

Patient Perspectives on Telehealth during the Pandemic in the United States

Manal Sultan Alhussein, Xiang Michelle Liu

Abstract—Telehealth is an advanced technology using digital information and telecommunication facilities that provide access to health services from a distance. It slows the transmission factor of COVID-19, especially for elderly patients and patients with chronic diseases during the pandemic. Therefore, understanding patient perspectives on telehealth services and the factors impacting their option of telehealth service will shed light on the measures that healthcare providers can take to improve the quality of telehealth services. This study aimed to evaluate perceptions of telehealth services among different patient groups and explore various aspects of telehealth utilization in the United States during the COVID-19 pandemic. An online survey distributed via social media platforms was used to collect research data. In addition to the descriptive statistics, both correlation and regression analyses were conducted to test research hypotheses. The empirical results highlighted that the factors such as accessibility to telehealth services and the type of specialty clinics that the patients required play important roles in the effectiveness of telehealth services they received. However, the results found that patients' waiting time to receive telehealth services and their annual income did not significantly influence their desire to select receiving healthcare services via telehealth. The limitations of the study and future research directions are discussed.

Keywords—Telehealth, patient satisfaction, pandemic, healthcare, remote patient monitor.

I. INTRODUCTION

TELEHEALTH refers to telecommunication services that provide contactless health care using advanced technology and electronic information. Telehealth supported patients and caregivers during the pandemic, ensuring the continuity of providing qualified healthcare to patients with a need, especially elderly patients with mobility issues and chronic diseases. Patients in rural areas do not need to cancel their appointment due to lack of transportation or traveling costs [1]. Since COVID-19 forced many industries to work remotely including healthcare organizations, the use of telehealth has dramatically increased. Even though many healthcare providers were in quarantine, telehealth allowed them to communicate with their patients as well as other professionals and to ensure that effective care is delivered remotely. The authors believe that there is a pressing need for different stakeholders such as healthcare providers, policy makers, and information technology practitioners to gain better understandings of patient perspectives on telehealth services during the pandemic in order to continuously improve healthcare service quality. Furthermore, more attentions should be directed on the critical

aspects of mitigating barriers to access telehealth services among various patient groups.

The adoption of telehealth was steadily increased before the outbreak of COVID-19, while the pandemic prompted it to a further extent. The accessibility and availability of telehealth supported healthcare delivery to people in their places. For example, patients at high health risk or with a chronic disease who needed refill medication could be extensively served via a telehealth platform, which offers a contactless alternative for patient safety. Expenses of traveling or lack of transportation were critical issues that could be solved via telehealth which resulted in decreases of appointment cancellations or rescheduling.

This study aimed to examine patients' perspectives on and their knowledge about telehealth services in the United States. Another focus is to discover whether certain specialty clinics offered by telehealth could benefit patients more compared to other types of specialties.

II. BACKGROUND

A. Challenges and Barriers to Telehealth Implementation

Access to healthcare has increased due to the availability of advanced technology even in rural areas, which offers patients and healthcare providers with communication opportunities. Studies [2]-[4] focused on the implementation of telehealth before the pandemic crisis along with its challenges and opportunities. The studies found that it is essential to use patient experiences to highlight telehealth benefits to overcome some difficulties. Defining the telehealth framework, ensuring sufficient staff is involved, and encouraging the healthcare system to continue using telehealth can improve the quality of services. The studies [2]-[4] found that patients and clinicians were satisfied with the virtual video visit for follow-up patients compared with the in-person visits. Another study [5] disclosed a significant difference in telehealth adoption between urban and rural regions due to cost, reimbursement, and technical issues. Several factors must be considered in improving and expanding telehealth services like patient and clinician experience, efficient telehealth scheduling, availability of telehealth access for both patient and clinician, and telehealth infrastructure [6].

In-person visits declined about 80% in the United States during the COVID-19, including the patients recovered from COVID-19 and those stayed home with minor complications,

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yet higher satisfaction was reported based on patient experience on telehealth [7]. Compared to the era before COVID-19, the crisis dramatically increased telehealth adoption and accelerated digital health transformation. Due to the rapid transformation of healthcare to virtual care via telehealth during COVID-19, telehealth services faced similar challenges to the era before COVID-19. Even though patients showed satisfaction of telehealth services from both pre-pandemic and during-pandemic periods, compared to the urban cities, low availability of telehealth services and fewer opportunities for patients to access telehealth during quarantine in the rural areas actually increased health disparities [8].

B. Primary Application Domains of Telehealth

Telehealth services do not necessarily benefit every clinic or specialty equally. Prior studies demonstrated certain application domains of telehealth have more direct and positive impacts on patient care, including blood pressure control [9], ophthalmology care [10], psychiatric clinic visits, and substance use disorder treatment clinics [11]. Telehealth is not only an effective tool for chronic patients who need close monitoring of their disease, it is also proven to be an effective way to communicate in-patient with the professionals during quarantine since 5% of COVID cases need intensive care unit services and many professionals were in quarantine [12]. In summary, the use of telehealth during the pandemic reflects a variation based on specialty clinics. The above studies illustrated that patients who had a chronic disease or needed specific clinics that did not require in-person visits, like mental health clinics, were satisfied with care services and benefited from the transformation. Thus, telehealth reflected a considerable accretion during the pandemic compared to the era before COVID-19.

C. Literature Synthesis

A systemic review was conducted during the early stage of COVID-19 to identify the role of telehealth in controlling diseases [13]. The authors highlighted a significant gap in the areas of evaluating effectiveness of using telehealth for elderly, high-risk patients, and other clinics that do not depend on in-person visits. In addition, [13] called for more studies to focus on evaluating patient satisfaction of telehealth services. Reference [14] researched ethnic and economic differences in telehealth usage during the pandemic. The authors stated that the limitation of the dataset and study design did not provide sufficient information for a specific barrier to the telehealth on patient level. The study suggested focusing on patient outcomes on the effectiveness of various telehealth technologies to provide understanding for delivering quality healthcare as a future research topic. The patient satisfaction and telehealth effectiveness for infection control and follow-up for chronic disease were considered a research gap and required further studies.

Reference [15] studied the patient perspective on telemedicine during the pandemic. The authors used an online survey to collect the data, and their results showed that 55% of participants had used telehealth which was greater by

approximately 30% before the pandemic. The data showed that 70% of patients preferred to select in-person visits for the next appointment. This study recommended that decreasing waiting time to receive care services encourage patients to use telehealth. Waiting time can be a significant factor that might impact a patient's decision to select telehealth.

Many scientists investigate the telehealth services during and before the pandemic, which embodies some similarities and differences. Despite the rising of adoption and operation of telehealth during the crisis, there are several challenges in adopting telehealth in certain regions and patient groups. Therefore, further research into the patient perspective on telehealth and their satisfaction level is crucial to improve healthcare quality and deliver effective healthcare service from a distance.

III. RESEARCH METHODOLOGY

A quantitative survey study was designed and carried out to gather data on patients' opinions, experiences, and knowledge of telehealth. This study went through the rigorous review process under the Institution Review Board (IRB) at the authors' university and was approved according to the 45CFR46.101(b)(2): (2) Tests, Surveys, Interviews. The research population is any patient who experienced telehealth services in the United States and aged 18 years and older. The target sample size is 100 or more, and the total number of responses received was 72. The survey instruments were input into the Google Form tool and a URL to the online survey was posted on social media channels such as LinkedIn and Facebook. Data were collected and stored in Google Form and the data collection period was from January 24th, 2022 until March 15th, 2022.

All data that did not meet the study criteria were excluded. Descriptive statistics such as mean and standard deviation plus the Pearson correlation statistics between critical variables had been chosen since they can demonstrate a relationship between dependent and independent variables. For instance, the correlation between patient age and access availability of telehealth aimed to illustrate which age group primarily accessed the telehealth services and bring insight on telehealth accessibility to other groups. In addition, linear regression analysis was used to test hypotheses proposed as follows based on the literature review.

This research investigates four hypotheses:

- H1. Patient satisfaction levels with telehealth services positively affect their desire to select telehealth services to receive healthcare.
- H2. The type of clinics specialties that patients visit when receiving telehealth services has a significant impact on the availability of access to telehealth during the pandemic.
- H3. Patient waiting time to receive telehealth services has a significant effect on their desire to select telehealth to receive healthcare services.
- H4. Annual income has a significant impact on patient desire to select receiving healthcare services remotely via telehealth.

The dependent variable (DV) and independent variable (IV) for this study were given in Table I.

TABLE I
 DEPENDENT AND INDEPENDENT VARIABLES

Hypothesis	IV (X)	DV (Y)
1	Satisfaction level	Selecting Telehealth
2	Accessibility during COVID-19	Type of Clinics Specialties
3	Waiting time	Selecting Telehealth
4	Annual income	Selecting Telehealth

IV. DATA ANALYSIS AND RESULT

The total number of responses was 72, and all data that did not meet the research criteria were excluded as the following:

- One response never used telehealth.
- Eight respondents had experienced telehealth in different countries.
- One response did not complete the survey.

A. Sample Size, Demographic Data, and Descriptive Statistics

The total sample size is sixty-two (n = 62) participants who met the research criteria. Table II represents the demographic data. 75.81% of the participants were female. This value indicates that female shows more interest in participating in this research and have experienced telehealth, approximately 52% higher than men as illustrated in Fig. 1. Moreover, 67.74% of the entire response refers to patients in Virginia compared to other states in the country as shown in Fig. 2, and 50.00% of the participants were Caucasians among various ethnic groups as summarized in Fig. 3.

The demographic data illustrated that patients in the middle age (25-44) show more interest to experience telehealth by approximately 13% as shown in Fig. 4 and 27% of them have an annual income of \$25,000-\$34,999 as shown in Fig. 5. This result explained that most patients who preferred telehealth had low annual income and were considered middle-aged patients.

TABLE II
 SAMPLE SIZE AND DEMOGRAPHIC DATA

Variable	Value	Variable	Value
Sample size, N	62	States, n (%)	
Gender, n (%)		BA	1 (1.61%)
Female	47 (75.81%)	DC	3 (4.84%)
Male	15 (24.19%)	DE	1 (1.61%)
Age Group, n (%)		IL	3 (4.84%)
18-24	12 (19.35%)	IA	1 (1.61%)
25-34	20 (32.26%)	KY	1 (1.61%)
35-44	20 (32.26%)	MD	5 (8.06%)
45-65	10 (16.13%)	NJ	2 (3.23%)
Race, n (%)		NY	2 (1.61%)
Arab American	1 (1.61%)	PA	1 (1.61%)
Asian	1 (1.61%)	VA	42 (67.74%)
Black or African America	7 (11.29%)	WA	1 (1.61%)
Central Asian	1 (1.61%)	Annual Income, n (%)	
Middle East	7 (11.29%)	> \$100,000	14 (22.58%)
Mix LatinX	1 (1.61%)	\$25,000 - \$34,999	17 (27.42%)
Prefer not to Say	6 (9.68%)	\$35,000 - \$49,999	8 (12.90%)
White	31 (50.00%)	\$50,000 - \$74,999	8 (12.90%)
Asian American	7 (11.29%)	\$75,000 - \$99,999	6 (9.68%)
		N/A	9 (14.52%)

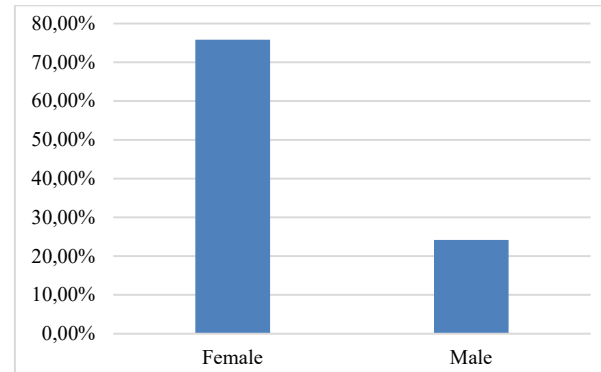


Fig. 1 Percentage of the participants among gender

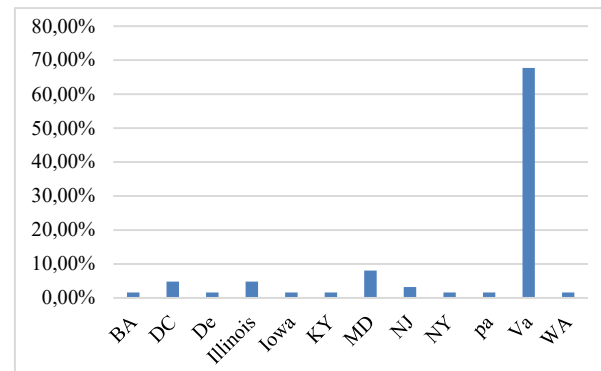


Fig. 2 Percentage of the participants from various states in the United States

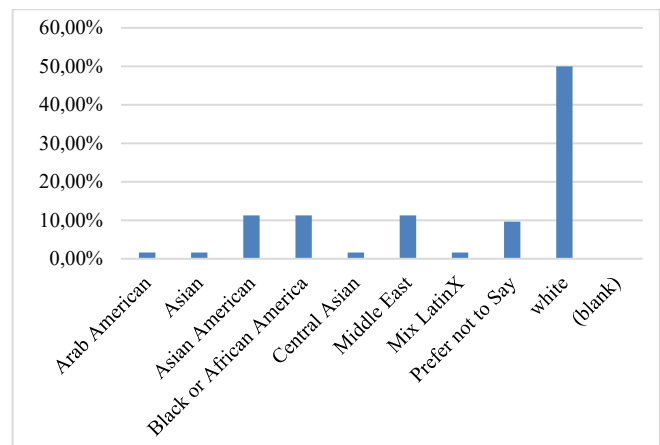


Fig. 3 Percentage of the participants among race

Since the data used in the survey were categorical, transforming them to numeric is necessary to calculate the descriptive statistics. We refer to Table III for variable's numerical transformation.

Descriptive statistics are represented in Table IV for age and annual income where the categorical data are transferred to numerical data. The mean represents the data set's average, also called the measure of the central tendency, and the standard deviation measures how data are distributed around the mean. The participant age average was 2.45 and the standard deviation was 0.989 which means that the difference in the average

number of participants' age is about 0.989 from the mean. Furthermore, the annual income average is 2.43, and the standard deviation is 1.8, which means that the difference in the average numbers of the annual income is about 1.8 from the mean in Fig. 6.

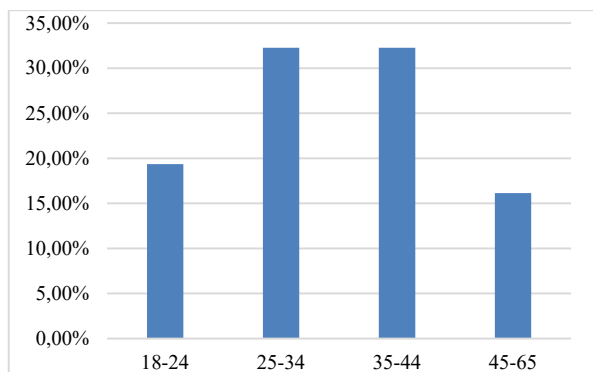


Fig. 4 Percentage of the participants among age groups

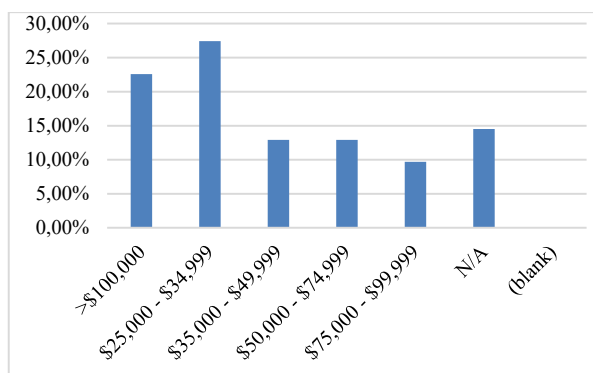


Fig. 5 Percentage of the participants among annual income

TABLE III
NUMERICAL TRANSFORMATION

Survey Question	Survey Options	Value
Age Group	18-24	1
	25-34	2
	35-44	3
	45-65	4
	>65	5
	Other	0
Annual Income	\$25,000 - \$34,999	1
	\$35,000 - \$49,999	2
	\$50,000 - \$74,999	3
	\$75,000 - \$99,999	4
	> \$100,000	5
	Other	0

TABLE IV
DESCRIPTIVE STATISTICS FOR AGE AND ANNUAL INCOME

Age Group		Annual Income	
Mean	2.452	Mean	2.435
Standard Deviation	0.986	Standard Deviation	1.807

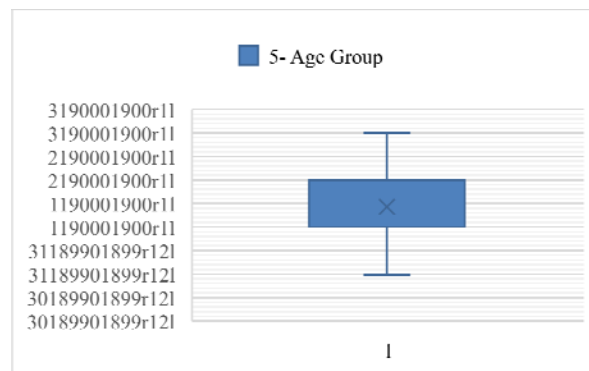


Fig. 6 Distribution of the age group data from the mean

B. The Essential Domain Applications Related with Telehealth

Delivering an effective telehealth requires an efficient platform that provides end-to-end encryption for video conferences and has an excellent ability to share necessary documentation or images. Healthcare providers are responsible for facilitating remote healthcare delivery for patients needed with a platform that comply with Healthcare Insurance Portability and Accountability Act (HIPAA) regulations. The survey findings in Fig. 8 show that about 29% of healthcare providers used Zoom for virtual conferences, significantly higher than other telehealth software adopted by the hospitals, such as MyChart in addition to various platforms such as Facetime or Google Meet.

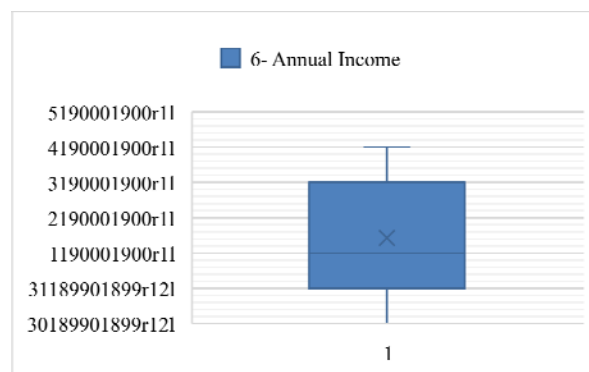


Fig. 7 Distribution of the annual income data from the mean

A patient with chronic diseases needs to assess the vital signs or continue to monitor them. For example, a patient who has uncontrolled high blood pressure needs to keep tracking her blood pressure during daily life activities in order to assess health condition and take any appropriate measures if needed. Moreover, such tracking and assessment requires additional monitoring devices such as Remote Patient Monitoring to ensure all patient data are recorded and monitored. The survey result, as illustrated in Fig. 9, revealed that 37% had measured their vital signs at home, whereas 5% of the participant had used advanced modalities such as fitness watches and Remote Patient Monitors. 32% had a walk to the nearest clinic for vital signs or other investigations such as blood tests. The data show that for certain specialty clinics, utility of telehealth is

particularly high by enabling qualified healthcare to be delivered remotely by collecting all necessary data from patients related to health conditions from a distance.

$$(df) = n-2,$$

$$62-2= 60$$

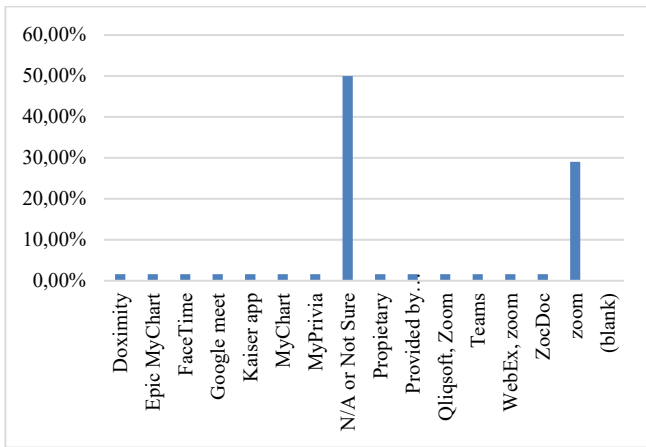


Fig. 8 Most common application used to facilitate communication with patient through telehealth

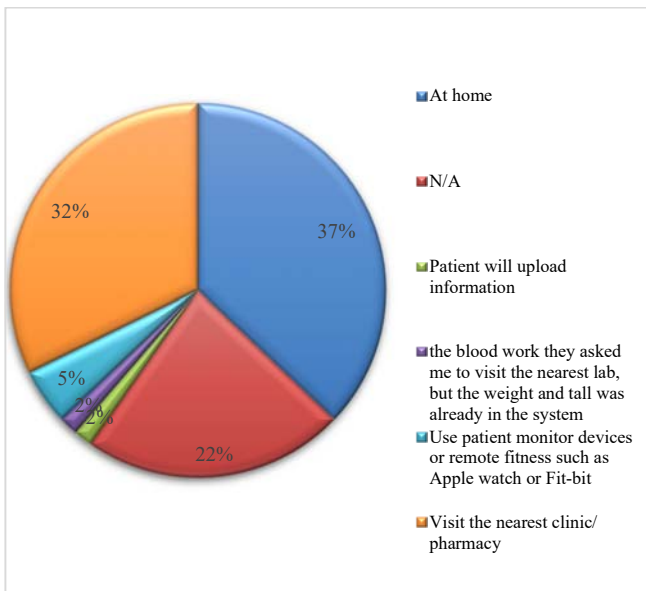


Fig. 9 Different ways patients used to record vital signs

C. Correlation and Linear Regression Analysis

Pearson correlation is the r-value, and when it is equal to 0, the null hypothesis indicates no relationship between variables. If it is not equal to 0, it is essential to demonstrate the absolute value of the coefficient, which reflects the correlation strength. When the r-value is 0 to 1, it indicates a positive correlation, and if it is 0 to -1, it is a negative correlation—interpreting r-value based on [16].

Identifying the significance of the relationship through linear regression allowed us to determine whether the relationship between a dependent variable and an independent variable was statically significant, comparing it to alpha equal to 0.05. In this study, a significant level is an alpha equal to 0.05 or 0.01 depending on the case, and the degree of freedom is:

Table IV illustrates the results of the correlation and Linear Regression test that is used to test hypotheses. It shows that there is a moderately positive relationship between patient satisfaction levels and their desire to select telehealth services, and the relationship is statically significant, $r_{(60)} = 0.54$ and $p < 0.01$. This finding indicated that patient satisfaction levels substantially impact their choice to receive telehealth services. Therefore, it is essential to follow up with patients and spend enough time discussing their condition to ensure they are satisfied with the services delivered.

There is a weak positive relationship between the type of clinics specialties that patients visit via telehealth and the availability of access to telehealth during the pandemic, and the relationship is statically significant, $r_{(60)} = 0.30$ and $p < 0.05$. The findings explained that the availability of access to telehealth services could differ depending on the type of clinics' specialties such as clinics where patients do not require to do hospital tests such as X-rays or labs can benefit more from telehealth services. However, the hypothesis that waiting time to receive telehealth services has a significant adverse effect on their desire to select telehealth to receive healthcare services was rejected. The correlation and linear regression result showed a very weak or no relationship between variables and $p > 0.05$. This finding reflects that patients covet to receive telehealth services in spite of a long period of waiting time to receive care. Due to the limited sample size, this result might vary with a larger sample. The other hypothesis rejected is on annual incomes significantly impacting patients' desire to select receiving healthcare services remotely via telehealth. The correlation and linear regression result did not support the hypothesis since it showed a very weak or no relationship between variables and $p > 0.05$. The result demonstrated that yearly payments have no direct effect on patients' decision to receive healthcare services remotely via telehealth. However, this result might vary if applied to a larger sample. Scatter plots that assess linearity in Figs. 10-13 explained homogeneity.

TABLE V
CORRELATION AND LINEAR REGRESSION

Hypothesis	r-value = multiple R	Coefficient Interpretation	p-value	Significance
1	0.5451	Moderate relationship	0.0000046	Significant
2	0.3037	Weak relationship	0.01640	Significant
3	0.09278348	Very weak or no relationship	0.473214	Not Significant
4	0.09589508	Very weak or no relationship	0.458436	Not significant

V. DISCUSSION

The adaption and utilization of telehealth services during the pandemic have been skyrocketing as a contactless alternative to mitigate the contagious spread of COVID-19. This study evaluated patient perspectives on telehealth that extended delivery of qualified and effective remote healthcare services,

assessed barriers that might impact telehealth effectiveness, and highlighted the vital domain applications that extend telehealth usability.

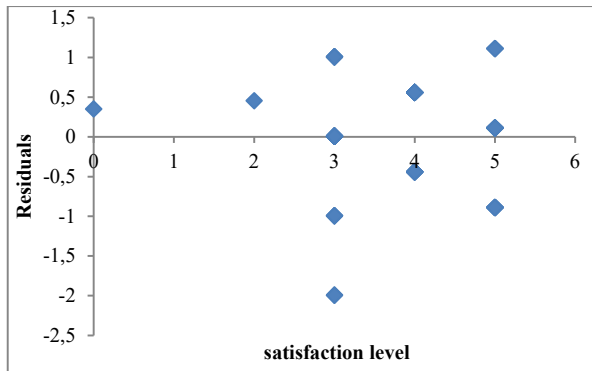


Fig. 10 Satisfaction Level Residual Plot

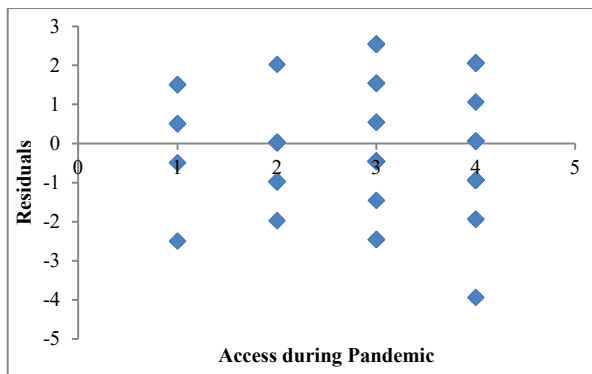


Fig. 11 Access during Pandemic Residual Plot

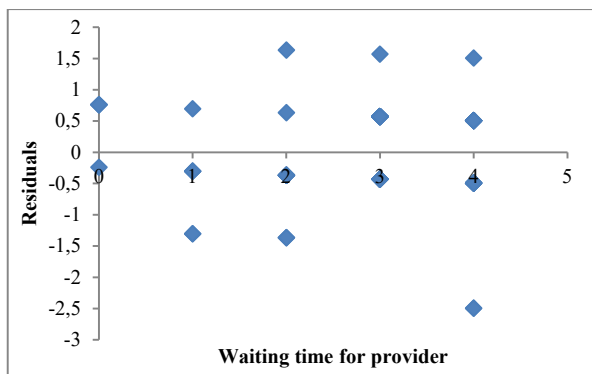


Fig. 12 Waiting Time for Provider Residual Plot

Data collected included demographic data that represented female Caucasians who showed more interest in sharing their experience with telehealth among other gender and ethnic groups. Furthermore, most of the participants were middle-aged, which implies their ability to deal with technology. In addition, most of the participants in this study live in Virginia State of the United States, which reflected their ability to access telehealth compared to others who live in rural areas. Therefore, this result might vary if applied to larger sample size including people living in rural areas. The result confirmed the findings in [4] that the availability of technology in urban areas

facilitates accessibility to telehealth services compared with other far regions in the country. Furthermore, [6] found that patients and healthcare providers were satisfied with telehealth as a tool facilitating care services from a distance. That means professionals deliver effective communication with their patients to ensure their satisfaction. The literature supported the first hypothesis in this paper, where satisfaction level positively impacts patient desire to select telehealth compared to in-person visits. For that reason, providing health care services to patients with professionalism and expertise is the critical success factor for telehealth practice, especially during virtual conferences. The satisfaction level with the service will in turn encourage patients to use telehealth in the future compared to in-person visits.

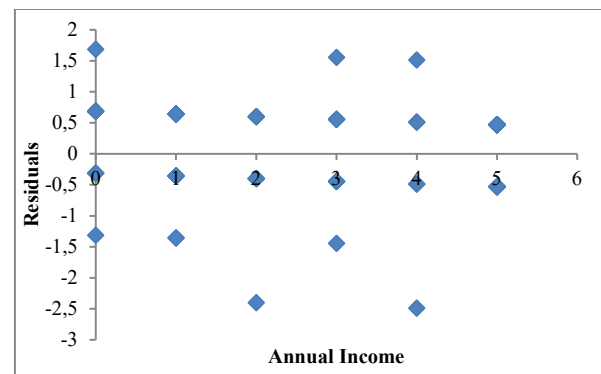


Fig. 13 Annual Income Residual Plot

Reference [9] found that patients with chronic diseases such as uncontrolled blood pressure are significantly benefited from telehealth. Our study found that telehealth encouraged patients to self-measure their blood pressure and manage the required data. Reference [9] supported the second research hypothesis of our study. Certain types of clinics specialties were significantly affected by accessibility to telehealth services positively during the pandemic. That means telehealth has a significant impact on improving patient health and quality of care for specific clinics specialties such as chronic diseases clinics where those clinics do not require hospital intervention procedures. Therefore, the availability of access to telehealth for those clinics is essential.

Reference [15] found that in-person visits were the first choices for patient selection for a future visit by about 70% of patients. Patients recommended that decreasing waiting time can improve facilitating telehealth delivery. However, the rejected hypothesis in this study showed a very weak or no relationship between waiting time to receive telehealth and patient desire to select telehealth services in the future. The limited sample size might impact this result and the result may change for a more significant number of participants.

Reference [5] considered significant barriers that might impact telehealth, such as cost, reimbursement, and technical issues. However, the last hypothesis was rejected since it shows no significant relationship between annual income and patient desire to select telehealth for future visits. That results required more investigation with a larger sample size since the sample size in this study was limited.

Reference [10] found that 88.1% of patients who received eye care via telehealth were satisfied with the services and preferred using virtual meetings. This study found that Zoom was the most common platform that a healthcare provider used. The recent update by Zoom illustrated that Zoom launched end-to-end encryption (E2EE) for video conferences, which provides higher level of security and privacy protection for user communications.

Reference [9] found that patients had high self-control to measure and monitor their uncontrolled blood pressure via telehealth. This study supported our findings that patients used various tools to recode their vital signs, such as fitness watches, Patient Remote Monitor, or home scales. That means a patient can measure and deliver the required data from a distance.

It is essential to highlight the limitation that might impact the study results and require further investigations. Collecting data in approximately two months was not efficient in expanding the sample size. Furthermore, some data were excluded since it did not meet the research criteria. In addition, some hypotheses were rejected due to the insignificance relationship between dependent and independent variables, which might vary in a larger sample.

Healthcare providers, policy makers, researchers, and related communities of practitioners must collaborate and conduct further studies on telehealth adoption and implementation; the outcomes can shape the future of telehealth. In addition, allowing patients to share their direct evaluations of the received services can highlight challenges. In addition, that will encourage researchers to collect data for future studies since it is more realistic to have surveys filled out by patients immediately after each visit. Those studies can provide more insights for researchers and healthcare communities to deliver effective care remotely to decrease disparities.

VI. CONCLUSION

Healthcare organizations aim to deliver effective and efficient healthcare for patients from a distance to mitigate COVID-19 infection and spreading. Telehealth is a contactless alternative that ensures patients receive care in a safer manner. This study highlighted patient perspectives on telehealth during the pandemic. Participants showed a significant positive satisfaction level with their desire to select telehealth in future visits. In addition, the type of clinics specialties showed positive association with the availability of access to telehealth for these clinics. Future studies are essential to compare telehealth services in different countries to improve healthcare delivery.

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