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Disparities in the Uptake of Telemedicine and Implications for Clinical Trial Enrollment in Patients With Breast Cancer

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Purpose: Since the COVID-19 pandemic, telemedicine has emerged as an alternative to office visits in routine radiation oncology practice. The purpose of this study was to identify factors associated with patient preference for an initial consult via telemedicine and correlation with clinical trial enrollment.

Methods and Materials: We evaluated patients with breast cancer seen during the open enrollment of a prospective randomized trial from June 1, 2020, to May 13, 2021. Univariate and multivariate logistic regression models were used to identify factors associated with virtual versus in-person initial consultation. All statistical tests were 2-sided, and the null hypothesis was rejected for \( P < .05 \).

Results: We identified 476 patient consultations with 259 office visits and 217 telemedicine visits. On multivariate analysis, increased age, unemployment, chemotherapy receipt, and radiation at our institution were associated with decreased usage of telemedicine for consultation visit. Out of 217 patients who underwent a telemedicine initial consultation, 10% were eligible to enroll on the trial, and of those eligible 76% enrolled. Out of 259 patients who underwent office visit initial consultation, 14% were eligible to enroll on the trial, and of those eligible 53% enrolled. Among eligible patients, there was no statistically significant difference in clinical trial enrollment between telemedicine and office visits.

Conclusions: Older patients, unemployed patients, those receiving chemotherapy, and those who subsequently received radiation at our institution were less likely to use telemedicine for their initial consult. Despite these disparities in telemedicine usage, there was no difference in clinical trial enrollment. Telemedicine may be an effective platform for clinical trial enrollment though further strategies to improve its access are essential. © 2022 Elsevier Inc. All rights reserved.

Introduction

Since the COVID-19 pandemic, numerous studies have identified telemedicine as a suitable platform for radiation oncology visits with high patient and physician satisfaction.\(^1\)\(^\text{-}\)\(^2\) Recent data have also found socioeconomic disparities in access to digital technologies that are becoming increasingly important to address so that already existing disparities in patient care are not exacerbated as the use of telemedicine increases.\(^8\)\(^\text{-}\)\(^10\) Among Medicare beneficiaries, the proportion of beneficiaries who lacked digital access was higher among those 85 years or older, those widowed, those with high school education or less, those who identified as Black or Hispanic, those who received Medicaid, those whose primary language was not English, or those who had a disability.\(^9\) This is further supported by evidence of racial/ethnic, language, insurance, and household income disparities between patients completing office visits
versus virtual visits in oncologic care.9-12 These disparities are also commonly cited barriers to clinical trial enrollment.13-15

We aimed to identify factors associated with patient preference for an initial telemedicine visit and correlation with clinical trial enrollment.

Methods and Materials

This study was approved by the institutional review board. We reviewed all electronic medical records of patients with breast cancer who had an initial consultation either in person or virtually during the open enrollment of a prospective randomized controlled noninferiority trial evaluating radiation fibrosis with 5 versus 3 fractions from June 1, 2020, to May 13, 2021 (NYU S14-01306, NCT#02276885). This trial opened on September 17, 2014, and closed to accrual on May 13, 2021. To capture a period of time when patients with breast cancer at our institution were being offered both telemedicine and in-person visits and during which this clinical trial was open, we chose a study period from June 1, 2020, to May 13, 2021, for the present study. All patients on the trial were treated with external beam accelerated partial breast irradiation in the prone position. Three-dimensional conformal or intensity modulated radiation therapy treatment planning was allowed. There was only 1 other competing breast cancer trial open during the study period, the Precision trial, a phase II study of breast conserving surgery without adjuvant radiation therapy for favorable risk breast cancer (NCT #02653755). The trial was open but no patients were offered an initial consultation in person or via telemedicine. All virtual consultations were conducted via video except for 5 visits that were telephone only. This study includes patients seen by 2 providers who see patients with breast cancer at our institution. Patient and tumor characteristics and treatment planning parameters were recorded.

Statistical analysis

Descriptive statistics, including medians, ranges, frequencies, and percents were used to describe patient, tumor, and treatment characteristics. Univariate and multivariate logistic regression were performed to calculate odds ratios and characterize factors associated with virtual versus in-person initial consultation and factors associated with clinical trial enrollment, where the null hypothesis was rejected for P < .05. Statistical analyses were conducted in R Studio Version 1.1.383 (Boston, MA).

Results

Between June 1, 2020, and May 13, 2021, 476 patients with breast cancer were identified, with 259 patients (54%) undergoing initial consultation in-person and 217 patients (45%) undergoing initial consultation via telemedicine. All patients were female. Two providers were assessed and both saw an equal number of in-person and telemedicine patients. Out of 274 total patients seen by provider 1, 55% underwent in-person consultation and 45% underwent a consultation via telemedicine. Out of 202 total patients seen by provider 2, 53% underwent an in-person consultation and 47% underwent a consultation via telemedicine.

Overall patient characteristics

Patient characteristics are summarized in Table 1. Patients with office visits had a median age of 64 years old (interquartile range [IQR], 54-74 years old), 56% were White, 87.6% were not of Hispanic ethnicity, 46.7% were married or partnered, 50.2% were employed, 29% were retired, 17% were unemployed, 85.7% lived in New York City, 86.9% listed English as their primary language, and 88% did not require an interpreter for initial consultation. Most had high performance status: 97.7% had an Eastern Cooperative Oncology Group score <2 and 66.4% had body mass index <30. About 19.3% had a personal prior history of radiation and 45.6% had a family history of breast cancer. Patients with telemedicine visits had a lower median age of 60 years old (IQR, 50-68 years old), were statistically significantly less likely to be divorced (7.4% vs 13.9%) or widowed (4.6% vs 12%), and were statistically significantly less likely to be retired (16.1% vs 29.0%) or unemployed (10.1% vs 17.0%).

In terms of disease presentations at time of consult, most patients presented with primary disease (84.6% in office visit arm and 85.3% in telemedicine arm), invasive ductal carcinoma (74.0% in office visit arm and 71% in telemedicine arm), and grade 1 to 2 (64.1% in office visit arm and 62.7% in telemedicine arm). Most patients presented with early stage disease in both groups: 57.6% presenting with pT0-T1 disease and about 80% presenting with pN0-Nx.

In terms of treatment management, most patients underwent lumpectomy (77% in both arms) and sentinel lymph node biopsy (about 65% in both arms). On univariate analysis, patients with telemedicine visits were associated with decreased rates of radiation treatment done at our cancer center (82.6% vs 71.9%; P = .01) and decreased rates of patients undergoing radiation treatment when initially recommended at consultation (14.7% vs 6.6%; P = .006). There was no statistically significant difference in terms of radiation dose received in patients who underwent office visit versus virtual initial consultation. Patients with telemedicine consultation were more likely to have an additional visit before the simulation visit compared with patients with office visit consultation (7.8% vs 3.1%; P < .001).

Multivariate analysis identifying patient factors associated with telemedicine usage for initial consultation is shown in Table 2. Older patients were less likely to use telemedicine for their initial consultation (P = .024). Patient who were unemployed were also less likely to use telemedicine compared with...
Table 1  Baseline patient characteristics according to type of visit

| Patient characteristics | Office visit, n (%) | Telemedicine, n (%) | P value |
|-------------------------|---------------------|---------------------|---------|
| Patients, n             | 259 (54)            | 217 (45)            |         |
| Female, n               | 259 (100)           | 217 (100)           |         |
| Median age (IQR), years | 64 (54-73)          | 60 (50-68)          | <.001   |
| Race                    |                     |                     | .183    |
| White                   | 145 (56)            | 141 (65)            |         |
| Asian                   | 35 (13.5)           | 19 (8.8)            |         |
| African American        | 36 (13.9)           | 28 (12.9)           |         |
| Unknown                 | 43 (16.6)           | 29 (13.4)           |         |
| Ethnicity               |                     |                     | .339    |
| Not of Hispanic ethnicity | 227 (87.6)        | 188 (86.6)          |         |
| Hispanic/Latino         | 27 (10.4)           | 20 (9.2)            |         |
| Unknown                 | 5 (1.9)             | 9 (4.1)             |         |
| Marital status          |                     |                     | .005    |
| Single                  | 67 (25.9)           | 69 (31.8)           |         |
| Divorced                | 36 (13.9)           | 16 (7.4)            |         |
| Married                 | 115 (44.4)          | 115 (53.0)          |         |
| Partnered               | 6 (2.3)             | 6 (2.8)             |         |
| Widowed                 | 31 (12.0)           | 10 (4.6)            |         |
| Unknown                 | 4 (1.5)             | 1 (0.5)             |         |
| Occupation              |                     |                     | <.001   |
| Employed                | 130 (50.2)          | 146 (67.3)          |         |
| Retired                 | 75 (29.0)           | 35 (16.1)           |         |
| Unemployed              | 44 (17.0)           | 22 (10.1)           |         |
| Unknown                 | 10 (3.9)            | 14 (6.5)            |         |
| Home location           |                     |                     | .499    |
| Manhattan               | 87 (33.6)           | 68 (31.3)           |         |
| Out of NY state         | 27 (10.4)           | 24 (11.1)           |         |
| NYC borough (not Manhattan) | 135 (52.1)      | 110 (50.7)          |         |
| NY state                | 10 (3.9)            | 15 (6.9)            |         |
| Language                |                     |                     | .002    |
| English                 | 225 (86.9)          | 207 (95.4)          |         |
| Non-English             | 34 (13.1)           | 10 (4.6)            |         |
| Interpreter needed      |                     |                     | .007    |
| No                      | 228 (88)            | 207 (95.4)          |         |
| Yes                     | 31 (12)             | 10 (4.6)            |         |
| Current COVID vaccination|                     |                     | .655    |
| Yes                     | 190 (73.4)          | 164 (75.6)          |         |
| MyChart                 |                     |                     | .122    |
| Yes                     | 243 (93.8)          | 211 (97.2)          |         |
| Primary coverage        |                     |                     | .031    |
| Private                 | 183 (70.7)          | 173 (79.7)          |         |
| Public (Medicare/Medicaid) | 76 (29.3)      | 44 (20.3)           |         |
| ECOG                    |                     |                     | .412    |
| <2                      | 253 (97.7)          | 215 (99.1)          |         |
| ≥2                      | 6 (2.3)             | 2 (0.9)             |         |

(Continued)
Table 1 (Continued)

| Patient characteristics                      | Office visit, n (%) | Telemedicine, n (%) | P value |
|---------------------------------------------|---------------------|---------------------|---------|
| BMI                                         |                     |                     | .751    |
| <30                                         | 172                 | 148                 |         |
| >30                                         | 87                  | 69                  |         |
| Family history breast cancer                |                     |                     |         |
| Yes                                         | 118 (45.6)          | 113 (52.1)          | .185    |
| Radiation history                           |                     |                     |         |
| Yes                                         | 50 (19.3)           | 30 (13.8)           | .142    |
| Disease type at consult                     |                     |                     |         |
| Primary                                     | 219 (84.6)          | 185 (85.3)          | .934    |
| Recurrent                                   | 21 (8.1)            | 18 (8.3)            | 1       |
| Metastatic                                  | 19 (7.3)            | 14 (6.5)            | .844    |
| T stage                                     |                     |                     | .082    |
| Tis                                         | 44 (17.0)           | 43 (19.8)           |         |
| T0-T1                                       | 146 (56.4)          | 118 (54.4)          |         |
| T2-T4                                       | 31 (12.0)           | 31 (14.3)           |         |
| X                                           | 22 (8.5)            | 16 (7.4)            |         |
| N stage                                     |                     |                     | .336    |
| Negative                                    | 141 (54.4)          | 115 (53)            |         |
| Positive                                    | 36 (13.9)           | 33 (15.2)           |         |
| X                                           | 69 (26.6)           | 63 (29.0)           |         |
| M1                                          | 18 (6.9)            | 16 (6.5)            | .974    |
| Histology                                   |                     |                     | .063    |
| IDC                                         | 194 (74.9)          | 154 (71)            |         |
| DCIS                                        | 44 (17)             | 43 (19.8)           |         |
| ILC                                         | 19 (7.3)            | 11 (5.1)            |         |
| Other histology                             | 2 (0.8)             | 9 (4.1)             |         |
| Grade                                       |                     |                     | 1       |
| 1-2                                         | 166 (64.1)          | 146 (62.7)          |         |
| >2                                          | 58 (22.4)           | 48 (22.1)           |         |
| Unknown                                     | 11 (4.2)            | 33 (15.2)           |         |
| ER positive                                 | 221 (85.3)          | 172 (79.3)          | .394    |
| PR positive                                 | 193 (74.5)          | 160 (73.7)          | .431    |
| HER2 positive                               | 28 (10.8)           | 25 (11.5)           | .932    |
| LVI                                         | 41 (15.8)           | 31 (14.3)           | .69     |
| EIC                                         | 44 (17.0)           | 31 (14.3)           | .001    |
| Positive IDC margin                         | 11 (4.2)            | 10 (4.6)            | 1       |
| Positive DCIS margin                        | 5 (1.9)             | 4 (1.8)             | 1       |
| Surgical management                         |                     |                     |         |
| Lumpectomy                                  | 200 (77.2)          | 167 (77.0)          | .903    |
| Mastectomy                                  | 35 (13.5)           | 33 (15.2)           | .715    |
| None                                        | 24 (9.3)            | 17 (7.8)            |         |
| Axillary management                         |                     |                     | .864    |
| SLNB                                        | 168 (64.9)          | 133 (61.3)          |         |

(Continued)
patients who were employed ($P = .05$). Patients who required chemotherapy either neoadjuvantly or adjuvantly were less likely to use telemedicine ($P = .0$). Finally, patients receiving their radiation at our institution were less likely to have used telemedicine for their initial consultation ($P = .001$). Marital status, interpreter needed, primary language, and primary coverage were not associated with visit type preference after covariate adjustment.

Clinical trial enrollment

Table 1 shows the proportion of patients who underwent telemedicine versus office visit consultation and who were eligible for the trial and who then enrolled. Out of 217 patients who underwent a telemedicine initial consultation, 10% were eligible to enroll on the trial, and of those eligible 76% enrolled. Out of 259 patients who underwent office visit consultation, Table 1 shows the proportion of patients who underwent telemedicine versus office visit consultation and who were eligible for the trial and who then enrolled. Out of 217 patients who underwent a telemedicine initial consultation, 10% were eligible to enroll on the trial, and of those eligible 76% enrolled. Out of 259 patients who underwent office visit consultation, 22% were eligible to enroll on the trial, and of those eligible 67% enrolled.

**Table 1 (Continued)**

| Patient characteristics | Office visit, n (%) | Telemedicine, n (%) | $P$ value |
|-------------------------|--------------------|-------------------|-----------|
| ALND                    | 25 (9.7)           | 23 (10.6)         |           |
| None                    | 46 (17.8)          | 44 (20.3)         |           |
| Unknown                 | 20 (7.7)           | 17 (7.8)          |           |
| Chemotherapy            | 105 (40.5)         | 65 (30.0)         | .021      |
| Hormone therapy         | 180 (69.5)         | 144 (66.4)        | .527      |
| Radiation recommended   | 242 (93.4)         | 193 (88.9)        | .115      |
| Radiation               |                    |                   |           |
| Yes, at our institution | 215 (88.8)         | 157 (81.3)        | .007      |
| Yes, elsewhere          | 14 (5.8)           | 16 (8.3)          | .490      |
| No                      | 13 (5.4)           | 20 (10.4)         | .106      |
| Radiation fields        |                    |                   |           |
| Whole                   | 106 (40.9)         | 87 (40.1)         | .269      |
| Partial                 | 52 (20.1)          | 27 (12.4)         | .140      |
| CW + RNI                | 28 (10.8)          | 15 (6.9)          | .393      |
| Breast + RNI            | 19 (7.3)           | 18 (8.3)          | .499      |
| Other field(s)          | 13 (5.0)           | 0 (0)             | .001      |
| Unknown                 | 9 (3.5)            | 24 (11)           |           |
| Radiation fractionation |                    |                   |           |
| Conventional            | 47 (18.1)          | 37 (17.1)         | .545      |
| Hypofractionation       | 100 (38.6)         | 81 (37.3)         |           |
| Accelerated             | 66 (25.5)          | 41 (18.9)         |           |
| Unknown                 | 14 (5.4)           | 12 (5.5)          |           |
| Radiation oncology visits before sim |                   |                   | .008      |
| > 1                     | 9 (4.2)            | 19 (12.2)         |           |
| NA                      | 45 (17.4)          | 61 (28.1)         |           |
| Median time interval consult to sim (days) (IQR) | 12.5 (6, 22)       | 13 (8.5, 27)      | .073      |
| Median time interval consult to treatment (days) (IQR) | 27 (20, 35)       | 27 (24, 42)       | .115      |
| Eligible for clinical trial, n | 36 (14)            | 21 (10)           | .204      |
| Enrolled on clinical trial, n (% of those eligible) | 19 (53)            | 16 (76)           | .142      |
| Enrolled by provider 1  | 14 (74)            | 12 (75)           | 1         |
| Enrolled by provider 2  | 5 (26)             | 4 (25)            | 1         |

**Abbreviations:** ALND = axillary lymph node dissection; BMI = body mass index; COVID = coronavirus disease; CW = chest wall; DCIS = ductal carcinoma in situ; ECOG = Eastern Cooperative Oncology Group; EIC = extensive intraductal component; ER = estrogen receptor; HER2 = human epidermal growth factor receptor 2; IDC = invasive ductal carcinoma; ILC = invasive lobular carcinoma; IQR = interquartile range; LVI = lymphovascular invasion; NY = New York; NYC = New York City; PR = progesterone receptor; RNI = regional node irradiation; SLNB = sentinel lymph node biopsy.
initial consultations, 14% were eligible to enroll on the trial, and of those eligible 53% enrolled. Among eligible patients, there was no statistically significant difference in clinical trial enrollment between telemedicine and office visits. For both in-person consultation and telemedicine consultations, 75% of patients were enrolled by provider 1. Provider 1 had higher enrollment than provider 2, but the 2 providers saw very similar proportions of telemedicine to in-person visits. This limits the potential bias of provider on clinical trial enrollment as it relates to visit type.

**Trend in telemedicine consultations and clinical trial enrollment**

*Figure 1* shows the trend in telemedicine and in-person consultations and the number of patients enrolled after telemedicine or in-person consultation from June 2020 to May 2021. The number of telemedicine consults decreased from June to September 2020 until it was less than the number of in-person consults in September 2020. In parallel, the number of patients enrolled via telemedicine decreased during that time, and the first person to enroll after an in-person consultation occurred in September 2020. From September

| Variable                  | OR (95% CI) | P value |
|---------------------------|------------|---------|
| Age                       | 0.97 (0.94-1.0) | .024    |
| Marital status            |            |         |
| Single (ref)              |            |         |
| Divorced                  | 0.63 (0.25-1.58) | .33     |
| Married                   | 0.16 (0.66-2.07) | .6      |
| Partnered                 | 0.72 (0.19-2.72) | .63     |
| Widowed                   | 0.49 (0.17-1.4) | .19     |
| Unknown                   | 0.25 (0.02-3.78) | .32     |
| Occupation                |            |         |
| Employed                  |            |         |
| Retired                   | 0.64 (0.31-1.3) | .22     |
| Unemployed                | 0.47 (0.22-1.01) | .05     |
| Unknown                   | 0.85 (0.27-2.76) | .79     |
| Interpreter needed        |            |         |
| Yes                       | 0.71 (0.25-2.0) | .52     |
| Primary coverage          |            |         |
| Medicaid/Medicare         | 1.16 (0.59-2.3) | .67     |
| Chemo                     |            |         |
| Yes                       | 0.32 (0.19-0.55) | 0      |
| Radiation at our institution | 0.34 (0.17-0.65) | .001    |

Abbreviations: CI = confidence interval; OR = odds ratio.

**Table 3 Baseline eligible patient characteristics according to enrollment in clinical trial**

| Patient characteristics eligible | Not enrolled, n (%) | Enrolled, n (%) | P value |
|----------------------------------|---------------------|----------------|---------|
| Patients, n                      | 22                  | 35             |         |
| Median age (IQR), y              | 65 (63-71)          | 70 (62.5-74)   | .471    |
| Race                             |                     |                |         |
| White                            | 19 (86.4)           | 26 (74.2)      | .328    |
| Asian                            | 0 (0)               | 1 (2.9)        |         |
| African American                 | 0 (0)               | 4 (11.4)       |         |
| Unknown                          | 3 (13.6)            | 4 (11.4)       |         |
| Ethnicity                        |                     |                |         |
| Not of Hispanic ethnicity        | 22 (100%)           | 33 (94.3)      | .688    |
| Hispanic/Latino                  | 0 (0)               | 2 (5.7)        |         |
| Marital status                   |                     |                | .856    |
| Single                           | 3 (13.6)            | 4 (11.4)       |         |
| Divorced                         | 4 (18.2)            | 6 (17.1)       |         |
| Married                          | 12 (54.5)           | 16 (45.7)      |         |
| Partnered                        | 1 (4.5)             | 2 (5.7)        |         |
| Widowed                          | 2 (9.1)             | 7 (20.0)       |         |
| Occupation                       |                     |                | .142    |
| Employed                         | 10 (45.5)           | 20 (57.1)      |         |
| Retired                          | 7 (31.8)            | 13 (37.1)      |         |
| Unemployed                       | 2 (9.1)             | 2 (5.7)        |         |
| Unknown                          | 3 (13.6)            | 0 (0)          |         |
| Location                         |                     |                | .725    |
| Manhattan                        | 8 (36.4)            | 13 (37.1)      |         |
| Out of NY state                  | 1 (4.5)             | 3 (8.6)        |         |
| NYC borough (not Manhattan)      | 11 (50.0)           | 18 (51.4)      |         |
| NY state                         | 2 (9.1)             | 1 (2.9)        |         |
| Language                         |                     |                | .688    |
| English                          | 22 (100.0)          | 33 (94.3)      |         |
| Non-English                      | 0 (0)               | 2 (5.7)        |         |
| Interpreter needed               |                     |                | .688    |
| No                               | 22 (100.0)          | 33 (94.3)      |         |
| Yes                              | 0 (0)               | 2 (5.7)        |         |
| Current COVID vaccination        |                     |                | .647    |
| No                               | 22 (100.0)          | 34 (97.1)      |         |
| Yes                              | 0 (0)               | 2 (5.7)        |         |

(Continued)
2020 to May 2021, the number of telemedicine and in-person consults fluctuated, with slightly more in-person consults. Clinical trial enrollment after in-person consult increased as the number of in-person consults increased.

**Enrolled patient characteristics**

Patient characteristics of enrolled patients are summarized in Table 3. Patients who enrolled had median age of 70 years old (IQR, 62.5-74 years old). Out of the 35 patients who enrolled, 65% were White, 94.3% were not of Hispanic ethnicity, 51.4% were married or partnered, 57.1% were employed, 88.5% lived in New York City, 94.3% spoke English as a primary language and did not need an interpreter, all had Eastern Cooperative Oncology Group scores <2, and 62.9% had body mass index <30. There were no statistically significant differences in patients who were eligible but chose not to enroll. All eligible African American and Asian patients and all eligible patients who did not speak English as a primary language enrolled in the clinical trial.

**Discussion**

Although multiple studies have compared characteristics of patients seen prepanademic and inpanademic, our study evaluated factors associated with the selection of in-person versus virtual initial consultation among patients with breast cancer inpanademic from June 2020 to May 2021, when all patients were offered both types of visits.7,9 In June 2020, the number of telemedicine visits initially greatly surpassed the number of in-person visits. It decreased over time until it was less than the number of in-person consults in September 2020. The decrease in telehealth visits over time is consistent with the national trend analysis from the Assistant Secretary for Planning and Evaluation office using the household pulse survey conducted from April 2021 to October 2021, which showed a modest decline in telehealth use over the course of the year, though telehealth visit rates still remained above prepanademic rates.16

Our data support that increasing age is associated with decreased telemedicine usage, most likely due to decreased access and comfort in use of digital technologies. A recent study showed that approximately one-quarter of Medicare beneficiaries lack either a smart phone or a computer with a high-speed internet connection.8 The proportion of beneficiaries who lacked digital access was higher among those with low socioeconomic status, those 85 years or older, and in communities of color. Expanding policies to provide reduced-cost phone or internet services to families with lower income and assistance programs for the elderly to learn how to use technology may help reduce these disparities. Although our study showed that increasing age and unemployment were associated with decreased telemedicine usage, our study showed no statistically significant difference in age or employment status between eligible patients who enrolled and those who did not enroll on the trial, suggesting that decreased telemedicine usage in older and unemployed patients had no effect on clinical trial enrollment. This should, however, be interpreted with caution given the low number of eligible patients for the trial.

Many studies have also shown that racial and ethnic minorities and non-English speaking patients are less likely to use telemedicine.12,16,17 In a multicenter, prospective cohort study of 2365 outpatients receiving cancer care during the pandemic, Schmidt et al17 showed that Black and Hispanic patients were less likely to have an increase in telehealth utilization, and Hispanic patients were more likely than White patients to have pandemic-related delays in cancer care. Our study showed no statistically significant difference in telemedicine versus in-person consultations between
patients of different races or ethnicities. In fact, all eligible patients who did not speak English as a primary language enrolled in the clinical trial. There were only 2 eligible patients who did not speak English as a primary language, limiting any definite explanation. However, both patients were seen in-person with an in-person interpreter, which potentially highlights the importance of in-person visits and in-person interpreters for improved communication and clinical trial enrollment. All eligible African American and Asian patients also enrolled in the clinical trial. Aside from low numbers of African American and Asian patients, this finding may also be because of our institution being located in a highly urban setting and strongly promoting an inclusive community through health equity research, clinical care, medical education, and recruitment initiatives, which may increase trust between providers and patients from diverse backgrounds. Institutional efforts to reduce racial and ethnic barriers may help narrow these disparities and improve care.

There have been a few studies assessing the effect of disparities in telemedicine usage on cancer outcomes. In a retrospective study of 720 United States patients with thoracic cancer during the COVID-19 pandemic, telemedicine visits were described as successful if a patient completed the entire scheduled visit with video capability or as unsuccessful if the visit was conducted via telephone without video or the patient had a no-show or missed encounter. Patients with Medicaid had significantly higher odds of unsuccessful telemedicine visits compared with those with private insurance, and those with at least 1 unsuccessful telemedicine visit had higher likelihood of an emergency department or urgent care visit or hospitalization. In a propensity-matched analysis pre- and postpandemic of newly referred patients with cancer starting systemic therapy comparing in-person versus virtual visits, there were no discernable differences in 3-month clinical outcomes among cohorts, including rates of chemotherapy discontinuation and all-cause or cancer-specific emergency visits or hospitalizations. The number of treatment delays and mean duration of delays were similar across cohorts. As we integrate virtual care into health care systems, further high-quality research studies are needed to assess outcomes for patients with decreased telemedicine usage to avoid perpetuating already existing disparities in patient care.

Demographic disparities in telemedicine use persist in regards to audio versus video telehealth usage, further potentially increasing inequality in quality of care and clinical outcome. Based on the National Census Bureau’s Household Pulse Survey conducted from July 2021 to October 2021, patients without a high school diploma, adults aged 65 and older, those who self-identified as Latino, Asian American, or Black, and those with household income <$100,000 had lower odds of using video-enabled telehealth services. In contrast to a phone visit, a video visit may allow a partial physical examination and nonverbal communication, leading to a strong patient-provider relationship. In a large National Comprehensive Cancer Network network survey sent to oncology providers including 10% of radiation oncology physicians, office visits were compared with both telephone and video visits. Of the 1038 providers who answered the survey, 93% indicated that office visit was better than telephone visit and 86% indicated that office visit was better than video visit for establishing a personal connection with a patient or family. This highlights the potential limitation of telemedicine visits in establishing a therapeutic alliance as well as the use of video to further optimize patient physician
communication. Shaverdian et al.\textsuperscript{7} reported that telephone-only patients were 2 times more likely than those who had an audiovisual encounter to report that their understanding of the treatment plan would be better with an in-person visit.

Effective patient-physician communication has been shown to be even more crucial in clinical trial enrollment.\textsuperscript{22,23} Given that clinical trial protocols are discussed during the initial consultation, we aimed to characterize whether telemedicine initial consultations affected clinical trial enrollment. All patients were offered telemedicine visits and only 2 providers were assessed with an equal number of patients seen in-person or via telemedicine, thus limiting any patient and provider selection bias. Our study showed no difference in clinical trial enrollment between telemedicine and office visits, suggesting that video visits may be just as effective as office visits in establishing therapeutic alliance. Out of the 21 eligible patients who underwent telemedicine visits, 76% enrolled, while out of the 26 patients eligible who underwent office visits, 53% enrolled. Of note, all of the patients in our study underwent telemedicine visits with video except for 5 patients who underwent telephone-only encounters. Out of the patients eligible for the trial, all underwent telemedicine visits with video.

Our study found patients who required chemotherapy either neoadjuvantly or adjuvantly were more likely to undergo an office visit consultation. This could potentially be due to multiple factors, including patients scheduling their initial consultation in-person on the same day as their chemotherapy infusion to limit travel or increased familiarity with the cancer center from previous visits. Patients for whom radiation was recommended did not preferentially select a virtual or in-person initial consultation. However, patients who underwent their initial consultation in-person were then more likely to receive their radiation at our institution compared to patients who underwent a virtual consultation. Our study did not show a significant difference in patient’s home location between patients undergoing in-person versus telemedicine initial consult, so this is less likely to account for the lower rates of telemedicine patients receiving radiation at our institution. It is unknown whether this observed difference represents the effect of an increased patient-physician therapeutic alliance during an office visit leading to higher patient compliance or the cause of patients preferring to undergo radiation at our institution, which led to preferential selection of an in-person initial consultation.

Our study showed no statistically significant difference in telemedicine usage by patient disease presentation including primary, recurrent, or metastatic disease or by radiation treatment recommendation. Similarly, Shaverdian et al.\textsuperscript{7} showed no significant difference by cancer diagnosis, radiation consultation intent, or symptomatic or metastatic disease among patients with a wide variety of disease sites. This further demonstrates that patients with diverse clinical presentations and radiation treatment recommendations did not preferentially select a telemedicine or office visit type. However, further studies are needed to better define underlying reasons for patient selection and effect on care to ensure equal access and benefit from telemedicine, especially in already disadvantaged patient populations.

Our study is limited in the diversity of patients including only female patients with breast cancer and the limited number of patients eligible for the clinical trial. Based on the National Census Bureau’s Household Pulse Survey conducted from July 2021 to October 2021, men were associated with lower odds of using video-enabled telehealth services compared with women, and transgender individuals had higher odds of using video-enabled telehealth compared with cisgender women, though the sample size for transgender individuals was small.\textsuperscript{16} These data suggest potential variations in technological use based on gender, though reasons for these disparities are not well defined. Our data do not provide causal relationship between patient characteristics and selection of telemedicine versus office visits or between telemedicine and office visit consultation and clinical trial enrollment. Additional studies are needed to further characterize disparities associated with variations in telemedicine usage to optimize patient care and clinical trial enrollment for the most vulnerable patients.

**Conclusion**

This study demonstrates that older patients, unemployed patients, and those requiring chemotherapy were less likely to use telemedicine for their initial consult. Those who underwent an in-person initial consultation were then more likely to receive their radiation at our institution. Despite these disparities in telemedicine usage, there was no difference in clinical trial enrollment. Telemedicine may be an effective platform for clinical trial enrollment, though further strategies to improve its access are essential to not perpetuate already existing disparities in patient care and clinical trials.

**References**

1. Damico NJ, Deshane A, Kharouta M, et al. Telemedicine use and satisfaction among radiation oncologists during the covid-19 pandemic: Evaluation of current trends and future opportunities. *Adv Radiat Oncol* 2022;7:100835.
2. Miller RC, Simone BA, Lombardo JF, et al. A pilot trial using telemedicine in radiation oncology: The future of health care is virtual. *Telemed Rep* 2021;2:171-178.
3. Orazem M, Oblak I, Spanic T, et al. Telemedicine in radiation oncology post-covid-19 pandemic: There is no turning back. *Int J Radiat Oncol Biol Phys* 2020;108:411-415.
4. Tevaarwerk AJ, Chandereng T, Osterman T, et al. Oncologist perspectives on telemedicine for patients with cancer: A national comprehensive cancer network survey. *JCO Oncol Pract* 2021;17:e1318-e1326.
5. Zhang H, Cha EE, Lynch K, et al. Radiation oncologist perceptions of telemedicine from consultation to treatment planning: A mixed-methods study. *Int J Radiat Oncol Biol Phys* 2020;108:421-429.
6. Johnson BA, Lindgren BR, Blaes AH, et al. The new normal? Patient satisfaction and usability of telemedicine in breast cancer care. *Annal Surg Oncol* 2021;28:5668-5676.
7. Shaverdian N, Gillespie EF, Cha E, et al. Impact of telemedicine on patient satisfaction and perceptions of care quality in radiation oncology. *J Natl Compr Canc Netw* 2021;19:1174-1180.

8. Roberts ET, Mehrotra A. Assessment of disparities in digital access among medicare beneficiaries and implications for telemedicine. *JAMA Intern Med* 2020;180:1386-1389.

9. Tam S, Wu VF, Williams AM, et al. Disparities in the uptake of telemedicine during the covid-19 surge in a multidisciplinary head and neck cancer population by patient demographic characteristics and socioeconomic status. *JAMA Otolaryngol Head Neck Surg* 2021;147:209-211.

10. Katz AJ, Haynes K, Du S, et al. Evaluation of telemedicine use among us patients with newly diagnosed cancer by socioeconomic status. *JAMA Oncol* 2022;8:161-163.

11. De B, Fu S, Chen YS, et al. Patient, physician, and policy factors underlying variation in use of teledmedicine for radiation oncology cancer care. *Cancer Med* 2022;11:2096-2105.

12. Qian AS, Schiaffino MK, Nalawade V, et al. Disparities in telemedicine during covid-19. *Cancer Med* 2022;11:1192-1201.

13. Perni S, Moy B, Nipp RD. Disparities in phase 1 cancer clinical trial enrollment. *Cancer* 2021;127:4464-4469.

14. Bero EH, Rein LE, Ranerjee A, et al. Characterization of underrepresented populations in modern era clinical trials involving radiation therapy. *Pract Radiat Oncol* 2021;11:453-459.

15. Unger JM, Hershman DL, Osaroigbion RU, et al. Representativeness of black patients in cancer clinical trials sponsored by the National Cancer Institute compared with pharmaceutical companies. *JNCI Cancer Spectr* 2020;4:pkaa034.

16. Madjid Karimi ECL, Couture SJ, Gonzales A, Grigorescu V, Smith SR, De Lew N. National survey trends in telehealth use in 2021: Disparities in utilization and audio vs. video services, February 1st 2021 (issue brief).

17. Schmidt AL, Bakouny Z, Bhalla S, et al. Cancer care disparities during the covid-19 pandemic: Covid-19 and cancer outcomes study. *Cancer Cell* 2020;38:769-770.

18. Waseem N, Boulanger M, Yanek LR, et al. Disparities in telemedicine success and their association with adverse outcomes in patients with thoracic cancer during the covid-19 pandemic. *JAMA Netw Open* 2022;5 e2220543.

19. Hsiehchen D, Muquith M, Haque W, et al. Clinical efficiency and safety outcomes of virtual care for oncology patients during the covid-19 pandemic. *JCO Oncol Pract* 2021;38:769-770.

20. DiMatteo MR, Taranta A, Friedman HS, et al. Predicting patient satisfaction from physicians’ nonverbal communication skills. *Med Care* 1980;18:376-387.

21. Mast MS. On the importance of nonverbal communication in the physician-patient interaction. *Patient Educ Couns* 2007;67:315-318.

22. Albrecht TL, Eggly SS, Gleason ME, et al. Influence of clinical communication on patients’ decision making on participation in clinical trials. *J Clin Oncol* 2008;26:2666-2673.

23. Joseph G, Dohan D. Diversity of participants in clinical trials in an academic medical center: The role of the ‘good study patient?’. *Cancer* 2009;115:608-615.