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Analyzing disparities in access to teledermatology compared with dermatology clinic visits before, during, and after COVID-19 quarantine

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Abstract The COVID-19 pandemic has caused significant changes in dermatologic care, likely exacerbating health disparities for specific minority populations. The use of teledermatology has also become more prevalent during this period. The aim of this study was to determine if the proportion of teledermatology versus office-based visits varied significantly during three study periods of the COVID-19 pandemic. The secondary objective was to determine whether there are significant differences in the use of office-based dermatology versus teledermatology care across the following demographic subgroups: insurance type, race/ethnicity, age, and language during the same periods. A chart review of dermatology visits in electronic medical records at a tertiary referral center in Washington, DC, was conducted. The overall telehealth visit rate was 0% in the prequarantine period, 61.12% during the quarantine period, and 10.59% in the postquarantine period. After assessing telehealth utilization rates among the demographic subgroups, we noted that Medicaid users, Black patients, 64-year-olds or older, and English speakers may benefit the least from telehealth services. Teledermatology use necessitated by the COVID-19 pandemic may have promoted health care disparities for specific marginalized populations.

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Introduction

The COVID-19 pandemic initiated an abrupt transition from in-person office visits to telemedicine when national recommendations mandated the suspension of all non-urgent consultations around mid-March of 2020. This change urged government-sponsored insurance, such as Medicaid and Medicare, to loosen restrictions on coverage and reimbursement for telemedicine visits for patients previously ineligible to receive these services from their homes.1,2 This policy, designed to reduce health care disparities among vulnerable populations, decreased transportation access barriers associated with the transition to telemedicine.3 The litera-
ture suggests teledermatology could potentially promote technologic disparities for low socioeconomic, minority backgrounds, older adults, or those with limited English-speaking proficiencies. For example, non-English speaking patients with baseline lower digital and health literacy skills may have trouble with the technologic complexity of virtual visits. Additionally, the use of video requires internet access, a service lacking in many low-income and rural areas; thus, vulnerable populations who already face barriers to care may have difficulties meaningfully engaging with teledermatology technology.

Many in-office dermatologic visits became widely unavailable and were substituted by teledermatology services during the pandemic. There are three main categories of teledermatology: synchronous, asynchronous, and hybrid. The synchronous live interaction teledermatology modality involves video and audio conferencing for real-time interactive feedback between patient and provider. In contrast, the asynchronous, store, and forward teledermatology modality involves uploading dermatologic images to a portal for providers to review and aid in diagnosis or treatment. The hybrid model combines elements of both systems with options for live interaction and store-and-forward technology. Of the three, synchronous live interaction is analogous to an in-person clinical encounter. There are several potential benefits of the use of teledermatology. For example, a retrospective review from 2014 to 2017 of teledermatology consultations in an urban safety-net health care system found that wait times from teledermatology referrals were shorter, no-show rates were lower, and biopsy rates increased. Another study found that implementation of a teledermatology triage system at a San Francisco hospital was associated with cost savings.

The overall utility of teledermicine and its impact on health inequities remains unclear in dermatology. The objective of this study is to determine whether the proportion of teledermatology versus office-based visits varied significantly during the following three study periods: the 3 months prior to COVID-19 quarantine, 3 months after COVID-19 quarantine, and 3 months after COVID-19 vaccine availability, to assess the impacts of the pandemic on use patterns of dermatologic services. Additionally, to determine disparities in access to teledermatology, this study assesses differences in visit type use across four significant characteristics: insurance type, race/ethnicity, age, and language.

Methods

This study was approved by the Georgetown University Institutional Review Board (IRB). Electronic medical records from the Medstar Health System in Washington DC were queried to collect visit-level data from three dermatology outpatient clinics for retrospective review over the following study periods: prequarantine, the 3-month period prior to COVID-19 quarantine (December 2019 to February 2020); during quarantine, the 3-month period during the quarantine (April 2020 to June 2020); and postquarantine: the 3-month period of vaccine availability and distribution after quarantine (January 2021 to March 2021). Inclusion was limited to completed Medstar Dermatology clinical encounters conducted at Georgetown University Hospital, Washington Hospital Center, and Chevy Chase outpatient sites between December 1, 2019, and March 31, 2021. All outpatient encounters within the study periods aggregated across the three study sites were included in the analysis.

Teledermatology visits were defined as visits completed under the synchronous modality of teledermatology. In-office dermatology visits were defined as visits completed in person in the clinic, office, or concierge setting. Visit demographics were selected for this study based on the potential to illustrate significant disparities in access to care across subgroups.

Data characteristics were summarized by frequency and percentage. The $\chi^2$ test was used to analyze the differences in the proportion of dermatologic service use among the three study periods. The Fisher exact test was used instead of the $\chi^2$ test when the expected cell count was less than five.

Data was also separated by insurance type, race/ethnicity, age, and lingual groups. There were five subgroups when separated by insurance type (Medicare, Medicaid, private insurance, self-pay, and other/unknown), five subgroups when separated by race/ethnicity (Black, Hispanic/Latino, Caucasian/White, Asian, and other/unknown), 3 subgroups when separated by age groups (0-18 years old, 19-64 years old, and >64 years old), or two subgroups when separated by lingual groups (English speaking and non-English speaking). The differences in dermatologic service use among three study periods within each subgroup were also assessed using the $\chi^2$ test or Fisher exact test, based on the expected cell count.

Relevant follow-up tests were carried out in case of significant results. We controlled for familywise error rates across tests using Benjamini and Hochberg’s false discovery rate (FDR) approach (1995).

For all tests, $P$ values < .05 was considered significant. All statistical analyses were performed using RStudio (version 1.4.1106).

Results

Baseline encounter characteristics

One hundred percent of prequarantine encounters were conducted via routine office visits. Thus, this distribution was used as a proxy for baseline access to dermatologic services across visit demographics, as reported in Table 1. Broken by insurance type, 62% of all prequarantine visits were with private insurance users, 23% with Medicaid users, 14% with Medicare users, and 1% with self-pay/other/unknown. Broken down by race/ethnicity, 46% of all visits were with White patients, 25% with Black patients, 21% with other/unknown,
Table 1  Characteristics of the study population and the distribution of patients using teledermatology versus in-office visits across each study parameter.

| Variable 1 | Level 1 | Variable 2 | Level 2 | Prequarantine | Quarantine | Postquarantine | P value |
|------------|---------|------------|---------|---------------|------------|----------------|---------|
| Overall    |         | Utilization of dermatologic services | Office visits (%) | 5,541 (100) | 965 (38.88) | 4,110 (89.41) | <.0001 |
| Insurance  | Medicare| Utilization of dermatologic services | Office visits (%) | 777 (100) | 140 (32.71) | 786 (88.81) | <.0001 |
| Medicaid   |         | Utilization of dermatologic services | Office visits (%) | 1,720 (100) | 240 (48.29) | 820 (93.93) | <.0001 |
| Private insurance | | Utilization of dermatologic services | Office visits (%) | 3,410 (100) | 575 (37.56) | 2,475 (88.24) | <.0001 |
| Self-Pay   |         | Utilization of dermatologic services | Office visits (%) | 26 (100) | 3 (27.27) | 9 (81.82) | <.0001 |
| Other/Unknown | | Utilization of dermatologic services | Office visits (%) | 58 (100) | 7 (46.67) | 20 (86.96) | <.0001 |
| Black/African-American | | Utilization of dermatologic services | Office visits (%) | 1,390 (100) | 282 (37.85) | 1,191 (91.62) | <.0001 |
| Hispanic/Latino  | | Utilization of dermatologic services | Office visits (%) | 317 (100) | 36 (36.73) | 255 (90.43) | <.0001 |
| Caucasian/White | | Utilization of dermatologic services | Office visits (%) | 2,564 (100) | 452 (42.01) | 1,767 (89.65) | <.0001 |
| Asian      |         | Utilization of dermatologic services | Office visits (%) | 128 (100) | 17 (26.56) | 77 (81.91) | <.0001 |
| Other/Unknown | | Utilization of dermatologic services | Office visits (%) | 1,142 (100) | 178 (35.67) | 820 (86.32) | <.0001 |

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6% with Hispanic/Latino patients, and 2% with Asian patients. Stratified by age, 67% of patients were in the 19 to 64 age group, 29% were in the >64 age group, and 4% were in the 0 to 18 age group. Also, 81% of all visits were with English-speaking patients, whereas 19% were with non–English-speaking patients and patients whose language was unknown.

**Primary outcome**

Comparing visit type utilization across the three study periods revealed that the telehealth visits rate was 0% in the prequarantine period, 61.12% during the quarantine period, and 10.59% in the postquarantine period. The telehealth visits rate was statistically significantly different from the office visit rate across the three study periods (P < .0001).

**Secondary outcomes**

Post hoc analysis with pairwise tests controlling for familywise error rate using false discovery rate (FDR) approach showed that the telehealth visits rate was significantly different between quarantine and postquarantine periods across all insurance groups (P < .05) (Fig. 1), all racial/ethnic groups (P < .05) (Fig. 2), both language groups (P < .05) (Fig. 3), and all age groups (P < .05) (Fig. 4).

**Discussion**

**Utilization by visit type**

In the three months before the COVID-19 quarantine, telehealth was not used at the clinic sites included in this study; however, there was a significant overall shift to telehealth during the quarantine. Once mandates restricting in-person services were lifted in COVID-19 vaccine availability, there was an overall shift back to primarily office visits (89.41%) (Table 1).

**Utilization by insurance type**

Before the quarantine, private insurance users accessed dermatologic services at Medstar Health more than any other insurance group. Medicare users were the most underrepresented among the three major insurance types (Table 1). Comparing telehealth visit rates versus office visit rates by insurance type across quarantine and postquarantine periods, our data revealed that the self-pay insurance group had the highest telehealth visit rate both during and after the quarantine (Fig. 1). This finding could be explained by the fact that telehealth visits are more cost-efficient than office visits, an important consideration for patients paying for services exclusively out of pocket. 1,11 Alternatively, the Medicaid

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**Table 1 (continued)**

| Variable 1 | Level 1 | Variable 2 | Level 2 | Prequarantine | Quarantine | Postquarantine | P value |
|------------|---------|------------|---------|---------------|------------|----------------|---------|
| Age        | 0-18 y/o| Utilization of dermatologic services | Office visits (%) | 204 (100) | 20 (21.28) | 121 (79.61) | <.0001 |
|            | 19-64 y/o| Telehealth visits (%) | 0 (0) | 74 (78.72) | 31 (20.39) |         |         |
|            |         | Office visits (%) | 3,741 (100) | 643 (36.2) | 3,040 (88.37) | <.0001 |
|            | >64 y/o | Telehealth visits (%) | 0 (0) | 1,133 (63.8) | 400 (11.63) |         |         |
|            |         | Office visits (%) | 1,596 (100) | 302 (49.35) | 949 (94.43) | <.0001 |
| Language   | English speaking | Utilization of dermatologic services | Office visits (%) | 4,482 (100) | 818 (39.14) | 3,296 (90.15) | <.0001 |
|            | non-English speaking/Unknown | Telehealth visits (%) | 0 (0) | 1,272 (60.86) | 360 (9.85) |         |         |
|            |         | Office visits (%) | 1,059 (100) | 147 (37.5) | 814 (86.5) | <.0001 |
|            |         | Telehealth visits (%) | 0 (0) | 245 (62.5) | 127 (13.5) |         |         |
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usage in the postquarantine period (8.38% and 9.57%, respectively) (Fig. 2).

Consistent with our hypothesis, these results emphasize the difficulties with maintaining access to technology in a group that is already considered to be disproportionately disadvantaged. A cross-sectional study evaluating patient satisfaction with teledermatology showed that non-White patients were more concerned with conversation privacy and inappropriate access to their data. Black and Hispanic patients are also less likely to own a computer or have broadband internet access at home. Additionally, negative cultural perceptions of the telemedicine model may influence their distrust of the telehealth environment.

The Asian patient population had the highest telehealth visit rate during and after the quarantine (73.44% and 18.09%, respectively) (Fig. 2). This finding is inconsistent with other findings in the literature suggesting that Asian populations have a lower desire for telehealth visits especially compared with their White counterparts. This result may have occurred because the English-speaking Asian population has higher rates of technology-based, technically skilled jobs than the rest. Our data could reflect this population’s comfort and familiarity with the abrupt transition to telemedicine technology.

**Utilization by language**

Prequarantine office visits stratified by language reveal that prior to the quarantine, English speakers accessed dermatologic services at Medstar Health more than non-English speakers (Table 1). The non–English-speaking patient population had the highest telehealth visit utilization rate after the quarantine (13.5%) (Fig. 3).

Our findings are inconsistent with other findings in the literature suggesting that non-English-speaking populations would have trouble connecting with telehealth care. One hypothesis is that these patients may find Medstar Health’s teledermatology system relatively user-friendly. Virtual interpreters are a potential barrier for non-English speakers. Therefore, having a robust medical interpretation system for telehealth visits is essential. Accessing medical translators (either through designated medical translator devices or via cell phone) during in-person office visits can be cumbersome, and using one can be time-consuming when aiming for smooth patient-provider communication. Ultimately, with a well-integrated and user-friendly virtual visit platform, non-English speakers may benefit from teledermatology.

**Utilization by age**

To assess variations in telehealth use by age, the study population was stratified into three age groups. Patients between the ages of 19 and 64 comprise the most significant percentage of the patient population during the prequarantine period (Table 1). During the quarantine period, 0- to 18-year-olds used teledermatology at the lowest rate (79.61%) but used

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**Fig. 3** Distribution (in percentages) of patients who accessed dermatologic care using in-office versus telehealth between English-speaking and non-English-speaking patients during the quarantine and postquarantine era of the COVID-19 pandemic.

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**Utilization by race/ethnicity**

Prequarantine office visits broken down by race/ethnicity reveal that White patients had the lowest rate of telehealth usage during the quarantine (57.99%). In comparison, Black and Hispanic populations had the lowest rates of telehealth

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**Fig. 4** Distribution (in percentages) of patients who accessed dermatologic care using in-office versus telehealth across three age groups during the quarantine and postquarantine era of the COVID-19 pandemic.

It at the highest rate after quarantine (20.39%) (Fig. 4). We posit that most of this age group are minors and likely cannot independently commute to their office visits. As a result, they may prefer telehealth visits as a more convenient option for their guardians.

During the postquarantine period, patients 64 years and older used telehealth at the lowest rates compared with their counterparts from other age groups (5.57%) (Fig. 4). This result may be because members of this age group are less likely to find comfort with new technology and prefer the less complex, traditional in-office visits when readily available. The transition to telehealth services during the COVID-19 pandemic may have created health care barriers for older age groups while benefiting younger age groups, further supporting the utility of maintaining teledermatology services and office visits in the future.¹⁻¹⁴

**Study limitations**

The racial designations in our study were obtained from self-reported electronic medical records data. Approximately 20% of study participants categorized their race and ethnicity as unknown, making it impossible to draw conclusions from that subset. Similarly, 19% of study participants were
non-English speaking patients whose primary language was unknown. For this group, it is impossible to make inferences about how language or translation access might have played a role in their telehealth utilization. As the literature describes, the unknown population may mask health care disparities among minority groups. Additionally, our results regarding ethnicity/race are specific to MedStar Health and do not necessarily reflect the ethnic representations in other health systems. Lastly, only synchronous teledermatology visits were included in this study, so the results from our study may not be generalizable to practices that utilize asynchronous or hybrid modalities of teledermatology.

Conclusion

Use of teledermatology services during and after the quarantine differed significantly across the insurance, race/ethnicity, language, and age subgroups. Medicaid patients were the least represented in total telehealth visits during and after the quarantine period in this study. Black and Hispanic patients returned to traditional office visits during the postquarantine period at a higher rate than their counterparts from other races. The non–English-speaking patient population had the highest rate of telehealth visit use both during and after the quarantine. Patients over 64 years of age used telehealth at a lower rate than other age groups during and after the quarantine period. Specific patient groups such as Medicaid users, the elderly, and Black or Hispanic patients may experience fewer telehealth benefits than other patients.

Further studies are needed to characterize the demographic of patients most likely to access and benefit from telehealth services. Additional research regarding disaster preparedness and contingency planning for telehealth during future pandemics may be beneficial.

Conflict of interest

The authors declare no conflict of interest.

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