






ⓐ Patient- and Provider-Level Factors Associated With Telehealth Utilization Across a Multisite, Multiregional Cancer Practice From 2019 to 2021

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ABSTRACT

PURPOSE In response to the COVID-19 pandemic, many cancer practices rapidly adopted telehealth services. However, there is a paucity of data regarding ongoing telehealth visit utilization beyond this initial response. The purpose of this study was to assess changes in variables associated with telehealth visit utilization over time.

METHODS This is a cross-sectional, year-over-year, retrospective analysis of telehealth visits conducted across a multisite, multiregional cancer practice in the United States. Multivariable models examined the association of patient- and provider-level variables with telehealth utilization across outpatient visits conducted over three 8-week periods from July to August in 2019 (n = 32,537), 2020 (n = 33,399), and 2021 (n = 35,820).

RESULTS The rate of telehealth utilization increased from <0.01% (2019) to 11% (2020) to 14% (2021). The most significant patient-level factors associated with increased telehealth utilization included nonrural residence and age ≤65 years. Among patients residing in rural settings, video visit utilization rates were significantly lower and phone visit utilization rates were significantly higher compared with patients from nonrural residences. Regarding provider-level factors, widening differences in telehealth utilization were observed at tertiary versus community-based practice settings. Increased telehealth utilization was not associated with duplicative care as per-patient and per-physician visit volumes in 2021 remained consistent with prepandemic levels.

CONCLUSION We observed continuous expansion in telehealth visit utilization from 2020 to 2021. Our experiences suggest that telehealth can be integrated into cancer practices without evidence of duplicative care. Future work should examine sustainable reimbursement structures and policies to ensure accessibility of telehealth as a means to facilitate equitable, patient-centered cancer care.

ACCOMPANYING CONTENT

 [Data Supplement](#)

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INTRODUCTION

Adoption of synchronous telehealth services was not widespread in the United States before the COVID-19 pandemic.^{1,2} Patients with cancer with COVID-19 were found to be at risk for poor clinical outcomes³; thus, hematology and oncology providers were charged with the difficult task of balancing continuity of care in the setting of widespread disease transmission.⁴ In addition, the declaration of the US Public Health Emergency (PHE) and executive shelter-in-place orders propelled cancer centers to implement non-traditional models of care delivery, including telehealth visits. Furthermore, the Centers for Medicare and Medicaid

Services (CMS) increased flexibility in reimbursement for telehealth services to support adoption,⁵ whereas federal and state governments relaxed or removed licensing barriers that limited the provision of telehealth across state lines.^{2,6,7} As a result, a rapid and unprecedented surge in telehealth utilization was observed nationwide.^{8,9}

After initial adoption of telehealth visit utilization, ASCO issued an interim policy statement in July 2020 encouraging policymakers to permanently expand coverage to adequately reimburse providers for telehealth services.¹⁰ Furthermore, in July 2021, ASCO issued formal standards and practice recommendations for the continuous implementation of

CONTEXT

Key Objective

What factors are associated with oncology telehealth visit utilization beyond the initial pandemic response? To our knowledge, this study is among the first and largest real-world analyses of telehealth visit utilization by patients with cancer. It is the only such analysis to examine patient- and provider-related factors and integration with facility-based visits.

Knowledge Generated

Telehealth visit utilization increased from 2020 to 2021 without evidence of duplicative care, and patient satisfaction with telehealth was as good as facility-based visits. The most significant factors associated with increased telehealth visit utilization included patients younger than 65 years and nonrural residence, as well as tertiary versus community-based provider practice setting.

Relevance

This study shows continuous growth of telehealth visit utilization across a multisite, multiregional cancer practice that did not result in duplicative care or compromise patient satisfaction with care. It highlights the need for future studies to examine sustainable reimbursement structures and equitable access considerations.

telehealth services within the context of oncology care.¹ With these standards, renewal of the PHE, and reimbursement policies extended by CMS through at least 2022, US cancer practices have been able to sustain telehealth services. However, there is a paucity of data regarding the provider- and patient-level factors associated with telehealth utilization across US cancer practices beyond the initial COVID-19 pandemic response.²

Consistent with national trends, including a reported 63-fold increase in telehealth use among Medicare beneficiaries from 2019 to 2020,¹¹ at our institution, between March 11 and April 20, 2020, there were a 10,880% increase in video visits and a 13,650% increase in telephone visits, as well as expansion of established telehealth services and implementation of new virtual care offerings.⁶ The primary objective of this study was to identify patient- and provider-level factors associated with telehealth visit utilization beyond initial implementation across the Mayo Clinic medical oncology and hematology practice from 2019 to 2021. Defining cohorts with low utilization can enable future qualitative studies to understand barriers to telehealth and support the development of interventions to overcome them, ensuring equitable telehealth access.¹²

METHODS

Setting

The Mayo Clinic medical oncology and hematology practice is a multisite, multiregional cancer practice comprising three geographically diverse, tertiary referral campuses in the US Midwest (Rochester, MN), Southwest (Scottsdale, AZ), and Southeast (Jacksonville, FL) and the rural, community-based hospitals and clinics throughout the Mayo Clinic

Health System (MCHS) in the Upper Midwest (Western Wisconsin, Southern Minnesota, and Northern Iowa).⁴

Study Design

An institutional review board–approved (#20-013109) cross-sectional, retrospective study of the Mayo Clinic cancer practice was conducted among patients who provided signed authorization for retrospective record research. Ambulatory clinic visits conducted by physicians, advanced practice providers (APPs), and hematology/oncology fellows between 2019 and 2021 were identified for analysis according to the criteria in [Figure 1](#). The period of immediate pandemic response (March–June 2020) was characterized by overall decreased visit volumes and correspondingly rapid adoption of telehealth visit utilization. For this reason, we focused our cross-sectional year-over-year analysis on visits conducted during the period immediately after this (July–August), when overall visit volumes had returned to normal, and when state shelter-in-place mandates were lifted.

Analysis

Univariate analysis (chi-squared analysis, conducted via Prism) was used to compare differences in telehealth utilization according to the provider type ([Table 1](#)). Then, multivariable modeling was used to examine patient- and provider-level variables associated with telehealth utilization. The analyses were run separately for 2020 and 2021 to decrease potential patient- and provider-related duplication of data across years. For all analyses, the level of significance was defined as $P < .05$.

To evaluate the effects of provider-level variables on telehealth and in-person visit utilization outlined in [Table 2](#), we used mixed-effect regression models to account for repeated

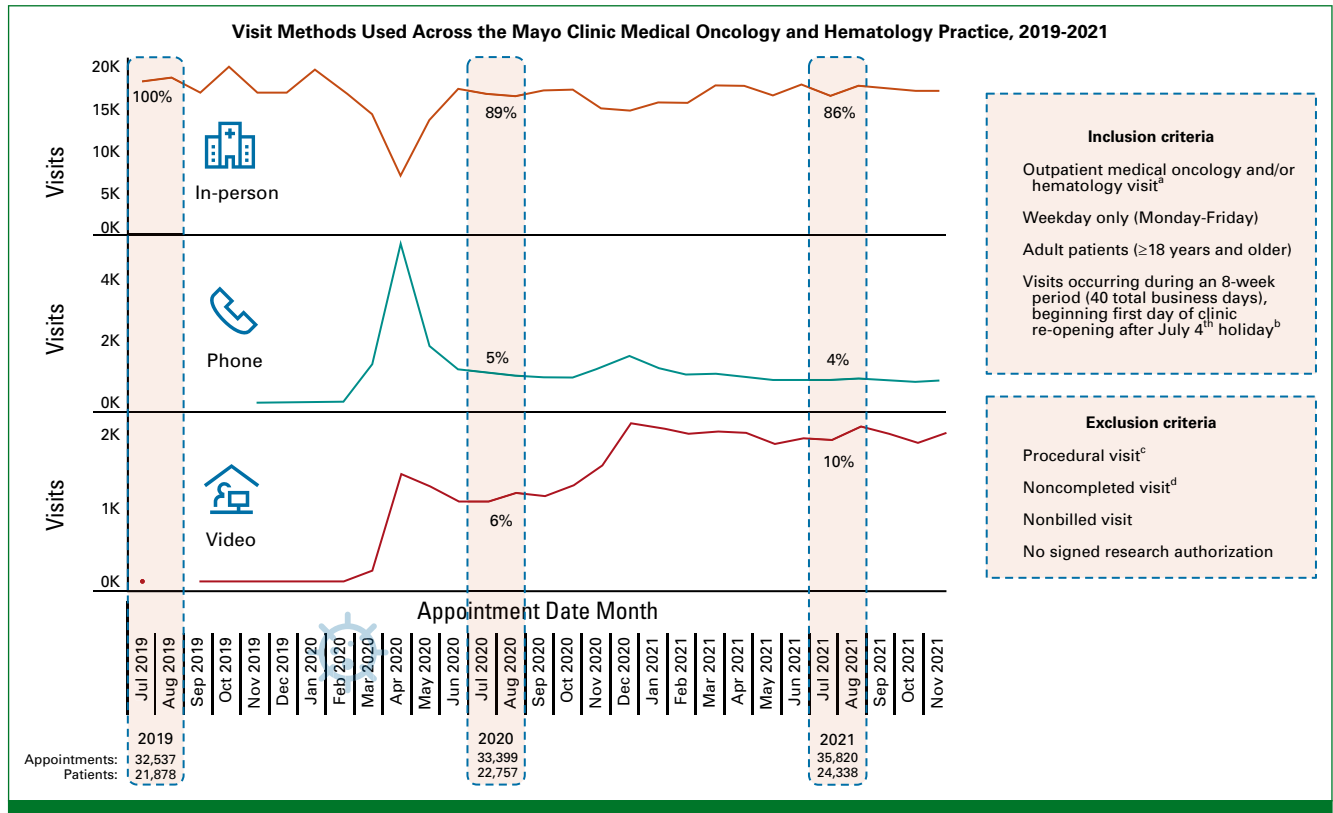


FIG 1. Visit methods used across the Mayo Clinic medical oncology and hematology practice, 2019-2021. ^aRadiation oncology and surgical oncology providers and visits not included in this analysis. ^bAs shown in the figure, the period of immediate response to the COVID-19 pandemic (March 2020-June 2020) was characterized by overall decreased visit volumes and correspondingly rapid expansion of telehealth utilization. For this reason, we decided to focus our analysis on visits conducted during the period immediately after this, when visit volumes had returned to normal and federal shelter-in-place mandates had been lifted. ^cVisits conducted for the purpose of a procedure (eg, bone marrow biopsy) were excluded from this analysis, as such visits are not able to be conducted virtually. ^dNoncompleted visits (eg, no-show visits) were excluded from this analysis.

provider bias. To account for the significant differences in telehealth utilization across provider types per univariate analysis, multivariable modeling was restricted to visits conducted by staff physicians only.

For patient-level analyses, separate logistic regression models were derived for video and phone visits. Final models included patient residence setting, age, sex, race, ethnicity, language preference, language/interpreter services requirement, and payor type as the dependent variables. The primary residence zip code was used to determine the residence type in accordance with Rural-Urban Commuting Area (RUCA) codes. We defined rural residence type as RUCA 4-14 and nonrural as RUCA 1-3.¹³ The remaining patient-level variables were abstracted from the electronic health record. Other factors that may affect telehealth utilization, such as household income or broadband and cellular access, were not available for analysis in this study.

Patient-level multivariable models were designed to identify differences in telehealth utilization by tumor-specific

disease. However, given the variability in patient visit volumes among disease groups and the variable disease course among and within specific tumor groups, we hypothesized that this factor may not be adequately analyzed through the original cross-sectional, year-over-year approach. Thus, we investigated video visit utilization according to disease groups through longitudinal analysis in a cohort of established patients receiving ongoing care throughout the study period.

Patient Satisfaction

Patient satisfaction surveys were analyzed as available. Surveys are routinely administered as part of the Mayo Clinic patient experience and conducted by Press Ganey using a version of their validated survey instrument.¹⁴ Surveys are administered electronically and solicited via an e-mail invitation within 1 week of telehealth visits,¹⁴ and for in-person visits, surveys were either mailed to patients' homes or solicited via the same e-mail process.

TABLE 1. Rate of Telehealth Utilization by Provider-Level Variables

Year	2020 (%)			2021 (%)		
Visit Modality	In-Person	Video	Phone	In-Person	Video	Phone
Totals	89	6	5	85	11	4
Region and practice type						
Minnesota ^t	88	6	6	84	11	5
Florida ^t	90	8	2	85	13	2
Arizona ^t	85	8	7	86	10	4
MCHS ^c	95	3	2	94	4	2
Provider type						
Staff physicians	87	8	5	83	13	4
Advanced practice providers	94	2	4	92	5	3
Fellows/trainees	93	3	4	88	8	4
Sex (physicians only)						
Female ^a	82	12	6	79	16	5
Male ^a	87	8	5	83	13	4
Career stage (physicians only)						
Early (<10 years) ^{a,b}	84	10	6	80	16	4
Mid (10-20 years) ^{a,b}	86	9	5	81	14	5
Late (>20 years) ^{a,b}	86	9	5	82	13	5

Abbreviations: c, community practice type; MCHS, Mayo Clinic Health System; t, tertiary practice type.

^aAmong physicians at tertiary practices (to mitigate bias related to practice type).

^bCategorized according to years since graduation from hematology/oncology fellowship.

RESULTS

Overall Trends

Outpatient visits conducted over an 8-week period from July to August 2019 (n = 32,537) were compared with those in July–August 2020 (n = 33,399) and 2021 (n = 35,820; [Fig 1](#)). The telehealth utilization rate, including telephone and video visits, was <0.01% in 2019 and increased to 11% in 2020 and 14% in 2021.

Provider-Level Findings

Using univariate analysis ([Table 1](#)), staff physicians were significantly more likely to use telehealth visits compared with APPs (13% v 7% in 2020 [chi-squared statistic, $\chi^2 = 300.5$; $P < .0001$] and 18% v 8% in 2021 [$\chi^2 = 626.6$; $P < .0001$]) and with hematology/oncology fellows (13% v 7% in 2020 [$\chi^2 = 63.2$; $P < .0001$] and 18% v 12% in 2021 [$\chi^2 = 42.9$; $P < .0001$]). No significant variation in telehealth utilization was observed over time across the three US regional tertiary practices ([Table 1](#)).

Multivariable modeling was then used ([Table 2](#)), restricted to established patient visits (81.9% of all visits) to mitigate confounding because of potential differences by visit type. Among established patient visits conducted by physician providers in 2020, when compared with community-based MCHS providers, being a tertiary care provider

was the most significant provider-level predictor of telehealth utilization (odds ratio [OR], 1.091; 95% CI, 1.020 to 1.123; $P < .0003$). This difference in utilization by provider practice setting became more pronounced in 2021 (OR, 1.136; 95% CI, 1.080 to 1.170; $P < .0001$). Among tertiary site physicians, female sex was the most significant predictor of telehealth utilization in 2020 (OR, 1.055; 95% CI, 1.031 to 1.081; $P = .027$). By 2021, this difference no longer reached statistical significance (OR, 1.010; 95% CI, 0.986 to 1.022; $P = .0791$). Career stage was not a significant predictor of telehealth utilization ([Table 2](#)).

Patient-Level Findings

Nonrural patients were significantly more likely to use video visits than rural patients in 2020 (OR, 1.041; 95% CI, 1.028 to 1.054; $P < .0001$). This difference persisted in 2021 although it was less pronounced (OR, 1.023; 95% CI, 1.008 to 1.039; $P = .003$). By contrast, nonrural patients were significantly less likely to use phone visits than rural patients in 2020 (OR, 0.978; 95% CI, 0.967 to 0.989; $P < .0001$) and 2021 (OR, 0.979; 95% CI, 0.969 to 0.989; $P < .0001$).

Patients 65 years and younger were significantly more likely than those older than 65 years to use video visits in 2020 (OR, 1.021; 95% CI, 1.004 to 1.038; $P = .0177$), and this difference became more pronounced in 2021 (OR, 1.035; 95% CI, 1.014 to 1.056; $P = .0009$). No other factors were associated with a significant difference in telehealth utilization in 2020,

TABLE 2. Multivariable Analysis of Patient- and Physician-Level Predictors of Telehealth Utilization in 2020 and 2021

Factors Associated With Telehealth Utilization	2020		2021	
	OR (range)	P	OR (range)	P
Patient-level factors				
Video				
Residence (RUCA): nonrural v rural	1.041 (1.028-1.054)	<.0001	1.023 (1.008-1.039)	.003
Age: 65 years and younger v older than 65 years	1.021 (1.004-1.038)	.0177	1.035 (1.014-1.056)	.0009
Patient sex: female v male	1.011 (0.999-1.023)	.0722	1.023 (1.011-1.054)	.527
Race: White v non-White	0.994 (0.974-1.015)	.5764	0.965 (0.952-1.023)	.0839
Ethnicity: non-Hispanic v Hispanic	1.004 (0.980-1.030)	.7548	0.965 (0.937-0.994)	.0186
Preferred language: English v other	0.998 (0.923-1.080)	.966	0.987 (0.946-1.056)	.4088
Language services: interpreter required v not required	0.970 (0.879-1.070)	.545	0.975 (0.910-1.053)	.3732
Payor: government v others	0.984 (0.967-1.005)	.0576	0.960 (0.941-0.980)	<.0001
Phone				
Residence (RUCA): nonrural v rural	0.978 (0.967-0.989)	<.0001	0.979 (0.969-0.989)	<.0001
Age: 65 years and younger v older than 65 years	1.002 (0.987-1.018)	.7676	0.988 (0.975-1.002)	.0883
Patient sex: female v male	1.005 (0.994-1.015)	.4023	0.981 (0.972-0.991)	.0001
Race: White v non-White	1.007 (0.988-1.025)	.4919	0.995 (0.978-1.012)	.5673
Ethnicity: non-Hispanic v Hispanic	0.991 (0.969-1.014)	.447	0.998 (0.978-1.017)	.799
Preferred language: English v others	1.006 (0.937-1.079)	.874	1.011 (0.953-1.073)	.7108
Language services: interpreter required v not required	1.029 (0.943-1.124)	.5226	1.003 (0.932-1.079)	.9471
Payor: government v others	1.013 (0.998-1.029)	.0876	1.011 (0.998-1.024)	.1103
Physician-level factors				
Video and phone				
Practice type: tertiary v community	1.091 (1.020-1.123)	.0003	1.136 (1.080-1.170)	<.0001
Physician sex: female v male	1.055 (1.031-1.081)	.027	1.010 (0.986-1.022)	.0791
Physician career stage: mid v late	0.987 (0.943-1.033)	.5652	1.004 (0.958-1.052)	.8693
Physician career stage: early v late	1.005 (0.962-1.049)	.8309	1.004 (0.962-1.048)	.8479

NOTE. Bold entries indicate factors which achieved statistical significance ($P < 0.05$).

Abbreviations: OR, odds ratio; RUCA, Rural-Urban Commuting Area.

whereas in 2021, several factors were associated with a statistically significant difference.

Specifically, non-Hispanic patients were less likely to use video visits than Hispanic patients (OR, 0.965; 95% CI, 0.937 to 0.994; $P = .0186$). Of note, patients requiring interpreter services were as likely as those who were English-speaking to use video or phone telehealth visits. Patients with a government payor were less likely to use video visits than those with other payors (OR, 0.960; 95% CI, 0.941 to 0.980; $P < .0001$). Finally, female patients were less likely to use phone visits than male patients (OR, 0.981; 95% CI, 0.972 to 0.991; $P = .0001$).

Tumor-Specific Findings

Multivariable modeling did not identify significant differences in telehealth utilization according to tumor-specific disease (data not shown). Longitudinal analysis was conducted in an established patient cohort receiving ongoing care throughout the study period. We identified 13,897 unique, established patients who experienced three or more

hematology/oncology visits from July 2020 to October 2021. Among this cohort, 5,481 (39.4%) engaged in at least one telehealth visit, including 2,920 (21.0%) and 3,386 (24.4%) patients completing at least one telephone or video visit, respectively. There was no significant difference in video visit utilization rate between solid tumor oncology and hematology, 25% and 24%, respectively (Data Supplement [Table S1], online only). Video visit utilization rates ranged from 20% to 27% in solid tumor-specific disease groups; however, neuro-oncology was an outlier (52% utilization rate). Within the hematology practice, rates ranged from 17% to 29%.

Patient Satisfaction

In 2019, of 3,540 patients who completed surveys, 3,197 patients (90.3%) selected a top-box response of very good when asked about their likelihood to recommend the practice after the visit. In 2020, 2,508 of 2,732 patients (91.8%) responded this way after an in-person visit, compared with 362 of 393 (92.1%) after a telehealth visit. In 2021, 3,471 of 3,728 patients (93.1%) responded this way after an in-

person visit, compared with 599 of 662 (90.5%) after a telehealth visit (Data Supplement [Fig S1]).

Practice Dynamics

Per-patient and per-physician visit volumes were measured over time to determine whether the observed increase in telehealth utilization was associated with an increase in the overall per-patient and/or per-physician practice volumes (Data Supplement [Table S2]). To maintain consistency and mitigate confounding, analysis was restricted to visits conducted by staff physicians at tertiary campuses.

Across all appointment types, 1.24 appointments were conducted per patient in 2019. This increased to 1.25 for 2020 and then fell to 1.23 for 2021. Concurrently, a progressive decline in per-patient, in-person care was observed (1.24, 1.06, and 0.98 for 2019–2021, respectively). Considering the possible influence of increased one-time new or second opinion appointments conducted via telehealth, the analysis was restricted to established/return appointments only. Findings were similar despite this restriction.

Regarding physician practice dynamics, across all appointment types, 97.0 appointments per physician (representing 78.3 unique patients) were conducted in 2019. This increased to 103.3 appointments per physician in 2020 (representing 82.6 unique patients); however, by 2021, 96.7 appointments per physician (representing 78.7 unique patients) were conducted, consistent with volumes in 2019. Findings were again similar when restricted to established/return appointments.

DISCUSSION

Previous studies have relied primarily on single insurer-based data sources to glean insights into telehealth utilization among cancer populations.^{15,16} Our study—conducted across a multisite, multiregional cancer practice with tertiary and community-based clinics and hospitals in the United States—to our knowledge, is among the first and largest real-world analyses of telehealth utilization in patients with cancer and the only such analysis of practice- and provider-related factors associated with telehealth utilization. The period of initial adoption of telehealth services, in direct response to the onset of the COVID-19 pandemic and PHE shelter-in-place orders, was followed by sustained growth from 2020 to 2021.

The most significant provider-level factor associated with increased telehealth visit utilization was tertiary practice setting, with comparable rates across three US geographic regions. Physicians were more likely than APPs to use telehealth, and this may be due to their primary role in devising patient care plans at important points in the cancer continuum, which could often be completed virtually, whereas the APPs' primary role was to facilitate in-person care for

patients receiving active, systemic therapy—the volumes of which were well-preserved during the pandemic, including the initial PHE shelter-in-place period.

The most significant patient-level factors associated with utilization of telehealth visits included nonrural residence and age ≤ 65 years. Although some differences associated with increased telehealth utilization became less pronounced from 2020 to 2021 (female physician sex and nonrural patient residence), others became more pronounced (tertiary practice setting and patient 65 years and younger).

From 2020 to 2021, among rural patients, video visit utilization rates were significantly lower and phone visit rates were significantly higher compared with telehealth utilization by patients from nonrural residences. Although 20% of the US population lives and works in rural areas, only 3% of oncology practices provide care in these areas, and increased travel burden has been shown to have a detrimental impact on outcomes for rural patients with cancer.^{17–19} Given the high patient-related costs required for rural patients to receive in-person cancer care (greater travel distances, additional lodging, etc), telehealth services have long been considered a possible mechanism to improve access and alleviate the burden of cancer care for rural populations.^{18,19} In our study, the high rate of phone visit utilization confirms a willingness of rural patients to participate in telehealth visits. Although it is encouraging that video visit utilization differences between rural and nonrural patients became less pronounced from 2020 to 2021, the persistent disparity indicates a need for future studies to examine barriers with video visit use among rural populations. With the anticipated removal of reimbursement for telephone visits as part of the PHE expiration anticipated in 2023,^{7,16} such disparities may become compounded as cancer practices may be less inclined to offer telephone-based services without adequate reimbursement.

Widening differences in telehealth utilization were also observed from 2020 to 2021 among physicians practicing at tertiary versus community-based practice settings. This is consistent with findings that rural medical practices have generally used telehealth services less often than urban and suburban practices.¹⁶ The reason for this is likely multifactorial, including potential cultural differences in patients' perceived risk of visiting doctors in community clinics versus travel to major medical centers during the global pandemic and differences in personnel and infrastructural resources available to support effective telehealth integration within community cancer practices. This is an area of active study at our institution.

There was no significant difference in phone visit utilization rates from 2020 to 2021 in those older than 65 years versus 65 years and younger. However, there was a progressive disparity between older and younger patients in video visit utilization, with older patients less likely to use the

technology. Although many older adults are technologically adept, studies have demonstrated lower virtual care utilization and digital literacy among older adults.^{20,21} In addition, access to technology and internet connectivity remain important barriers for older adults. Among Medicare beneficiaries, a 2020 study demonstrated that 41.4% did not have a computer with high-speed internet connection at home, 40.9% lacked a smartphone, and 26.3% had neither.²² As the delivery of cancer care becomes increasingly technology-enabled, strategies aimed at improving digital health literacy and accessibility among older adults—such as the provision of sufficient technological hardware, deployment of digital nurse navigators, and digital education resources recently described by Chu et al²⁰—should be considered to ensure equitable access to these services.

We observed no difference in telehealth visit utilization by race, ethnicity, or primary language in 2020; however, in 2021, Hispanic patients were significantly more likely to use video visits than non-Hispanic patients. Although previous work has traditionally demonstrated lower telehealth utilization among racial and ethnic minority populations,^{12,23–26} a recent analysis of telehealth utilization surveys conducted by the United States' Office of Health Policy found that respondents who self-reported as Latino, Black, and multi-racial had higher odds of using telehealth services overall in 2021.¹² Furthermore, although this study found significant disparities among subgroups in terms of telehealth modality (audio v video), the highest share of visits that used video occurred among young adults age 18–24 years—a group not significantly represented across the comparatively older cancer patient population in our study.

Modest increases in per-patient and per-physician care volumes were observed at the time of initial telehealth adoption in 2020. However, by 2021, per-patient and per-physician care volumes returned to prepandemic levels. Notably, this occurred in the setting of telehealth expansion from 2020 to 2021. These findings suggest that by July 2021, telehealth visits were being deployed in an integrated manner across our practice without evidence of additive/duplicative care. Some have raised concerns that extending the CMS waiver for coverage of telehealth services may lead to fraud, waste, and abuse. Recently, the US Government Accountability Office (GAO) has outlined recommendations for CMS to strengthen data analysis and oversight of telehealth administration for this purpose.¹⁶ However, consistent with our findings, the GAO report did not find evidence of increased overall care in the setting of telehealth expansion (total Medicare services have notably declined 14% postwaiver, despite ongoing expansion of telehealth services).¹⁶

Importantly, telehealth adoption and expansion occurred organically across our practices during the study time-frame. There have been no formal institutional policies, incentives, or mandates to promote the increased utilization of telehealth services. Therefore, the growth of

telehealth utilization can be considered primarily driven by an associated increase in patient and/or provider preferences toward this model of care over time. In line with previous studies²⁷ as well as recent findings across the Mayo Clinic practice,¹⁴ we also demonstrate that patient satisfaction ratings for telehealth visits in 2020 and 2021 have remained at least as good as previous baselines established in 2019 for in-person care (Data Supplement [Fig S1]).

Longitudinal analysis of established patients receiving ongoing cancer care demonstrated no significant differences in video visit utilization among disease groups. Some disease settings and treatment modalities are expected to be more amenable to telehealth utilization than others, such as patients receiving oral cancer-directed therapy regimens, compared with those requiring in-person interventions (radiation or infusions).²⁸ Nevertheless, the COVID-19 pandemic has led many groups to challenge the existing cancer care delivery paradigm. One study demonstrated the feasibility of home-based telehealth visits the day before chemotherapy administration.²⁹ Others have used telehealth to facilitate chemotherapy administration in remote populations³⁰ or shown the effectiveness of shared-care models between community and academic centers to improve access to stem-cell transplantation.³¹ As alternative care delivery models continue to evolve across disease groups, strategic implementation of telehealth to promote patient-centered cancer care delivery should remain the focus of future investigation.

Results of this study must be interpreted within the context of retrospective study design. In addition, the study population was derived from a single health system and may not be nationally representative; however, visits were conducted across multiple geographic regions in the United States and practice types. Other factors that may affect telehealth utilization, such as household income or broadband and cellular access, were also not available for analysis in this study. In particular, internet access represents an important factor in need of further study. Differences in patient portal utilization have been shown to be significantly affected by internet accessibility,³² and limited internet access represents a major barrier to telehealth engagement in many rural areas.³³

In conclusion, after the onset of the COVID-19 pandemic, unprecedented utilization of telehealth visits has continued across many US and global cancer practices. At our institution, we have observed sustained growth of telehealth utilization since initial adoption in 2020. Our experiences suggest that telehealth can be deployed as a fully integrated aspect of care within a multisite, multiregional cancer practice, without evidence of duplicative care. With the anticipated end of the PHE declaration, payors' reimbursement structuring and licensing provisions for practice across state lines may significantly affect whether this care model can be sustainably offered to patients going forward.

Future work is needed to help guide effective policy-making in this regard and to ensure that ongoing deployment

remains associated with equitable access to patient-centered cancer care.

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DISCLAIMER

The funding entities had no role in the design and conduct of the investigator-initiated study; collection, management, analysis, and interpretation of the data; and preparation and review of the manuscript.

PRIOR PRESENTATION

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DATA SHARING STATEMENT

The data generated in this study are available upon request from the corresponding author.

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AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST**Patient- and Provider-Level Factors Associated With Telehealth Utilization Across a Multisite, Multiregional Cancer Practice From 2019 to 2021**

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