Utilization of teledermatology services for dermatological diagnoses during the COVID-19 pandemic

Annie He1 · Tongil TI Kim2 · Khang D. Nguyen1

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Abstract
Little is known about trends in teledermatology adoption and use for managing dermatologic patients, especially changes in use influenced by the COVID-19 pandemic. In this retrospective cohort study, we analyzed encounter data from the Healthjump dataset (containing electronic health record data from throughout the USA) for visits from November 2019 to July 2021 with a primary dermatology-related diagnosis. There was a striking rise in teledermatology use with the onset of the pandemic in February 2020, peaking in April 2020 with 2178 teledermatology encounters (32.8% of all encounters). Subsequently, teledermatology use waned. Most teledermatology care was delivered via synchronous means with little use of asynchronous or telephone communication. When compared to those with neoplastic skin diseases, patients with inflammatory skin diseases were more likely to be seen via teledermatology (OR 3.30, 95% CI 3.12–3.49). Certain demographic groups were less likely to receive care via teledermatology, such as men (compared with females, OR 0.76, 95% CI 0.74–0.78) and patients 65 and older (compared with those below 65, OR 0.59, 95% CI 0.57–0.62). Our work shows increased adoption of teledermatology at the onset of the COVID-19 pandemic with decreasing use over time. Future efforts are needed to ensure continued and expanded use of a valuable care modality to reach vulnerable populations.

Keywords Dermatology · COVID-19 · Teledermatology · Telemedicine · Telehealth · Electronic health records

Abbreviations
CI Confidence interval
COVID-19 Coronavirus disease 19
EHR Electronic health record
ICD-10 International Classification of Diseases, Tenth Revision
IQR Interquartile range
OR Odds ratio

Introduction
The COVID-19 pandemic has dramatically impacted health care delivery in the USA, shifting care to electronic alternatives to reduce virus transmission. Telemedicine utilization increased as much as 154% in 2020 [4]. Little is known about trends in the use of telemedicine specifically for the care of patients with dermatologic diagnoses. Knowledge of utilization patterns can inform efforts to expand access and insurance coverage for teledermatology, the utilization of telemedicine to deliver care by dermatologists.

Teledermatology care generally is delivered via store-and-forward (asynchronous) and synchronous modalities [1]. Store-and-forward teledermatology involves patients or referring clinicians taking photographs of skin concerns and sending them for review to a dermatologist, while synchronous teledermatology entails real-time, virtual visits with audiovisual communication between a dermatologist and patient [1]. Also included within the scope of teledermatology care are telephone calls, email communication, and online portal messaging [6]. Data on the use of these various teledermatology modalities have been limited to clinics or small hospital systems. We analyzed outpatient encounter data from the Healthjump dataset within the COVID-19 Research Database to assess teledermatology and non-teledermatology delivery changes for dermatology-related diagnoses.

*Khang D. Nguyen
nguyenmdpublications@gmail.com
1 Department of Dermatology, The University of Texas Southwestern Medical Center, 5939 Harry Hines Blvd, Dallas, TX 75390, USA
2 Naveen Jindal School of Management, The University of Texas at Dallas, Richardson, TX, USA
Methods

Exempt from review by the UT Southwestern Medical Center institutional review board, this retrospective cohort study was an analysis of encounters from November 2019 to July 2021 in the Healthjump dataset, an aggregate of anonymized, outpatient encounter data from multiple national electronic health record (EHR) platforms. Access to the dataset was provided through the COVID-19 Research Database. Using ICD-10 codes, we identified visits for which the primary diagnosis was dermatology-related and categorized them into broad disease categories (Supplementary Table). We classified each visit as in-person, asynchronous teledermatology (encompassing store-and-forward encounters, email communication, and online messaging portal communication), synchronous teledermatology, or telephone based on evaluation and management, place of service, and modifier codes from the AAD website [3]. Multivariate logistic regression analysis was performed using R (R Core Team, version 4.0.2) to determine associations between patient age, sex, and diagnosis category on teledermatology utilization. P values less than 0.05 were considered significant.

Results

The study population of 286,364 patients had a median age of 42 years (IQR: 19–63), and 59.4% of whom were female. Teledermatology encounters were scarce before February 2020. Most teledermatology encounters were synchronous, which peaked at 2,178 encounters (32.8% of all encounters) in April 2020 and declined subsequently (Fig. 1). The most common primary dermatologic diagnoses were inflammatory conditions, followed by infectious and neoplastic diagnoses among others (Fig. 2). In multivariate logistic regression analysis, patients age 65 or older (compared with those below 65, OR 0.59, 95% CI 0.57–0.62) and male patients (compared with females, OR 0.76, 95% CI 0.74–0.78) were less likely to be cared for via teledermatology (Table 1). Patients with inflammatory conditions were the most likely to be cared for via teledermatology (OR 3.30, 95% CI 3.12–3.49) when compared to patients with neoplastic diagnoses.

Discussion

The COVID-19 pandemic and reimbursement changes have spurred the adoption of many forms of teledermatology [2]. Our analysis shows a sharp increase in teledermatology for the management of dermatologic diagnoses in early 2020. While our data show that its use has

![Fig. 1 Monthly encounters for dermatological diagnoses by visit type over time](image.png)
continually declined since a peak in April 2020, teledermatology use remains more prevalent than before the pandemic. The decline coincides with COVID-19 vaccine introduction, improved disease treatment, and relaxation of pandemic restrictions [7]. Certain categories of skin diseases (such as inflammatory diseases) were more likely to be seen via teledermatology compared to neoplastic conditions, which may be due to the relative ease of diagnosis and management of these conditions when working within the limitations of the teledermatology medium [5].

Surprisingly, the vast majority of teledermatology care was delivered via synchronous technologies. It is unclear why there was little utilization of asynchronous and telephone modalities, but one possibility may be that such services rendered were not properly recorded by providers. Future work could assess these discrepancies and lower barriers to the appropriate use of alternate modalities.

Our analysis comes with some limitations. Despite integrating multiple EHR systems, Healthjump may not be representative of the US population and does not include provider specialty data, precluding more specific analysis of teledermatology care provided by dermatologists. Also, the possibility of miscoding for services rendered could affect our analysis. We were not able to include analyses of patient location, race, primary language, and socioeconomic status, additional factors that could influence teledermatology use.

Teledermatology holds much promise for the expansion of dermatologic care to underserved populations and for improved continuity of care. However, our data show waning use with time. Additional efforts are required to expand teledermatology utilization, especially lesser-used modalities, and ensure equal access for all patients.

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Author contributions AH contributed to formal analysis, funding acquisition, investigation, methodology, resources, software, visualization, Writing—original draft, writing—review and editing. TTK contributed to data curation, formal analysis, funding acquisition, investigation, methodology, resources, software, supervision, validation, visualization, writing—review and editing. KDN contributed to conceptualization, funding acquisition, investigation, methodology, project administration, supervision, validation, writing—original draft, writing—review and editing.

Declarations

Conflict of interest Dr. Khang Nguyen is chair of the American Academy of Dermatology Health IT Committee.

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