


# Technology Learning and the Adoption of Telehealth Among Community-Dwelling Older Adults During the COVID-19 Outbreak

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## Abstract

The present study aims to examine changes in the prevalence of telehealth utilization in older adults before and during the COVID-19 outbreak, and to investigate the relationship between learning a new technology and the adoption of telehealth during the outbreak. The study sample came from the National Health and Aging Trend Study COVID-19 Supplement ( $N=1769$ ). The adoption of telehealth was assessed for utilization of emails and video calls to communicate with healthcare providers. Logistic regressions were performed to test the study aims. The findings showed that older adults substantially increased the utilization of telehealth during the outbreak. Additionally, learning a new technology is related to the adoption of both emails and video calls to access telehealth. The findings suggest that older adults may be motivated and able to quickly learn a new technology that is required to access telehealth during the COVID-19 outbreak.

## Keywords

telehealth, COVID-19, technology learning, remote healthcare, older adults

## Introduction

Telehealth, usually referred to as remote healthcare services via telecommunication, has become increasingly prevalent during the coronavirus disease (COVID-19) outbreak (Hollander & Carr, 2020; Patel et al., 2021). It has been estimated that the number of Medicare beneficiaries who utilized telehealth increased from approximately 13,000 before the pandemic to 1.7 million during the last week of April 2020 (Verma, 2020). During the outbreak, telehealth has served as an alternative way to deliver the healthcare services and minimize the transmission of COVID-19 at the in-person healthcare appointments.

Telehealth can be particularly important to older adults during the pandemic as COVID-19-positive patients aged 60 or older have the highest mortality compared to younger individuals (Bonanad et al., 2020). Additionally, healthcare delays are prevalent among older adults during the COVID-19 outbreak, as a national poll shows that about one-third of US older adults have delayed health care due to COVID-19-related concerns (Malani, 2021). Therefore, improving older adults' access to remote healthcare delivery (i.e. telehealth) is important to prevent health complications due to delayed care during the outbreak. Unfortunately, approximately 13 million older adults (38%) were not ready to use video visits with healthcare providers during the COVID-19 outbreak, largely due to a lack of confidence in and inexperience with

technology that is required to communicate with healthcare providers (Lam et al., 2020). Furthermore, older adults can face distinct challenges in learning and navigating a new technology, such as frustration in their interactions with new technology (Bardach et al., 2021; Rogers & Fisk, 2010).

The adoption of telehealth, such as emails and video calls, requires learning new technology or programs. However, it remains unclear as to whether older adults who learned a new technology are able to successfully navigate telehealth within a short time during the COVID-19 outbreak. Findings from a pilot program on rapid integration of home telehealth suggest that short-term technology learning may facilitate immediate adoption of telehealth (Hawley et al., 2020). Additionally, qualitative evidence shows that the ability to quickly learn a new technology is crucial to older adults' adaptation to telehealth during the outbreak (Franzosa et al., 2021). However, population level evidence is scant on learning a new technology and quick adoption of telehealth among older adults during the outbreak.

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## Study Objectives

Existing evidence on technology learning and telehealth adoption during the COVID-19 outbreak has focused on community-based samples or qualitative designs, which has limited generalizability at the population level. To bridge this gap, the present study aims to use a national survey to 1) examine the changes in the prevalence of telehealth utilization before and during the COVID-19 outbreak, and 2) investigate the relationship between new technology learning and the adoption of telehealth.

## Methods

### Sample

The study sample came from the Round 10 of the National Health and Aging Trend Study (NHATS) COVID-19 Supplement, a mail survey study that was conducted among a national sample of Medicare beneficiaries aged 70 or older during the COVID-19 outbreak (Freedman & Hu, 2020). Data were collected from June to October 2020, with an overall response rate of 83.5%. The exclusion of proxy respondents and respondents who had missing data on telehealth resulted in a sample size of  $N=1769$ .

### Measures

**Adoption of telehealth.** Respondents were asked to indicate whether they communicate with their usual healthcare providers using telehealth before and during the COVID-19 outbreak, respectively. Two types of telehealth were assessed: 1) Email or portal message, and 2) video calls. Participants who did not use emails before the outbreak but used emails during the outbreak were coded as the adoption of emails (1=yes). Participants who did not use emails both before and during the outbreak were coded as no adoption of emails (0=no). The adoption of video calls was coded in the same way.

**New Technology learning.** Respondents were asked, “during the COVID-19 outbreak, have you learned a new technology or program to go online? (This include learning to use a smartphone, computer or iPad or a program like Zoom or FaceTime).” The response categories were Yes and No.

**Covariates.** Socio-demographic and health covariates were selected based on previous research (Choi & DiNitto, 2013; Czaja et al., 2006), including age group, gender, race, education, family income in 2019, and living arrangement. Four quartiles of income were created among the entire national sample. Health indicators included a count of eight chronic conditions. Dementia status was coded using the NHATS-provided classification (Kasper et al., 2013). COVID-19-related depressed and anxious feelings were measured separately by a single item on a 4-point scale.

## Analysis Strategy

Descriptive statistics were conducted to capture the sample characteristics. Changes in the prevalence of telehealth utilization before and during the COVID-19 outbreak were estimated. Logistic regressions were conducted to test the study aims, controlling for socio-demographics and health covariates. The NHATS-provided analytic weights and design factors were used to account for the complex survey design and to generate population estimates. All analyses were conducted in STATA 17.

## Results

Sample characteristics were presented in Table 1. Less than half of the sample was in the age group 70 to 74, and over half of the sample were female. The majority were non-Hispanic whites. Respondents had an average of 2.5 conditions, and about 5% reported probably or possible dementia. About one-third of the respondents learned a new technology. Among older adults who did not use email or video calls to communicate with healthcare providers before the outbreak, about 7.54% adopted emails and 20.89% adopted video calls during the outbreak.

The changes in the prevalence of telehealth utilization before and during the COVID-19 outbreak were shown in Table 2. Significant increase in the utilization of telehealth was observed. Specifically, the prevalence of telehealth utilization among older adults increased by 5.59% (95% CI: 4.46–6.97,  $p < 0.001$ ) for email and portal message and 19.99% (95% CI: 17.46–22.78,  $p < 0.001$ ) for video calls to communicate with healthcare providers.

Results from the logistic regressions of technology learning and the adoption of telehealth were presented in Table 3. Learning a new technology was significantly associated with the adoption of telehealth. Specifically, compared to older adults who did not learn a new technology, those who learned a new technology during the outbreak were 2.42 times (95% CI: 1.20–4.86,  $p = 0.014$ ) more likely to adopt emails and 2.72 times (95% CI: 1.85–4.09,  $p < 0.001$ ) more likely to adopt video calls to communicate with healthcare providers.

## Discussion

The present study found that older adults have substantially increased the utilization of telehealth during the COVID-19 outbreak, and that learning a new technology is associated with the adoption of telehealth. Although emerging evidence suggests that learning a new technology is related to older adults' adoption of telehealth during the COVID-19 outbreak (Franzosa et al., 2021; Hawley et al., 2020), these findings have been based on community samples and qualitative designs. By using data from a national survey, the present study findings complement previous evidence by examining

**Table 1.** Sample Characteristics (unweighted  $N = 1,769$ , weighted  $N = 16,963,198$ ).

	N	Percentage (95% CI)	Mean (SE)	Range
<b>Age</b>				
70–74	494	46.84 (43.76, 49.82)		
75–79	559	28.71 (26.20, 31.36)		
80–84	394	15.01 (13.49, 16.68)		
85–89	228	6.89 (6.00, 7.90)		
≥90	94	2.54 (1.20, 3.24)		
<b>Gender</b>				
Male	774	45.34 (41.99, 48.73)		
Female	995	54.66 (51.27, 58.01)		
<b>Race</b>				
Non-Hispanic White	1475	88.75 (86.29, 90.81)		
Non-Hispanic black	195	4.59 (3.76, 5.58)		
Hispanic	58	4.11 (2.85, 5.88)		
Other	34	2.56 (1.60, 4.05)		
<b>Education</b>				
High school or below	569	30.17 (26.64, 33.97)		
Above high school	1180	69.82 (66.03, 73.36)		
<b>Family income in 2019</b>				
1st Quartile	372	18.22 (16.05, 20.63)		
2nd Quartile	369	20.54 (17.61, 23.83)		
3rd Quartile	458	27.66 (24.95, 30.54)		
4th Quartile	490	33.57 (29.10, 38.36)		
<b>Living arrangement</b>				
Living with someone	1203	71.96 (69.66, 74.15)		
Living alone	566	28.04 (25.85, 30.34)		
Count of chronic conditions			2.53 (.04)	0–7
<b>Dementia status</b>				
No dementia	1640	94.72 (93.58, 95.67)		
Probable/possible dementia	127	5.28 (4.33, 6.42)		
Feeling depressed			1.97 (.03)	1–4
Feeling anxious			2.16 (.03)	1–4
<b>Learned a new technology</b>				
No	1189	67.76 (64.36, 70.99)		
Yes	500	32.24 (29.01, 35.64)		
<b>Adoption of email or portal</b>				
No	1281	92.46 (90.73, 93.88)		
Yes	102	7.54 (6.12, 9.27)		
<b>Adoption of video calls</b>				
No	1387	79.11 (76.24, 81.72)		
Yes	311	20.89 (18.28, 23.75)		

Note. CI = confidence interval. SE = standard error.

N were unweighted and percentages were weighted. Ranges and weighted means were reported for continuous variables. Person-level analytic weights and design factors were used to account for the NHATS complex survey design. Adoption of email and video calls were coded among participants who did not use telehealth before the COVID-19 outbreak.

technology learning and the adoption of telehealth during the outbreak at a population level.

Interestingly, the increase in the prevalence of video calls utilization (19.99%) is higher than that of email utilization (5.59%). The difference between the changes in the prevalence of emails and video calls may reflect older adults' preference for synchronous face-to-face connections over asynchronous email communication when it comes to virtual

medical care, which may be due to the need to have more in-depth interactions with healthcare providers to receive prompt responses. Also, this difference may reveal the healthcare system's capacity to provide telehealth. Specifically, there may be a lack of infrastructure for email communication, leading to difficulties in asynchronous care compared to synchronous care. Nevertheless, the overall prevalence of email utilization is higher than video calls,

**Table 2.** Estimated prevalence of the utilization of telehealth before and during the COVID-19 outbreak.

	Before COVID-19 pandemic (95% CI)	During COVID-19 pandemic (95% CI)	Changes in the utilization of telehealth (95% CI)	p value
Email (%)	25.92 (22.12, 30.12)	31.51 (27.93, 35.33)	5.59 (4.46, 6.97)	<.001
Video (%)	4.28 (3.17, 5.76)	24.27 (21.68, 27.08)	19.99 (17.46, 22.78)	<.001

Note. Person-level analytic weights and design factors were used to account for the NHATS complex survey design. CI = confidence interval.

**Table 3.** Adjusted odds ratios for learning a new technology predicting adoption of telehealth to communicate with healthcare providers during the COVID-19 pandemic.

	Adopted email to communicate with healthcare providers		Adopted video to communicate with healthcare providers	
	OR (95% CI)	p value	OR (95% CI)	p value
Learned a new technology (ref=no)				
Yes	2.42 (1.20, 4.86)	<b>.014</b>	2.75 (1.85, 4.09)	<b>&lt; .001</b>
Age (ref=70–74)				
75–79	1.41 (.72, 2.77)	.304	.82 (.54, 1.23)	.329
80–84	.60 (.24, 1.49)	.268	.61 (.36, 1.03)	.063
85–89	.81 (.26, 2.52)	.713	.41 (.18, .95)	<b>.037</b>
≥90	.73 (.13, 4.12)	.717	.70 (.28, 1.77)	.449
Gender (ref=male)				
Female	1.52 (.79, 2.93)	.204	1.72 (1.05, 2.82)	<b>.033</b>
Race (ref=non-Hispanic White)				
Non-Hispanic black	1.06 (.41, 2.77)	.902	.68 (.33, 1.43)	.309
Hispanic	2.62 (.78, 8.78)	.117	.86 (.27, 2.69)	.792
Other	2.96 (.70, 12.48)	.135	.70 (.09, 5.43)	.725
Education (ref= high school or below)				
Above high school	1.21 (.50, 2.92)	.659	2.16 (1.37, 3.40)	<b>.001</b>
Family income in 2019 (ref=1st quartile)				
2nd Quartile	1.04 (.32, 3.40)	.953	.63 (.28, 1.39)	.245
3rd Quartile	1.42 (.44, 4.59)	.549	.83 (.43, 1.60)	.567
4th Quartile	2.53 (.93, 6.91)	.069	1.37 (.70, 2.71)	.354
Living arrangement (ref=living with someone)				
Living alone	.78 (.36, 1.72)	.537	.86 (.57, 1.29)	.459
Count of chronic conditions	.97 (.78, 1.20)	.777	1.19 (1.02, 1.39)	<b>.027</b>
Dementia status (ref=no dementia)				
Probable/possible dementia	3.25 (.84, 12.59)	.087	1.06 (0.35, 3.25)	.911
Feeling depressed	1.02 (.58, 1.77)	.951	.81 (.59, 1.11)	.184
Feeling anxious	.92 (.56, 1.48)	.722	1.70 (1.13, 2.54)	<b>.012</b>
Model specifics				
F (df)	3.04 (55)	<b>.002</b>	3.89 (55)	<b>&lt; .001</b>
Number of persons	1381		1647	

Note. OR = odds ratio. Df = degree of freedom. Person-level analytic weights and design factors were used to account for the NHATS complex survey design. Sample sizes vary due to missing data after listwise deletion.

suggesting that some barriers, such as the opportunity to learn a new program, may be related to the adoption of video calls. Additional efforts are needed to understand the specific types of treatments that are more appropriate for using telehealth than in-person care, in conjunction with patients' needs and preferences (Imlach et al., 2020; Rogers & Fisk, 2010).

The present study finds that learning a new technology during the outbreak predicts higher likelihood of the adoption of telehealth. That is, among older adults who have not used telehealth before the COVID-19 outbreak, those who learned a new technology are more than twice as likely to adopt telehealth during the outbreak compared to those who did not

learn technology. This finding echoes recent qualitative evidence that older adults who received rapid training on technology were able to complete at least one telehealth visit during outbreak (Hawley et al., 2020). Altogether, older adults may be capable of quickly learning technology to access telehealth. Due to a massive transition from face-to-face to online healthcare services during the COVID-19 outbreak, older adults may find it necessary to learn technology to adopt telehealth and access essential health services. More specifically, reduced in-person healthcare appointments during the outbreak may have triggered older adults' motivation to use telehealth. Another barrier to adopt telehealth may be older adults' concerns over their privacy. In particular, earlier evidence shows that privacy and security risks must be addressed to implement successful telehealth programs (Hall & McGraw, 2014). Previous intervention research also shows that problem-solving learning approach may be effective in enhancing older adults' digital health literacy and self-efficacy (Xie, 2011). Collectively, further research is needed to identify approaches that facilitate efficient technology learning and the adoption of telehealth among older adults, especially during an urgent time such as a pandemic.

The study findings should be interpreted in light of limitations. First, no information on the frequency of telehealth use is available, thus it is not possible to capture more detailed changes in telehealth utilization before and during the outbreak. Second, the COVID-19-related depressed and anxious feelings were measured using single item questions, which cannot capture a comprehensive spectrum of symptoms. Third, due to the cross-sectional nature of the data, the causal relationship between technology learning and the adoption of telehealth cannot be concluded. Older adults may have learned to use video calls to speak with family members, and thus been able to use technology to access telehealth. Last, the missing data on telehealth were non-random, thus changes in the prevalence of telehealth utilization may be underestimated.

In conclusion, older adults have substantially increased the utilization of emails and video calls to access healthcare services during the COVID-19 outbreak. Providing opportunities to learn new technology may help older adults facilitate the adoption of telehealth. Future technology training should be tailored to older adults in consideration of their distinct needs and preferences. Additional efforts are needed to identify effective approaches for older adults to learn a new technology and to develop training programs involving their caregivers.

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