The Virtual Doctor Is In: The Effect of Telehealth Visits on Patient Experience

Ja-Naé Duane
Bentley University
jduane@bentley.edu

Morgan Stosic
University of Maine
morgan.stosic@maine.edu

Jonathan Ericson
Bentley University
jericson@bentley.edu

Brigitte N. Durieux
Dana-Farber Cancer Institute
brigitten_durieux@dfci.harvard.edu

Justin J. Sanders
McGill University
Justin.Sanders@mcgill.ca

Erryca Robicheaux
Bentley University
robicheaux.e@gmail.com

Danielle Blanch-Hartigan
Bentley University
dhartigan@bentley.edu

Abstract

COVID-19 has accelerated the adoption of telehealth. With this shift comes a need for empirically based research regarding the effect of telehealth on patient experience. The present study employed an online survey (N = 996) examining whether a patient's perceptions of a telehealth visit predicts (a) the likelihood that they will schedule a future telehealth visit, and (b) their recall of clinical information. Participants viewed a video of a real clinician delivering information on a COVID-19 antibody test, and responded to demographic, socioemotional, and cognitive items. We found that for every 1-point increase in an individual's satisfaction with their interaction with the doctor, they were .73 times more likely to revisit the doctor ($p < .01$). These results provide insight for researchers and medical professionals regarding patient perceptions of virtual encounters and suggest best practices to consider as we further integrate telehealth.

1. Introduction

During the COVID-19 pandemic, patient and clinician interactions through virtual telehealth visits increased dramatically since 2019 [1,2]. For many, this forced shift introduced a new medical practice setting [3]. As a result, both clinicians and patients have had to adjust their physical environments (e.g., home-based offices) for virtual visits [4]. The adoption of telehealth has continued to increase despite the relaxation of shelter-in-place mandates, and there are indicators that telehealth is here to stay [3]. Although recent research explores how clinicians conduct these visits [5,6], there is little empirical evidence regarding how these virtual encounters impact patient experiences.

Information technologies, such as telehealth environments, provide opportunities for behavior change support systems [7] that can foster positive health outcomes [8]. However, measuring such health behaviors within these digital systems can be a challenge [7]. Researchers have indicated that patient engagement and health outcomes can be improved through IT platforms (e.g., telehealth) [9]. Additionally, recent research suggests that virtual visits affect clinician behavior and communication [10,11] compared to in-person visits. Recommended behaviors such as maintaining a neutral posture and eye contact can help provide patients with a "webside manner" [6,12-14]. However, there is still a need for more research that examines how these virtual environments affect the patient and their experience. Therefore, we ask the following research question: *does a patient's perceptions of a telehealth visit predict (a) the likelihood that they will schedule future telehealth encounters, and (b) the likelihood of recalling clinical information?* To address this research question, we conducted an online study that provided participants with a simulated telehealth appointment where participants received information about a COVID-19 antibody test from an actual physician, and responded to demographic, socioemotional, and cognitive questions.

This research contributes to the literature in two ways. First, it provides much-needed empirical evidence to this budding area of research. Secondly, it provides insight to both researchers and clinicians regarding experiential and cognitive impacts of telehealth appointments.

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The rest of the paper is organized as follows. Section 1 provides a theoretical background for this study. Section 2 outlines the research methodology. Section 3 provides our results. Section 4 discusses our observations based on our findings. Finally, Section 5 discusses the paper's implications for research and practice and provides recommendations for future research.

1.1. Telehealth environments

Telehealth environments differ from traditional clinical settings for several reasons. First, by being in one's own environment during the experience, there is a sense of familiarity [15] that both the patient and the clinician experience. This provides an opportunity for social connection [16] that may support the patient-clinician relationship. For example, attending a virtual visit from one's home enhances the likelihood of self-disclosure of thoughts and feelings [17,18], which may not occur in a clinical setting. Finally, the sharing of personal environments may shift the power dynamic [15] between the patient and the clinician. The patient is no longer in a traditional setting that is out of their control. Instead, they are in an environment they are familiar with, and they may feel more empowered due to this shifted power dynamic [15].

Both patients and clinicians rely on non-verbal cues [5]. For example, cues such as eye contact or facial activity provide individuals with contextual clues about how to interpret the information they are receiving from the other person [19]. However, within virtual environments, non-verbal cues may be reduced [4] or distorted [20,21], which could lead to a loss of pertinent information [22,23]. Technological factors such as bandwidth and poor video resolution could decrease patient satisfaction [4]. However, it is unclear how these positive and negative aspects of the telehealth experience as well as other perceptions of care during the visit could influence recall and intention to follow-up after a telehealth appointment.

1.2. The present study

In sum, previous research has primarily examined how clinicians conduct telehealth visits [e.g., 5,6]. As a result, we know little about whether a patient's perceptions of a telehealth visit predict the likelihood that they will schedule a future telehealth visit and the likelihood that they will recall clinical information presented during the visit. To examine this research question, we conducted an online study in which participants viewed a video of a real clinician delivering information on a COVID-19 antibody test, and responded to demographic, socioemotional, and cognitive items. We used two ordered logistic regression to test the following hypotheses:

(H1) The more positive a patient's perceptions of their telehealth visit, the higher the likelihood that they will revisit the doctor in a telehealth environment.

(H2) The more positive a patient's perceptions of their telehealth visit, the more likely they will recall clinical information.

2. Methodology

2.1. Participants

Participants were recruited through Amazon Mechanical Turk (MTurk). We conducted a sensitivity power analysis using G*Power to identify the smallest effect size we were powered to detect. For a linear multiple regression *F*-test, we used the following input parameters: α (two-sided) = .05, power = .80, number of predictors = 5. This resulted in the power to detect a small effect size ($f2$ = 0.01) [24]. A total of 1096 participants consented to participate in the study. 100 participants were excluded for not passing attention check questions or reporting video player issues, yielding a final sample size of N = 996 (65.6% M, 34.2% F; M_{AGE} = 34.91 years, SD_{AGE} = 11.13 years). All participants provided their informed consent in accordance with the requirements of Bentley University's Institutional Review Board (IRB) and were compensated $0.50 for successfully completing the study. The total time required to complete the study was 15 minutes or less.

2.2. Procedure

This study utilized the analogue patient methodology [25,26]. Participants were asked to imagine themselves as a patient at a telehealth appointment in which they would receive information about a COVID-19 antibody test from an actual physician.

Participants watched a 30-second video of a clinician presenting information on a COVID-19 antibody test. The video of the physician was recorded against a green screen so that the background could be altered while holding the verbal and nonverbal communication of the physician constant. Participants were randomly assigned to view the video with one of six backgrounds, which varied in the number of visible objects (e.g., plants, family photos, certifications).

After watching the video, Participants completed a survey regarding their impressions of the physician, their memory for both the physician and the virtual interaction, and demographic questions.

2.3. Measures

This study aimed to determine whether a patient's perceptions of a telehealth visit predicted the likelihood they would schedule future telehealth encounters (H1), as well as the likelihood of recalling clinical information presented during the encounter (H2). In order to test these hypotheses, several measures were employed. First, participants were given five questions regarding their satisfaction with the doctor (*Interaction Satisfaction*). They also rated his overall communication (*Doctor's Overall Communication*). Next, there were five questions on the immersiveness (*Immersion*) of the interaction with the doctor. All socioemotional responses were gathered using 5-point scales based on previous research [27]. Participants were asked to indicate the likelihood of revisiting the doctor within a telehealth environment (*Revisit Doctor*), on a 5-point scale from 1 (strongly agreeing with intending to revisit this doctor) to 5 (strongly disagreeing with intending to revisit this doctor).

Cognitive measures examined each participant's recall of the clinical information (*Clinical Information*) that the doctor presented during the telehealth experience (e.g., True or False: The COVID-19 antibody test is negative in about 30% of people who did have infection.). Additionally, participants were asked their level of comfort with telehealth (*Telehealth Comfort*). To indicate their most recent telehealth appointment *(Last Telehealth Appointment)*, and to provide basic demographic information. Finally, we coded the six different office backgrounds in terms of the number of *Environmental Factors* that were visible (e.g., family photos, diplomas, books). The office background with the least number of visible objects was coded a 1 while the office background with the greatest number of visible objects was coded a number 6.

2.4. Data analysis

There were two analyses conducted for this study. First, to assess the likelihood of a participant revisiting this doctor within a telehealth environment (H1), an ordered logistic regression with robust standard errors was used to conduct the analysis. An ordered logistic regression is a model used for categorical dependent variables. For example, when survey choices can be answered as "never", "monthly", "weekly" or "daily", an ordered logit regression can be used for predicting outcomes by more than one response category.

We also assessed the predicted likelihood of recalling the information provided by the doctor (H2). To do so, an ordered logit model with robust standard errors was used to conduct the analysis. The dependent variable, *Clinical Information* (e.g., *"The test can be used to diagnose active COVID-19 cases. True or False?"*), is a cognitive measure to assess the amount of clinical information participants recall from the interaction. Participants received 1 if no clinician information was recalled, 2 if a quarter of the information was recalled (*Some Clinical Information*), 3 if three-quarters of the information was recalled (*Most Clinical Information*), and 4 if all the clinical information was recalled. An alpha level of .10 was set *a priori* for all statistical tests.

3. Results

3.1. Pearson correlations

Before conducting the ordered logit analysis on the likelihood of a participant revisiting the doctor within a telehealth environment, we computed Pearson correlations between the main variables. Table 1 shows the resulting correlation matrix. All variables had significant correlations (all *p*s < .05) except for the environment variable, which had negligible correlation. This lack of significance for the environment variable may indicate multicollinearity problems, which led to the exclusion of this variable from the final logistic regression analyses. All other variables were kept for the logit models due to significance despite varying correlation strengths.

Table 1. Pearson correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Revisit Doctor	1.0							
(2) Interaction Satisfaction	0.8*	1.0						
(3) Comfort with Telehealth	-0.2	-0.3*	1.0					
(4) Memory of Interaction	0.1*	0.1*	-0.1	1.0				
(5) Immersion	-0.5	-0.6*	0.3*	-0.0*	1.0			
(6) Doctor's Overall Communication	0.6*	0.8*	-0.3	-0.1*	-0.4*	1.0		
(7) Last Telehealth Appointment	0.1*	0.1*	-0.2*	0.2*	-0.1*	0.1*	1.0	
(8) Environmental Factors	0	0	0	0	-0.0	-0.0	-0.0	1.0

*** p<.01, ** p<.05, * p<.10

3.2. Likelihood of revisiting the doctor

Odds ratios of revisiting the doctor are reported in Table 2. The overall ordered logit model was statistically significant (pseudo-R^2 = .468, p < .0001). This suggests that most variables have at least marginal effect sizes, and that satisfaction with the interaction and the doctor's overall communication had the most prominent effects. Consistent with H1, the ordered logit model indicates that for every 1-point increase in Interaction Satisfaction (*e.g., "Overall, how satisfied were you with the quality of care you received from this doctor?"*), the odds of actually revisiting the doctor for those participants who strongly agreed that they would revisit the doctor are .73 times more likely than other participants (p < .01), holding all other factors constant. In other words, the odds of revisiting the doctor decrease as satisfaction with the interaction decreases.

Regarding the Doctor's Overall Communication (*"How would you rate the overall communication by this doctor?"*), for every 1-point increase in the communication rating, the odds of revisiting the doctor for those who strongly agree that they would revisit the doctor are .16 times more likely than other participants (p < .01). As seen with this variable (Table 2), the correlation becomes negative when participants who either somewhat agree that they would revisit this doctor through those who somewhat disagree. Surprisingly, those who somewhat disagree that they would revisit this doctor have 12.4 times more odds of revisiting the doctor for every 1-point increase in their rating of the doctor's overall communication quality. These results are consistent with H1.

Regarding the relationship between *Telehealth Comfort* (*"How comfortable are you using telehealth?"*) and considering *Revisiting the Doctor* (*"I would visit this doctor again."*), the logit model also indicates that those who reported feeling more comfortable with telehealth are .07 times less likely to revisit the doctor than those participants who indicated they would strongly agree to *Revisiting the Doctor* (p = .10). Although there was a positive and significant correlation between those who are comfortable with telehealth and their consideration to revisit, this was a marginal effect (p > .10). Overall, these results are consistent with H1.

Additionally, *Interaction Satisfaction*, *Doctor's Overall Communication*, and *Telehealth Comfort* proved significant (all p < .10). Both satisfaction with the interaction and the doctor's communication were significant (all p < .01), and the comfort with telehealth variable was also marginally significant (p < .10). Thus, consistent with H1, these results indicate that how the patient's perceptions of the doctor impact the likelihood that they will revisit that doctor in a telehealth environment. Furthermore, the doctor's ability to communicate effectively within this type of environment and the individual's comfort level with telehealth will marginally impact their odds of revisiting the doctor; although this finding is consistent with H1, the results are marginal and warrant further research.

Table 2. Odds ratios of revisiting a doctor in a telehealth environment

	1 Strongly Agree	2 Somewhat Agree	3 Neither Agree Nor Disagree	4 Somewhat Disagree	5 Strongly Disagree
Interaction Satisfaction	.725***	-.381***	-.271***	-.052***	-.019***
Memory of Interaction	.001	-.001	-.001	-.000	-.000
Immersion	-.021	.011	.008	.001	.000
Doctor's Overall Communication	.155***	-.082***	-.058***	-.011***	.124***
Telehealth Comfort	-.070*	.037*	.026*	.005*	.001*
Last Telehealth Appointment	-.005	.002	.002	.000	.000
*** p<.01, ** p<.05, * p<.10					

3.3. Likelihood of recalling clinical information

Odds ratios for recalling clinical information are reported in Table 3. The *Clinical Information* variable was created through the sum of information the participants retained. The overall model (Table 3) was statistically significant (pseudo-R^2 = .440, p < .0001). *Interaction Satisfaction*, *Immersion*, and *Telehealth Comfort* were highly significant (p < .001). The indicates that as participants feel more immersed and comfortable within the telehealth setting, that it affects their level of satisfaction with the experience.

Table 3. Odds ratios of recalling clinical information in telehealth environments

	No Clinical Information	Some Clinical Information	Most Clinical Information	All Clinical Information
Interaction Satisfaction	-.034***	-.044***	.024***	.054***
Immersion	-.019***	-.025***	.013***	.030***
Doctor's Overall Communication	-.000	-.000	.000	.000
Telehealth Comfort	.030**	.039**	-.021**	-.047**
Last Telehealth Appointment	-.002	-.002	.001	.000
*** p<.01, ** p<.05, * p<.10				

When examining *Interaction Satisfaction*, for every 1-point increase in the level of satisfaction, the odds of recalling clinical information was most prominent for those who recalled all the information at .05 times more than individuals in the other categories ($p < .01$), holding all factors constant. Not surprisingly, individuals who did not recall any clinical information during this study are predicted to be 3 times less likely to recall clinical information in a telehealth setting in the future. Thus, consistent with H2, the more the individual is satisfied with the encounter with the doctor, the more likely they are to recall clinical information during that encounter.

Regarding the immersiveness of the experience, we observed a negative effect for participants who were only able to recall a quarter of the clinical information provided (-0.025x odds, $p < .01$) and for those who were unable to recall any information (-0.019x odds, $p < .01$). However, for every 1-point increase in *Immersion*, the odds of participants who recalled all clinical information is .03 more likely than those individuals in other categories ($p < .01$). Thus, consistent with H2, these results suggest that as participants feel more immersed within the telehealth environment, their likelihood of retaining clinical information also increases.

The impact that *Telehealth Comfort* has on the probability of recalling clinical information indicates that those who are comfortable with telehealth but could not recall more than 1/4th (25%) of the clinical information have a .03 ($p < .01$) greater likelihood of recalling such information compared to individuals who are not comfortable with telehealth ($p < .05$). Finally, those who are comfortable with telehealth and could recall at least half of the clinical information provided have a 2-4% decrease in odds of recalling clinical information versus those who identified as not comfortable with telehealth ($p < .05$). This result is both counterintuitive and may indicate that those who are less comfortable with telehealth may be more inclined to listen to the doctor closely than those individuals who are comfortable in telehealth environments.

In sum, results were generally consistent with H2 (the more positive a patient's perceptions of their telehealth visit, the more likely they will recall clinical information). There is a correlation between how satisfied an individual is with a telehealth encounter and the information that is retained from the visit. Furthermore, the more immersed the individual can be within the experience, the more likely they are to retain the information.

4. Discussion

The present study examined the relationship between telehealth experiences and patients' perceptions of the virtual clinical encounter. Though recent research suggests that clinicians should consider enhancing virtual environments for overall patient satisfaction, the results of this study indicate that the patient's comfort with telehealth, perception of the doctor's communication, and satisfaction with the virtual encounter may predict intentions to revisit a doctor in a telehealth environment. We also found that there very little evidence for spillover effects from participants' telehealth experiences prior to this study in that the effect sizes were marginal and insignificant. This may be due to telehealth environments being relatively new for many individuals. Additionally, since this doctor was a new doctor for the study participants, they may have treated this telehealth experience differently than they would if it was with a doctor they had seen before.

Regarding cognitive responses, although interaction satisfaction, the feeling of immersion within the environment, and comfort with telehealth were significant and may theoretically contribute to the retention of clinical information [28,29], their effects sizes were marginal and do not fully explain whether a patient accurately recalled clinical information in a telehealth encounter. However, our findings do indicate that if an individual is slightly uncomfortable with telehealth visits, then they are more inclined to listen to the clinical information presented and recall it.

Other work has demonstrated adequate information recall among cancer patients in clinical telehealth visits. For example, patients reported

whether they recall various information categories being discussed, rather than recalled specific information from that discussion. [30]. In in-person clinical settings, other work has found information recall to be unsatisfactory (cancer patients recalled about 50% of information correctly) [31]. To assist patients in recalling crucial clinical information, doctors can summarize their recommendations in the "open note" section of a patient's chart or in a letter to patients and other members of the care team, as is common in other health systems (e.g., the NHS in the United Kingdom). Another recommendation would be to use "teach back" approaches with patients. Research has demonstrated positive effects using such approaches with patients [32-34]. Additionally, clinicians may want to consider providing clinical information in varying forms (e.g., written, visual illustrations) to ensure that patients have the pertinent information that they need from the clinician.

4.1. Limitations and future directions

This study has several limitations. Although adequately powered, online samples may not generalize to real patient populations. The COVID-19 antibody test context may have played a role in recall and overall experience reported. The online format and uniform encounter provided consistency across participants but does not capture all the factors related to intention to revisit a doctor, or predictors of recall. We also cannot determine the causal direction of these relationships. For example, recalling more clinical information may cause analogue patients to also report more positive experiences.

Telehealth platforms are designed and employed in a variety of ways, thus limiting the present study's internal and external validity. Additionally, this study did not examine how web connectivity or digital interfaces may affect the interaction between the doctor and the patient or the doctor's communication of the clinical information. Future research should leverage this variability that technology as it plays an essential role in the patient's overall telehealth experience. For example, researchers could research the effects of telehealth platforms, as well as the use experience of such platforms, on the patient's experience. Furthermore, future research can explore whether a prior relationship with a doctor impacts the patient's ability to retain clinician information within a virtual environment, such as telehealth.

5. Conclusion

This paper contributes to both telehealth research and practice by providing empirical evidence relevant to this growing field. Our results suggests that a patient's experience of a telehealth visit may impact their recall for clinical information and intentions to seek follow-up care over telehealth. Our results also suggest several avenues for future research, including comparing the impact of different telehealth platforms on patient experience and information recall. For practitioners, our results suggest that telehealth encounters may impact a patient's perceptions and impressions of care, as well as cognitive and adherence-related outcomes. In particular, our results suggest that improving the telehealth patient experience may lead to more consistent follow-up care. Telehealth is here to stay, and researchers must support practitioners as they explore novel ways of improving the overall patient experience and clinical outcomes in these virtual environments.

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