modifications to facilitate clinician–patient interactions. These factors were shown to be important contributors to motivating clinicians to adopt telemedicine and improving clinician satisfaction.[22–27]

Clinicians have expressed concerns that telemedicine could possibly hamper in-person clinic visit interactions, where a face-to-face discussion enables clinicians to assess patients' nonverbal cues and receptiveness to the assessment and plan.[12] Nonverbal interactions such as these are critical in eliciting and appreciating patient distress[28] and lead to higher patient satisfaction and quality of care.[29] In a surgical setting, for example, a randomized clinical trial of clear versus covered masks demonstrated that patients preferred to see their surgeon's face, and patients rated surgeons with clear masks as demonstrating more empathy and building trust.[30,31] Some telemedicine platforms allow for these face-to-face communications. Previous studies have demonstrated that patient–clinician communication via telemedicine platforms can establish close relationships when appropriate steps are taken.[32–36] Our data suggest that when appropriately used for appropriate patients, telemedicine can provide just as much of a connection and favorable patient experience as in-person visits.

Telemedicine can reduce the costs of travel and parking, housing arrangements, and lost income from missing work for both patients and their caregivers. Transportation has been noted to be the highest out-of-pocket nonmedical cost for patients receiving cancer treatment, and those with inadequate transportation are more likely to miss appointments and rely on emergency department care.[37–41] A recent study noted that the number of people living outside a 60-minute driving range of major hospitals almost doubled because of rural hospitals closing.[44] Telemedicine has the potential to deliver high-level care from a distance.[43] It is possible that patient experience may vary based on distance from the cancer center because telemedicine may provide an opportunity for indirect patient cost savings (lost productivity due to visit time and costs associated with transportation) and improve patient access and convenience. However, Press Ganey provided deidentified data to MCC, and thus we could not correlate distance traveled with patient-reported experience.

One of the important aspects of implementing telemedicine is to provide adequate support for both patients and clinicians, and this is reflected in consistently high scores for the telemedicine technology category, without any statistical differences across the study period. Screening tools have been developed to assess patients' readiness for telemedicine, and additional personnel, such as social workers, have been deployed to assist with this process.[44–47] As noted previously, establishing the Department of Virtual Health at MCC early in the pandemic was an important aspect in the implementation of telemedicine. The department provided dedicated clinical and administrative support to facilitate several touchpoints with patients before their actual visit and to understand patients' support needs. Appropriate patient-facing and provider-facing educational materials were developed and are readily accessible to help with connectivity.

Despite extra support, the digital divide will be an important hurdle, especially in terms of disparities in internet access, devices, and technical proficiency.[48–51] A 2018 report found that 20% of Americans have access to the internet only through smartphones, with the most common reason being high broadband costs.[52] A study of >600,000 Medicare beneficiaries demonstrated that 26% did not have access to either a computer with high-speed internet or a smartphone with a wireless data plan. Individuals who were older (aged ≥85 years), Black or Hispanic, widowed, or lacking more than a high school education reported limited digital access.[51] Some healthcare systems have also loaned devices to patients and have partnered with cell phone carriers and community-based organizations to provide infrastructure for patients to connect to the internet.[27,46,53] For the hybrid visits at MCC, iPads were provided to connect with caregivers who could not be present in the clinic.

Although experience of care scores from the Press Ganey survey provided important insights and reaffirmed the processes established to ensure the highest standard of cancer care is delivered, there are some limitations to the data reported in this study. While this study reports on a large cohort of telemedicine patients, the study population was from a single cancer center. Given the limitation of anonymized data that is provided by Press Ganey to the institution, authors did not have the ability to take nonindependence of observations during statistical analysis; that is, some patients may have completed a combination of outpatient and telemedicine surveys multiple times over the study period. Additionally, the study does not measure PEC longitudinally for the same patient. Although statistical adjustments were made, it is important to note that the comparisons of access and care provider

concern between telemedicine and in-person appointments were based on differently worded items and, in the case of access to care, a different number of items. The deidentified data did not capture patient-level variables, such as income, education, comorbidities, or purpose of visits (ie, discussing treatment options, changing treatment, or discussing results). Patients' expectations of their care delivery during the pandemic in itself is a confounder. This was a research study leveraging PEC survey data, and thus inherent limitations to this type of study apply, including selection and respondent bias. Although we adjusted for the type of clinic visit and which clinic patients were seen in, the types of patients who were seen in person may be systematically different from those seen in virtual visits (eg, more acute or complex problems), which may affect their experience with care. Respondent bias is also an important limitation of a research study leveraging PEC survey data, where patients who are more or less satisfied may be more likely to respond. Additionally, response rates to PEC surveys tend to be low and thus a selection bias can be introduced by nonresponders that can limit generalizability of findings across all patients. Future qualitative studies will be required to provide further insights on PEC with telemedicine. Finally, although patient experience was positive with telemedicine, long-term data are necessary to determine whether quality of care and oncologic outcomes are equivalent to in-person visits.

Conclusions

Telemedicine implementation resulted in higher PEC rates during the study compared with in-person visits in the access and care provider concern categories. Over-time analysis of telemedicine data showed no difference in PEC scores for telemedicine, suggesting that implementation of telemedicine was effective and has the potential to be an important adjunct in cancer care delivery.

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Supplemental online content for:

Telemedicine Adoption in an NCI-Designated Cancer Center During the COVID-19 Pandemic: A Report on Patient Experience of Care

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eAppendix 1. Telemedicine and Outpatient Questions in Key Categories of Access and Care Provider

	Telemedicine	In-Person
Access	Ease of scheduling appointment	Wait time between calling and first scheduled appointment
	Ease of contacting	Courtesy/Concern of staff who made appointment
		Reach office staff on phone with ease
Care provider	Care provider concern for questions/worries	Doctor's concern for questions and worries

eAppendix 2. Telemedicine Experience Press Ganey Questions

Category	Questions
Access	1. Ease of arranging your virtual visit
	2. Ease of contacting us (eg, email, telephone, web portal)
Care provider	1. Concern the care provider showed for your questions or worries
	2. Explanations the care provider gave you about your problem or condition
	3. Care provider's efforts to include you in decisions about your care
	4. Care provider's discussion of any proposed treatment (eg, options, risks, benefits)
	5. Your confidence in this care provider
	6. Likelihood of your recommending this care provider to others
Telemedicine technology	1. Ease of talking with the care provider over the virtual connection
	2. How well the video connection worked during your virtual visit
	3. How well the audio connection worked during your virtual visit
Overall assessment	1. How well the virtual visit staff (including the care provider) worked together to care for you
	2. Likelihood of your recommending our virtual visit service to others

eAppendix 3. Patient Characteristics Over Different Time Intervals

Characteristic	April 2020–June 2020		July 2020–October 2020		November 2020–February 2021		March 2021–June 2021	
	In-Person n (%)	Telemedicine n (%)	In-Person n (%)	Telemedicine n (%)	In-Person n (%)	Telemedicine n (%)	In-Person n (%)	Telemedicine n (%)
Total patient visits	88,932	13,390	145,608	13,337	145,519	11,600	160,125	12,618
Surveys sent out	27,530	4,227	43,243	3,675	44,363	5,641	48,714	9,445
Respondents	5,507 (20.0)	1,020 (24.1)	8,377 (19.4)	845 (23.0)	9,816 (22.1)	1,649 (29.2)	9,618 (19.7)	2,436 (25.8)
Median age (range), y	68.0 (18.0–94.0)	69.0 (18.0–92.0)	68.0 (18.0–99.0)	69.0 (19.0–96.0)	69.0 (18.0–98.0)	69.0 (20.0–97.0)	68.0 (18.0–101)	69.0 (18.0–98.0)
Sex								
Female	2,655 (48.2)	492 (48.2)	4,092 (48.9)	415 (49.1)	4,748 (48.4)	834 (50.6)	4,641 (48.3)	1,246 (51.1)
Male	2,850 (51.8)	528 (51.8)	4,284 (51.1)	430 (50.9)	5,068 (51.6)	815 (49.4)	4,977 (51.7)	1,190 (48.9)
Race/Ethnicity								
White non-Hispanic	4,582 (83.2)	817 (84.8)	6,925 (82.7)	635 (87.0)	8,053 (82.0)	1,319 (84.6)	7,954 (82.7)	2,001 (85.6)
White Hispanic	273 (4.96)	41 (4.26)	403 (4.81)	29 (3.97)	450 (4.58)	72 (4.62)	424 (4.41)	75 (3.21)
Black	242 (4.39)	47 (4.88)	422 (5.04)	26 (3.56)	447 (4.55)	59 (3.78)	463 (4.81)	90 (3.85)
Other	410 (7.45)	58 (6.02)	627 (7.48)	40 (5.48)	865 (8.81)	110 (7.05)	777 (8.08)	172 (7.36)
Insurance								
Private	1,643 (29.8)	301 (29.5)	2,566 (30.6)	241 (28.5)	2,874 (29.3)	476 (28.9)	2,928 (30.4)	709 (29.1)
Medicare	3,462 (62.9)	660 (64.7)	5,212 (62.2)	562 (66.5)	6,348 (64.7)	1,083 (65.7)	6,043 (62.8)	1,600 (65.7)
Medicaid	79 (1.43)	6 (0.59)	129 (1.54)	1 (0.12)	125 (1.27)	26 (1.58)	130 (1.35)	23 (0.94)
Other	323 (5.87)	53 (5.20)	470 (5.61)	41 (4.85)	469 (4.78)	64 (3.88)	517 (5.38)	104 (4.27)
Visit type								
NP/EP	1,386 (25.21)	238 (23.4)	2,424 (28.96)	224 (26.54)	2,733 (27.84)	342 (20.69)	2,666 (27.75)	466 (19.11)
FU	4,121 (74.78)	782 (76.7)	5,953 (71.07)	621 (73.5)	7,083 (72.15)	1,307 (79.3)	6,952 (72.26)	1,970 (80.9)
Clinic type								
Blood and marrow transplant	136 (2.47)	57 (5.59)	186 (2.22)	39 (4.62)	183 (1.86)	62 (3.76)	178 (1.85)	41 (1.68)
Breast	765 (13.9)	51 (5.00)	1,160 (13.8)	44 (5.21)	1,285 (13.1)	85 (5.15)	1,210 (12.6)	150 (6.16)
Cutaneous	769 (14.0)	37 (3.63)	1,072 (12.8)	23 (2.72)	1,259 (12.8)	30 (1.82)	1,199 (12.5)	55 (2.26)
Endocrine	114 (2.07)	76 (7.45)	284 (3.39)	62 (7.34)	403 (4.11)	102 (6.19)	410 (4.26)	171 (7.02)
Gastroenterology	618 (11.2)	131 (12.8)	961 (11.5)	99 (11.7)	1,078 (11.0)	173 (10.5)	1,044 (10.9)	257 (10.6)
Genitourinary	690 (12.5)	141 (13.8)	1,144 (13.7)	112 (13.3)	1,274 (13.0)	229 (13.9)	1,236 (12.9)	312 (12.8)
Hematology	897 (16.3)	152 (14.9)	1,381 (16.5)	166 (19.6)	1,572 (16.0)	264 (16.0)	1,584 (16.5)	312 (12.8)
Radiation therapy	591 (10.7)	89 (8.73)	796 (9.50)	70 (8.28)	1,203 (12.3)	137 (8.31)	1,198 (12.5)	276 (11.3)
Sarcoma	241 (4.38)	37 (3.63)	348 (4.15)	30 (3.55)	365 (3.72)	78 (4.73)	368 (3.83)	105 (4.31)
Thoracic	400 (7.26)	90 (8.82)	538 (6.42)	88 (10.4)	686 (6.99)	103 (6.25)	650 (6.76)	150 (6.16)
Other	286 (5.19)	159 (15.63)	507 (6.05)	112 (13.24)	508 (5.18)	386 (23.38)	541 (5.62)	607 (24.93)

Abbreviations: EP, existing patients; FU, follow-up patients; NP, new patients.

eAppendix 4. Comparison of Access and Care Provider Concern

Score	In-Person n (%)	Telemedicine n (%)	*P* Value
Access	32,808	5,910	<.001
1–2	61 (0.19)	13 (0.22)	
2–3	289 (0.88)	41 (0.69)	
3–4	1,863 (5.68)	245 (4.15)	
4–5	10,080 (30.7)	1,131 (19.1)	
5	20,515 (62.5)	4,480 (75.8)	
Care provider concern	21,610	5,846	<.001
1–2	295 (1.37)	17 (0.29)	
2–3	219 (1.01)	21 (0.36)	
3–4	609 (2.82)	71 (1.21)	
4–5	2,284 (10.6)	436 (7.46)	
5	18,203 (84.2)	5,301 (90.7)	

eAppendix 5. Telemedicine Versus In-Person Adjusted Mean Score Differences in Access and Care Provider Concern

Time Interval	Telemedicine Mean Score (lower limit–upper limit)	In-Person Mean Score (lower limit–upper limit)	*P* Value
Access			
April 2020–June 2020	4.73 (4.69–4.79)	4.66 (4.64–4.68)	<.001
July 2020–October 2020	4.73 (4.69–4.78)	4.64 (4.62–4.66)	<.001
November 2020–February 2021	4.75 (4.69–4.78)	4.65 (4.63–4.67)	<.001
March 2020–June 2021	4.71 (4.69–4.78)	4.64 (4.62–4.66)	<.001
Care provider concern			
April 2020–June 2020	4.86 (4.82–4.90)	4.78 (4.75–4.80)	<.001
July 2020–October 2020	4.88 (4.82–4.90)	4.77 (4.75–4.80)	<.001
November 2020–February 2021	4.87 (4.82–4.92)	4.71 (4.68–4.75)	<.001
March 2021–June 2021	4.85 (4.80–4.90)	4.70 (4.67–4.74)	<.05

Mean scores were adjusted for age, sex, race/ethnicity, insurance, clinic type, and visit type.

eAppendix 6. Telemedicine Scores Over Time for Access, Care Provider, Telemedicine Technology, and Overall Assessment Categories

Score	April 2020–June 2020	July 2020–October 2020	November 2020–February 2021	March 2021–June 2021
Access				
1–2	0 (0.00)	4 (0.48)	3 (0.18)	6 (0.25)
2–3	12 (1.19)	5 (0.60)	12 (0.73)	12 (0.50)
3–4	58 (5.73)	25 (2.98)	64 (3.91)	98 (4.05)
4–5	228 (22.5)	186 (22.1)	307 (18.7)	410 (16.9)
5	714 (70.6)	620 (73.8)	1,252 (76.4)	1,894 (78.3)
Care provider concern				
1–2	1 (0.10)	4 (0.48)	2 (0.12)	6 (0.25)
2–3	5 (0.49)	0 (0.00)	9 (0.55)	13 (0.54)
3–4	17 (1.68)	16 (1.90)	28 (1.72)	40 (1.65)
4–5	130 (12.9)	111 (13.2)	182 (11.2)	307 (12.7)
5	858 (84.9)	710 (84.4)	1,410 (86.5)	2,051 (84.9)
Telemedicine technology				
1–2	5 (0.49)	6 (0.72)	7 (0.43)	10 (0.41)
2–3	13 (1.28)	9 (1.07)	22 (1.34)	18 (0.74)
3–4	59 (5.82)	34 (4.05)	63 (3.85)	75 (3.10)
4–5	161 (15.9)	134 (16.0)	219 (13.4)	355 (14.7)
5	775 (76.5)	656 (78.2)	1,325 (81.0)	1,959 (81.1)
Overall assessment				
1–2	0 (0.00)	5 (0.60)	0 (0.00)	4 (0.17)
2–3	5 (0.50)	3 (0.36)	6 (0.37)	16 (0.67)
3–4	36 (3.56)	22 (2.64)	35 (2.15)	47 (1.95)
4–5	154 (15.2)	108 (12.9)	187 (11.5)	280 (11.6)
5	815 (80.7)	696 (83.5)	1,398 (86.0)	2,059 (85.6)

eAppendix 7. Adjusted Mean Score Differences in Access, Care Provider Concern, Telemedicine Technology, and Overall Assessment Over Different Time Intervals

Time Interval	Adjusted Mean Score	Lower Limit	Upper Limit
Access			
April 2020–June 2020	4.74	4.69	4.79
July 2020–October 2020	4.73	4.69	4.78
November 2020–February 2021	4.75	4.69	4.80
March 2021–June 2021	4.71	4.64	4.77
Care provider concern			
April 2020–June 2020	4.84	4.80	4.87
July 2020–October 2020	4.84	4.80	4.87
November 2020–February 2021	4.85	4.81	4.89
March 2021–June 2021	4.83	4.78	4.87
Telemedicine technology			
April 2020–June 2020	4.79	4.74	4.84
July 2020–October 2020	4.77	4.72	4.82
November 2020–February 2021	4.80	4.74	4.86
March 2021–June 2021	4.74	4.68	4.81
Overall assessment			
April 2020–June 2020	4.84	4.80	4.88
July 2020–October 2020	4.82	4.78	4.86
November 2020–February 2021	4.84	4.79	4.89
March 2021–June 2021	4.80	4.75	4.84

Mean scores were adjusted for age, sex, race/ethnicity, insurance, clinic type, and visit type.

eAppendix 8. Difference Between Time Intervals for Telemedicine Access, Care Provider Concern, Telemedicine Technology, and Overall Assessment

Time Interval	Difference	Lower Limit	Upper Limit	Adjusted *P* Value
Access				
July 2020–October 2020:April 2020–June 2020	−0.001279	−0.008485	0.005926	0.968407
November 2020–February 2021:April 2020–June 2020	0.005082	−0.000941	0.011104	0.132253
March 2021–June 2021:April 2020–June 2020	0.004863	−0.000764	0.010490	0.117672
November 2020–February 2021:July 2020–October 2020	0.006361	−0.000220	0.012942	0.062520
March 2021–June 2021:July 2020–October 2020	0.006143	−0.000078	0.012364	0.054454
March 2021–June 2021:November 2020–February 2021	−0.000219	−0.005021	0.004583	0.999427
Care provider concern				
July 2020–October 2020:April 2020–June 2020	0.002294	−0.003603	0.008191	0.749627
November 2020–February 2021:April 2020–June 2020	−0.000027	−0.004961	0.004907	0.999999
March 2021–June 2021:April 2020–June 2020	0.000114	−0.004493	0.004721	0.999908
November 2020–February 2021:July 2020–October 2020	−0.002321	−0.007710	0.003068	0.685372
March 2021–June 2021:July 2020–October 2020	−0.002180	−0.007271	0.002911	0.689344
March 2021–June 2021:November 2020–February 2021	0.000141	−0.003795	0.004077	0.999721
Telemedicine technology				
July 2020–October 2020:April 2020–June 2020	−0.000474	−0.007952	0.007005	0.998468
November 2020–February 2021:April 2020–June 2020	0.003036	−0.003213	0.009286	0.595834
March 2021–June 2021:April 2020–June 2020	0.001122	−0.004715	0.006960	0.960424
November 2020–February 2021:July 2020–October 2020	0.003510	−0.003324	0.010344	0.550217
March 2021–June 2021:July 2020–October 2020	0.001596	−0.004864	0.008056	0.920768
March 2021–June 2021:November 2020–February 2021	−0.001914	−0.006900	0.003072	0.757168
Overall assessment				
July 2020–October 2020:April 2020–June 2020	0.001255	−0.005723	0.008233	0.967223
November 2020–February 2021:April 2020–June 2020	0.001824	−0.004001	0.007650	0.852177
March 2021–June 2021:April 2020–June 2020	0.001414	−0.004025	0.006854	0.909077
November 2020–February 2021:July 2020–October 2020	0.000569	−0.005815	0.006954	0.995764
March 2021–June 2021:July 2020–October 2020	0.000159	−0.005875	0.006194	0.999889
March 2021–June 2021:November 2020–February 2021	−0.000410	−0.005064	0.004244	0.995908

Mean scores were adjusted for age, sex, race/ethnicity, insurance, clinic type, and visit type.