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Teledermatology during COVID-19: a comparison of video and telephone visits with patient-uploaded images at an urban academic medical center

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Abstract

The COVID-19 pandemic stimulated adoption of teledermatology via video and telephone modalities by outpatient dermatology clinics. However, it was unknown how patient-related factors may have impacted, whether video or phone visits were used, and if visit modality impacted management. Consequently, we conducted a retrospective cross-sectional study of teledermatology visits occurring between March 30, 2020 and May 30, 2020 at an urban tertiary care center. A total of 788 teledermatology visits including 525 video visits and 263 telephone visits, mostly supplemented by patient-uploaded images, were analyzed. Patient age ($P<0.001$) and visit type (new versus return patient status), ($P<0.001$) were significant predictors of likelihood of video visit. No significant difference between video and telephone visits was found with regard to frequency of treatment modification ($P=0.52$), frequency of biopsy referral ($P=0.73$), biopsy noncompliance rate ($P=0.44$), or proportion of biopsies showing a new malignant lesion ($P=0.92$). With age as a significant predictor of visit modality, maintaining both video and phone modalities could prove useful to maximize patient participation. It appears either can be used without concern that choice of modality would impair the ability to change treatment, recognize a lesion requiring biopsy, recognize a new malignant lesion, or negatively affect compliance with biopsy.

Keywords: COVID-19, teledermatology, telephone, video, virtual

Introduction

Telemedicine, defined as “the use of electronic information and communications technologies to provide and support health care when distance separates the participants,” is a medium of care delivery initially pioneered for patients living in rural regions beginning in the 1960s-1970s [1,2]. Of the medical specialties, dermatology was one of the first to engage in telemedicine, with reports of virtual dermatological diagnosis as early as 1972 [3]. Since its inception, teledermatology has advanced to encompass live synchronous visits as well as “store-and-forward” methods, in which a dermatologist reviews digital photos and clinical information asynchronously [4]. It has been implemented in both specialty and primary care settings with high levels of physician and patient satisfaction [5,6].

When the COVID-19 pandemic in March 2020 resulted in the closing of outpatient clinics, teledermatology evolved from an optional service to a necessity. We undertook a retrospective cross-sectional analysis of teledermatology visits to characterize and compare the patient demographics and clinical management of visits conducted via video versus telephone with supplemental photos.

Methods

With institutional review board approval, a retrospective chart review was performed to abstract patient demographics and clinical data of interest. Patients receiving dermatology care via

Table 1. Demographics of patients engaging in teledermatology from March 30, 2020 to May 30, 2020 at a single urban academic medical center.

	Overall	Video	Telephone
	N=788	N=525	N=263
Age, N (%)			
0-17 years	153 (19.42)	121 (23.05)	32 (12.17)
18-64 years	515 (65.36)	344 (65.52)	171 (65.02)
65+ years	120 (15.23)	60 (11.43)	60 (22.81)
Sex, N (%)			
Female	532 (67.51)	349 (66.48)	183 (69.58)
Male	256 (32.49)	176 (33.52)	80 (30.42)
Race/Ethnicity, N (%)			
Black/African American	354 (44.92)	226 (43.05)	128 (48.67)
White	286 (36.29)	194 (36.95)	92 (34.98)
Unknown	54 (6.85)	48 (9.14)	6 (2.28)
Hispanic/Latino	44 (5.58)	25 (4.76)	19 (7.22)
Asian/Mideast Indian	37 (4.70)	25 (4.76)	12 (4.56)
Multiracial	12 (1.52)	6 (1.14)	6 (2.28)
American Indian or Alaska Native	1 (0.13)	1 (0.14)	0 (0)
Zip Code, N (%)			
606 prefix	499 (63.32)	317 (60.38)	182 (69.20)
Non-606 prefix	289 (36.68)	208 (39.62)	81 (30.80)
Insurance, N (%)			
Private	494 (62.69)	348 (66.29)	146 (55.51)
Medicaid	156 (19.80)	98 (18.67)	58 (22.05)
Medicare	130 (16.50)	72 (13.71)	58 (22.05)
None	6 (0.76)	5 (0.95)	1 (0.38)
Medicare-Medicaid/IlliniCare	2 (0.25)	2 (0.38)	0 (0)

telemedicine at the University of Chicago during the time period from March 30, 2020 to May 30, 2020 were included in the study. Exclusion criteria included patients seen in person or outside of the delineated time frame. Patients were given a choice of video visit or telephone visit and were instructed to send digital photos of their skin concerns for both teledermatology modalities.

Student's t-test and z-tests for proportions were used and multivariable logistic regression was performed using patient age, sex, race/ethnicity, zip code, insurance type, and new versus return patient status to determine significant predictors of visit modality. The designated outcome measure is the odds of having a video visit over a telephone visit. Statistical analysis was performed using Microsoft Excel (Version 16.41, Microsoft Corporation, Redmond, WA USA) and STATA (Version 17, StataCorp LLC, College Station, TX, USA). The alpha value was set at 0.05. Hypothesis tests for patient demographics and new

patient status were two-sided and other hypothesis tests were one-sided.

Results

A total of 785 patients with 788 total teledermatology visits mostly supplemented by patient-uploaded images were seen between March 30, 2020 and May 30, 2020. Of these, 525 visits occurred via video conference and 263 occurred via telephone call. In the corresponding 2-month period during the prior year of pre-COVID-19 normal operations (March 30, 2019 to May 30, 2019), the dermatology clinic saw 2,341 patients. Our data suggested an overall 66.34% decrease in patient volume during the study period with pandemic operations.

Demographic characteristics of patients participating in teledermatology visits are shown in **Table 1**. The overall average age of patients

engaging in teledermatology visits was 39 years (SD 22.26) and the average age of patients engaging in video visits (36 years) was significantly lower than that of patients engaging in telephone visits (45 years; $P < 0.001$). Multivariable logistic regression analysis demonstrated that age was significantly associated with lower odds of having a video visit compared to telephone visit (OR, 0.978; 95% CI, 0.968-0.988; $P < 0.001$). Race and ethnicity data showed that 44.92% of patients self-identified as Black/African American, 36.29% White, 6.85% Unknown, 5.58% Hispanic or Latino, 4.70% Asian/Mideast Indian, 1.52% Multiracial, and 0.13% American Indian/Alaska Native. There were no statistically significant differences in the proportions of racial or ethnic identities between video and telephone visits. Of note, the proportions of each race or ethnicity participating in teledermatology did mark a departure from the clinic's normal-operations racial/ethnic breakdown of 39.77% Black/African American, 48.27% White, 8.29% Hispanic/Latino, 5.30% Asian/Mideast Indian, 3.59% Multiracial, 0.56% Unknown, and 0.30% American Indian/Alaska Native (**Table 2**). Analysis of patient zip codes indicated that roughly 63.32% of patients engaging in teledermatology originated from Chicago, Illinois (zip codes beginning in 606), whereas 36.68% were from outside of Chicago.

Overall, 67% of teledermatology visits were classified as return patient visits, whereas 33% were new patient visits. Multivariable logistic regression

Table 2. Distribution of patient racial and ethnic identities during a 2-month period of normal operations from March 30, 2019 to May 30, 2019.

Overall	
N=2,341	
Sex, N (%)	
Female	1,455 (62.15)
Male	886 (37.85)
Race/Ethnicity, N (%)	
White	1,130 (48.27)
Black/African American	931 (39.77)
Hispanic/Latino	194 (8.29)
Asian/Mideast Indian	124 (5.30)
Multiracial	84 (3.59)
Unknown	13 (0.56)
American Indian or Alaska Native	7 (0.30)



Figure 1. Most frequent diagnoses associated with teledermatology visits (N=788).

indicated that new patient visits were significantly more likely to be video visits than return patient visits (OR, 20.43; 95% CI, 10.5-39.8; $P < 0.001$). There was no significant difference in average number of diagnoses per visit between video (1.59) and telephone visits (1.52; $P = 0.31$). The top ten most frequent diagnoses for video visits and telephone visits combined are listed in **Figure 1**, with acne being the most frequent diagnosis.

Regarding treatment modification, defined as addition of a new agent, discontinuation of an agent, a dosage or frequency adjustment, or referral for in-clinic treatment, there was no significant difference in frequency of treatment modifications between video visits (71.0%) and phone visits (68.8%; $P = 0.52$). The proportion of video visits resulting in referral for in-person biopsy (5.5%) was not significantly different from the proportion of telephone visits resulting in biopsy referral (4.9%; $P = 0.73$). Of note, approximately 17.5% of telephone visits occurred without a patient photo uploaded. However, none of these visits resulted in a referral for biopsy, which suggests that the comparison of teledermatology modalities with respect to frequency of biopsy referral is not confounded by a lack of lesion visualization in the telephone visit group. A total of 38 sites on 35 different patients were biopsied, with 26 from video visits and 12 from telephone visits. The rate of noncompliance with biopsy referral was not significantly different between video (17.2%) and telephone visits (15.4%; $P = 0.44$). The proportion of biopsies showing a new malignant lesion was not significantly different between referral from video (15.4%) versus telephone visits (16.7%; $P = 0.92$).

Discussion

Increasing patient age was associated with significantly less engagement in video visits. This could possibly be related to increased comfort with telephone visits among older patients. The significance of this association suggests that it might be worthwhile to maintain telephone visits as an option to ensure that older patients are not excluded from access to teledermatology services. Analysis by race and ethnicity showed similar proportions between video and telephone visits, suggesting that no single racial or ethnic group trended toward a predilection to a particular modality. However, proportions of each identity participating in teledermatology did not precisely mirror the racial/ethnic proportions observed during normal clinic operations, which suggests the need for additional exploration of how telemedicine may affect disparities in dermatology. It was observed that the majority of patients engaging in teledermatology resided in Chicago, IL suggesting that, although telemedicine was originally designed to reach rural patients, teledermatology can successfully reach urban patients who might otherwise seek in-person care.

New patient status was significantly associated with increased likelihood of video visit. One potential explanation is that direct visualization of skin is often needed at a patient's initial encounter, whereas medication regimen adjustments for return patients can often be performed over telephone. Further qualitative research should be directed toward patient motivations for choosing a particular modality. There was no significant difference in the proportion of visits resulting in a management change between video and telephone visits with uploaded photos, suggesting that the two modalities are comparable in allowing dermatologists to evaluate for potential treatment modification. Similar rates of biopsy referrals and noncompliance suggest that the teledermatology modality used does not strongly impact recognition of lesions requiring biopsy or patient compliance. Overall, the majority of patients were compliant with their biopsy referral despite the pandemic. The

proportion of biopsy reports showing new malignant lesions was not significantly different between video and telephone with images, signifying that no single modality was more sensitive for malignancy detection.

Limitations of this study include its cross-sectional and single-center design, which may reduce the generalizability of the results. Furthermore, full skin examinations were not performed via teledermatology, which may bias the results toward conditions amenable to telehealth. Finally, patients failing to upload digital photos prior to the visit often had their teledermatology visits canceled by the clinic, which consequently may limit the interpretation of our findings to patients with access to technology and familiarity with its use.

Conclusion

Our study found that age and new versus return patient status were the strongest predictors of choice of teledermatology visit modality. Although there are many potential explanations for this, maintaining both teledermatology modalities may prove useful in maximizing patient participation. The fact that the majority of patients who received virtual care originated from a nearby zip code suggests that teledermatology can be used to reach an urban population who would otherwise go to a tertiary care center in-person. Based on our findings, it appears reasonable for dermatologists to engage in both video and telephone visits with images without concern that the patient's choice of modality will compromise the ability to modify treatment, recognize a lesion requiring biopsy, recognize a new malignant lesion, or promote compliance with recommended biopsy. Our findings may also inform policy decisions about continued reimbursement beyond the COVID-19 pandemic for the two teledermatology modalities with supplemental patient-uploaded images.

Potential conflicts of interest

The authors declare no conflicts of interest.

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