A COVID-19 Telehealth Impact Study—Exploring One Year of Telehealth Experimentation

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Importance: This three-part study characterizes the widespread implementation of telehealth during the first year of the COVID-19 pandemic, giving us insight into the role of telehealth as we enter a stage of "new normal" health care 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. Using a large claims data stream and surveys of providers and patients, we studied telehealth in all 50 states to inform health care leaders.

Design, setting, and participants: In March 2020, the MITRE Corporation and Mayo Clinic founded the COVID-19 Healthcare Coalition (C19HCC), to respond to the pandemic. We report trends using a dataset of over 2 billion health care claims covering over 50% of private insurance activity in the United States (January 2019–December 2020), along with key elements from our provider survey (July–August 2020) and patient survey (November 2020–February 2021).

Main outcomes and measures: There was rapid and widespread adoption of telehealth in the Spring 2020 with over 12 million telehealth claims in April 2020, accounting for 49.4% of total health care claims. Providers and patients expressed high levels of satisfaction with the telehealth. Seventy-five percent of providers indicated that telehealth enabled them to provide a quality care. Eighty-four percent of patients agreed that quality of their telehealth visit was good.

Results: *Peak levels of telehealth use varied widely among states ranging from 74.9% in Massachusetts to 25.4% in Mississippi. Every clinical discipline saw a steep rise with the largest claims volume in behavioral health. Provision of care by out-of-state provider was common at 6.5% (October–December 2020). Providers reported multiple modalities of telehealth care delivery. Seventy-four percent of patients indicated they will use telehealth services in the future.*

Conclusions and relevance: *Innovation shown by providers and patients during this period of rapid telehealth expansion constitutes a great natural experiment in care delivery with evidence supporting widespread clinical adoption and satisfaction on the part of both patients and providers. The authors encourage continued broad access to telehealth over the next 12 months to allow telehealth best practices to emerge, creating a more effective and resilient system of care delivery.*

In the weeks and months after the World Health Organization declared the COVID-19 pandemic in March 2020, the world of health care changed dramatically for patients and providers. In that month, leadership from Mayo Clinic and the MITRE Corporation established the COVID-19 Healthcare Coalition (C19HCC) to launch a private sector response to many challenges facing the US health care system and communities. The C19HCC Telehealth Workgroup recognized that we were at the start of a great experiment in the application of telehealth. Within a very short time, telehealth has transformed our health care delivery system due to unprecedented innovation by health systems, technology partners, payers, and regulators.[1]

Physicians and other health care professionals are rapidly adopting telephone, email, and video-enabled platforms to care for patients during this time of "social distancing" in an attempt to limit human-to-human contact and virus spread.[2] Telehealth enables care without physical touch but can preserve the emotional and intellectual connectedness needed for medical practice and health preservation. The C19HCC Coalition initiated the Telehealth Impact Study to describe and document the expansion of telehealth during the pandemic. There is no grant funding associated with the project.

The project began reporting findings on the Coalition's website, https://c19hcc.org/telehealth/, during the summer 2020 to help guide health system and public policy leaders in their work to combat COVID-19. The site now includes reporting at the state and national levels from our claims data and subgroups in the survey analyses.

Key points for the reader to consider are listed in Table 1.

Key points

Key points	Considerations
Question	How can our experience of rapid telehealth adoption during the COVID-19 pandemic guide us to enlightened policy decisions for a "new normal" of medical practice.
Findings	This three-part study including claims data analysis and surveys of providers and patients documents widespread innovations and adoption of telehealth across clinical domains during the COVID-19 pandemic. Providers and patients perceived high levels of satisfaction and expectations to continue to use telehealth in the future.
Meaning	Payers and providers should maintain high levels of telehealth access during the next year to allow best practices to emerge and to enable a full assessment of telehealth value.

METHODS

We used a combination of data sources for this project to evaluate objective and subjective aspects of telehealth growth during the pandemic. These include a large nationwide health care claims dataset, a survey of providers, and a survey of patients. The claims dataset comes from large health care claims files provided by Change Healthcare (Nashville, TN), representing more than 50% of private insurance claims in the United States. More than 2 billion claims reflect care for more than 150 million individuals. The dataset was certified by expert determination to be in accordance with Health Insurance Portability and Accountability Act (HIPAA) privacy requirements. No identifying information of individuals or covered entities was provided.

We focused on trends in telehealth and non-telehealth activity between January 1, 2019 and December 31, 2020. The dataset 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. A significant limitation of the data is that it does not include the majority of Medicare and Medicaid indemnity claims. The dataset includes patient care episodes from all 50 states, including the District of Columbia, Puerto Rico, and the US Virgin Islands, enabling a comparison of changes during 2020 with a stable baseline of 2019 claims.

The project team first started posting dynamic reporting of the claim analysis on the coalition website, https://c19hcc.org/telehealth/, in July 2020. We experienced a lag time of completed reporting of approximately 60 days, so that updates were posted on the website every month. Patient location was determined from patient home address, and provider location came from the billing address as reported in the claims. The research protocol was approved by the Mayo Clinic Institutional Review Board. Health services research and data science team members from Mayo Clinic and MITRE collaborated to interpret the data and create reports. Data visualization specialists from MITRE created the web design and reporting framework for the C19HCC.org reporting site.

The provider survey was created by the study team. It was informed by prior work, including surveys developed by the American Medical Association (AMA), Massachusetts Health Quality Partners (MHQP), and the National Committee on Quality Assurance. The survey was distributed by members of the C19HCC, AMA, American Telemedicine Association, MHQP, MassChallenge, and state medical societies. The survey was managed through the Mayo Clinic health services research team using the Qualtrics Online Survey Platform (Qualtrics, Inc., Provo, UT, and Seattle, WA). The survey was open from July 15 to August 15, 2020.

All answers, from both physicians and other providers, are included in this analysis. Clinical subspecialties were collected through structured and open text responses. Subspecialties were combined into relevant specialty groupings and then rolled up into larger specialty categories to facilitate data aggregation. Respondents were allowed to leave individual questions unanswered. For this reason, response volumes vary from question to question. In cases where a provider did not report their specialty or provide a rurality designation, the data are not included under that reporting frame. Reporting of all questions from the survey appeared first in November 2020 on the study website.

The patient survey was drafted by the study team and modeled, in part, on surveys developed by the MHQP. The 20-question survey was open to persons who are 18 years or older and having at least one telehealth encounter between March 1, 2020 and January 30, 2021. It was managed through the Mayo Clinic health services research team using the Qualitrics Online Survey Platform. The survey was available in English language only and was open from December 1, 2020 to February 5, 2021. It was distributed through the C19HCC Coalition and study team's organizational networks. Additionally, the survey was offered through The Mighty (www.themighty.com) and Savvy Cooperative (www.savvy.coop) digital communities.

Patients answered questions relating to their most recent telehealth encounter. Questions covered a range of specific topics, including the technology platform used, clinical problems addressed, alternatives to telehealth considered, and satisfaction. Patients were allowed to select multiple answers for some questions and allowed to skip any question. Each respondent identified their form of health insurance. Those replying with multiple insurance products were assigned to a single class. Respondents indicating both Medicare and a private insurance carrier, for example, were assigned to the Medicare classification. Those indicating any form of Veteran's or armed forces health care were assigned to that classification. When a respondent did not report their insurance carrier, age, or rurality designation, the data are not included under that specific report, resulting in variable total denominator counts. Reporting of the patient survey results first appeared in March 2021 on the study website.

Although we analyzed a very large claims dataset, it should be considered a "convenience sample" and may have additional built-in bias due to data supplier coverage. Similarly, the provider and patient surveys are convenience samples of respondents from across the United States and were offered only in English. Limitations must be considered when deriving conclusions about telehealth from these sources. We are unaware of any other study that combines a telehealth claims analysis with both patient and provider surveys.

CLAIMS RESULTS
Throughout 2019, nationwide telehealth claim frequency showed only slight increases on a monthly basis. Beginning of March 2020, we see a dramatic spike in telehealth claims activity (Figure 1). Submitted claims were a modest 524,670 in February 2020 and then spiked to 12,626,363 claims in April, a 24-fold increase. This reflects the fact that many medical offices closed for face-to-face care at the time and rapidly initiated telehealth connections with patients. As offices began reopening in May, we see a relative decline in telehealth claims, which began to plateau in the last quarter of 2020. During the pre-pandemic baseline, October–December 2019, telehealth claims represented just 1.3% of all claims; they rose to a peak of 49.4% in April 2020 and settled to 21.5% in October–December 2021.

The abrupt rise in March and April 2020 was common in all 50 states and territories. However, the peak and subsequent pattern of decline did vary among jurisdictions. The website reporting tool enables graphical display of all data reports by state. Table 1 shows an overview of key statistics from each jurisdiction. For example, Massachusetts providers delivered 74.5% of encounters via telehealth in April 2020, and this leveled off to just 49.9% during the October–December timeframe. This was the highest peak percentage of any jurisdiction. Mississippi had the lowest peak telehealth
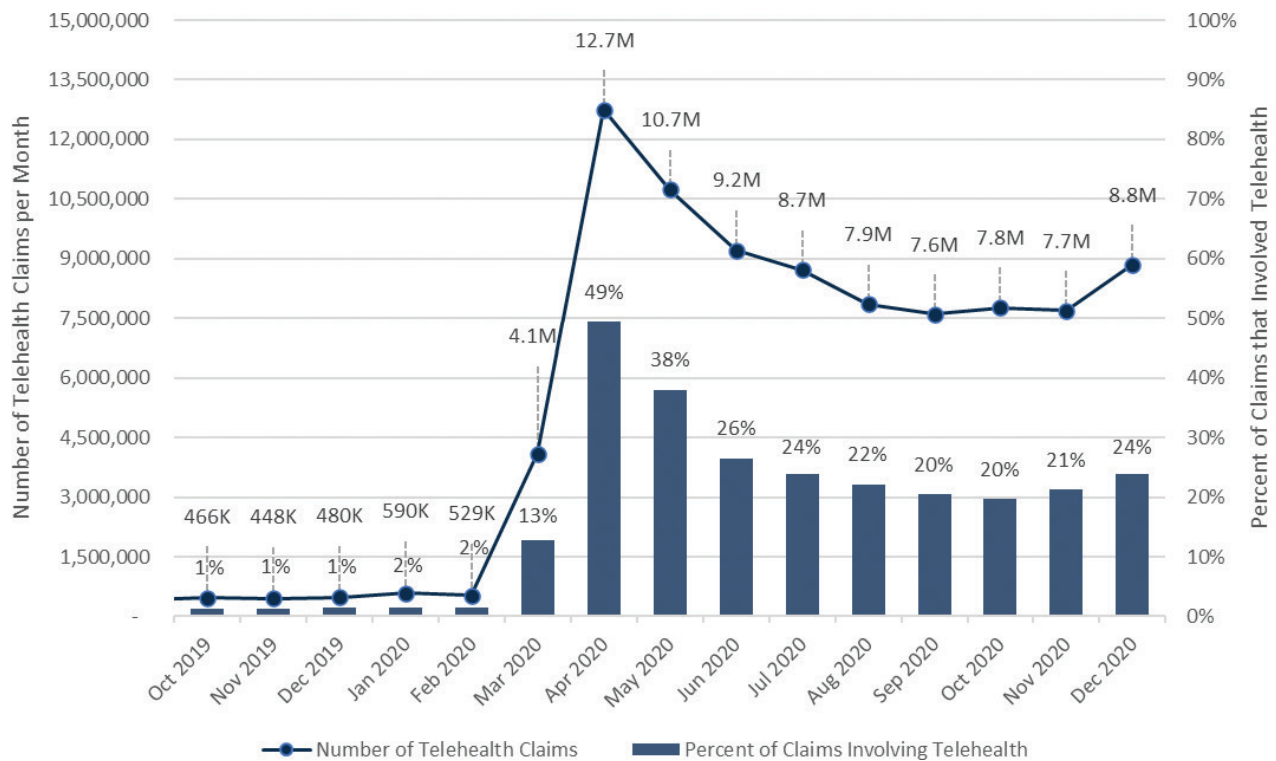
Figure 1—Number of telehealth claims and percentage of total claims from January 2019 to December 2020.

utilization at 25.4% in April, declining to 10.1% in October–December 2020.

To understand which clinical conditions were being addressed through telehealth, we grouped claims by diagnosis codes. We used the AHRQ Clinical Classifications Software for 1CD-10-PCS (beta version).[3] The primary ICD-10 code for each encounter is assigned to a clinical classification. The frequency of telehealth claims for behavioral and mental health disorders far exceeded all other clinical issues (Figure 2). Claims for behavioral and mental health disorders were 4–5 times more frequent than those for other common categories of disease, including circulatory and endocrine disorders.

Insurance claims data fields of "home address" and "billing address" were used to determine relative locations of patients and providers. In the pre-pandemic period, October–December 2019, 31% of telehealth services were delivered by out-of-state and 69.0% by in-state providers (Figure 3). During the height of the pandemic, as new providers began using telehealth, in-state use rose to 95% in April 2020. This leveled out to 6.5% out-of-state and 93.5% in-state services during October–December 2020.

PROVIDER SURVEY RESULTS
The national telehealth physician survey was completed by 1,594 respondents, 87% physicians and 13% other qualified health care providers from 30 states representing all regions of the United States. Of those reporting, race and ethnicity broke down as follows: 76% White/Caucasian, 10% Asian/Pacific Islander, 3.7% Hispanic/LatinX, 2.7% Black/African American, and 0.1% Native American/American Indian/Alaska Native. We note that the respondent

Table 1. Telehealth claims profile, 50 states and territories

Jurisdiction	% Telehealth Claims, Oct-Dec 2019 Average	% Telehealth Claims, Apr 2020	% Telehealth Claims, Oct-Dec 2020 Average	% Telehealth Claims from In-State Providers, Oct-Dec 2020 Average	% Telehealth Claims from Out-of-State Providers, Oct-Dec 2020 Average
Alabama	2.2	40.7	14.5	84.9	15.1
Alaska	3.7	49.8	26.6	95.3	4.7
Arizona	5.6	39.7	26.4	97.0	3.0
Arkansas	1.0	47.9	18.1	94.1	5.9
California	2.1	50.8	31.4	94.7	5.3
Colorado	1.5	51.9	25.8	95.8	4.2
Connecticut	0.7	61.6	22.0	94.4	5.6
Delaware	0.9	58.5	28.7	93.1	6.9
D.C.	1.3	67.9	36.8	72.1	27.9
Florida	1.1	41.8	18.0	95.9	4.1
Georgia	1.9	45.0	18.7	89.6	10.4
Hawaii	1.4	43.8	27.1	96.7	3.3
Idaho	0.7	39.7	19.1	93.7	6.3
Illinois	0.9	47.3	23.7	95.7	4.3
Indiana	1.7	50.7	17.5	64.7	35.3
Iowa	3.4	46.2	20.9	94.4	5.6
Kansas	1.2	40.5	17.8	87.5	12.5
Kentucky	1.2	53.4	23.0	85.5	14.5
Louisiana	0.8	56.0	17.8	97.5	2.5
Maine	0.7	64.0	19.6	95.4	4.6
Maryland	0.6	54.3	24.5	86.2	13.8
Massachusetts	0.6	74.5	49.9	95.4	4.6
Michigan	1.0	64.8	24.6	94.2	5.8
Minnesota	1.1	56.6	32.0	84.9	15.1
Mississippi	1.4	25.4	10.1	85.1	14.9
Missouri	1.3	40.2	15.0	85.8	14.2
Montana	0.9	35.6	16.3	94.3	5.7
Nebraska	0.5	32.8	13.2	91.6	8.4
Nevada	1.4	34.2	17.9	89.8	10.2
New Hampshire	0.5	63.8	30.9	84.5	15.5
New Jersey	1.0	52.3	17.2	91.0	9.0
New Mexico	1.9	60.6	39.2	89.8	10.2

Table 1. (Continued)

Jurisdiction	% Telehealth Claims, Oct-Dec 2019 Average	% Telehealth Claims, Apr 2020	% Telehealth Claims, Oct-Dec 2020 Average	% Telehealth Claims from In-State Providers, Oct-Dec 2020 Average	% Telehealth Claims from Out-of-State Providers, Oct-Dec 2020 Average
New York	1.0	57.7	17.3	96.4	3.6
North Carolina	1.2	46.6	19.7	96.5	3.5
North Dakota	1.1	37.4	14.6	79.6	20.4
Ohio	0.7	48.7	22.2	97.3	2.7
Oklahoma	1.1	36.7	15.2	91.7	8.3
Oregon	0.9	59.4	27.8	96.0	4.0
Pennsylvania	0.8	54.3	24.9	93.3	6.7
Puerto Rico	0.3	68.8	53.4	98.4	1.6
Rhode Island	0.3	60.9	30.6	92.9	7.1
South Carolina	1.3	36.7	14.4	90.2	9.8
South Dakota	0.7	38.6	14.0	95.8	4.2
Tennessee	1.0	35.4	13.4	95.3	4.7
Texas	1.8	43.3	18.4	96.9	3.1
Utah	1.0	34.0	17.4	94.3	5.7
Vermont	1.2	73.5	43.8	95.4	4.6
Virginia	1.0	43.5	22.2	89.0	11.0
Washington	1.1	40.9	22.9	94.0	6.0
West Virginia	1.7	44.4	16.2	81.8	18.2
Wisconsin	1.6	54.9	23.7	89.8	10.2
Wyoming	2.8	36.6	14.4	79.5	20.5
All jurisdictions	*1.3*	*49.4*	*21.5*	*93.5*	*6.5*

population was disproportionately high for white physicians and low for Asian, Black/African American, and Hispanic/LatinX compared with Association of American Medical Colleges (AAMC) statistics.[4] By gender, 49.5% identified as female and 47.2% as male. They reported accepting a broad range of insurance types: private/commercial payer (87.4%), Medicare (76.8%), Medicaid (72.5%), Veteran's insurance programs (37.5%), and Free Care (29.6%). Details of provider's age, geographic distribution, and other characteristics are available on the study website. A sample of questions and responses is included here. A full report with breakdown by rurality and clinical specialty is available on the study website.

Overall, 79.4% of provider reported they started offering telehealth just since the pandemic and only 15.9% had used it prior to the pandemic. A wide range of technology platforms were used,
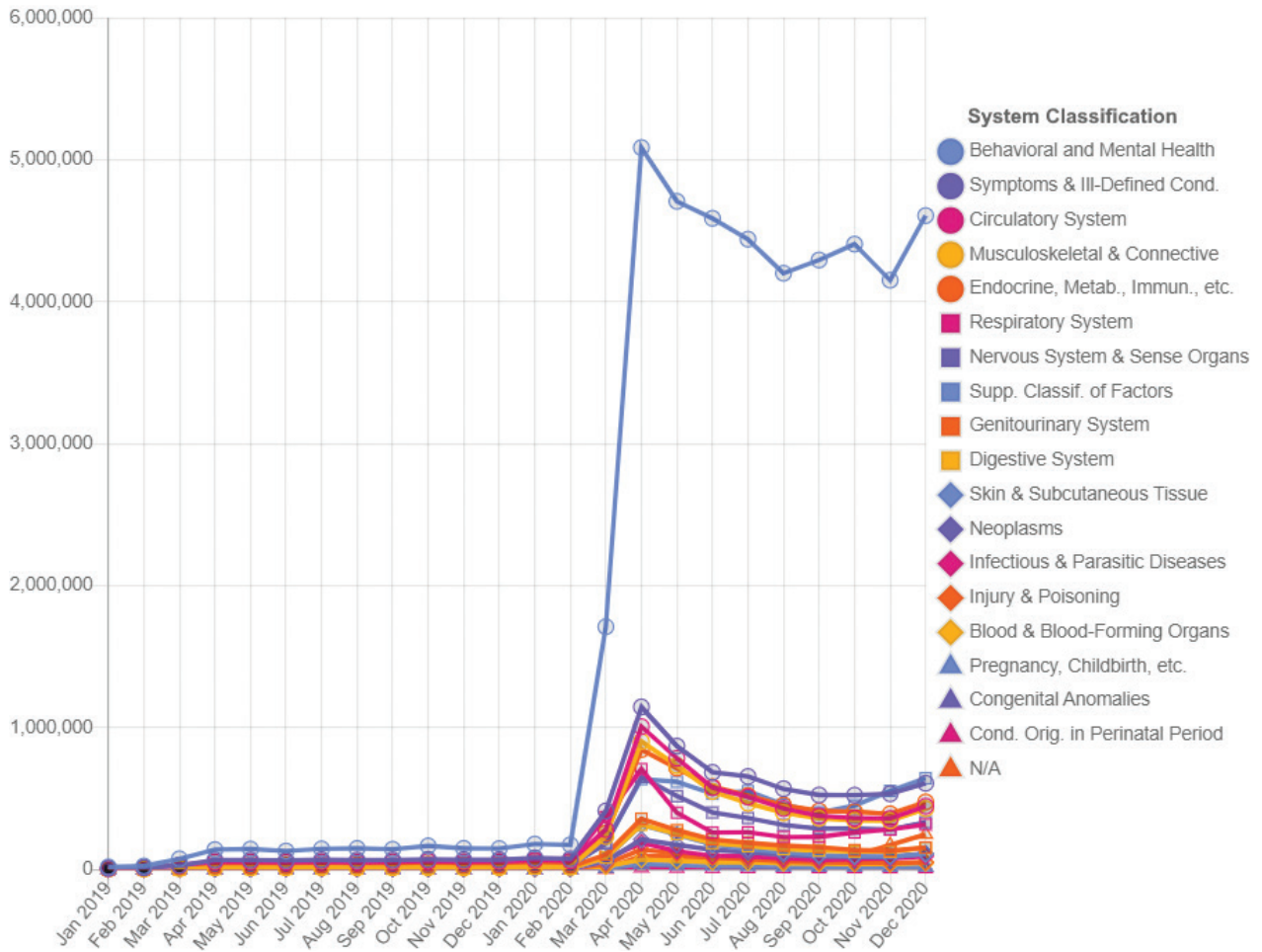
Figure 2—Telehealth claims by clinical classification of primary diagnosis.
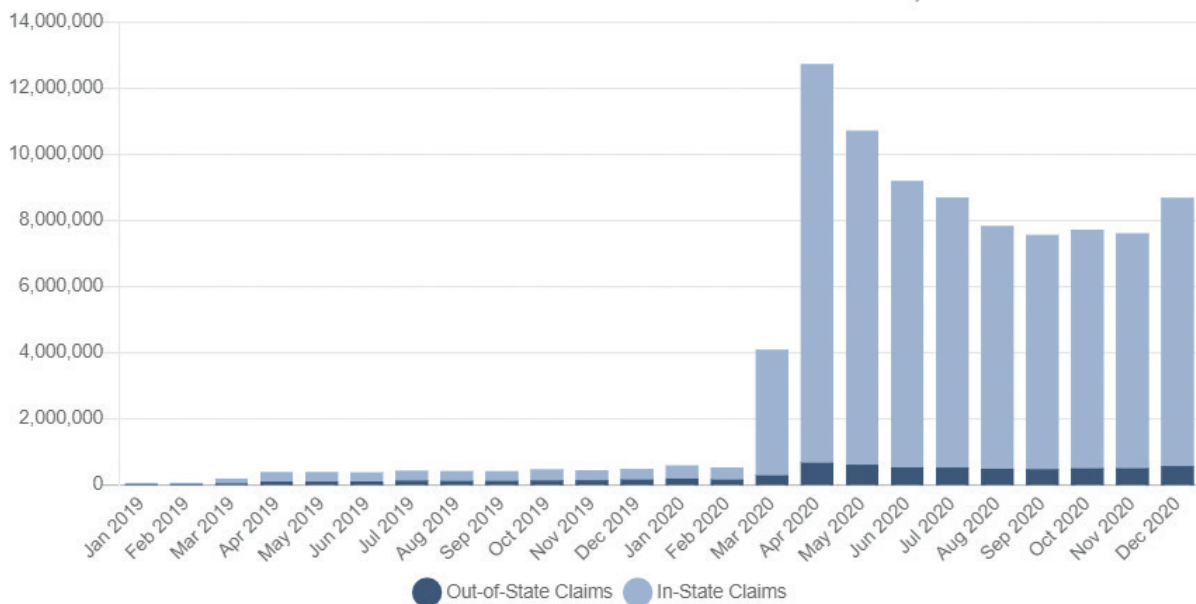

Figure 3—Telehealth claims for services delivered in-state versus out-of-state.

with Zoom (34%), audio-only (29.4%), and Doxy.me (28.3%) the most frequently cited. Most providers used multiple platforms to deliver telehealth care (Figure 4). Respondents reported relatively low rates of use of even simple sensor technologies like scales, pulse oximeters, and thermometers (Figure 6). Overall, providers reported high marks on questions related to telehealth enabling quality of care (Figure 5). Highest ratings (replied "agree" or "strongly agree") were reported for care coordination (89%), chronic disease management (89%), and mental/behavioral health (83%). Acute care

(62%) and perioperative care/procedures (59%) received the lowest ratings.

Questions relating to perceived barriers for continued use of telehealth elicited a broad range of concerns. Leading the list was low insurance coverage for telehealth and liability and technology challenges for patients (Figure 7). Providers cited lack of patient access to technology and lack of digital literacy as their greatest concerns. These were ranked most highly by rural providers. Lack of patient access to broadband/internet was a major concern in all
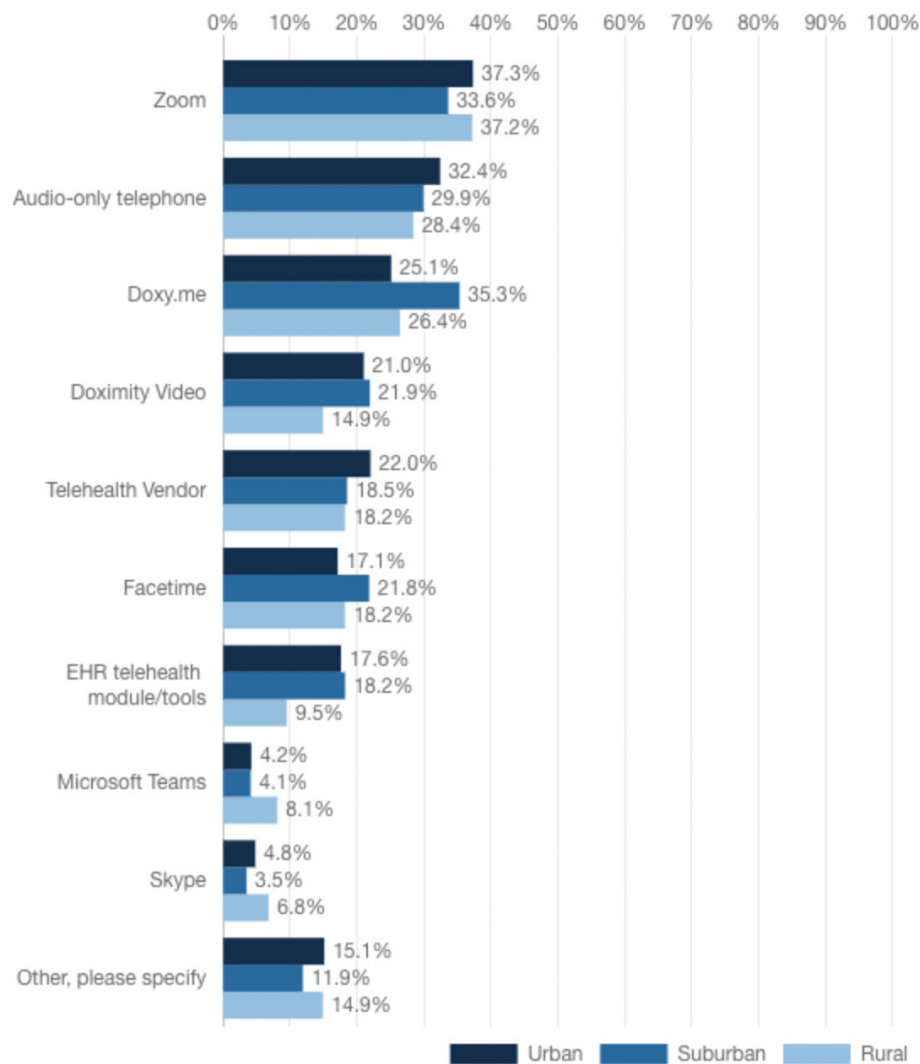

Figure 4—How are you accessing telehealth in your practice? (Choose all that apply.)

To what extent do you agree or disagree with the following statements?
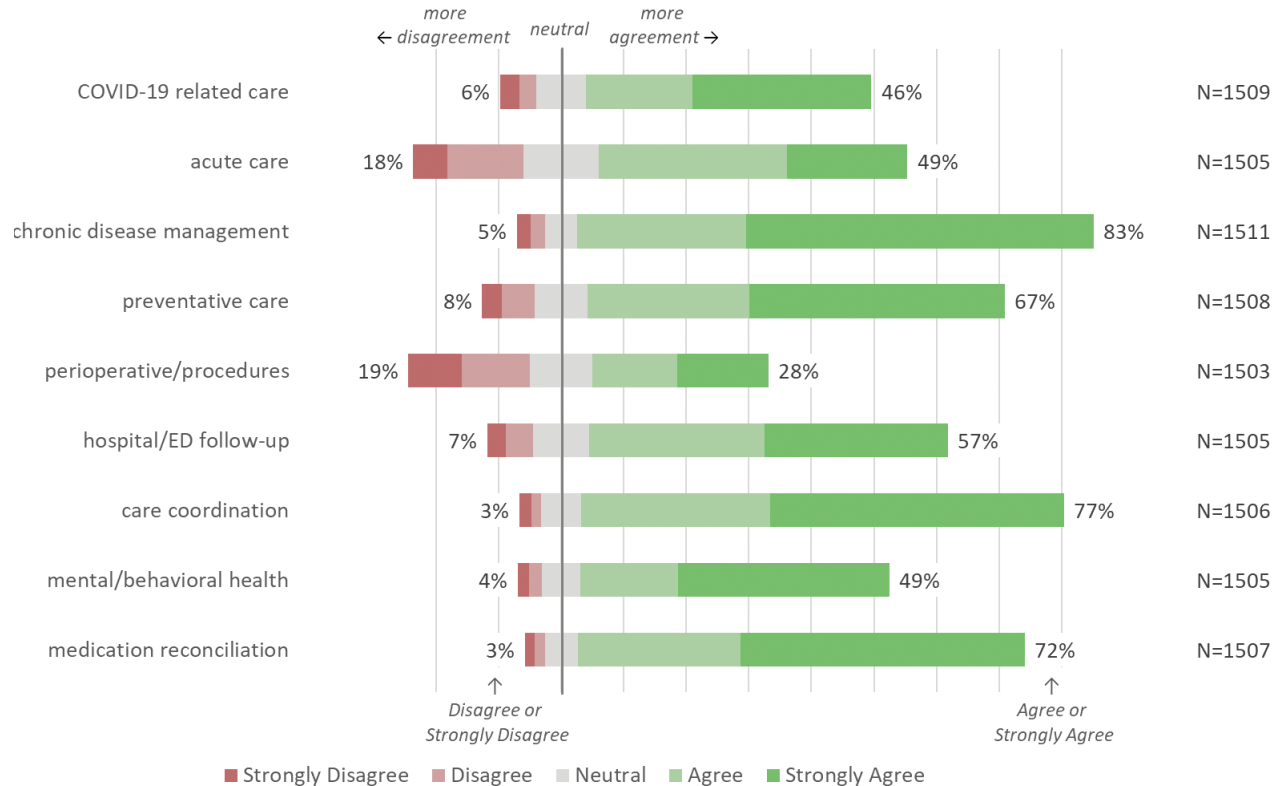Telehealth enables me to deliver quality care for...

*Figure 5—Provider's perception of quality of care.*

groups, urban (61.1%), suburban (59.0%), and rural (71.6%) (Figure 8).

PATIENT SURVEY RESULTS

The patient survey was completed by 2,007 adults. Of those reporting, race and ethnicity broke down as follows: 82.5% White/ Caucasian, 1.8% Asian/Pacific Islander, 4.8% Hispanic/LatinX, and 6.3% Black/African American. By gender, 81.6% identified as female and 14.8% as male. Patients reported private/commercial payer (56.0%), Medicare (26.9%), Medicaid (11.3%), and VA/military (2.5%). A sample of questions and responses is included here. Displays of each of the 20 questions with breakdown by age, rurality, and insurance are available on the study website.

Patients' use of telehealth during the pandemic appears to have been a vital source of care with 54.5% reporting that they would have delayed care without the telehealth option (Figure 9). The delaying care option was selected most by younger persons (62.9%) and least by seniors (44.2%). If telehealth was not available, 15.8% would have considered using an urgent care clinic and 10.5% would have considered going to the emergency room for their medical issue.

Regarding providers, 78.3% of patients reported that their last telehealth visit was conducted with their own provider, with seniors reporting the highest rate of visit with their own provider at 82.9% (Figure 11). A series of questions dealt
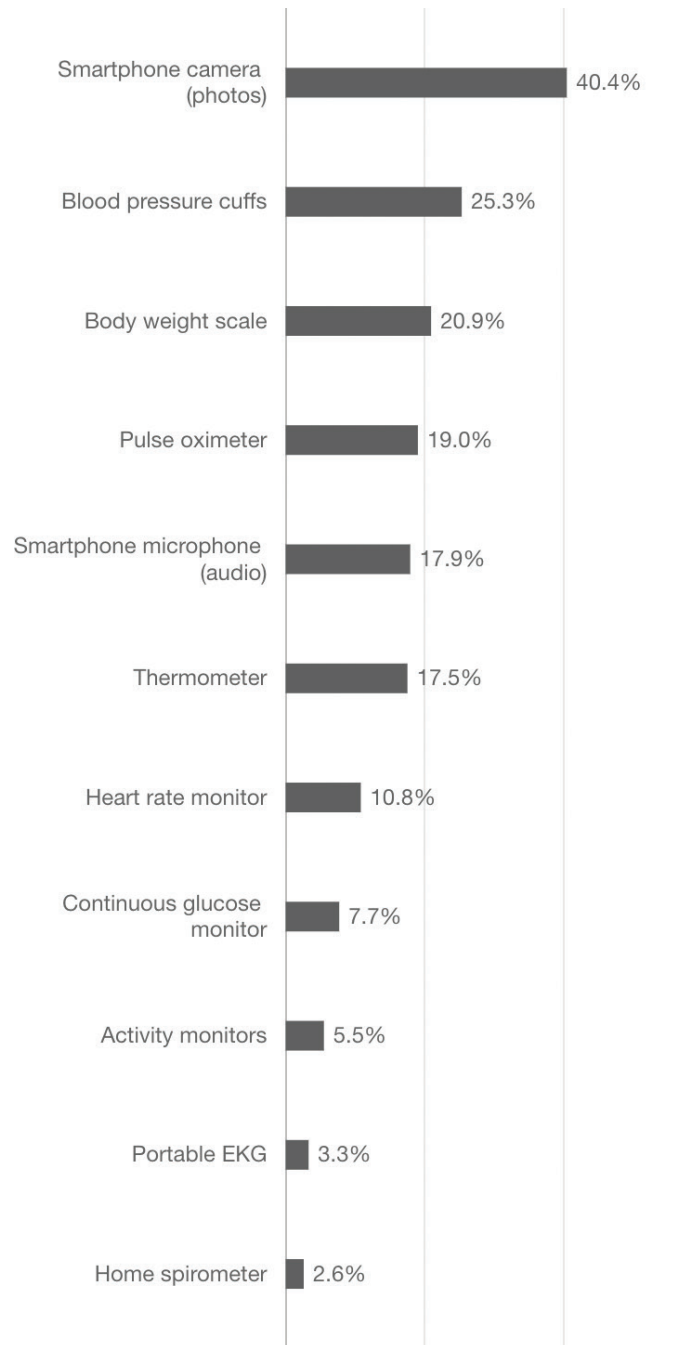
Figure 6—*What, if any, remote sensor technologies are helping you provide better care for your patients via telehealth? (Choose all that apply.)*

with respondents' perceptions of their most recent telehealth visit (Figure 10). They gave high scores for feeling a personal connection with the provider, the thoroughness of the provider, and feeling that the provider was prepared with information about their medical history. The most telling question, "Thinking about your last telehealth visit, would you have chosen telehealth over an in-person appointment if both required a co-pay?" was answered by all
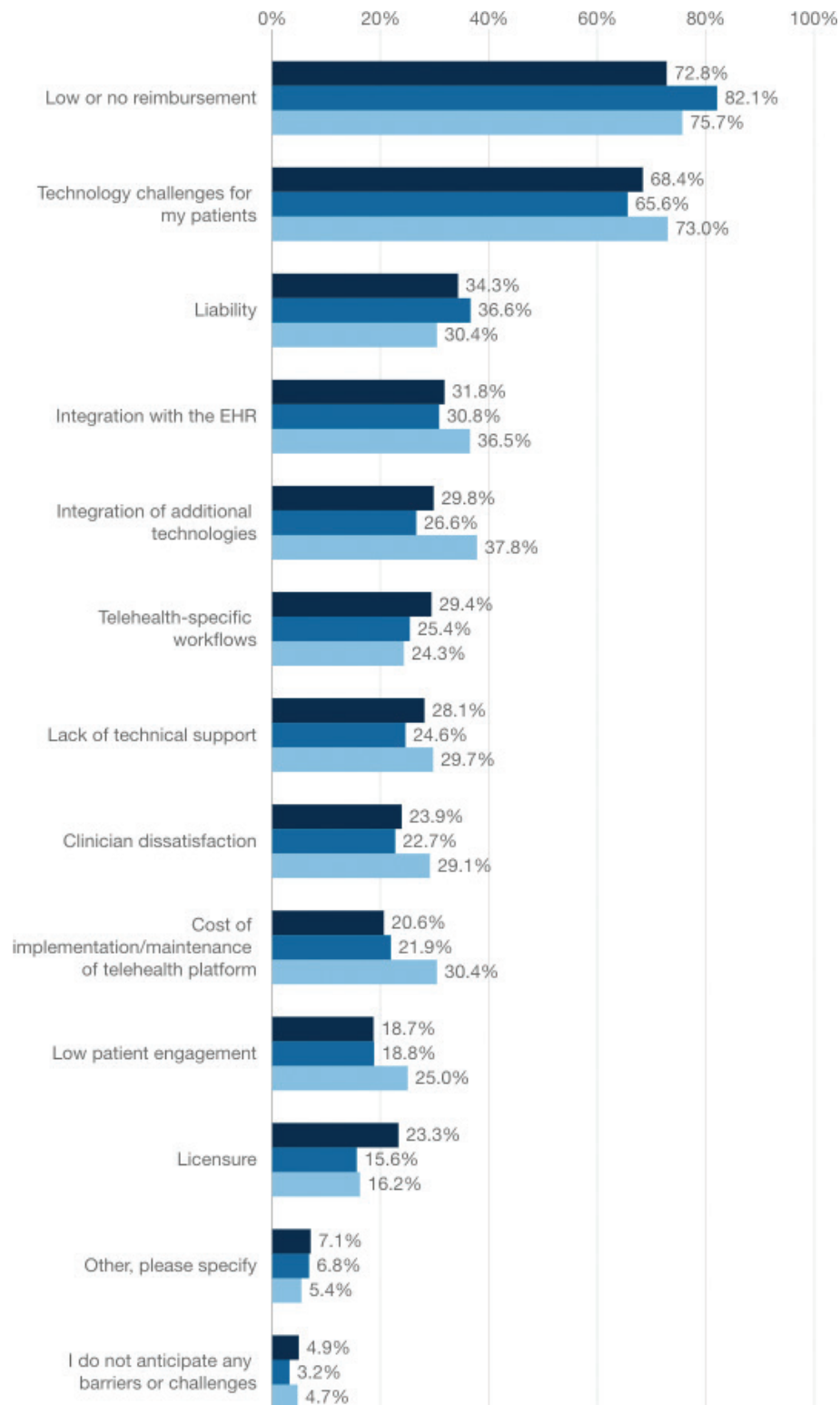
Figure 7—Which of the following, if any, do you anticipate being barriers and challenges in your organi-zation related to maintaining telehealth after COVID-19? (Choose all that apply.)
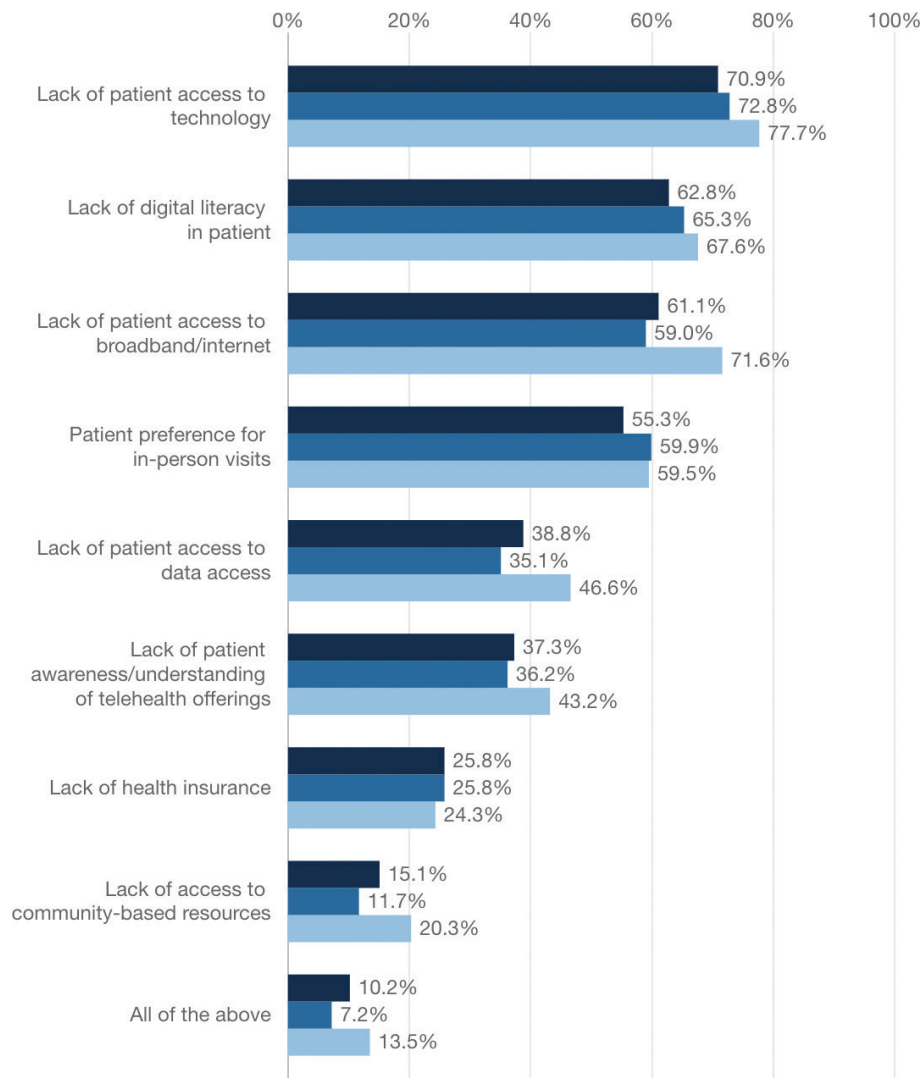
Figure 8—Which of the following, if any, do you perceive as barriers to your patients accessing tele-health? (Choose all that apply.)

age groups very positively (Figure 12): 40.8% responded "yes" and another 25.7% selected "either one would have been fine."

Some of the drivers of patient satisfaction included convenience and cost: 76% of patients indicated that telehealth removed transportation as a barrier; 65% no longer had to take time off work for doctor's appointment; 67% had less costs related to their telehealth visit versus an in-person visit.

DISCUSSION

The COVID-19 public health emergency served as a catalyst for the broad adoption of telehealth services by most health care providers. Although there has long been a growing interest in telehealth, utilization before the pandemic was low owing to a combination of the following factors: reimbursement gaps and a prohibitive regulatory landscape, as well as perceived technical and workflow barriers.
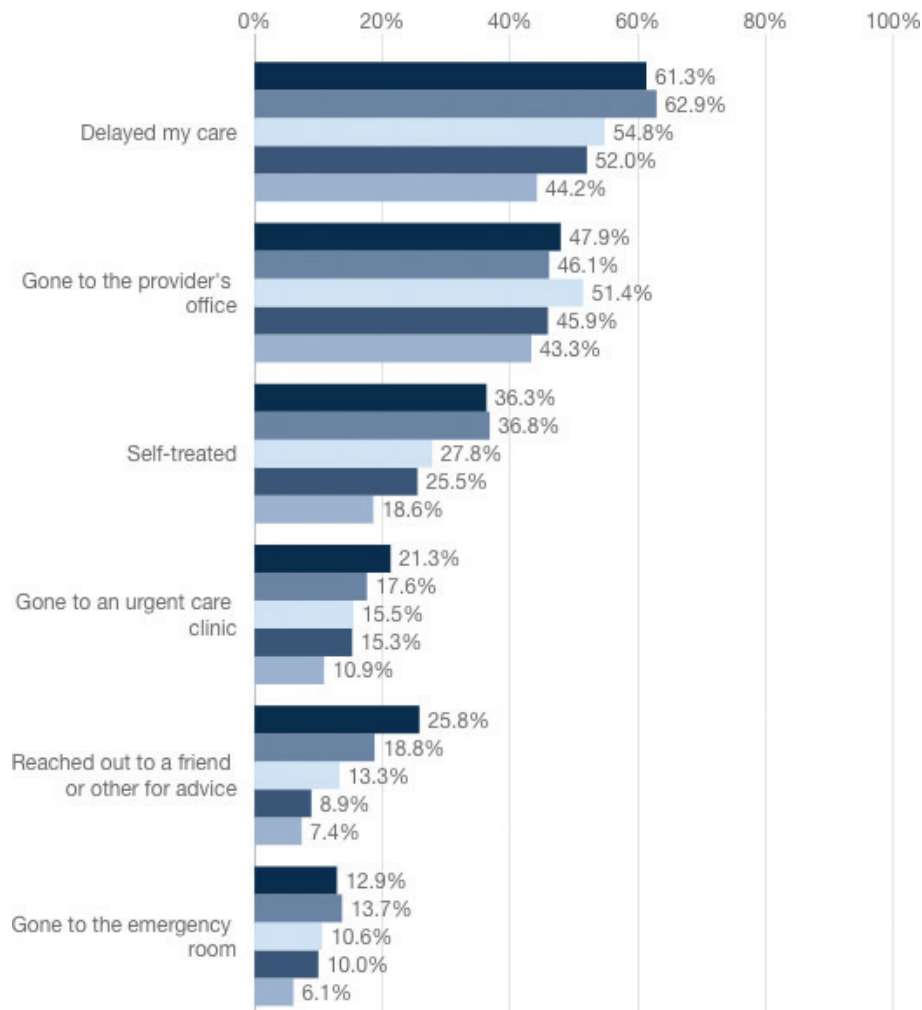
Figure 9—During the COVID-19 period, what would you have done if you did not have a telehealth option during this period? (Choose all that apply.)

The concurrent need to provide care while promoting physical distancing (or even quarantine) gave payers, legislators, and providers a burning platform to effectively work together to serve the needs of patients. In our claims dataset, from January 2019 through January 2020, telehealth claims grew slowly, by approximately 44,000 per month. At that linearized rate, it would have taken over 13 years to get to the 7 million monthly claims reported in the last quarter of 2020. It would have taken more than 22 years to achieve the 12 million claims reported in April 2020, just one month after the declaration of the public health emergency.

As seen in Figure 2, all clinical areas showed a dramatic increase in telehealth claims from February to April, with some clinical domains showing >50-fold increase (e.g., digestive disease, musculoskeletal disease, and skin diseases). Of interest, we identified a slight trend of higher use of telehealth by women. For non-telehealth claims, the ratio was 50.05% male to 49.95% female. For telehealth claims, the ratio was 46.13% male to 53.87% female.

It is notable that the proportion of telehealth care delivered by out-of-state providers was relatively high (31.1%) in the pre-pandemic period

Thinking about your most recent telehealth visit,
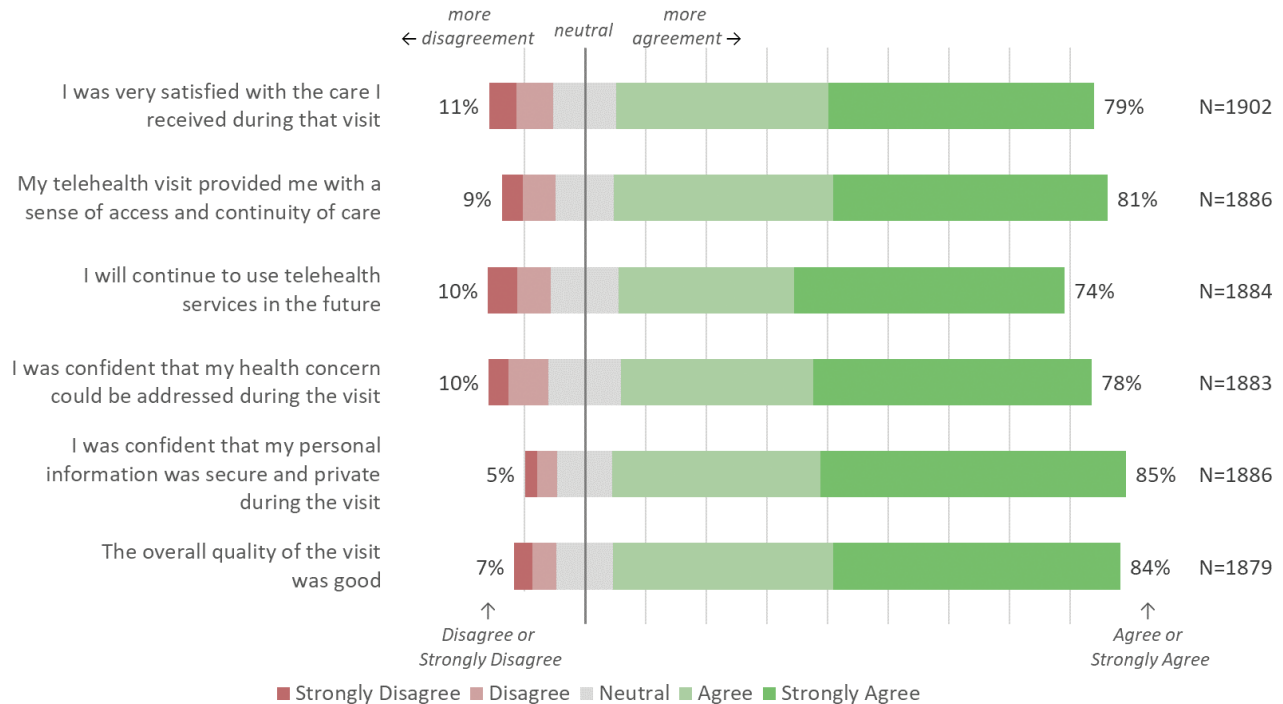how much do you agree or disagree with the following statements?

Figure 10—Thinking about your most recent telehealth visit, how much do you agree or disagree with the following statements?

(October–December 2019). This is likely due to restrictions that favored telehealth for rural applications. During the pandemic, we saw a tremendous adoption of telehealth across medical groups and health systems of all types. The October–December 2020 time period is likely more predictive of what our new normal will be with out-of-state telehealth care at 6.5%. The specific percentages vary among states, but out-of-state telehealth is now established as an important source of care in every state. Establishing new mechanisms to maintain appropriate cross-state licensing for telehealth services will be critical to providing populations with access to needed services. Reinstatement of pre-pandemic state-level licensing restrictions for telehealth delivery would represent a significant restriction in patient access.

The data reported from both the physician and patient surveys show that a substantial majority of telehealth users are satisfied and expect continued use of telehealth into the future. Among providers, more than 70% agreed or strongly agreed that telehealth allowed them to provide quality care for their patients, and this number rose to 90% when focused on chronic condition management. Similarly, 90% of patients expressed high levels of satisfaction with the care they received via telehealth services. Notably, nearly two-thirds of patients would have deferred care, and 40% would have risked exposure to COVID-19 by going to their care providers' offices had telehealth not been an option.

The most frequent telehealth modality during this study period was video enabled. We also see consistently high use of audio-only visits. Use of remote patient monitoring systems to collect and upload physiologic data (e.g., heart rate,
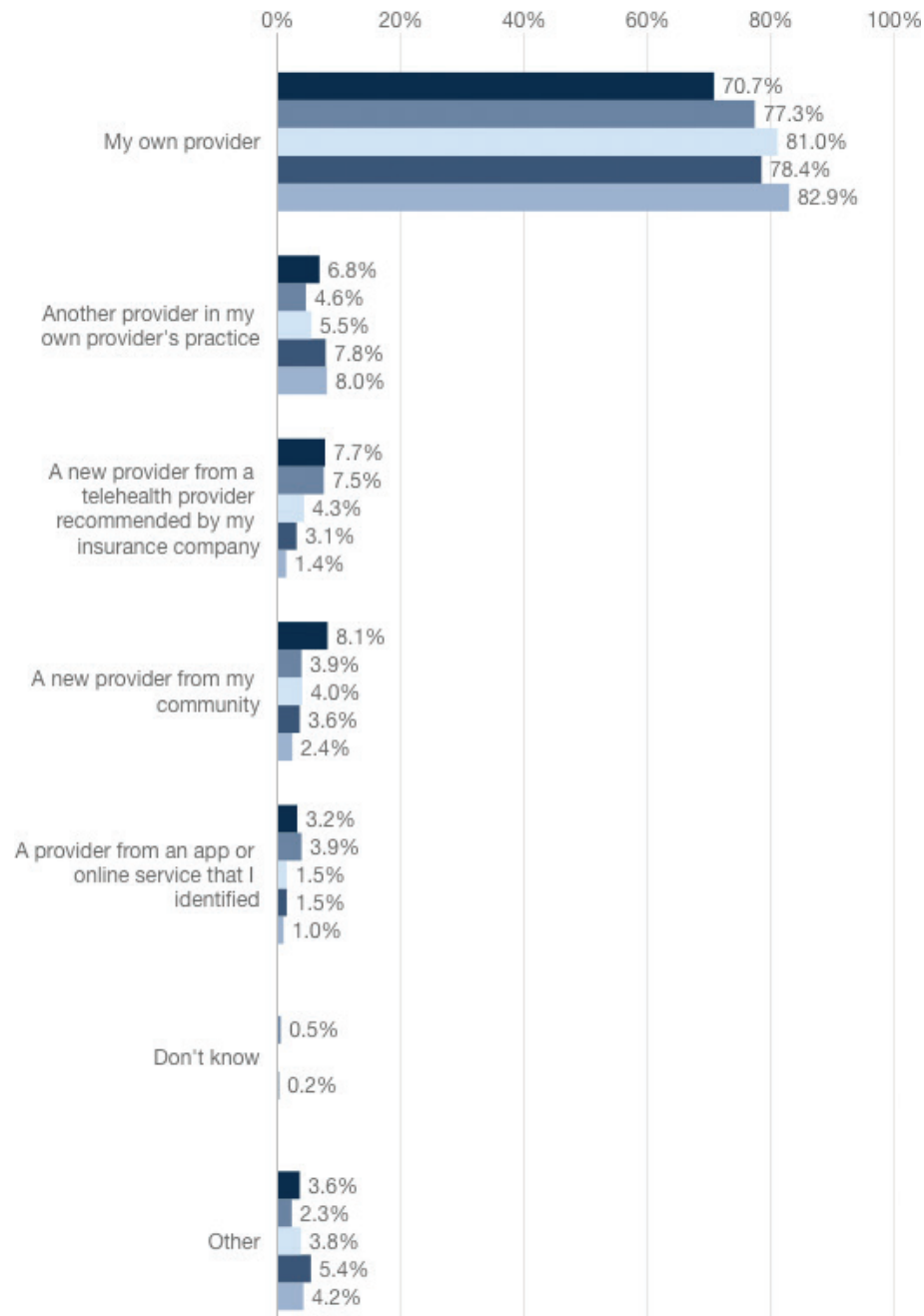
Figure 11—What was the nature of your relationship to the individual who provided the telehealth service for your most recent visit?

temperature, and oxygen saturation) to the health care team has also increased since the declaration of the public health emergency. These systems allow a health care team to identify patients whose status may be deteriorating sooner, so that earlier, lower acuity interventions may be applied.

For example, the Mayo Clinic COVID-19 frontline care team leveraged remote patient monitoring systems for the majority of COVID-19 patients. The mortality rates for patients managed by this model of care were one-third of those observed in national data.[5]
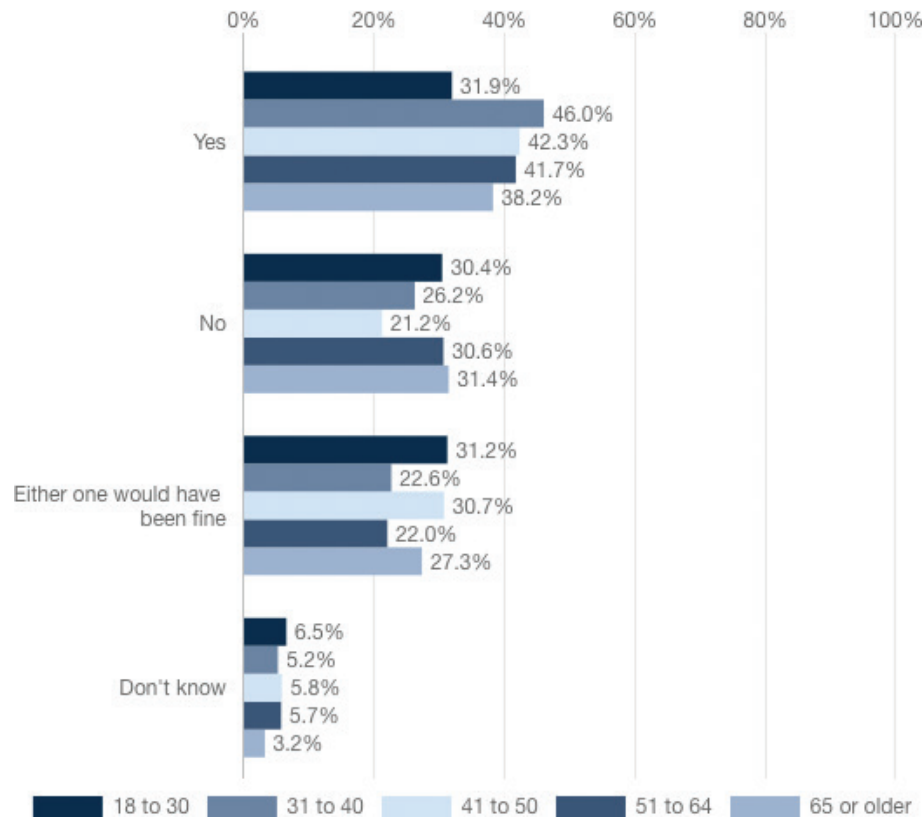
Figure 12—Thinking about your last telehealth visit, would you have chosen telehealth over an in-person appointment if both required a co-pay?

Our provider survey shows that providers are concerned about barriers to telemedicine, including access to technology, digital literacy, and lack of broadband access. In addition, providers indicated that uncertainty about reimbursement and new risks of liability are barriers to continued use of telehealth. Although there are documented gaps in the digital literacy and broadband access in the United States, our patient survey results show that people from urban, suburban, and rural locations are all highly engaged using telehealth. This must be viewed as a positive signal since those with limited mobility, transportation, or other challenges to accessing traditional health care facilities have perhaps the most to gain from telehealth care delivery.

Other investigators have identified concerns regarding disparities in access to telehealth with particular attention to vulnerable populations.[6,7] Lam et al. estimated that 13 million seniors (38%) were not ready for video visits, predominantly owing to inexperience with technology, and an additional 20% of older patients were unready for telephone visits because of difficulty hearing, difficulty communicating, or dementia.[8]

The high levels of quality and satisfaction from both providers and patients in our study support the notion that time and effort to address all barriers to telehealth access will be good societal investments. As the health care community adapts these new models of delivery, we expect

refinement in the selection of symptoms, diagnoses, patients, and workflows that can optimally support telehealth. We encourage further research to create longitudinal measures of cost, quality, and satisfaction of telehealth services.

Our Telehealth Impact Study is limited by the lack of objective outcomes data. Our patient survey was limited to patients who received care using telehealth services. Understanding the details of patients who did *not* receive care via telehealth will be important to fully understand barriers, for example, the digital divide, and their risks as it relates to accessing telehealth. We also have concerns for the generalizability of some of our findings. Even though patient survey respondents were representative of the urban/ rural breakdown, our respondents were disproportionately white females.

We expect that research gaps in the use of telehealth services will be filled by other organizations. This could include studies on the financial impacts of telehealth. For example, researchers should explore immediate-term transactional costs and also conduct longer-term analyses of downstream health utilization.

Finally, the claims data we used represented the commercially insured population (including Managed Medicare), leaving out patients covered by the full range of these governmental programs. However, 26% of our patient survey respondents were Medicare insured, which is higher than the estimated 18% of the US population covered by Medicare. Among our patient respondents, 11% were covered by Medicaid programs, which is less than the 19% estimated nationally.

RECOMMENDATIONS

The COVID-19 pandemic necessitated the widespread adoption of telehealth across the country and created an opportunity to leverage the many benefits telehealth has to offer. All three components of our study—the analysis of telehealth claims and the national provider and patient surveys—confirm the fast adoption of and positive experience with telehealth overall. The rapid adoption of telehealth speaks to the value this technology provides.

Telehealth utilization and acceptance is here to stay, as indicated by the persistence of high use rates of telehealth toward the end of 2020. Now, we have both an opportunity and a responsibility to better understand how we can leverage telehealth and other digital technologies to improve the access, quality, and effectiveness of health care while making it available equitably across patient populations. Our surveys of patients and providers revealed that there is variation on how telehealth has been embraced across age groups, by rurality of patient populations and by provider specialty. We need to better understand how this nascent form of care delivery can be improved for all populations.

Five things must happen for telehealth to live up to its potential and truly be integrated into care. We recommend the United States to

- develop a flexible payment system that continues to support telehealth for both phone (audio-only) and video visits,
- make significant strides to ensure patient access to telehealth through better broadband access, distribution of technology, and insurance benefit rules allowing telehealth access regardless of geography (urban, suburban, and rural),
- determine what kind of support and education are needed to drive the digital literacy of both patients and providers to maximize value from telehealth and other digital technologies,
- facilitate a regulatory and professional licensure environment that enables qualified

health professionals to deliver care across expanded geographies in order to serve the needs of patients, and

- expand research focused on the optimal use of telehealth and asynchronous modalities (e.g., remote patient monitoring) to produce measurable clinical, financial, and patient experience outcomes.

CONCLUSION

We encourage regulators, legislators, and insurance companies to maintain high levels of access to telehealth for patients at least through one more year of pandemic recovery. The nation needs the flexibility enabled by telehealth. We recommend that research for this period be aggressively funded to garner the information necessary to inform more permanent regulatory and reimbursement approaches to telehealth in the post-COVID era. Future research should focus on issues of clinical outcomes and equity of access to care, especially for vulnerable populations.

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