

Integrating Third-Party Apps With Electronic Health Records to Support COVID-19 Response

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On March 11, 2020, the World Health Organization declared COVID-19 a global pandemic.¹ Following this declaration, countries rapidly sought supplies and resources to test for infected individuals, protect health care workers treating patients, and begin development of pharmaceuticals to treat and prevent the spread of COVID-19.²

In response, software and health information technology (IT) developers also began to rapidly create and deploy digital tools that could be used to help treat patients and assist in the fight against COVID-19. Telehealth was identified as a method of health care delivery that could reduce disease transmission, preserve personal protective equipment, and minimize the impact of patient surges on health care facilities.^{3,4} Other digital technologies, such as mobile phones, remote monitoring devices, and web-based apps, were also used to support epidemiologic surveillance, contact tracing, and evaluation of public health interventions.⁵ This paper highlights the rapid integration of telehealth- and COVID-19–related software applications with electronic health records (EHRs) during the pandemic from January 2020 to June 2021.

App integrations are commonly performed using EHR application programming interfaces (APIs). APIs enable easier access and exchange of data through automated and predictable communications among different computer systems. The integration of third-party apps using APIs has the potential to expand the range of tools health care providers can use to diagnose, treat, and communicate with patients beyond the functionalities that their EHR developer may support.⁶ Other research has shown that the number of apps that integrate with EHRs is growing⁷; however, little is known about the role of EHR-integrated apps in supporting COVID-19 response efforts. This paper provides early insights into the integration of these apps during a public health emergency.

We examined apps discovered in EHR public app galleries to identify telehealth- and COVID-19–related apps that were integrated before and after the onset of the COVID-19 pandemic in the United States. The objectives of this study were to (1) track the integration of telehealth- and COVID-19–related apps over time, (2) identify the primary functionality of apps designed to support the COVID-19 response, and (3) examine

ABSTRACT

OBJECTIVES: To (1) track the integration of telehealth- and COVID-19–related apps with electronic health records (EHRs) over time, (2) identify the primary functionality of apps designed to support the COVID-19 response, and (3) examine whether apps available prior to the pandemic added new telehealth- or COVID-19–related functionalities during the pandemic.

STUDY DESIGN: Data were collected from public EHR app galleries on a monthly basis from December 31, 2019, through June 1, 2021.

METHODS: Apps were identified as relating to COVID-19 or telehealth using text analysis of the app marketing materials. Descriptive analyses were conducted to characterize telehealth- and COVID-19–related apps discovered through the app galleries, identify their primary functionality, and examine whether any apps added new telehealth- or COVID-19–related functionalities during the pandemic.

RESULTS: The number of COVID-19–related apps increased from 0 in March 2020 to 19 a month later and continued to grow to 62 as of June 2021. The number of telehealth-related apps more than doubled from prepandemic levels ($n=41$) to a total of 87 apps by June 2021. These apps were 2 times more likely to contain specialized capabilities used to support COVID-19 response efforts, such as secure messaging, vaccine administration, and laboratory testing, compared with all apps listed in the EHR app galleries.

CONCLUSIONS: These findings demonstrate the potential of integrating third-party apps into EHRs to expand the range of tools that health care providers can use to diagnose, treat, and communicate with patients.

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whether apps discovered prior to the pandemic added new telehealth- or COVID-19–related functionalities during the pandemic.

STUDY DESIGN AND METHODS

Data Sources

Data were collected from public app galleries hosted by 4 EHR developers: Allscripts,⁸ Athenahealth,⁹ Cerner Corporation,¹⁰ and Epic Systems Corporation,¹¹ in addition to Boston Children's Hospital's SMART (or Substitutable Medical Apps and Reusable Technologies).¹² For this analysis, we consider any app discovered in these galleries as an EHR-integrated app. Data were collected on a monthly basis from December 31, 2019, through June 1, 2021. Monthly cumulative COVID-19 case counts in the United States were obtained from the CDC's COVID Data Tracker.¹³

Identification of Telehealth- and COVID-19–Related Apps

Apps were identified as telehealth if they mentioned “telehealth,” “telemedicine,” “video consult,” or “video visit” in the app marketing materials pulled from each gallery. Similarly, apps were identified as relating to COVID-19 if they mentioned “COVID,” “coronavirus,” or “pandemic” in their app marketing materials.

For the purposes of this analysis, March 1, 2020, was considered the onset of the pandemic. Apps that were identified prior to the onset were categorized as “discovered prior to pandemic,” and those discovered after the onset were categorized as “added during pandemic.” Several apps that were initially identified prior to the onset of the pandemic updated their marketing materials after the onset to include new functionalities or use cases related to the pandemic. These apps were categorized as “added functionalities,” and those that did not make any updates to their marketing materials were categorized as “no changes.”

Text analysis was performed to identify the primary functionality of each app, and a manual review was conducted to verify its accuracy. Further details about the methods used to create this data set and the text analysis program have been previously published.⁷

Statistical Analysis

Descriptive analyses were conducted to characterize telehealth- and COVID-19–related apps discovered through the app galleries, identify their primary functionality, and examine whether any apps added new telehealth- or COVID-19–related functionalities during the pandemic. Two-sample *t* tests were performed to test for statistically significant differences ($P < .05$). All analyses were conducted using SAS version 9.4 (SAS Institute).

RESULTS

Figure 1 shows the total number of unique telehealth- and COVID-19–related apps listed across the 5 galleries, along with

TAKEAWAY POINTS

The findings from this study provide early insights into how health information technology policies may be advancing the role that third-party apps played in supporting efforts to respond to the COVID-19 pandemic.

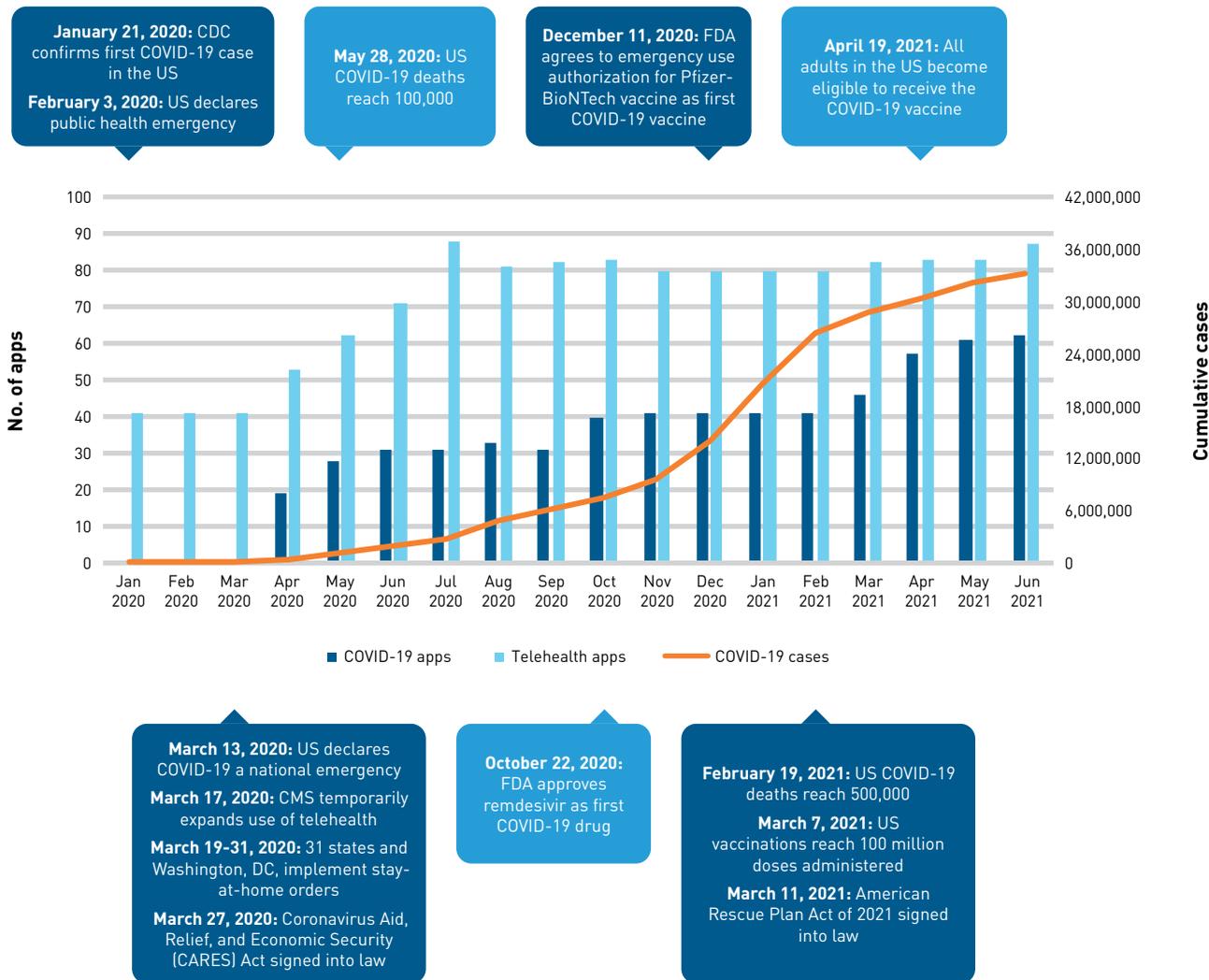
- ▶ In May 2020, the federal government finalized a policy that sought to make integration of third-party apps with electronic health records (EHRs) easier by requiring EHR developers to adopt secure, standards-based application programming interfaces.
- ▶ We observed a rapid increase in telehealth- and COVID-19–related apps integrating with EHRs following the onset of the pandemic.
- ▶ These apps provided health care providers with an influx of new tools that could be used to diagnose, treat, and communicate with patients.

monthly cumulative COVID-19 case counts. As of the beginning of March 2020, the United States had 1199 cumulative COVID-19 cases. At this time, there were 41 apps listed in these galleries to support telehealth and 0 apps marketed to support COVID-19 response efforts. One month later, at the beginning of April 2020, the cumulative number of COVID-19 cases grew to 257,751, and the first COVID-19–related apps (18 in total) emerged in these galleries. The number of telehealth-related apps also grew to 53. As the cumulative number of COVID-19 cases continued to grow throughout 2020 and into 2021, the total number of telehealth- and COVID-19–related apps also grew. Although the total number of telehealth apps rapidly increased during the first half of 2020, these apps peaked in July 2020 (88 apps), then leveled off through the remainder of the study period. Meanwhile, the total number of COVID-19–related apps steadily increased throughout the duration of the study and was at its highest level in the last month of data collection (62 apps).

Figure 2 shows the percentage of telehealth- and COVID-19–related apps listed in galleries by whether they were identified prior to the onset of the pandemic and whether the app added new telehealth- or COVID-19–related functionalities during the pandemic. Among telehealth apps marketed as of June 1, 2021, 51% were newly added to a gallery during the pandemic, 29% were discovered prior to the pandemic with existing telehealth functionalities, and 21% were discovered prior to the pandemic and added telehealth-related functionalities after the onset of the pandemic. This exhibit also shows that 0 apps were marketed with COVID-19–related functionalities prior to the pandemic because it was a novel virus. We found that 42% of apps with COVID-19–related functionalities existed prior to the pandemic but added COVID-19–related functionalities after the onset. Fifty-eight percent of COVID-19 apps were newly added to the galleries during the pandemic.

Figure 3 categorizes telehealth apps by whether their primary functionalities include video or nonvideo capabilities (eg, scheduling and billing, secure messaging, patient satisfaction surveys), as well as any changes made after the onset of the pandemic. Overall, 10 telehealth apps (11%) primarily provided video-only functionality, 36 provided both video and nonvideo functionalities (41%), and 41 provided only nonvideo functionalities (47%). Most apps that added telehealth functionalities or were newly discovered

FIGURE 1. Cumulative Number of Telehealth- and COVID-19–Related Apps Listed in App Galleries During the COVID-19 Pandemic, January 2020–June 2021



Source: Data were obtained from online app galleries hosted by Allscripts, Athenahealth, Cerner, Epic, and SMART from December 30, 2019, to June 1, 2021. Cumulative COVID-19 case counts were obtained from the CDC’s COVID Data Tracker on June 10, 2021.

during the pandemic were primarily apps with only nonvideo capabilities. More than half of telehealth-related apps that were discovered prior to the onset and did not make any changes during the pandemic provided both video and nonvideo functionalities. Similarly, approximately 4 in 10 apps added during the pandemic also provided both video and nonvideo functionalities.

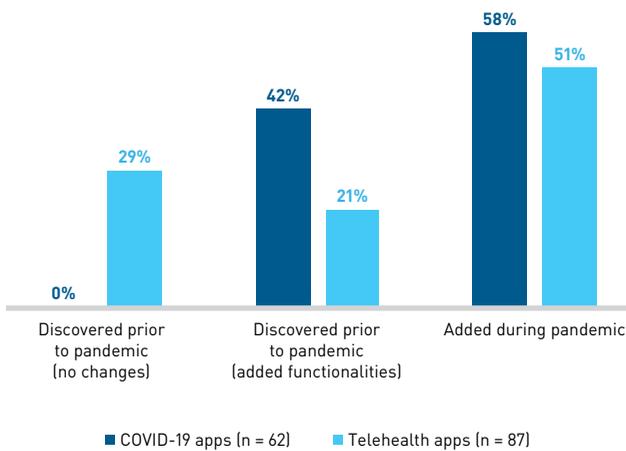
The **Table** lists the intended use or functional category for telehealth- and COVID-19–related apps. Scheduling and billing were the most common functionalities for apps marketed to support pandemic response efforts. Nearly two-thirds of COVID-19 apps and more than three-fourths of telehealth-related apps supported these administrative functions. The next most common uses

for COVID-19–related apps were for vaccine administration and management (26%), patient education (24%), and health information management (21%). Other common functionalities for telehealth apps included provider efficiency tools (36%), secure messaging (26%), and digital check-in (18%).

DISCUSSION

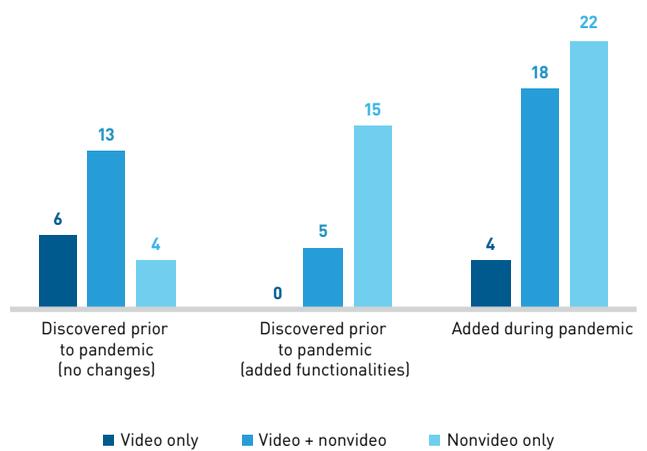
This study provides early insight into the rapid integration of third-party apps with EHRs in clinical settings during the COVID-19 pandemic. The number of COVID-19–related apps listed in these galleries rapidly increased from 0 in March 2020 to 19 a month

FIGURE 2. Percentage of Telehealth- and COVID-19–Related Apps by App Changes After the Onset of the Pandemic



Source: Data were obtained from online app galleries hosted by Allscripts, Athenahealth, Cerner, Epic, and SMART from December 30, 2019, to June 1, 2021.

FIGURE 3. Number of Telehealth-Related Apps by Video and Nonvideo Functionality and App Changes During the Pandemic*



*Nonvideo functionality refers to apps that were marketed as “telehealth” but primarily provided administrative and patient engagement functionalities that supported scheduling and billing, secure messaging, and patient satisfaction surveys.

Source: Data were obtained from online app galleries hosted by Allscripts, Athenahealth, Cerner, Epic, and SMART from December 30, 2019, to June 1, 2021.

TABLE. Percentage of Telehealth- and COVID-19–Related Apps by Functional Category

Functional category	All apps (n = 854) (reference)	COVID-19 apps (n = 62)	Telehealth apps		
			All telehealth (n = 87)	Video (n = 46)	Nonvideo only (n = 41)
Scheduling and billing	43%	63%*	77%*	72%*	83%*
Patient education	17%	24%	16%	11%	22%
Provider efficiency tools	16%	19%	36%*	35%*	37%*
Health information management	12%	21%*	9%	7%	12%
Patient satisfaction surveys	9%	15%	17%*	15%	20%*
Secure messaging	8%	18%*	26%*	24%*	29%*
Patient monitoring	5%	11%*	17%*	20%*	15%*
Digital check-in	4%	16%*	18%*	13%*	24%*
Vaccine administration and management	4%	26%*	10%*	4%	17%*
Laboratory testing	2%	13%*	5%	2%	7%

*Significantly ($P < .05$) different from “all apps” reference group.

Source: Authors’ analysis of data from online app galleries hosted by Allscripts, Athenahealth, Cerner, Epic, and SMART from December 30, 2019, to June 1, 2021.

later and continued to grow to 62 as of June 2021. The number of telehealth-related apps more than doubled from prepandemic levels (n = 41) to a total of 87 apps by June 2021. This growth may reflect increased demand for digital technologies to support pandemic response efforts.

HHS temporarily issued several measures to make it easier for patients to receive medical care through telehealth during the public health emergency.¹⁴ One of these measures included flexibility for health care providers and their patients to use video communication apps that did not comply with Health Insurance Portability and

Accountability Act regulations for telehealth purposes. Approximately half of the telehealth apps identified during this analysis had video functionality. Nonvideo telehealth apps supported functionalities for scheduling and billing, digital check-in, secure messaging, and patient education.

COVID-19–related apps supported administrative functions and important tasks related to pandemic response efforts at higher rates compared with all apps listed in the 5 galleries. More than half of COVID-19 apps supported administrative functions, such as scheduling and billing and digital check-in, which enabled

social distancing by preventing overcrowding in waiting rooms. COVID-19–related apps were also used for vaccine administration, health information management, secure messaging, laboratory testing, and patient monitoring at higher rates.

Although the total number of COVID-19– and telehealth-related apps increased significantly throughout the course of the pandemic, this increase does not necessarily reflect new development of apps. Only approximately half of all COVID-19–related apps (58%) and telehealth-related apps (51%) were newly discovered in the app galleries during the pandemic. Approximately 2 in 5 COVID-19–related apps and approximately 1 in 5 telehealth-related apps were listed in an EHR app gallery prior to the pandemic but updated their marketing materials to include information about how the app can be used to support telehealth- or COVID-19–related efforts during the pandemic. We are unable to conclude whether these apps truly added new functionalities or whether the developers identified new COVID-19 or telehealth use cases that the app's existing capabilities could support.

Additionally, the listing of an app in an EHR app gallery does not necessarily reflect use of that app. Future research should consider exploring novel data sources that provide insights into the actual use of these apps by patients or clinicians, such as app downloads, user ratings, or system-generated data from APIs managed by health care organizations.

CONCLUSIONS

In May 2020, the Office of the National Coordinator for Health IT finalized the 21st Century Cures Act final rule that sought to make integration of third-party apps with EHRs easier by requiring certain developers of certified health IT to adopt secure, standards-based APIs using the Health Level Seven Fast Healthcare Interoperability Resources data exchange standard and by making available specific business and technical documentation necessary to interact with their certified API technology. The goal of these policies was to create a more open health IT ecosystem that promotes innovation, customer choice, and rapid scalability.

The findings from this study provide early insights into how these policies may be advancing the role that third-party apps played in supporting efforts to respond to the COVID-19 pandemic.

We observed a rapid increase in telehealth- and COVID-19–related apps integrating with EHRs following the onset of the pandemic. These apps provided health care providers with an influx of new tools that could be used to diagnose, treat, and communicate with patients, as well as directly support pandemic response efforts.

As more EHR technologies enable data exchange through standards-based APIs and adopt practices that facilitate integration, a dynamic ecosystem of apps can exist to manage health care needs and support public health. ■

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