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Improving Access to Cardiovascular Care Through Telehealth: A Single-Center Experience

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Abstract

Background: Historically, access to healthcare has been a serious shortcoming of our healthcare system. Approximately 14.5% of US adults lack readily available access to health care and this has been worsened by the coronavirus disease 2019 (COVID-19) pandemic. There are limited data on the use of telehealth in cardiology. We share our single-center experience in improving access to care via telehealth at the University of Florida, Jacksonville cardiology fellows' clinic.

Methods: Demographic and social variables were collected 6 months before and 6 months after the initiation of telehealth services. The effect of telehealth was determined via Chi-square and multiple logistic regression while controlling for demographic covariates.

Results: We analyzed 3,316 cardiac clinic appointments over 1 year. Of these, 1,569 and 1,747 were before and after the start of telehealth, respectively. Fifteen percent (272 clinical encounters) out of the 1,747 clinic visits during the post-telehealth era were through telehealth, completed via audio or video consultation. Overall, there was a 7.2 % increase in attendance after the implementation of telehealth (P value < 0.001). Patients who attended their scheduled follow-up had significantly greater odds of being in the post-telehealth group while controlling for marital status and insurance type (odds ratio (OR): 1.31, 95% confidence interval (CI): 1.07 - 1.62). Patients who attended had higher odds of having City-Contract insurance - an institution-specific indigenous care plan (OR: 3.51, 95% CI: 1.79 - 6.87) compared to private insurance. Patients who attended also had higher odds of being previously married (OR: 1.34, 95% CI: 1.05 - 1.70) or married/dating (OR: 1.39, 95% CI: 1.05 - 1.82) compared to patients who were single. Surprisingly, telehealth did not lead to an increase in the use of Mychart, our electronic patient portal (P value = 0.55).

Conclusions: Telehealth enhanced patients' access to care by improving appointment show-rate in a cardiology fellows' clinic during the COVID-19 pandemic. Telehealth as a resource adjunct to traditional care in cardiology fellows' clinic should be further explored.

Keywords: Telehealth; Cardiology; Telemedicine; Virtual care; Fellow-in-training; COVID-19

Introduction

Historically, access to healthcare in the United States has been a shortcoming of our healthcare system. Of the myriad of reasons why access has been difficult for many, healthcare costs, transportation barriers, availability of specialized care in the community, and trust in our healthcare system are recognized as significant barriers [1-7]. Indeed, health care cost continues to be reported as a prohibitive factor for many individuals, with a 2019 Centers for Disease Control and Prevention (CDC) report revealing that 8.3% of adults failed to obtain needed medical care due to cost [1]. Additional studies have also cited that the most common reason for the lack of insurance for Americans is the cost [2]. There is a notable 40% increased risk of death among uninsured patients due to advanced presentation and delayed care compared to patients with health insurance [3].

Transportation barriers pose an additional challenge, leading to rescheduled or missed clinic appointments and delayed care [4]. Patients without access to a vehicle, who live in rural areas, and who have a significant travel-time burden report more missed clinic appointments than their counterparts without transportation barriers [5]. Finally, lack of access to specialty care, including cardiology, remains an ongoing barrier. Not only is the current and predicted supply of cardiologists insufficiently meeting the demand, but the growing shortage is disproportionally affecting underserved communities, including low-income and rural communities [6-9].

Unfortunately, the coronavirus disease 2019 (COVID-19) pandemic has exacerbated all the barriers discussed. Following the guidance from public health officials, many hospitals and outpatient clinics, including specialty care, adopted policies to decrease patient volumes and decrease infection spread [10,

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11]. Consequently, these needed changes have worsened access to health care services, including cardiac care [12, 13]. Patients, understandably so, have also developed anxiety towards visiting healthcare centers due to fear of being exposed to infections [12]. In the United States, the no-show rate in clinics is as high as 30%, constituting about $150 billion in healthcare costs annually [14]. Missed outpatient appointments often result in delayed care, advanced stage of diseases at diagnosis, more emergency room visits, and overall adverse healthcare outcomes for patients [15]. Populations most affected by these factors include the young, minorities, and Medicaid populations [11]. Due to these challenges, there is increased awareness and reliance on telehealth to supplement traditional care [16, 17].

In the United States, many cardiology clinics reported incorporating telehealth services to augment their traditional care within 2 weeks after the onset of the pandemic [18-23]. Indeed, the remarkable shift and adoption of telehealth by healthcare systems and insurance providers has been motivated by agreeable regulatory changes. In March 2020, the Centers for Medicare and Medicaid services broadened their reimbursement coverage policies to include telehealth services [13]. In some studies, telehealth has been shown to increase access to healthcare and improve patient satisfaction across all demographics except in marginal populations including older patients, non-English speaking patients, and other ethnic/racial minorities [14, 15]. At the University of Florida, Jacksonville, we implemented strategic use of telehealth as an alternative to the traditional cardiology office visit. The goal of utilizing telehealth is the provision of specialized care to patients in the comfort of their homes without the need for travel while also eliminating patient anxiety about exposure to COVID-19 in the hospital. In this article, we present our experience and outcomes on the use of telehealth to bridge the gap in healthcare availability for patients in our cardiology clinics.

Materials and Methods

A retrospective cohort study was performed starting in March 2020. Approval was obtained and granted by the University of Florida Institutional Review Board (IRB) to conduct our study. This study was conducted in compliance with the ethical standards of the University of Florida IRB on human subjects.

Data on the effectiveness of telehealth were collected over 1 year: 6 months before and 6 months after the start of providing telehealth services. Early in the pandemic, all encounters were via audio telephone encounters using the registered patient contact information in our electronic medical record system, EPIC. After the first few months of the pandemic, an audiovisual (video) system was integrated into EPIC, which automatically linked with the patient's chart and telehealth encounters. This information was pooled from EPIC to create our database. Our database included all telehealth encounters from this period that were completed and closed. There were no failed telehealth encounters. Several variables were recorded during this period including the total number of cardiac clinic appointments, rate of missed appointments, number of patients utilizing MyChart (our institution's electronic patient portal), and the no-show rate (appointments not canceled or rescheduled prior to appointment time) before and after initiation of telehealth services. Patient demographics including age, sex, race, marital status, zip code, and insurance type were also recorded. Our study did not include any variables based on comorbidities or medical history as we focused primarily on logistical and demographic aspects of telehealth access. Physical examinations during telehealth encounters were limited to visual inspection and any abnormalities they may have, otherwise no additional data were collected. All variables are categorical and characterized via frequency and percentage. Descriptive statistics for the entire cohort are then stratified by telehealth availability and attendance. In the univariate analyses, Chi-square tests were used to determine if each covariate is associated with the main independent and dependent variable of interest. Any covariate having a significant association with the dependent variable (attendance) in the univariate test at 0.15 level of significance (i.e., P value < 0.15) was selected for the multivariable analysis and entered into the variable selection process in the multiple logistic regression model. All the covariates with a P value < 0.05 in the final multiple logistic regression model were considered statistically significant, controlling for all the other variables retained in the model.

Results

A total of 3,316 clinic visits were conducted with various cardiology fellows-in-training in our cardiology department in the 6 months before and after the initiation of telehealth services. Out of these total clinic visits, 1,569 were before the start of telehealth services. Fifteen percent (272 clinical encounters) out of the 1,747 clinic visits during the post-telehealth era were through telehealth. All telehealth encounters (both audio-only and audiovisual) were completed successfully without technical difficulties. Patient characteristics were similar before and after the start of telehealth except for the type of insurance coverage as noted in Table 1.

As shown in Table 2, the implementation of telehealth resulted in a significant increase in show-rate among patients in our cardiology clinic (7.18 percentage point difference, P value < 0.001) compared to pre-telehealth, in univariate analysis.

To ensure similar demographics and baseline characteristics by appointment status, all demographic covariates were also stratified by appointment status (Table 3).

In the multivariable analysis (Table 4), all covariates meeting the P < 0.15 threshold were included in the variable selection process. Age, sex, and race were excluded from the multiple logistic regression model during the selection process due to non-significance, while insurance type, marital status, and telehealth were included. Patients who attended a visit had significantly greater odds of being in the post-telehealth group while controlling for marital status and insurance type (odds ratio (OR): 1.31, 95% confidence interval (CI): 1.07 - 1.62). Patients who attended their clinic visits (in person or via telehealth) had higher odds of having City-Contract (indigenous care plan) insurance (OR: 3.51, 95% CI: 1.79 - 6.87) compared

Table 1. Demographic Covariates Stratified by Availability of Telehealth

Variable	Frequency (percent)		P value
	No telehealth (n = 1,569)	Telehealth (n = 1,747)	
Age, median (mean)	54 (50.4)	54 (50.9)	
Gender			0.917
Male	625 (39.8%)	699 (40.0%)	
Female	944 (60.2%)	1,048 (60.0%)	
Race			0.667
White	581 (37.0%)	632 (36.2%)	
AA	847 (54.0%)	943 (54.0%)	
Other	141 (9.0%)	172 (9.8%)	
Marital status			0.855
Previously married	517 (33.4%)	566 (32.6%)	
Married or dating	337 (21.8%)	399 (23.0%)	
Single	672 (43.4%)	747 (43.1%)	
Other	22 (1.4%)	23 (1.3%)	
Visit type[a]			NA
Established patient	931 (59.3%)	814 (46.6%)	
New patient	616 (39.3%)	628 (40.0%)	
Televisit	0 (0.0%)	272 (15.57%)	
Other	22 (1.4%)	33 (1.89%)	
Insurance			< 0.001*
Private	27 (2.1%)	80 (5.3%)	
Medicare	31 (2.4%)	115 (7.6%)	
Medicaid	946 (73.5%)	1051 (69.6%)	
City-Contract	259 (20.1%)	230 (15.2%)	
Other	25 (1.9%)	35 (2.3%)	

*Statistically significant (P value < 0.05). [a]Visit type is excluded from the analysis to avoid multicollinearity with the telemedicine variable. AA: African American; NA: not available.

to private insurance. Finally, patients who attended their clinic visits had higher odds of being previously married (OR: 1.34, 95% CI: 1.05 - 1.70) or married/dating (OR: 1.39, 95% CI: 1.05 - 1.82) compared to patients who are single.

Discussion

In this study, we demonstrate that the availability of telehealth improves the show-rate for patients in a busy cardiology fellows-in-training outpatient clinic. Multiple studies have demonstrated that telehealth is beneficial to the care of cardiac patients (without compromising clinical outcomes), especially during the COVID-19 pandemic [14-16]. Studies have shown that patients who receive care via telehealth have no increase in subsequent acute care visits or mortality [14]; have comparable clinical outcomes to in-person visits [15]; and are without any decrease in patient satisfaction scores [16].

Table 2. Chi-Square Analysis Between Introduction of Telehealth and Attendance of Scheduled Visits

Telehealth	Attendance		P value
	Show	No-show	
No telehealth	1,099 (70.04%)	470 (29.96%)	< 0.001
Telehealth	1,349 (77.22%)	398 (22.78%)	

With the COVID-19 pandemic, the importance of telehealth has gained increased momentum as a viable adjunct to traditional care [17]. Though several barriers exist to its implementation, recent research shows that patients are willing to use telehealth services, especially during the pandemic [18]. Barriers to the use of telehealth include lack of infrastructure; lack of awareness of telehealth as a viable option; and the unwillingness of patients to see any provider (rather than patients' primary provider) during telehealth visits [19]. Payers and insurance companies are also beginning to see the benefit and are encouraging the use of telehealth. In response to the COVID-19 pandemic, the Centers for Medicare and Medicaid Services and many commercial health plans have waived co-pays for telehealth visits to encour-

Table 3. Demographic Covariates Stratified by Appointment Status

Variable	Frequency (percent)		P value
	Show (n = 2,448)	No-show (n = 868)	
Gender			
Male	965 (39.1%)	368 (42.4%)	0.084
Female	1,492 (60.9%)	500 (57.6%)	
Race			
White	928 (37.9%)	285 (32.8%)	0.011*
AA	1,284 (52.5%)	506 (58.3%)	
Other	236 (9.6%)	77 (8.9%)	
Marital status			
Previously married	818 (33.6%)	265 (31.1%)	0.021*
Married or dating	565 (23.2%)	171 (20.1%)	
Single	1,020 (42.0%)	399 (46.9%)	
Other	29 (1.2%)	16 (1.9%)	
Visit type[a]			
Established patient	1,299 (53.1%)	446 (51.4%)	NA
New patient	873 (35.7%)	371 (42.7%)	
Telehealth	243 (9.9%)	22 (2.5%)	
Other	33 (1.3%)	29 (3.4%)	
Insurance			
Commercial	91 (3.9%)	16 (3.6%)	< 0.001*
Medicare	126 (5.3%)	20 (4.6%)	
Medicaid	1,633 (69.2%)	364 (82.9%)	
City-Contract	462 (19.6%)	27 (6.2%)	
Other	48 (2.0%)	12 (2.7%)	

*Statistically significant (P value < 0.05). [a]Visit type is excluded from the analysis to avoid multicollinearity with the telemedicine variable. AA: African American; NA: not available.

age more utilization among patients.

Initially, telehealth was limited to primary care services but there is now a strong trend toward the use of telehealth in specialized care. This new trend is exemplified in a few ophthalmology practices that have effectively incorporated the use of telehealth for routine screening of diabetic retinopathy and

Table 4. Multiple Logistic Regression Results (Attendance Is the Dependent Variable)

Parameter	OR	95% CI for OR		P value
Intercept				< 0.001
Marital status (reference: single)				
Previously married	1.34	1.05	1.70	0.021
Married or dating	1.39	1.05	1.82	0.019
Other	0.50	0.26	1.15	0.101
Insurance type (reference: private)				
City-Contract	3.51	1.79	6.87	< 0.001
Medicaid	0.85	0.49	1.47	0.551
Medicare	1.03	0.50	2.12	0.927
Other	0.78	0.34	1.78	0.548
Telemedicine	1.31	1.07	1.62	0.011

CI: confidence interval; OR: odds ratio.

other routine ophthalmic care [20-26]. It is well known that telehealth decreases the risk of infectious disease transmission, and therefore could lead to a decrease in the spread and morbidity/mortality of COVID-19 in the hospital setting. Despite these advantages, the emergence of telehealth in cardiology is relatively new as there are limited data on the impact of telehealth on the effectiveness of cardiac care and adherence to cardiology appointments.

In this single-center experience during the COVID-19 pandemic, we demonstrate that telehealth decreased patient no-show rate/missed clinic appointments in a busy cardiology fellows' outpatient clinic and thus is an effective adjunct to traditional care in this setting. Of note, no outcome data were collected, and while such data would have been insightful this was beyond the scope of our study objectives, which strictly focused on improving no-show rates (non-clinical outcome) with the introduction of telehealth services at our center. We speculate that patients find telehealth to be an attractive tool as it is easy to use, eliminates travel needs, and allows them to exercise social distancing from the safety of their homes. The use of telehealth in our cardiology clinic was associated with an OR of 1.31 in favor of patients keeping their cardiac appointments. Interestingly, City-Contract insurance, a subsidized health care plan in Jacksonville Florida, is particularly associated with higher odds (OR of 3.51) of keeping their appointments compared to other insurance plans. This is perhaps unsurprising, as patients with City-Contract are traditionally of lower socio-economic status and therefore are more likely to appreciate the travel-free appeal of telehealth. The financial and logistical burdens of travel are often amplified in this community so the use of telehealth among the most disadvantaged patients could help reduce healthcare disparities. Marital status also has a significant positive association with telehealth use and appointment adherence. Patients who were married and who were previously married show significantly higher odds of keeping their appointments using telehealth services when compared to patients who are single. Marital status has been shown to associate with lower risk and better health outcomes [27]. Our findings align with the concept of a "marriage protective effect" even during the COVID-19 pandemic. Having a spouse or a significant other is likely the stimulus for many to adhere to medical follow-up and our findings are congruent with this epidemiologic observation. A somewhat surprising finding in our study was that the availability of telehealth did not lead to an increase in the use of Mychart, the electronic patient portal (P valve 0.55). The use of Mychart is a requisite for telehealth visits at our institution. While we speculate that had the use of Mychart increased during the study, the use of telehealth by patients may have been even greater, we recognize that the underutilization of this important portal represents an important gap in the care of all our patients, especially our indigent population.

A few limitations in our study include the short study duration of 1 year, the single-center nature of the study, and the relatively small proportion of telehealth visits. However, none of these limitations affect the validity of the study findings. To our knowledge, this is one of the first studies conducted solely in a cardiology fellows' clinic in an inner-city population at a major university-affiliated hospital during the COVID-19 pandemic. While our study's aim was limited to assessing the impact of telehealth on show-rate in our outpatient cardiology fellow's clinic population, we hope that future studies can involve a broader clinic population and a more comprehensive assessment of the role of comorbidities in telehealth perception and compliance.

Based on our findings, we advocate the incorporation of telehealth services in cardiology fellows' clinics to reduce no-show rates and improve access to care for patients. Telehealth's strong performance in our indigenous city contract patients suggests it is particularly appealing to the most disadvantaged populations, and as such, represents a potential mechanism to help reduce cardiovascular health disparities in vulnerable groups.

Conclusions

Telehealth enhanced patients' access to care by improving appointment show-rate in a cardiology fellows' clinic during the COVID-19 pandemic. Telehealth as a resource adjunct to traditional care in cardiology fellows' clinic should be further explored.

Acknowledgments

None to declare.

Financial Disclosure

None to declare.

Conflict of Interest

There are no conflicts of interest by authors involved in this project.

Informed Consent

All informed consents relevant to this study were obtained in accordance with the University of Florida IRB mandates.

Author Contributions

Okechukwu Mgbemena, Kyeesha Becoats, Ian Tfirn, and Gladys Velarde contributed to the design, analysis, preparation of this manuscript, and final review of the manuscript. Edin Sadic, Azeem Rathore, and Steve Antoine contributed to preparation of this manuscript, and final review of the manuscript.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Abbreviations

COVID-19: coronavirus disease 2019; OR: odds ratio; CI: confidence interval

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