

Telemedicine Catches On: Changes in the Utilization of Telemedicine Services During the COVID-19 Pandemic

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As COVID-19 spread globally, health care delivery was forced into a period of rapid transformation. Telemedicine—the provision of health care visits through telephone, video conferencing, or electronic messaging—has historically faced adoption barriers, including patient and insurer acceptance.¹ Telemedicine's suitability for delivering care while promoting social distancing to slow disease transmission² has led to significant changes by stakeholders. In late February 2020, the CDC recommended that providers move to remote visits.³ On March 13, Independence Blue Cross (Independence) announced that telemedicine visits across a wide range of services would be eligible for reimbursement. Four days later, federal changes allowed reimbursement for Medicare beneficiaries' telemedicine visits⁴ and the use of noncertified communications applications, such as Zoom and FaceTime, without fear of Health Insurance Portability and Accountability Act enforcement.⁵ These significant changes to telemedicine policy, along with state stay-at-home orders and shifts in provider and patient behavior to reduce the likelihood of viral transmission and prioritize the care of vulnerable patients, facilitated the expansion and adoption of telemedicine.

Early evidence from ambulatory practices shows that telemedicine visits have been increasing at insufficient levels to offset declines in in-person visits.⁶⁻⁸ However, there has been limited investigation into whether disparities in receipt of telemedicine across age, race, ethnicity, socioeconomic status, and rurality extend into this new wave of unplanned telemedicine expansion.^{9,10} Our work extends these findings by also including telemedicine-only providers, examining demographics at a finer geographic scale (US Census tract), and extending the study period.

To better understand the utilization of telemedicine services across diagnoses and patient characteristics, we analyzed data from Independence, a large health plan based in southeast Pennsylvania.

METHODS

Data Sources and Population

We analyze the “prepandemic period” (January 1, 2018, through March 10, 2020) and the “pandemic period” (March 11, 2020,

ABSTRACT

OBJECTIVES: To determine the degree of telemedicine expansion overall and across patient subpopulations and diagnoses. We hypothesized that telemedicine visits would increase substantially due to the need for continuity of care despite the disruptive effects of COVID-19.

STUDY DESIGN: A retrospective study of health insurance claims for telemedicine visits from January 1, 2018, through March 10, 2020 (prepandemic period), and March 11, 2020, through October 31, 2020 (pandemic period).

METHODS: We analyzed claims from 1,589,777 telemedicine visits that were submitted to Independence Blue Cross (Independence) from telemedicine-only providers and providers who traditionally deliver care in person. The primary exposure was the combination of individual behavior changes, state stay-at-home orders, and the Independence expansion of billing policies for telemedicine. The comparison population consisted of telemedicine visits in the prepandemic period.

RESULTS: Telemedicine increased rapidly from a mean (SD) of 773 (155) weekly visits in prepandemic 2020 to 45,632 (19,937) weekly visits in the pandemic period. During the pandemic period, a greater proportion of telemedicine users were older, had Medicare Advantage insurance plans, had existing chronic conditions, or resided in predominantly non-Hispanic Black or African American Census tracts compared with during the prepandemic period. A significant increase in telemedicine claims containing a mental health-related diagnosis was observed.

CONCLUSIONS: Telemedicine expanded rapidly during the COVID-19 pandemic across a broad range of clinical conditions and demographics. Although levels declined later in 2020, telemedicine utilization remained markedly higher than 2019 and 2018 levels. Trends suggest that telemedicine will likely play a key role in postpandemic care delivery.

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through October 31, 2020). For simplicity, because prepandemic trends in 2020 were similar to 2018 and 2019 trends, where indicated in the text and exhibits, certain analyses use “prepandemic 2020” (January 1, 2020, through March 10, 2020) for their comparison group. Deidentified summary data derived from medical claims and eligibility files were provided by Independence. A majority of Independence members who used telemedicine throughout the study period were from the 5-county southeast Pennsylvania region (Philadelphia, Chester, Montgomery, Bucks, and Delaware counties); approximately 40% of telemedicine-utilizing members were nationally distributed. Telemedicine visits were identified using service type and place of service codes, Healthcare Common Procedure Coding System procedural codes, and procedure modifiers (“95,” “GQ,” and “GT”). For comparison, we also identified nontelemedicine primary care provider and specialist office visits in 2020. Comparative specialist visit counts were restricted to those with associated specialty codes that were also represented in telemedicine claims for the same period. That is, we did not consider any specialist office visits for services that were not also provided via telemedicine. Demographic characteristics including age, sex, and line of business came from member enrollment files. Race and ethnicity information came from the US Census Bureau’s 2018 American Community Survey 5-year aggregate Census tract–level files. Chronic condition indicators for members were derived based on claims records and using CMS condition algorithms.¹¹

A visit was defined as a unique combination of claim identifier, service date, member identifier, and provider. Multiple claims for a given member from the same provider on the same day were counted as a single claim. We included all claims incurred and posted by October 31, 2020. To avoid bias due to availability of claims-based chronic condition and behavioral health indicators, member demographic analyses (but not visit-level analyses) were restricted to members continuously enrolled for at least 6 months.

Clinical Data

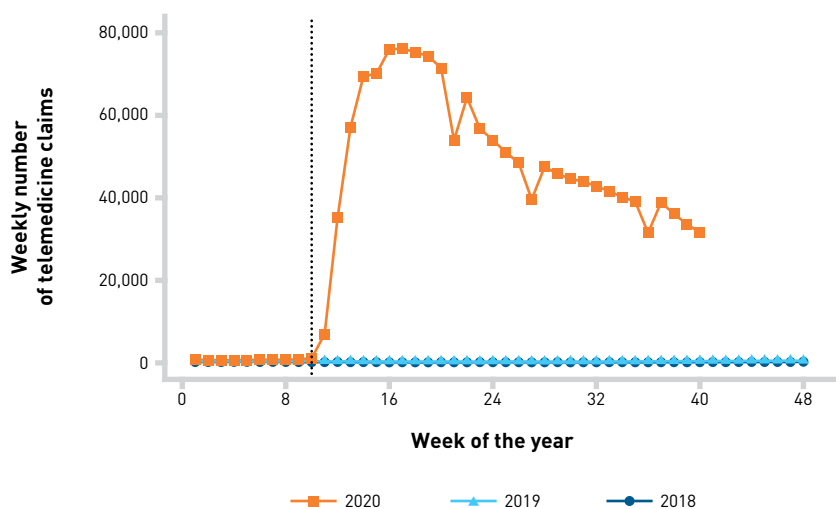
The primary *International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)* diagnosis codes reported by service providers on telemedicine claims were aggregated into 20 clinically meaningful categories by body system using the Healthcare Cost and Utilization Project Clinical Classifications Software Refined (CCSR) for the *ICD-10-CM*–coded diagnoses.¹² CMS’ chronic condition

TAKEAWAY POINTS

Telemedicine is a solution for providing medical care while preventing risk of COVID-19 transmission. Despite pulling back from its initial peak following regional stay-at-home orders, utilization remains high. This increase may spur broader adoption of telemedicine post pandemic.

- ▶ Weekly telemedicine visits for one insurer increased from a mean of 773 in 2020 prior to stay-at-home orders to 45,632 in subsequent weeks.
- ▶ Patients who were older, had existing chronic conditions, were male, or resided in predominantly non-Hispanic Black or African American Census tracts showed increased telemedicine utilization in later weeks of the pandemic. Mental health–related diagnosis codes experienced the greatest telemedicine increase of any clinical category.

FIGURE 1. Weekly Telemedicine Claims Over Time, January 2018–October 2020*



*Weeks 49 to 52 of 2018 and 2019 were excluded for clarity and because their level and trend did not differ from the depicted time periods. The dotted vertical line marks week 10, which ends March 10, 2020, the last week prior to Independence Blue Cross announcing its updated policy for reimbursing telemedicine visits. Several states instituted stay-at-home orders in the subsequent weeks.

criteria based on diagnosis codes and sites of care were used to identify chronic conditions.¹³

Statistical Analysis

95% CIs of the difference in proportions compared the prepandemic and pandemic periods. Data were analyzed in R version 3.5.1 (R Foundation for Statistical Computing).

RESULTS

We analyzed 1,589,777 telemedicine visits from 624,236 unique members between January 1, 2018, and October 31, 2020.

Telemedicine utilization gradually increased over 2018 and 2019 but remained low through prepandemic 2020 compared with the pandemic period (Figure 1). In prepandemic 2020 from January 1, 2020, through March 10, 2020, there was a mean (SD) of 773 (155)

weekly telemedicine visits. In the pandemic period, weekly visits averaged 45,632 (SD=19,937). Beginning in week 11 of 2020, which begins March 11, 2020, and marks the first week of the pandemic period, visits rose rapidly, from 1151 in week 10 to 6980, 35,160, and 57,104 in weeks 11 to 13 of 2020, respectively, to a peak of 76,186 visits in week 17 (which begins April 22, 2020). By comparison, analogous specialist in-person visits fell from 151,709 in week 10 of 2020 to 35,914 in week 15, before partially recovering to 101,982 in week 40 (eAppendix Figure [available at ajmc.com]). Primary care in-person visits fell from 81,457 in week 10 of 2020 to 14,943 in week 15, before recovering to 63,744 in week 40 (eAppendix Figure).

The Table compares demographic characteristics of distinct telemedicine users in pre-pandemic 2020 vs the pandemic period. A greater proportion of telemedicine users were in the age group 65 years and older and in a Medicare Advantage plan in the pandemic period compared with pre-pandemic 2020. In the pandemic period, members living in rural locations represented a smaller overall percentage of distinct telemedicine users compared with nonrural users. Pre-pandemic, members residing in rural locations made up a slightly larger percentage of total telemedicine users. Members with previously diagnosed chronic conditions and hospitalizations in the past 6 months exhibited greater increases in telemedicine utilization during the pandemic period compared with those without. This trend was consistent across all types of chronic conditions but was largest among members with hypertension. Telemedicine use expanded in later periods to include US Census tracts with higher percentages of population with families living below the federal poverty line and among Census tracts with, on average, 2.8 percentage points higher proportions of their population identifying as non-Hispanic Black or African American.

Figure 2 depicts clinical categories assigned to primary diagnosis codes on all telemedicine visits occurring in pre-pandemic 2020 and the pandemic period. The largest average claim count increases were observed for telemedicine visits with a mental or behavioral health diagnosis category (212 to 16,151; 7418%) and for visits with a primary diagnosis of a respiratory disease category (235 to 2346; 798%), which were the only CCSR clinical diagnosis categories that contained more than 100 codes per week in weeks 1 to 10. In the pandemic period, 14% of mental/behavioral telemedicine visits from members with at least 6 months of continuous enrollment were from members with no 6-month history of any behavioral health condition.

DISCUSSION

Using claims data from a large insurer, we demonstrate that telemedicine expanded dramatically during the COVID-19 pandemic, similar to other findings.⁹ Contrary to pre-pandemic research,¹⁴ we found marked increases in use of telemedicine among older members in particular. Independence's inclusion of telephone (ie, audio only) visits in the initial announcement may have increased accessibility to services, but other insurers whose policies with

regard to audio-only visits were not described also showed increased telemedicine use among older adults.⁹ In an academic health system, Black and non-privately insured patients (Medicare, Medicaid, and self-pay) were more likely to use the telephone compared with video teleconferencing for telemedicine visits.¹⁵

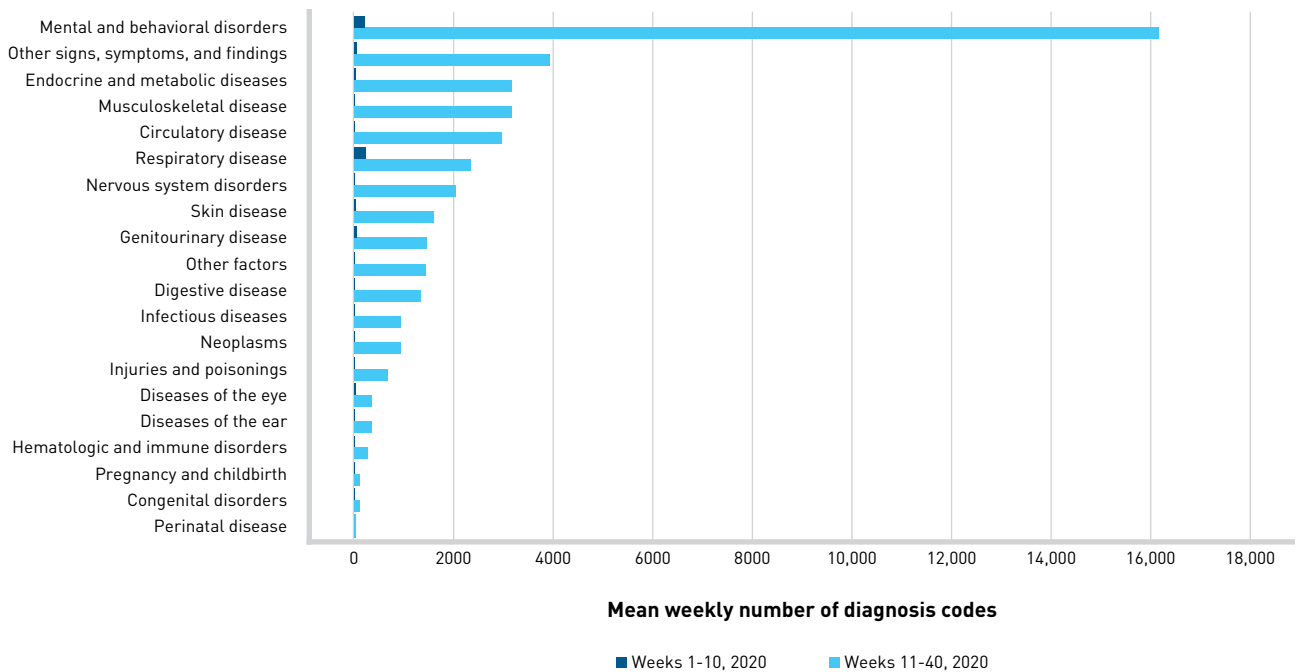
Telemedicine visits increased more among members with chronic conditions. This may reflect recognition of the need for careful care coordination among members' regular providers, particularly for management-intensive high-risk chronic diseases such as chronic kidney disease, chronic obstructive pulmonary disease, heart failure, and diabetes. Telemedicine visits for these members may have prevented exacerbations, potentially saving hospital capacity and lives. Telemedicine claims with an asthma diagnosis increased slightly from a high baseline in the earlier period, consistent with pre-pandemic telemedicine being used for general respiratory complaints. Telemedicine claims for hypertension also increased significantly, possibly because some aspects of hypertension management can be readily achieved with telemedicine.

Telemedicine use increased in a similarly high-risk group of patients: those with 1 or more inpatient hospitalization(s) in the past 6 months. Future research should evaluate whether these additional telemedicine visits added value by reducing readmissions among the recently hospitalized.

Following stay-at-home orders in March 2020, telemedicine use increased among members residing in predominantly non-Hispanic Black or African American Census tracts. This may be at least partially driven by an increase in the percent of Philadelphia County residents using telemedicine in 2020. From January to October 2020, 20% of distinct members with at least 1 telemedicine claim resided in Philadelphia County, which is more racially diverse than surrounding southeastern Pennsylvania counties. Before January 2020, only 7.2% of distinct members with at least 1 telemedicine claim resided in Philadelphia County. COVID-19 has brought to the forefront stark racial disparities that exist in the health care system. Higher rates of infection, hospitalization, and death have occurred in Black, Hispanic, and Asian populations compared with White populations.^{16,17} Telemedicine could represent a health care approach to improve access to primary and specialty care and provide timely and potentially lower-cost engagement with providers, both for COVID-19-related and other care needs. Future work should follow access to telemedicine for minority populations among both telemedicine and nontelemedicine users to identify disparities and ensure that the gains we document persist if some pre-pandemic restrictions on telemedicine return.

Telemedicine claims with diagnosis codes related to mental/behavioral health showed the greatest increase during the first wave of the COVID-19 pandemic, followed by diagnosis codes grouping to other signs and symptoms and codes grouping to the musculoskeletal and endocrine categories. These visits may be particularly amenable to telemedicine. In addition, early evidence indicates that the stress of the pandemic may have caused acute mental health needs.¹⁸

FIGURE 2. Paired Histogram of Mean Weekly Number of Primary Diagnosis Codes for Telemedicine Claims Across Clinical Categories in Prepandemic 2020 (weeks 1-10) vs the Pandemic Period (weeks 11-40 of 2020)



Limitations

We use claims data to gain a global, rather than health system-specific, view of the transition to telemedicine among the insured population. However, we could not investigate those who are uninsured, are insured through Medicaid or traditional Medicare or nonbilled activities, or did not appear in Independence claims records for the period of study. Patients calling public information lines, calling health systems, or discussing their symptoms with clinician-backed online chatbots are not included in our study. We also do not know the medical need among each group nor whether telemedicine addressed acute or preventive needs; older or chronically ill members might have derived additional benefit from an even greater increase in telemedicine. We did not assess variation in member access to communications technologies such as broadband internet or devices such as a computer, tablet, or cell phone, which can influence whether and how telemedicine services are used. Finally, data describing changes in telemedicine use across race and ethnicity groups are presented at the Census tract level according to the US Office of Management and Budget standards on race and ethnicity aggregations, and they should be considered only a proxy for changes occurring among individual members. Further work is needed to investigate the interactions of race, social determinants of health, uptake and continued use of telemedicine, and the effects on health outcomes.

CONCLUSIONS

The unprecedented scope of telemedicine’s adoption among Independence members likely accelerated the uptake of this new model of care by several years.¹⁹ Many providers have overcome the fixed costs of implementing telemedicine platforms and learned to deliver care without a hands-on exam. Relaxing prepandemic technical requirements for telemedicine visits has made telemedicine accessible to populations less versed in technology. Hundreds of thousands of patients of all ages and backgrounds have now experienced clinician visits without the transportation costs and waiting time of a typical in-person visit. Future telemedicine use may not resemble the current surge, but reversion to the former low levels of adoption is unlikely, as the ongoing level of telemedicine utilization demonstrates. As the future of telemedicine evolves, continued research into adoption trends, health outcomes, and patient and provider satisfaction will be needed to set policy and guidelines for safe and effective use of this technology. ■

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CLINICAL

TABLE. Characteristics of Members With Telemedicine Claims in Prepandemic 2020 (January 1, 2020–March 10, 2020) vs the Pandemic Period (March 11, 2020–October 31, 2020)^a

	Prepandemic 2020	Pandemic period	Difference in % [95% CI]
Member-level characteristics			
Number of unique (in each period) members with telemedicine claims	5283	552,737	
Age, n (%) ^b			
18–50 years	3434 (65.0)	254,807 (46.1)	–18.9 [–20.2 to –17.6]
51–65 years	1125 (21.3)	160,816 (29.1)	7.8 (6.7–8.9)
≥ 65 years	152 (2.9)	72,690 (13.2)	10.3 (9.8–10.7)
Male, n (%)	1869 (35.4)	227,784 (41.2)	5.8 (4.5–7.1)
Rural, ^c n (%)	241 (4.6)	13,452 (2.4)	–2.1 [–2.7 to –1.6]
Primary payer, ^d n (%)			
Commercial insurance	5175 (98.0)	494,125 (89.4)	–8.6 [–9.0 to –8.2]
Medicare Advantage	65 (1.2)	48,869 (8.8)	7.6 (7.3–7.9)
Other insurance	42 (0.8)	10,139 (1.8)	1.0 (0.8–1.3)
Clinical characteristics, ^e n (%)			
At least 1 behavioral health condition ^f	2237 (42.3)	187,912 (34.0)	–8.3 [–9.7 to –7.0]
At least 1 chronic condition ^g	2384 (45.1)	329,428 (59.6)	14.5 (13.1–15.8)
At least 1 acute inpatient hospitalization	163 (3.1)	24,039 (4.3)	1.3 (0.8–1.7)
At least 1 chronic condition and at least 1 acute inpatient hospitalization	123 (2.3)	21,016 (3.8)	1.5 (1.1–1.9)
Asthma	526 (10.0)	62,863 (11.4)	1.4 (0.6–2.2)
Cancer ^h	115 (2.2)	23,020 (4.2)	2.0 (1.6–2.4)
Chronic kidney disease	276 (5.2)	52,511 (9.5)	4.3 (3.7–4.9)
Congestive heart failure	50 (0.9)	15,746 (2.8)	1.9 (1.6–2.2)
Chronic obstructive pulmonary disease	129 (2.4)	27,215 (4.9)	2.5 (2.1–2.9)
Diabetes	378 (7.2)	65,081 (11.8)	4.6 (3.9–5.3)
Hypertension	723 (13.7)	142,179 (25.7)	12.0 (11.1–13.0)
Census tract–level characteristicsⁱ			
Mean (SD) population % Hispanic or Latino of any race in tract	9.0 (12.0)	8.6 (12.2)	
Mean (SD) population % non-Hispanic Asian	6.1 (7.5)	6.2 (7.5)	
Mean (SD) population % non-Hispanic Black or African American	11.5 (18.5)	14.3 (22.6)	
Mean (SD) population % non-Hispanic White	70.9 (23.5)	68.4 (26.6)	
Mean (SD) population % non-Hispanic Native Hawaiian or other Pacific Islander	0.04 (0.24)	0.04 (0.25)	
Mean (SD) population % non-Hispanic American Indian or Alaska Native	0.21 (0.98)	0.16 (0.78)	
Mean (SD) population % non-Hispanic other race	0.21 (0.60)	0.23 (0.63)	
Mean (SD) population % non-Hispanic 2 or more races	2.1 (1.8)	2.1 (1.7)	
Mean (SD) population % of families below federal poverty level, aged 18–65 years	6.7 (7.8)	7.3 (8.7)	

^aData are restricted to members who are continuously enrolled for at least 6 months prior to the service date of the most recent telemedicine claim.

^bThose younger than 18 form the omitted category by age. The difference between column totals and 100% is this age category.

^cData come from the Federal Office of Rural Health Policy data files.

^dPrimary payer is reported among members who are continuously enrolled with the same insurance type over the past 6 months.

^eClinical characteristics are measured using a 6-month lookback window among members who are continuously enrolled for at least the past 6 months.

^fBehavioral health conditions are measured using a 6-month lookback window and include depression; attention-deficit/hyperactivity disorder; conduct disorders, and hyperkinetic syndrome; anxiety disorders; autism spectrum disorders; bipolar disorder; intellectual disabilities and related conditions; learning disabilities; other developmental delays; personality disorders; posttraumatic stress disorder; and schizophrenia and other psychotic disorders.

^gCMS-defined chronic conditions of Independence Blue Cross members who had 1 or more telemedicine claim in the designated period. Chronic conditions include acquired hypothyroidism; acute myocardial infarction; Alzheimer disease; Alzheimer disease and related disorders or senile dementia; anemia; asthma; atrial fibrillation; benign prostatic hyperplasia; breast cancer; cataract; cerebral palsy; chronic kidney disease; chronic obstructive pulmonary disease and bronchiectasis; colorectal cancer; cystic fibrosis and other metabolic developmental disorders; diabetes type 1; diabetes type 2; endometrial cancer; epilepsy; fibromyalgia; chronic pain, and fatigue; glaucoma; heart failure; hip/pelvic fracture; hepatitis A; hepatitis B; hepatitis C; hepatitis D; hepatitis E; hyperlipidemia; hypertension; ischemic heart disease; leukemias and lymphomas; lung cancer; migraine and chronic headache; mobility impairments; multiple sclerosis and transverse myelitis; muscular dystrophy; osteoporosis; peripheral vascular disease; prostate cancer; rheumatoid arthritis/osteoarthritis; sensory blindness and visual impairment; sensory deafness and hearing impairment; spina bifida and other congenital anomalies of the nervous system; spinal cord injury; stroke/transient ischemic attack; and traumatic brain injury and nonpsychotic mental disorders due to brain damage.

^hCancers include breast cancer, colorectal cancer, endometrial cancer, lung cancer, leukemias and lymphomas, and prostate cancer.

ⁱData come from the United States Census American Community Survey 2018 5-year estimates data profiles and are based on the Census tract of the member's primary/home address. Ninety-nine percent of members could be matched to a valid Census tract identifier (1% of members were missing geographic information to perform matching to Census tract-level indicators). A total of 39,051 Census tracts were represented in the member cohort (3016 distinct Census tracts were represented in the prepandemic period and 38,949 unique Census tracts were represented in the pandemic period). Because these data are not at the member level, we present population percentages at the tract level.

these results through this publication and through the lay press where applicable. Due to enrollee privacy concerns, these data are not available to be shared for reanalysis. This manuscript represents a deidentified analysis of routinely collected data and therefore is exempt from human subject review.

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Authorship Information: Concept and design (ABF, SG, HS, AMB, ATC, AB, GD, JMB, RB, AS-M); acquisition of data (ABF, SG, HS, JMB, RB, AS-M); analysis and interpretation of data (ABF, SG, HS, AMB, AB, GD, JMB, RB, AS-M); drafting of the manuscript (ABF, SG, HS, ATC, AB, GD, JMB, RB, AS-M); critical revision of the manuscript for important intellectual content (ABF, SG, HS, AMB, ATC, GD, JMB, RB, AS-M); statistical analysis (ABF, SG, RB); provision of patients or study materials (SG, JMB, RB, AS-M); administrative, technical, or logistic support (SG, JMB, RB, AS-M); and supervision (ABF, SG, HS, GD, RB, AS-M).

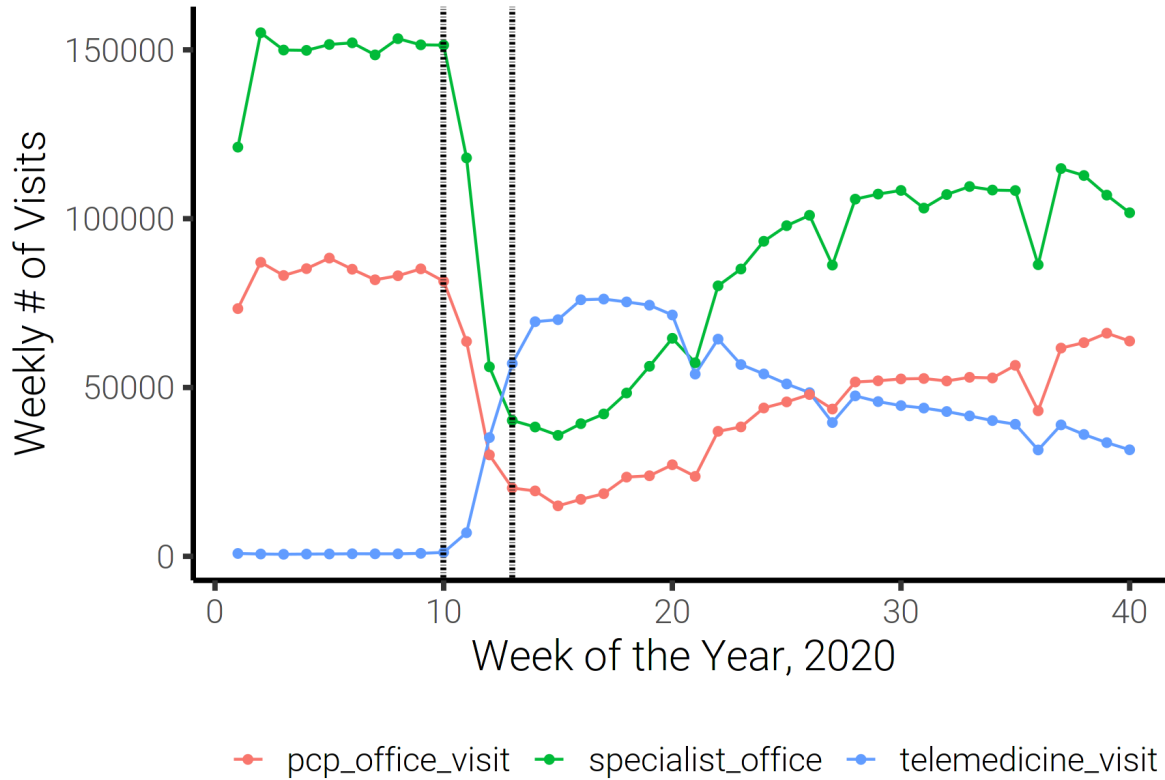
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eAppendix Figure. Comparison of weekly telemedicine visits from telemedicine, PCP, and specialist offices



Policy changes allowing the expansion of telemedicine from PCP-only to PCP plus specialist care complicate comparisons to non-telemedicine care. Here we provide comparison weekly aggregates for (1) all PCP visits where “office” is indicated as place of service on the medical claim, as well as (2) specialist visits where “office” is indicated on the claim as place of service AND only for servicing provider specialty codes also present on telemedicine claims. This exclusion criteria applied to specialty codes provides an approximation for visits that ‘could have’ occurred in in either an office or telemedicine setting. Specialty codes that were excluded from this comparison, or codes that existed in specialist office visits but not in specialist telemedicine visits, included podiatric surgery, hearing aid fitting, osteopathic manipulation, anatomic pathology, and clinical pathology. This supplementary Figure is truncated at week 40, as with our primary Figure 1.