


# Telehealth adoption during the COVID-19 pandemic: A social media textual and network analysis

Digital Health  
Volume 8: 1–10  
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DOI: 10.1177/20552076221090041  
journals.sagepub.com/home/dhj  


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## Abstract

**Objective:** The telemedicine industry has rapidly grown during the COVID-19 pandemic, and telemedicine has become a common form of care. The present study looks at the online conversation regarding telemedicine at the beginning of the pandemic and one year later. The Technology Acceptance Model is utilized to explain the findings.

**Methods:** Brandwatch and NUVI software captured social mentions on Twitter regarding telemedicine during the beginning of the pandemic (March 15, 2020–April 20, 2020) and one year later (March 12, 2021–April 19, 2021). SAS text-mining software analyzed the social mentions and organized them into ten unique topics for each time period. The research team analyzed the topics and organized them into themes. A network analysis was also performed to examine structure and influence within the network.

**Results:** In March–April 2020, the themes focused on the use of telehealth in general, telehealth for mental health applications, and Medicare covering telehealth services. In March–April 2021, the themes focused on news events regarding telehealth and the rise in prominence of telehealth services. The network analysis shows a shift in the distribution of telehealth information among influential accounts and reveals that the network became more connected, with a change in the control of information spread.

**Conclusions:** Technology Acceptance Model explains the social acceptance and spread of telemedicine. The transition in the conversation about telemedicine suggests a pattern of greater system use consistent with the Technology Acceptance Model. Telemedicine may have greatly increased in use because of the pandemic, but data suggests that its use may persist after the pandemic subsides.

## Keywords

General, telehealth, telemedicine, Twitter, mixed methods, social media

Submission date: 14 October 2021; Acceptance date: 9 March 2022

## Introduction

As is the case for a number of remote-based industries since the start of the COVID-19 pandemic, the telemedicine industry has shown significant growth resulting in a 154% increase in appointments compared to the same time period in 2019.<sup>1</sup> Growth is expected in the industry and is further predicted to achieve a value of \$266.8 billion by 2026.<sup>2</sup> With potential to overcome many of the previous

barriers of technological challenges, resistance, and

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costs,<sup>3</sup> the aim of this study is to evaluate the adoption of telemedicine during the COVID-19 pandemic by examining the online conversation regarding telemedicine.

## Literature review

Telemedicine has been used previously in cases where individuals have limited access to in-person healthcare,<sup>4</sup> but recent research on telemedicine during the COVID-19 era suggests that the pandemic has provided an opportunity to set up the necessary infrastructure for telemedicine to last well after the pandemic.<sup>5</sup> Telemedicine may include both synchronous services such as teleconferencing and a range of asynchronous services including patient portals and wearable devices.<sup>6</sup> These services each have their comparative advantages, as teleconferencing that is used primarily for new patient check-ins and wearable devices are more useful for tracking biometric data outside of an in-person healthcare setting.<sup>6</sup> Overall, telemedicine services are considered to carry a good number of benefits to healthcare systems that allow for greater ability to both prevent spread of the novel coronavirus in congregated healthcare settings and remove some of the economic burden of healthcare providers seeing more patients in-person.<sup>7</sup>

Despite these benefits, there are a number of barriers to the implementation of telemedicine as a broadly used medical practice. These may include participant barriers, such as a person's willingness to use telemedicine services, and institutional barriers, such as the necessary training by healthcare providers in implementing telemedicine services.<sup>7</sup> Additionally, major barriers may be based in legislative<sup>8</sup> or infrastructure<sup>6,8</sup> realities that may make telemedicine a challenge despite participant or provider decisions. For a more comprehensive discussion of the benefits and barriers of telemedicine, please refer to literature reviews on the implementation of telemedicine services<sup>6,7</sup> and recommendations for practitioners.<sup>8</sup> Considering these benefits and barriers, to understand the adoption of this technology and its potential for persistence, we refer to the social scientific Technology Acceptance Model (TAM).<sup>9</sup>

The TAM has been used to explain other patterns of adoption during the COVID-19 pandemic ranging from web-based learning<sup>10</sup> to the deployment of masks.<sup>11</sup> In short, the TAM explains the use of a new technology as being driven by a person's perceived usefulness and ease of use of the technology, which, in turn, result in a person's attitude formation and behavioral intention of technology use (see Figure 1 for a representation of how each of these variables have been found to be related).<sup>12</sup>

The TAM has also been used to relate the process of adoption across social media using social network analysis. While TAM is not necessarily equipped to explain social influence, the Theory of Reasoned Action,<sup>13</sup> which was its referent theory, includes a subjective

norm construct for this purpose.<sup>14</sup> The TAM can then explain people's perceived usefulness and ease of use of telemedicine, where the social network analysis reveals changes in the centrality measures that have potential to control communication within that network.<sup>15</sup> In turn, these patterns in communication may affect perceptions and acceptance of telemedicine. While studies of social media are not new to the field of health communication, much of the previous work has focused on support groups<sup>16,17</sup> or disease-specific information spread.<sup>18</sup> Some research in online support groups is noteworthy for its application in the COVID-19 pandemic; however, it is focused on the use of online forums to cope with the impact of the pandemic on mental health, as opposed to wider health applications.<sup>19</sup> The use of social media data to examine the adoption of medical technologies is a relatively novel application of the social media research techniques used in this study. This being said, some previous work has examined the adoption patterns of telemedicine for speech language pathology on social media early on in the pandemic.<sup>20</sup> In addition to addressing telemedicine broadly, this work is differentiated from this previous work by our use of the TAM, which may allow us to better illustrate how use of telemedicine is influenced by attitudes and, in turn, perceived usefulness and ease of use.

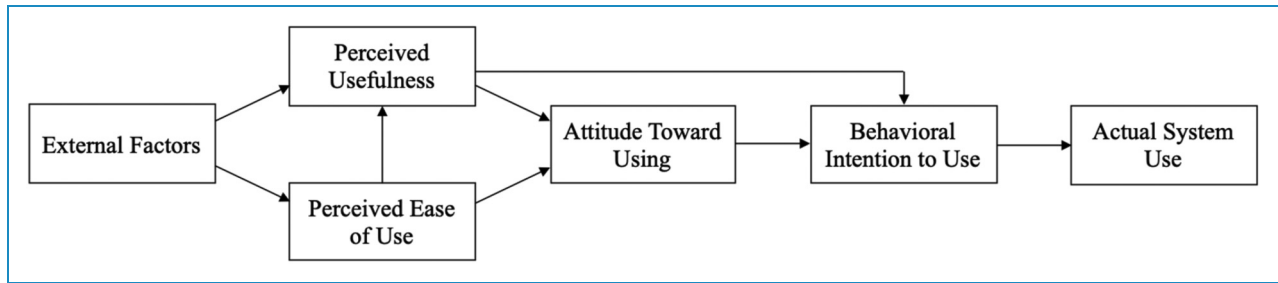
Relying on the TAM as a theoretical framework, a textual analysis was conducted using Twitter data to compare and contrast topics and influential contributors of the online telemedicine conversation. Our work further builds on previous work by showing changes in the online conversation surrounding telemedicine over time. Two datasets were collected to accomplish the comparison, one from the onset of the COVID-19 pandemic and the second dataset collected roughly one year later. As an exploratory analysis, the following research questions were guided by the TAM framework:

**RQ1:** What topics will be found in the online conversation relating to the perceived usefulness and/or perceived ease of use of telemedicine?

**RQ2:** Who are the influential online contributors to the telehealth conversation and how do these potential opinion leaders affect the adoption of telehealth services?

## Methods

Following our literature review (the steps of which are shown in Figure 2), we collected data using search terms (presented in appendix Table A1). Telemedicine and telehealth are differentiated by some, with the former including administration by physicians only and the latter being more broadly inclusive of nurses and pharmacists. For the purposes of this study and our data collection, we follow the lead of the World Health Organization and use both



**Figure 1.** Conceptual model of technology acceptance.

terms, interchangeably. To source the data, Twitter was accessed using social media listening software that provided full access to Twitter content. As a social network, Twitter is also useful in its ability to track how information is diffused through a network of users.<sup>21</sup> The use of Twitter data, and behavioral and content data generally, is preferred for studies of information spread over self report data because the self-reported measures of information exposure tend to be inaccurate.<sup>22</sup>

Social mentions of “telehealth” or “telemedicine” were collected using a query search for the words on NUVI<sup>23</sup> and Brandwatch<sup>24</sup> software. Social mentions were captured during two periods between March 15, 2020, and April 20, 2020, and again between March 12, 2021, and April 19, 2021. The first dataset included 200,093 global messages, while the latter included 81,798 messages. These two dates were chosen to provide a comparison between conversations and interests occurring at the start of the pandemic and one year after. Duplicate tweets (retweets) and robotic (bots) messages were removed using a Python script, resulting in a total of 74,718 messages from the first time period and 40,493 messages from the second time period. This process prevents the inclusion of messages that may tend to amplify certain viewpoints or distort the public conversations.

### Text analytics

The datasets were then analyzed separately using text-mining software, SAS Text Miner 15.1.<sup>25</sup> SAS Text Miner provides the ability to parse and extract information from text, filter and store the information, and assemble tweets into related topics for introspection and insights from the unstructured data. The Text Topic node was used to combine terms into topic groups. This clustering divided the document collection into groups based on the presence of similar themes using expectation maximization (EM) clustering. After visually examining each of the created topics, a 10-topic solution most clearly illustrated the main themes. Lastly, researchers reviewed the individual messages of the final topic groups to interpret the final themes to arrive at the description that appears in Table 1.

### Network analysis

As a final step in the study, the two original datasets were ingested into R for the network analysis. To examine conversation spread, the analysis looked at two primary variables of interest including the account that made the original tweet and the account that made the retweet. Retweets were then further filtered in a noise reduction process to exclude cases where an account retweeted themselves and to only include retweet activities that occurred four or more times. For the first dataset, this reduced the number of retweets from 118,558 to 280. For the second, 40,292 retweets were reduced to 394. With focus on the shortest path between Twitter users, the betweenness centrality was used to measure the shortest distance between the nodes.

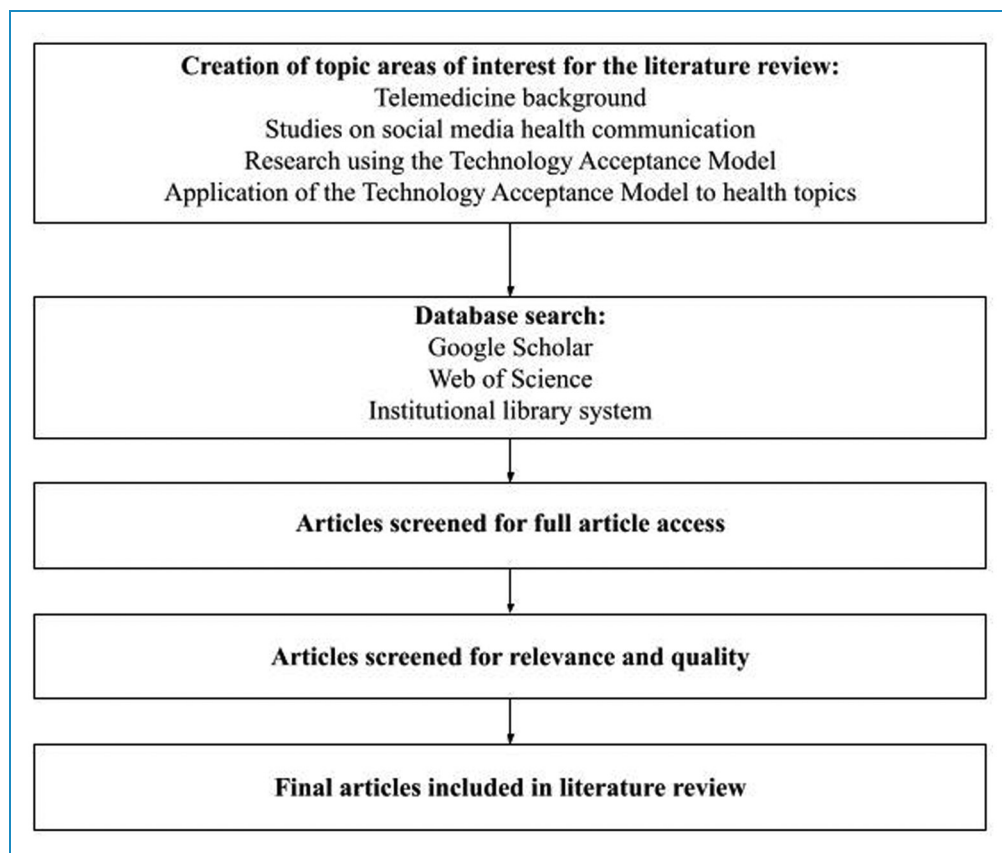
## Results

### Text analysis results between March 15 and April 20, 2020

The following topics were identified in the social mentions between March 15, 2020, and April 20, 2020, shortly after the World Health Organization announced the COVID-19 outbreak as a global pandemic on March 11, 2020.<sup>26</sup>

Table 1 presents the ten topics that were revealed in the telehealth online conversation discussing telehealth at the start of the pandemic. Topics 1, 6, and 7 provide examples of general telemedicine information that is being shared. In topic 1, telemedicine is introduced as a service for patients as the most prominent topic in the results. In topic 6, the data show more telehealth promotion with a focus on telehealth as a substitute for in-person doctor visits. In topic 7, more promotion of telehealth is revealed, with a focus on providers encouraging their patients to stay home and utilize their telehealth services.

As a second thematic grouping, topic 2 and topic 5 were both related to mental health services. Topic 2 related to online users detailing their online therapy experiences, which had been positive overall. Users who reported using online services for mental health and online therapy



**Figure 2.** Literature review protocol.

were happy and expressed excitement toward having their therapy sessions online. While users expressed happiness for mental health services to be offered via telehealth, topic 5 revealed concern for lack of insurance coverage. Topic 5 also captured social mentions that promote mental health telehealth services.

Topic 3 and topic 4 related to Medicare and telehealth show interest in how the government has expanded medical services offered via telehealth for Medicare users. Topic 3 discussion focused specifically on the expanded telehealth services through Medicare due to the COVID-19 pandemic. Topic 4 conversations did not mention COVID-19 explicitly, but instead related to the expansion of Medicare telehealth services as having no additional cost to Medicare users. Both topics captured mentions of users thanking the government, both the White House and Congress, for expanding Medicare telehealth services.

Finally, topics 8, 9, and 10 included popular articles in the press that were posted online and shared often, reaching a large audience. Topic 8 was about Google's launch of new features for health care providers in the Google My Business (GMB) dashboard for COVID-19 and telehealth. Topic 9 showed that the Federal Communications Commission (FCC) approved a \$200-million program to

fund telehealth services and devices for medical providers. The last topic, topic 10, shared an article detailing barriers in telehealth's ability to flatten the COVID-19 curve.

### *Text analysis results between March 12 and April 19, 2021*

The following topics were identified in the second dataset that collected telemedicine mentions occurring between March 12, 2021, and April 19, 2021, roughly one year after the COVID-19 outbreak was announced as a global pandemic (Table 2).

The topics identified in this second analysis were grouped into three main categories that included general news, insider news, and telehealth services. Of the general news group, topics 1, 3, 7, 8, and 10 all related to general news about telehealth services. Topic 1 showed that news aggregation was now being carried out by bots on Twitter. Topic 3, on the other hand, featured news posts on the Digital Health World Congress 2021 event held on March 30 and March 31, 2021. Topic 7 captured news on the Telehealth Modernization Act. Topic 8 featured reporting and commentary about Amazon's adoption of telehealth services for customers. Topic 10 focused on the news reports of the FDA's change of rules that

**Table 1.** Telehealth topics (March 15, 2020, and April 20, 2020).

ID	Topic	Description	No. of mentions	Example
1	Telehealth as a service	Telemedicine is an important service allowing patients to communicate with their doctors during the pandemic.	9531	“Telemedicine, telehealth, and virtual care have quickly become important tools for healthcare providers offering care for patients during this global health crisis”
2	Benefits for therapy	People share their telehealth therapy experiences, and therapists are promoting telehealth therapy sessions.	8847	“Had to do a therapy session via Telehealth today. My therapist said to do whatever I need to be comfortable, guess whose cat got to go to therapy!”
3	Government expands services	Due to COVID-19, the government expanded medical services offered via telehealth for Medicare users.	8705	“CMS expands telehealth benefits for medicare beneficiaries during COVID-19 outbreak”
4	Medicare provides support	Medicare has been expanded to include more telehealth services, at no extra cost.	7451	“Medicare will dramatically expand telehealth services in response to the coronavirus. Medicare patients can now visit any doctor by phone or video conference at no additional cost.”
5	Concern for coverage	As mental health services are offered via telehealth, there is concern that services are not covered by insurance.	7039	“@SenNeilAnderson Senator, please help! BCBS of Illinois is refusing mental health counseling via Telehealth to many of its members. This is an especially important time to make mental health care a priority!”
6	Telehealth replaces in-person	Telehealth visits are being substituted for in-person doctor visits.	6545	“For patients who meet certain criteria, our primary care offices are now offering telehealth visits. Patients can request a telehealth visit by calling their provider’s office, just as they would for an in-person visit”
7	Medical support for telehealth use	Medical providers are encouraging patients to stay home, while promoting telehealth appointments.	5074	“We stay at work for you. Please stay at home for us. Did you know that we are offering telehealth appointments? Stay home while you see a provider face-to-face”
8	Google provides tech support	Google launches business features for healthcare providers focused on COVID-19 and telehealth.	3462	“Google introduces new COVID-19 and Telehealth GMB links for healthcare providers”
9	FCC initiative	The FCC enacts a \$200-million telehealth initiative to ease the burden of COVID-19 on hospitals.	3281	“FCC enacts \$200 M telehealth initiative to ease COVID-19 burden on hospitals”
10	Why telehealth can’t Help	Article on barriers preventing telehealth from significantly flattening the coronavirus curve.	3256	“Why telehealth can’t significantly flatten the coronavirus curve, yet”

allowed at-home chemical abortion telehealth visits and commentary including statements from organizations of the US government.

Three topics related to news about telehealth services directed specifically to industry insiders, shareholders,

and employers. Topic 2 was largely populated by tweets reporting on market updates for IWS Holdings, Inc., which is a major company that offers telehealth services. Topic 4 featured news that pertained to both the EMR and EHR industries, linking to blogs that discussed

**Table 2.** Telehealth topics (March 12, 2021, and April 19, 2021).

ID	Topic	Description	No. of mentions	Example
1	Bots as news sources	Bots developed to aggregate telehealth news from multiple sources	5292	“Twitter’s most shared #digitalHealth content in FREE real time reports & weekly digests”
2	Stock market news	Market updates and commercial news about the telehealth operations of ISW Holdings	3712	“\$ISWH announces agreement in telehealth & home healthcare operations to add additional 40% to sales in the segment”
3	Thought leadership	News and blog articles about telehealth directed to technologically savvy readers	3383	“FIVE ways technology is transforming the healthcare industry”
4	Big business	Industry news for electronic records companies	3305	“Epic EHR versus Cerner EMR; Which one is better?”
5	Training & services	Advertising for telehealth training sessions for practitioners	1488	“Evidence-based approaches to engaging with your supervisees, meet licensure regulations and documents for risk management.”
6	Crossing the chasm	Teaching patients and practitioners how to better use telemedicine	1391	“Telehealth is a way to visit with your doctor on video or over the phone”
7	Telehealth Modernization Act	Advocacy of the Telehealth Modernization Act to US Senators	1370	“.@SenSchumer Please support the Telehealth Modernization Act (S. 368) to expand #telehealth access. #MSActivist”
8	Amazon	Reporting on Amazon entering the telehealth industry	1136	“This is extremely disturbing. Amazon jumps into health care with telemedicine initiative”
9	Promoting continued adoption	An article about the benefits of telehealth to employees	809	“Telehealth makes good business sense”
10	FDA abortion updates	Reporting on FDA rules changes to allow at home chemical abortions following telehealth visits	321	“... health officials say women seeking an abortion pill will not be required to visit a doctor’s office or clinic”

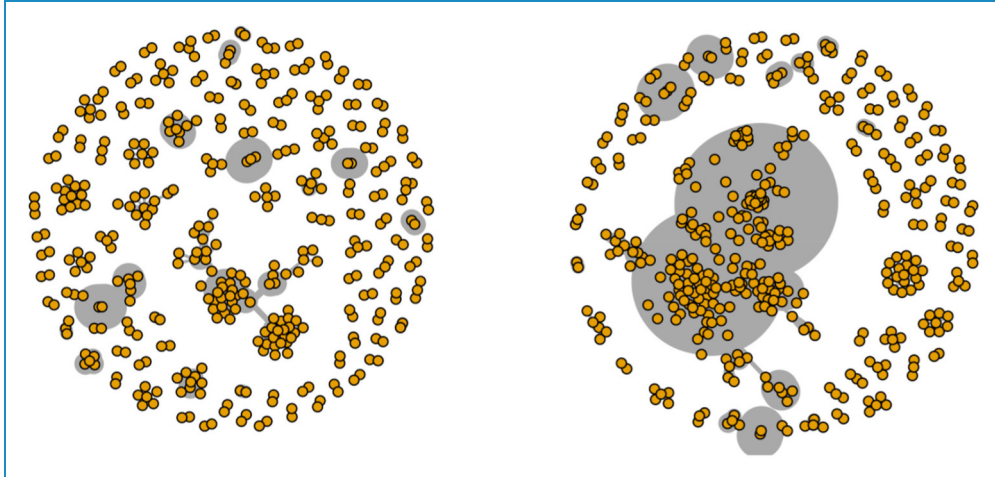
changes derived from the rise in prominence of telehealth services. Topic 9 contained links and commentary to an article that promotes the use of telehealth services for employers.

The final two topics, topic 5 and 6, related to telehealth services. Topic 5 included links to webinars on telehealth offered by <https://telehealth.org>. The website advertises webinars and learning for the process of screening for telehealth visits, engaging with patients, meeting legal regulations, and documenting visits. Lastly, topic 6 captured conversations that were centered around facilitating the process of telehealth for both patients and providers. This group included tweets that encouraged patients to ask if telehealth is a good service for them, posts teaching both patients and practitioners how to get the most out of their telehealth visits, and links to set up telehealth appointments offered by various providers.

### Network analysis results

To further understand the relationships within the social media data, a network analysis was conducted on both datasets. Betweenness centrality is a measure used in social network analysis that defines centrality by identifying the node with “the shortest path” or geodesic centrality. In this case, the more often a node bridges two other nodes, the geodesic path results in a higher degree of centrality in that network (Figure 3).

At the start of the pandemic, the top five most central accounts were *gawendaseminars* (1582.33), *SabrinaMcCarley* (1385.00), *SeemaCMS* (1243.00), *TheresaMarkoPT* (669.83), and *AOTAEvents* (552.00). Compared to one year later, the analysis revealed that not only were there many more accounts having centrality, but also the centrality measures were much stronger.



**Figure 3.** Betweenness centrality results at the start of the pandemic (on left) when compared to one year later (on right).

Table 3 reveals these differences in the strength between the start of the pandemic and one year later as measured by the top five most central accounts that were TelehealthBot (13,120.94), trendsinAI (6167.76), caring\_mobile (4773.95), MargaretSiegien (3381.48), and THL\_Medical (3344.85).

### Discussion and implications

At the start of the pandemic, mental health services were some of the first services to completely migrate to telehealth. These data showed that patients and mental health therapists were encouraged to use online therapy. Individuals with a more positive attitude toward telemedicine have been found to be more likely to use telemedicine for mental health services.<sup>27</sup> Furthermore, this positive sentiment can be transferred between groups in an online social network. Topic 2 also captured social mentions regarding other types of online therapy besides mental health, including physical therapy, occupational therapy, and speech therapy. This result mirrors the findings of previous work on Twitter posts surrounding the use of telemedicine for speech pathology therapy.<sup>20</sup>

Other topics indicated specific use cases for telemedicine that may be indicative of patients' perceived usefulness and ease of use of telemedicine. For instance, at the start of the pandemic, the data showed that people were concerned about insurance coverage for these services. Recognized as one of the biggest barriers for telemedicine, insurance coverage can be related to concern for costs. Additionally, due to the affective nature of some of the mentions, these posts may also be indicative of patients' attitude toward using telemedicine. This focus on institutional barriers to the implementation of telemedicine is not surprising considering their significance in affecting the adoption of telemedicine practices.<sup>7</sup> After making telehealth a common and vital function of the healthcare system in the United

States, a year later the conversation surrounding telehealth had shifted as news items evolved from the proposed Telehealth Modernization Act, the US Federal Drug Administration policy changes, and even Amazon policy, indicating a wider system use of telemedicine. This finding again is in-line with the previous results of tweets about telemedicine specific to the domain of speech therapy.<sup>20</sup>

External factors can also be seen as improving between the start of the pandemic and one year later. For instance, patients' access to telemedicine services became more readily available. Beyond Medicare, health insurance coverage could also be considered an important external factor in driving the start of adoption during the pandemic. Relating back to perceived ease of use, the last group of topics included Google's introduction of GMB to support healthcare providers with insurance claims and information management. The new COVID-19 and telehealth options allow providers to share accurate information about COVID-19. Changes in accessory services to telemedicine, such as the service discussed in this topic, may increase healthcare providers' perceived ease of use toward telemedicine.

Other external factors that became more prominent in the second textual analysis related to the use of bots in distributing information. As a result, this was prominent in both the textual analysis and the network analysis. As a centrality measure, betweenness suggests the accounts revealed in the analysis have the potential to control communication within that network and reveal the importance of certain nodes within the network. The results provide evidence of a shift in the distribution of telehealth information among influential accounts in the datasets, but also suggested a change in control of how the information was being shared. Perhaps most interesting was that the analysis revealed that the bot, Telehealth\_Bot, had become the

**Table 3.** Betweenness centrality results.

Start of the pandemic				
gawendaseminars	SabrenaMcCarley	SeemaCMS	TheresaMarkoPT	AOTAEvents
1582.33	1385.00	1243.00	669.83	552.00
One Year Later				
TelehealthBot	trendsinAI	caring_mobile	MargaretSiegien	THL_Medical
13,120.94	6167.76	4773.95	3381.48	3344.85

Note: As a centrality measure, betweenness suggests the above nodes (e.g. accounts) have the potential to control communication within that network.<sup>15</sup> The table includes the top five accounts for comparison only.

most central account to the telehealth conversation (see Table 3).

As an example of the increase in perceived usefulness, during the start of the pandemic, telehealth was being promoted as a tool that allowed social distancing. However, legal barriers, insurance rules, regulations, and other barriers had previously prevented the widespread availability and in turn usefulness of telehealth services. Telehealth can be most effective in preventing the spread of COVID-19 cases with increased accessibility and scalability. The article covered in topic 10 in the first dataset explicitly portrayed a value of telemedicine in the pandemic that may increase perceived usefulness of telemedicine to public health managers. Many of these changes suggest shifts in telehealth adoption consistent with the TAM. Compared to the start of the pandemic, the second topic analysis revealed topics that have moved away from introducing telehealth as a service and discussing issues of the technology, but now instead suggest widespread adoption. In sum, the analysis provided evidence for the increased relevance and interest in this type of content.

### Implications

Taking the discussion of these data altogether, the perceived ease of use and perceived usefulness of telemedicine for both patients and healthcare providers has shifted toward a more positive state of acceptance and use. In examining the data, we see that the online discussion has changed significantly to focus largely on news pertaining to telemedicine, excluding some discussion which focused on ways to increase ease of use of telemedicine for both patients and healthcare providers. This may indicate a widespread system adoption of telehealth services, and a transition from telemedicine being a niche feature of some domains in the healthcare system to being a widely accepted part of the system.

Telemedicine services have been in high demand and allow patients to get the care they need while staying safe

at home, but the technology also offers benefits outside of a pandemic in reduced travel, and increased profit as patients are seen more quickly. However, there remain opportunities for telehealth services to expand, and in understanding the relevant topics identified in this study, providers wanting to expand this area of business have a starting point to appeal to patients and accelerate adoption. As an alternative group of adopters, the healthcare industry was also identified in the results as a relevant audience. Topics in the second dataset, one year after the pandemic began, covered broader financial success about the industry as well as the benefits of telemedicine for employers. Topics moved toward the inclusion of numerous services and educational materials. Broadly speaking, this shift in content suggests that the industry has now overcome many of the previously identified barriers that had been preventing telemedicine's widespread use.

As public health communication has moved online, social media provides a useful channel for disseminating information to the public. By examining social media data at two timepoints, we were able to examine the adoption of telemedicine for wider healthcare domains as a result of the COVID-19 pandemic. As these stories disseminate in real life and on social media, providers can keep the solution top of mind for consumers while simultaneously gathering data to understand their customer base's experience through the adoption cycle presented by the TAM.

### Limitations and future research

Our study design does present some limitations in its use of social media data. First, we can only speak to individuals that post about telemedicine on Twitter. While this is a valuable sample, these individuals are not necessarily representative of all telemedicine stakeholders or general societal opinions on telehealth. However, studying content from Twitter provides insight into how posts from Twitter users can influence a public conversation. Future work may examine other social media, such as Facebook or



Reddit, in addition to qualitative, survey, and self-report study designs. Similarly, we chose to include all global English speaking tweets in our study, which can introduce some biases in locations and countries that differ in medicare and healthcare provided solutions. These biases may also be present when studying tech adoption in a sample collected from active social media users. Future research may expand this work to include a more representative sample, with additional languages and locations. Despite these limitations, we believe this study has notable implications for understanding the adoption of telemedicine.

## Conclusion

In examining the data collected one year after the World Health Organization announced the COVID-19 pandemic, online discourse shifted significantly toward a focus on telemedicine news and telemedicine services for patients and healthcare providers. This suggests the widespread interest and system adoption of telehealth services and a transition from telemedicine from being a niche feature of some domains in the healthcare system to being widely utilized. As predicted by the TAM, the value of telemedicine over traditional medicine became clear in terms of allowing people to receive healthcare while social distancing. Overall, the topics suggested an increase in perception of the usefulness of telemedicine for patients, healthcare providers, and public health managers. Services designed to increase the ease of use and access to telemedicine services became prominent as a vital external factor to the overall adoption and use of telemedicine technology.

The insights identified here through the use of the TAM are applicable to the industry as previous research has identified a number of these concerns as some of the biggest barriers to the adoption of telehealth services. The promotion of telemedicine has been effective, as many social mentions state the overwhelming response to telemedicine. Moreover, these data suggest COVID-19 has had a profound impact on the use of telemedicine in the healthcare system in the United States and a likewise period of precipitous growth in the telehealth industry.

**Declaration of conflicting interests:** The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

**Funding:** The author(s) received no financial support for the research, authorship, and/or publication of this article.

**Ethical approval:** Not applicable, because this article does not contain any studies with human or animal subjects.

**Informed consent:** Not applicable, because this article does not contain any studies with human or animal subjects.

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**Trial registration:** Not applicable, because this article does not contain any clinical trials.

## References

1. Koonin LM, Hoots B, Tsang CA, et al. Trends in the use of telehealth during the emergence of the COVID-19 pandemic—United States, January–March 2020. *Morb Mortal Wkly Rep* 2020; 69: 1595–1599.
2. Fortune Business Insights (2020). <https://www.globenewswire.com/news-release/2020/05/14/2033299/0/en/Telehealth-Market-2020-Size-Share-Growth-Trends-Market-to-Reach-266-8-Billion-by-2026.html>. Accessed: June 8, 2021.
3. Scott Kruse C, Karem P, Shifflett K, et al. Evaluating barriers to adopting telemedicine worldwide: a systematic review. *J Telemed Telecare* 2018; 24: 4–12.
4. Sirintrapun SJ and Lopez AM. Telemedicine in cancer care. *Am Soc Clin Oncol Educ Book* 2018; 38: 540–545.
5. Thomas EE, Haydon HM, Mehrotra A, et al. Building on the momentum: sustaining telehealth beyond COVID-19. *J Telemed Telecare* 2020; 1357633X20960638.
6. Anthony Jnr B. Implications of telehealth and digital care solutions during COVID-19 pandemic: a qualitative literature review. *Inform Health Soc Care* 2021; 46: 68–83.
7. Bokolo AJ. Exploring the adoption of telemedicine and virtual software for care of outpatients during and after COVID-19 pandemic. *Ir J Med Sci* 2021; 190: 1–10.
8. Jnr BA. Use of telemedicine and virtual care for remote treatment in response to COVID-19 pandemic. *J Med Syst* 2020; 44: 1–9.
9. Davis FD. *A technology acceptance model for empirically testing new end-user information systems: theory and results*. Doctoral Dissertation, Massachusetts Institute of Technology, 1985.
10. Baber H. Modelling the acceptance of e-learning during the pandemic of COVID-19-A study of South Korea. *Int J Manage Educ* 2021; 19: 100503.
11. Tsai WH, Wu YS, Cheng CS, et al. A technology acceptance model for deploying masks to combat the COVID-19 pandemic in Taiwan (my health bank): web-based cross-sectional survey study. *J Med Internet Res* 2021; 23: e27069.
12. Davis F. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q* 1989; 13: 319–340.
13. Fishbein M and Ajzen I. Belief, attitude, intention and behavior: an introduction to theory and research. *Philosophy and Rhetoric* 10.2 1975.
14. Lee JS, Cho H, Gay G, et al. Technology acceptance and social networking in distance learning. *J Educ Technol Soc* 2003; 6: 50–61.
15. Freeman LC. A set of measures of centrality based on betweenness. *Sociometry* 1977; 40: 35–41.

16. Hether HJ, Murphy ST and Valente TW. A social network analysis of supportive interactions on prenatal sites. *Digital Health* 2016; 2: 205520761662870.
17. Murthy D and Eldredge M. Who tweets about cancer? An analysis of cancer-related tweets in the USA. *Digital Health* 2016; 2: 205520761665767.
18. Meldrum S, Savarimuthu BTR, Licorish S, et al. Is knee pain information on YouTube videos perceived to be helpful? An analysis of user comments and implications for dissemination on social media. *Digital Health* 2017; 3: 205520761769890.
19. Nutley SK, Falise AM, Henderson R, et al. Impact of the COVID-19 pandemic on disordered eating behavior: qualitative analysis of social media posts. *JMIR Ment Health* 2021; 8: e26011.
20. Weidner K, Lowman J, Fleischer A, et al. Twitter, telepractice, and the COVID-19 pandemic: a social media content analysis. *Am J Speech Lang Pathol* 2021; 30: 2561–2571.
21. Kwak H, Lee C, Park H, et al. What is Twitter, a social network or a news media? In: Proceedings of the 19th international conference on world wide web, April 2010, pp.591–600.
22. González-Bailón S and Xenos M. The blind spots of measuring online news exposure: a comparison of self-reported and observational data in nine countries. *SSRN Scholarly Paper*. Rochester, NY: Social Science Research Network, January 20, 2020.
23. All in One Social CX platform | NUVI. (n.d.). Nuvi. Retrieved March 21, 2022, from <https://www.nuvi.com/>.
24. Brandwatch: A new kind of intelligence. (n.d.). Brandwatch. <https://www.brandwatch.com/>.
25. SAS® Text Miner. (n.d.). SAS® Text Miner. Retrieved March 21, 2022, from [https://www.sas.com/en\\_us/software/text-miner.html](https://www.sas.com/en_us/software/text-miner.html)
26. Cucinotta D and Vanelli M. WHO declares COVID-19 a pandemic. *Acta Bio Med* 2020; 91: 157.
27. Gilmore AK and Ward-Ciesielski EF. Perceived risks and use of psychotherapy via telemedicine for patients at risk for suicide. *J Telemed Telecare* 2019; 25: 59–63.

**Table A1.** SAS topics.

ID	Start of the pandemic	One year later
1	telemedicine, +pandemic, +care, +patient, covid19	realtime, +weekly digest, +realtime report, +digest, +spot
2	+session, +therapy, +therapist, +telehealth session, +time	iswh, healthcare, home, agreement, operations
3	Telehealth, covid-19, services, medicare, coronavirus	healthcare, telemedicine, health, telemedicine, +technology
4	+service, +telehealth service, medicare, +expand, telehealth	emr, ehr, public health, healthit, digital health
5	+health, mental, mental health, +care, +service	+visit, cme, +learn, +evidence base, +industry leader
6	+visit, +telehealth visit, +patient, +doctor, medicare	+patient, +appointment, +pandemic, +doctor, virtual
7	+appointment, +telehealth appointment, +schedule, +offer, +doctor	+expand, amazon, +service, +access, +telehealth service
8	+healthcare provider, healthcare, +provider, gmb, google	+care, +amazon, health, health care, +jump
9	fcc, covid-19, 200 m, +hospital, 200 m telehealth initiative	+business, +sense, business sense, +good, telehealth
10	coronavirus, +flatten, +curve, coronavirus curve, telehealth can	+abortion, +pill, +woman, +abortion pill, telemedicine

Note: Start of the pandemic data set included all mentions of telehealth or telemedicine occurring on Twitter between March 15, 2020, and April 20, 2020. One year later included mentions occurring during March 12, 2021, and April 19, 2021. The '+' symbol represents the inclusion of alternative forms of the word similar to the wildcard character in Boolean language.