

## TRENDS IN TELEHEALTH CARE FOR DIABETES DURING THE COVID-19 PANDEMIC

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### Abstract

**Importance:** This very large claims data analysis documents widespread adoption of telehealth services by patients with diabetes during the first year of the COVID-19 pandemic, giving us insight into the potential role of telehealth as we enter a stage of ‘new normal’ of healthcare delivery in the United States.

**Objective:** The COVID-19 Telehealth Impact Study was designed to describe the natural experiment of telehealth adoption during the pandemic. This focused analysis can assist program development for care of large number of patients with diabetes.

**Design, setting, participants:** In March 2020, the MITRE Corporation and Mayo Clinic founded the COVID-19 Healthcare Coalition (C19HCC) and Telehealth Impact Study to respond to the pandemic. We report trends using a data set of over 2 billion healthcare claims covering over 50% of private insurance activity in the United States (January 2019–March 2021).

**Main outcomes and measures:** We compared rates of telehealth use in the 1-year pre and 1-year post onset of the COVID-19 pandemic among a population of 8,339,633 patients with diabetes.

**Results:** Compared with a baseline of very low telehealth use in 2019, there was a rapid adoption of telehealth by patients with diabetes in Spring 2020. Twenty-seven percent of diabetic patients used telehealth in Q2 2020 and the rates declined in the ensuing months to approximately 13%. Diabetics and their providers used telehealth to address a wide variety of health problems. Seventy-seven percent of telehealth visits addressed diabetes, 53% hypertension, and over 40% of visits addressed mental and behavioral health diagnoses. Audio-only (telephone visits) accounted for a substantial portion of telehealth encounters (10.0–16.3%) and will be an important consideration for future telehealth planning. During the first 12 months of the pandemic, 98% diabetics used telehealth services four or fewer telehealth visits.

**Conclusions and relevance:** We believe that telehealth will quickly become a best practice for routine care of patients with diabetes and other chronic conditions. Telehealth interactions—two to four times per year supplemented with remote monitoring for glucose, blood pressure and weight have the potential to greatly enhance patient care. Further research will be needed to measure the telehealth impact on glycemic control, patient satisfaction and other outcomes. We encourage Centers for Medicare and Medicaid Services (CMS) and other payers to embrace and promote the use of telehealth based on this real-world experience of patients and providers during the pandemic.

Keywords: *claims data; covid-19; diabetes; digital health; pandemic; telehealth*

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The COVID-19 pandemic offers us lessons to learn about applications of telehealth for care of patients with diabetes and other conditions. Soon after the March 13, 2020 declaration of the national public health emergency due to the SARS-CoV2 virus, the United States

responded with emergency relaxation of regulations, which had previously restricted the use of telehealth services (1). Federal and state authorities allowed medical practices across state borders by removing professional licensure limitations. Public and private insurers announced temporary

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payment parity for telehealth using video and audio-only connectivity, with payments being equivalent to traditional face-to-face office visits. Physicians and other providers were now able to work with patients to meet their needs using telehealth. Over a period of weeks, most medical practices and health systems in the United States instituted telehealth offerings to their patients. In March 2020, the COVID-19 Telehealth Impact Study work group was formed as part of the COVID-19 Healthcare Coalition. The coalition is a private sector response to rapidly evaluate and create solutions to many of the challenges brought about by the pandemic. Prior reports from the project describe general trends in telehealth during the pandemic through a combination of claims analysis and surveys of patients and providers (2, 3). We report findings of telehealth services for the care of patients with diabetes during the first year of the pandemic. We describe use rates of telehealth encounters and the nature of problems for which diabetic patients sought care using a large national healthcare claims data set. This contribution of real-world evidence of telehealth will help inform enlightened public policies for the continued use of telehealth for care of patients with diabetes.

## BACKGROUND

Diabetes management requires consistent collaboration between patients and providers, which has traditionally been accomplished through frequent in-person visits to physician offices. In recent years, there has been an effort to facilitate more timely and less burdensome care using telehealth (4). Telehealth care for diabetes can involve video/telephone consults, self-monitoring devices, and mobile applications. Telephone and video consultations may be used for routine check-ups to discuss medication, diet, and exercise adherence, glucose levels as reported by monitoring devices, and to screen for foot ulcers shown over video calls or in photographs and to determine whether in-person appointments are needed. In addition to telehealth, other aspects of diabetes are undergoing a digital transformation. A growing number of people with diabetes use continuous glucose monitoring (CGM) systems, which report glucose levels at routine intervals that can be transferred to handheld readers, smartphones, and smart watches. Further advances in flash glucose monitoring (FGM) enable on-demand glucose readings without the need for device calibration (5). Glucose, insulin, and carbohydrate intake data can be stored in mobile applications, and accessed by patients and shared with providers. There are currently over 1,500 diabetes-related applications available through mobile phones and computer interfaces (4). Other digital innovations include foot temperature monitoring devices, and retinopathy screening tools are primarily used in clinical settings, but could be adapted for at-home use if proven to be effective. Early studies were inconclusive as to whether diabetes telehealth

provides a benefit above standard diabetes care practice (6, 7). In the years prior to the pandemic, there were many technical issues to consider such as maintaining Health Insurance Portability and Accountability Act of 1996 (HIPAA)-compliant software, a patchwork of reimbursement codes, and variable payment policies, which inhibited widespread adoption of telehealth services for diabetes and other chronic conditions (8).

During the COVID-19 pandemic, the care of people with diabetes became an area of great concern. Patients with diabetes, particularly those with poorly controlled diabetes, were susceptible to the SARS-CoV-2 virus. Diabetes was a common co-morbidity reported among those hospitalized and those dying from COVID-19 (9). Because of this risk, it was important for people with diabetes to adhere to strict social distancing, avoid public transportation and, to the extent possible, avoid crowded indoor spaces including doctor's offices. Telehealth use increased across all medical disciplines during the pandemic (10). Patients with diabetes used telehealth to review home glucose test results with their providers adjust medications and treat hyper- and hypoglycemia to prevent avoidable hospitalizations (11, 12). The use of telehealth during this time has highlighted some barriers to its use including cost of smartphones and data plans, bandwidth glitches that may lead to poor sound quality, and lack of technical knowledge. In the United States and worldwide, mobile phones have become widely accessible but many are limited in functionality to audio-only calls and SMS messaging (9).

This study was a collaborative effort between Mayo Clinic and The MITRE Corporation as part of the COVID-19 Telehealth Impact Study. We are grateful for voluntary efforts of the COVID-19 Healthcare Coalition and organizations, which contributed to the project, including Change Healthcare, the American Medical Association, the American Telemedicine Association, Digital Medicine Society, Massachusetts Health Quality Partners and Mass-Challenge HealthTech. The opinions expressed herein are those of the authors and do not represent views or policy positions of the workgroup member organizations.

## METHODS

Using a large national healthcare claims data set, we compared the use of telehealth in care of patients with diabetes in the 1-year pre and 1 year post the COVID-19 pandemic. We examined trends in care seeking in a large diabetic population, including the frequency of use of telehealth encounters and the types of telehealth used. We identified the clinical problems addressed during telehealth encounters using primary and secondary ICD-10 codes. The 'pre-pandemic' period includes those encounters occurring January 1, 2019–March 12, 2020 and 'pandemic' encounters are those from the March 13, 2020–March 31, 2021 period.

Claims were identified as being associated with a telehealth service based on the use of modifier 95, G code or use of a place of service code 2 indicating the home. The diabetes population was defined as those patients with at least two encounters using ICD10 code E10 or E11 as a primary diagnosis in 2019 and at least one encounter of any kind, for any diagnosis in 2020. Current Procedural Terminology (CPT) codes were used to identify specific encounter types as follows: telephone encounters (99441, 99442, 99443, 98966, 98967, 98968), remote patient monitoring (99453, 99454, 99457, 99458), medical nutrition counseling (97802, 97803, 97804, G0108, G0109, G0270), chronic care management (99358, 99487, 99489, 99490, 99491, G0506), virtual check-in (G2010, G2012), and routine eye care (92227, 92228, 92002, 92004, 92012, 92014).

This study was approved by the Mayo Clinic Institutional Review Board as part of the Telehealth Impact Study. The claims data came from large healthcare claims files provided by Change Healthcare (Nashville, TN), representing more than 50% of private insurance claims in the United States. In this data set, more than 2 billion claims reflect care for more than 150 million individuals. The data set was certified by expert determination to be in accordance with HIPAA privacy requirements. No identifying information of individuals or covered entities was provided. Data spanned telehealth and non-telehealth activity between January 1, 2019, and March 31, 2021. The data set includes claims from the private insurance marketplace, including employers, unions, and other purchasing groups. Also included are some Medicare Advantage programs and Medicaid programs using private insurance carriers. We used 'submitted claims' from providers to insurers and not 'closed claims' after payment determination to allow early identification of trends during the unfolding pandemic. We define a 'care seeking' patient as a patient who had any type of encounter (face-to-face or telehealth). A significant limitation of the data is that it does not include the majority of Medicare and Medicaid indemnity claims. The data set includes patient care episodes from all 50 states, the District of Columbia, Puerto Rico, and the US Virgin Islands.

## RESULTS

We identified 8,339,633 patients meeting our definition for the diabetic population. During 2019 (pre-pandemic time), we see a baseline of 75.7–79.4% of diabetics having at least one encounter, for any reason, during a 3-month period (Table 1). During this time, less than 32,000 (<1%) diabetic patients received a telehealth visit in any one quarter. At the onset of the COVID-19 pandemic in March 2020, the total care seeking behavior dropped abruptly, as measured by having any encounter with a provider. During the entire pandemic period, fewer diabetic patients sought care, ranging from 63.9 to 67.5% – more than 10% below the pre-pandemic period. Due to the public health emergency,

the use of telehealth by diabetics rose abruptly. In April–June, 2020, during the initial pandemic lock down, over 1.4 million patients representing 27% of the diabetic population who sought care had at least one telehealth visit (Fig. 1). The percentage receiving at least one telehealth visit declined and leveled off in the ensuing three quarters: approximately 14% in Q3 of 2020, 13% in Q4 2020, and 13% in Q1 of 2021. These telehealth visits represent care for diabetes as well as other diagnoses.

We evaluated the types of telehealth encounters based on CPT and HPCS codes selected by providers. In 80–90% of telehealth encounters, providers used routine office visit codes supplemented with a place of service modifier to indicate a telehealth visit. Figure 2 provides details on the use of other telehealth encounter types of particular interest. During the pandemic, the use of telephone visits, sometimes referred to as 'audio only', increased to

Table 1. Patients with diabetes seeking care

Quarter	Period	Diabetic patients seeking care	% Diabetic patients seeking care
Q1'19	Pre-pandemic	6,315,054	75.7
Q2'19	Pre-pandemic	6,536,404	78.4
Q3'19	Pre-pandemic	6,623,303	79.4
Q4'19	Pre-pandemic	6,615,705	79.3
Q1'20	Pre-pandemic	5,397,414	64.7
Q1'20	Pandemic	3,553,567	42.6
Q2'20	Pandemic	5,330,137	63.9
Q3'20	Pandemic	5,630,017	67.5
Q4'20	Pandemic	5,496,342	65.9
Q1'21	Pandemic	5,332,072	63.9

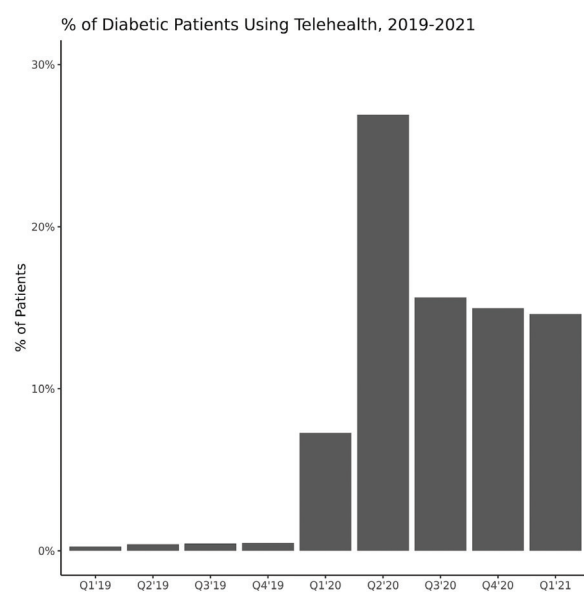


Fig. 1. Proportion of care seeking diabetic patients using telehealth per 3-month period.

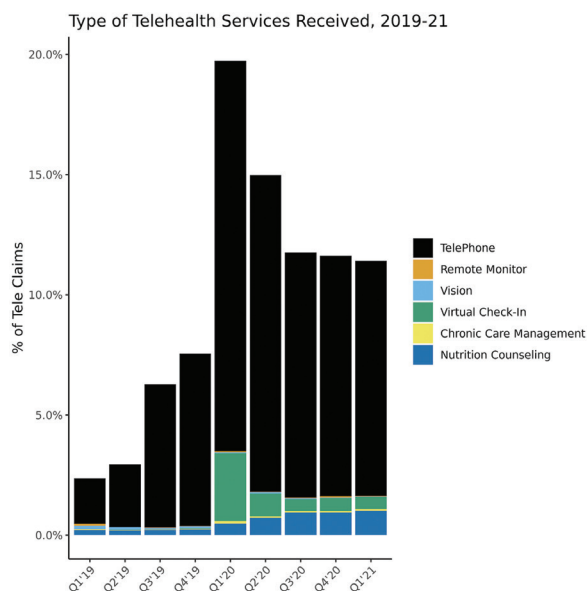


Fig. 2. Type of telehealth services received.

16.3% of telehealth visits in Q1 2020 and dropped down to 10% during the remainder of the year. Chronic Care Management (<1.0%) and virtual check-ins (<3.0%) are types of visits, which pre-dated the pandemic and played

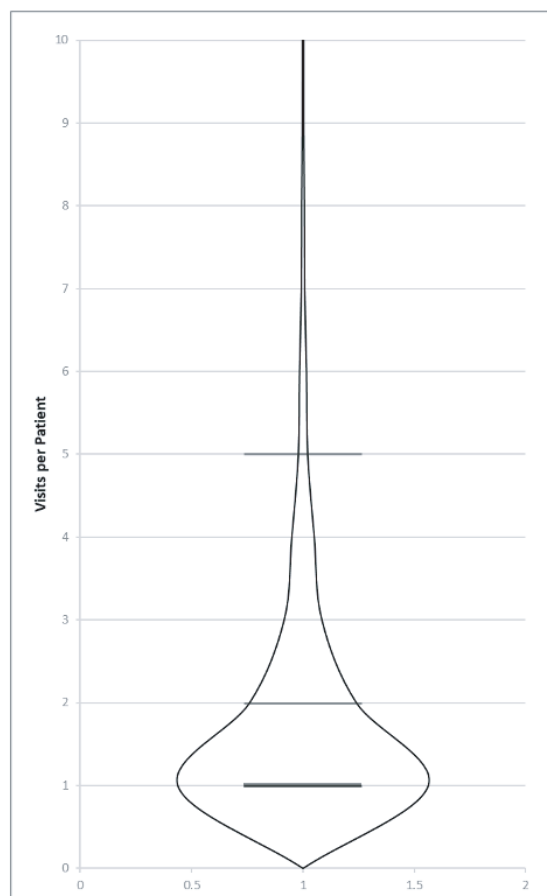
only a minor role during the pandemic. Nutrition counseling showed a steady increase but still less use (1.2%) of telehealth visits during the pandemic. Remote patient monitoring is a relatively new form of care which showed very little use (<1.0%) of telehealth encounters for diabetics during the pandemic.

Diabetic patients used telehealth for a wide range of health concerns. Table 2 details the 20 most common diagnostic categories based on primary and secondary ICD10 codes associated with telehealth encounters in the diabetic population. It was common for visits to use more than one diagnosis code. Seventy-seven percent of telehealth visits were billed using diagnosis codes for diabetes (ICD10 E10–E11) followed by 53% for hypertension. Mental and behavioral health diagnoses were very commonly used, including mood disorders (43%), anxiety/stress disorders (35%) and mental/behavioral disorders due to use of psychoactive substance (11%).

Fig. 3 shows a plot of telehealth visit frequency among diabetic patients who used telehealth for the 1-year period, April 1, 2020–March 31, 2021. Diabetics used a mean of 1.96 visits with a median of one visit during the 12 months. Ninety-eight percent of patients used four or fewer visits during the year. This includes all telehealth use for diabetes or any other clinical reasons.

Table 2. Top 20 reasons for diabetic patients to seek telehealth care in 2020

ICD10	ICD10 section description	% Encounters
<b>E10–E11</b>	Diabetes mellitus	77
<b>I10–I16.9</b>	Hypertensive diseases	53
<b>F30–F39</b>	Mood [affective] disorders	43
<b>E70–E88</b>	Metabolic disorders	40
<b>F40–F48</b>	Anxiety, dissociative, stress-related, somatoform, and other nonpsychotic mental disorders	35
<b>Z77–Z99</b>	Persons with potential health hazards related to family and personal history and conditions influencing health status	32
<b>M50–M54</b>	Other dorsopathies (cervical, thoracic, lumbar spine disorders)	14
<b>G40–G47</b>	Episodic and paroxysmal disorders (neurologic)	13
<b>I30–I52</b>	Other forms of heart disease	12
<b>E65–E68</b>	Overweight, obesity, and other hyperalimentation	12
<b>F10–F19</b>	Mental and behavioral disorders due to psychoactive substance use	11
<b>N17–N19</b>	Acute kidney failure and chronic kidney disease	11
<b>Z00–Z13</b>	Persons encountering health services for examinations (and screenings)	11
<b>R50–R69</b>	General symptoms and signs (e.g., fever, headache, and fatigue)	11
<b>J40–J47</b>	Chronic lower respiratory diseases	10
<b>R00–R09</b>	Symptoms and signs involving the circulatory and respiratory systems	10
<b>E00–E07</b>	Disorders of thyroid gland	10
<b>Z69–Z76</b>	Persons encountering health services in other circumstances	9
<b>I20–I25</b>	Ischemic heart diseases	9
<b>K20–K31</b>	Diseases of esophagus, stomach, and duodenum	9



Number of Visits	Number of Patients	% Patients
1	915,346	56.20%
2	389,519	23.90%
3	137,774	8.50%
4	82,044	5.00%
5	33,972	2.10%
6	25,386	1.60%
7	12,090	0.10%
8	10,063	0.10%
9	5,396	<0.1%
10+	15,857	<0.1%
<b>Total</b>	<b>1,627,447</b>	

Fig. 3. Telehealth visit frequency per diabetic patient, 4/1/20–3/31/21.

## DISCUSSION

The COVID-19 pandemic greatly accelerated the adoption of telehealth services across the healthcare system in the United States. In earlier reports from the COVID-19 Telehealth Impact Study, we found that the use of telehealth expanded in every clinical area, and all 50 states due to the innovation of providers and patients facing the need for social distancing to slow down the spread of the virus. Among all patient telehealth visits, diagnoses for endocrine,

nutritional, metabolic diseases and immune disorders ranked in the top five reasons for telehealth use during the pandemic among 19 diagnostic categories defined by the Agency for Health Care Research and Quality (3).

Patients with diabetes were particularly vulnerable to the virus. This study details how overall care seeking behavior, defined as having any encounter with a provider (face-to-face or telehealth), declined over 10% and remained down during the first 12 months of the pandemic.

Patients with diabetes converted a substantial fraction of face-to-face visits to telehealth during the pandemic. During Q2 2020, during the height of the initial pandemic lock down, 27% of the diabetic population used telehealth. Diabetes care requires a regular review of home blood glucose monitoring results, weight, diet, exercise, and medication compliance. All of these tasks are well suited for telehealth. In the study population, diabetics used an average of two telehealth visits in the 12-month period, April 1, 2020–March 31, 2021, with 98% using four or fewer telehealth visits. A very small percentage (<1%) of patients used more (up to 50) telehealth visits. It seems reasonable, for purposes of diabetes program planning and health insurance plan design, to expect —two to four telehealth visits per year for care of patients with diabetes.

In addition, we saw that certain services such as nutrition counseling and remote patient monitoring had a very little use during the pandemic and could easily become areas for appropriate growth. Just 1 year before the pandemic, in January 2019, CMS began use of codes for remote patient monitoring. This allows providers to collect and monitor blood pressure, weight, glucose, and other parameters useful for care of patients with chronic conditions. It is likely that these codes will become increasingly important for care of patients with diabetes in coming years. In December 2020, CMS clarified several aspects of remote monitoring. In particular, CMS finalized rules indicating that auxiliary personnel may provide services for CPT 99453 (initial set-up and patient education on use of equipment) and 99454 (device supply with daily recording and programmed alerts) incident to the billing practitioner's services under their supervision (13). The use of codes 99457 (20 min) and 99458 (additional 20 min) requires 'interactive communication' between providers and patients described as a conversation that occurs in real-time and includes synchronous, two-way interactions. CMS also explained that the device must be a medical device as defined by FDA Section 201(h), and that data must be electronically (i.e., automatically) collected and transmitted rather than self-reported.

During the pandemic, CMS and health insurers rapidly adjusted many payment rules to accommodate social distancing and enable patient and providers to connect (14). Payers encouraged the use of codes for audio-only visits.

CPT codes 99441, 99442, and 99443 (telephone E/M service; 5–10/11–20/21–30 min of medical discussion) were used by many providers for the first time. Our analysis shows a substantial but not excessive use of these codes, with 6–10% of telehealth encounters using these codes. They have rapidly become an important component of care for patients with diabetes and should continue to be available to patients and providers. Payment for audio-only visits helps ensure telehealth access for those who have basic telephones but who do not have smartphones or computers. Note that there are already reasonable restrictions on the use of these codes. In caring for a patient, they can be used only once in a seven-day period by the same provider for the same problem (15).

## CONCLUSION

The COVID-19 pandemic has given patients and providers alike a view into the future of care in the digital age. We believe that telehealth will quickly become a best practice component of the care of patients with diabetes and other chronic conditions. Telehealth interactions—two to four times per year supplemented with remote patient monitoring for those diabetics needing close monitoring of glucose, blood pressure, and weight have the potential to greatly enhance patient compliance, better glycemic control, and healthier lifestyle choices. This claims data analysis illustrates a pattern of ‘telehealth reasonable use’ determined by patients and providers working together to optimize care. Additional research will be needed to learn whether the routine use of telehealth will lead to improvements in glycemic control, lower complication rates, enhanced medication compliance, higher patient satisfaction, and other outcomes of interest. We encourage CMS and other payers to embrace and promote the use of telehealth services based on the real-world experience of patients and providers during the pandemic.

## Conflicts of interest and funding

The authors each declare no potential conflicts of interest related to publication of our manuscript, ‘COVID-19 Telehealth Impact Study – Exploring One Year of Telehealth Experimentation’.

## Author contributions

All authors contributed substantially to the research, including study design, data management, data analysis, data interpretation, and manuscript preparation.

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