Increased Revenue From Averted Missed Appointments Following Telemedicine Adoption at a Large Federally Qualified Health Center

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ABSTRACT: This study examined savings from averted missed appointments following telemedicine adoption. Data were obtained from a large Federally Qualified Health Center in Texas during the early pandemic months. Patient encounters fell into one of three categories: (1) in-person visit, (2) telemedicine alone with no support team engagement, and (3) telemedicine with previsit support team engagement for device and connectivity testing. Our findings revealed that in-person visits had a 21% missed appointment rate compared to 19% for telemedicine alone and 15% for telemedicine with previsit support. Translating the reductions following both telemedicine encounters into net reimbursement, telemedicine alone saved the Federally Qualified Health Center $16 444 per month, while telemedicine + support team reduced missed appointments and saved the clinic an additional $29 134. The revenue from averted missed appointments totaled $45 578 per month. In conclusion, telemedicine reduced missed appointments, and these averted missed appointments translated into cost-savings. Savings were more pronounced with the implementation of a support team that conducted previsit device and connectivity testing.

KEYWORDS: Cost-impact analysis, telemedicine, community-based clinics, missed appointments

Introduction

With the United States (US) spending almost twice as much as other wealthy countries on health care but lagging in primary care access measures, there are renewed calls for solutions to revamp how we deliver care. Telemedicine, which is the remote delivery of health care through the use of technology, offers a potential solution. In recent years, widespread telemedicine implementation has been increasing efforts to improve access to care, as well as to provide cost-effective health services to patients, especially those who reside in medically underserved or rural areas. Telemedicine tends to remove or minimize the effects of specific barriers, such as distance and ability, so that individuals can consult with physicians regardless of circumstance.[1]

Federally Qualified Health Centers (FQHCs) have become major primary care providers for millions of Americans. Often referred to as Community Health Centers, they provide medical, pediatric, dental, and behavioral health care to community members regardless of patient insurance status or ability to pay for services. About 1 in every 11 persons in the US receives services from Community Health Centers, making them a key component of the health care safety net.[2] Over the past decade, the US experienced a substantial growth in FQHCs following the passage of the Affordable Care Act, which prompted expansions in newly insured populations and placed a significant demand on primary care services, particularly in underserved, low-income communities.[3,4] Because of limited funding, FQHCs are often restricted in the sophistication of services that they offer; hence, telemedicine was not readily available in most FQHCs prior to 2020.

The COVID-19 pandemic provided an opportunity to address telemedicine capacity through the Coronavirus Aid, Relief, and Economic Security (CARES) Act, which authorized clinics, including FQHCs, to extend telemedicine services to Medicare and Medicaid beneficiaries at adequate reimbursement rates during the pandemic.[5] FQHC administrators understood that an optimal transition to telemedicine required a considerable allocation of human capital and technology resources; otherwise, utilization of telemedicine could exacerbate existing health disparities.[6] Like many other ambulatory care providers, FQHCs experienced a profound decrease in the volume of in-person visits following the stay-at-home orders of the pandemic due to patient avoidance of in-person visits and limited patient understanding on how to use virtual care platforms.

Considering the digital divide,[7] (defined as disparities in access to smart devices and the internet), as well as its potential impact on patients' adoption of telemedicine, the FQHC system recognized that telemedicine alone could not be a panacea for its patient population and that such a transition could unravel additional challenges with financial ramifications. Hence, it is important for this mode of care to, at worst, break even; at best, it would exceed expected return on investment from the clinic perspective. Recognizing adoption barriers that often exist for people with lower socioeconomic status (SES), the FQHC system provided a technology support program to

bridge patient technology gaps, reduce the likelihood of missed appointments, and improve the patient experience.

Missed appointments impose a major burden on the health care system, as they are associated with higher health care costs and poorer health outcomes for patients due to delayed treatment or diagnosis.[8] Beyond the revenue losses associated with missed appointments, missed appointments may contribute to health care costs further downstream.[9] Studies have shown that individuals with chronic diseases who require continued care for treatment have a higher chance of hospitalization if they miss their appointments.[9]

This manuscript describes the implementation of telemedicine at a large, 55-clinic FQHC and the potential savings associated with this transition from the FQHC perspective. This study focuses on missed appointments and increased revenue associated with reductions in missed appointments following the implementation of telemedicine and the technology support program in the clinics. Studies of this nature are important for clinics with similar patient demographics and that seek to adopt telemedicine. Missed appointments represent lost revenue, and from an operational perspective, cost-impact analyses inform go/no-go decisions and can help in planning for a successful telemedicine launch in community-based clinics.

Methods

Data were obtained from a large FQHC in Texas consisting of 23 clinic locations in 6 counties, with 55 individual clinics. Its payor mix comprises Medicaid (43%), Medicare (5%), private (19%), and uninsured (33%). One out of every two patients are Hispanic/Latino (51%), and 38% live below the 100% federal poverty level (FPL).

Program implementation: Rapid planning and implementation

Telemedicine implementation for this FQHC involved six steps:

(1) **Select and purchase telemedicine platform.** After IT configuration and vendor selection, the FQHC purchased a telemedicine platform that integrates with the organization's electronic health record (EHR) system.

(2) **Engage providers**. The FQHC convened service-line work groups charged with making determinations about visit types that were appropriate/inappropriate for telehealth, including specific protocols and algorithms for management of known or suspected COVID-19 cases. For example, well-visits for infants often require vaccinations, making this visit type inappropriate for telemedicine.

(3) **Revise provider schedules**. Clinician schedules were modified to include a certain percentage of telemedicine vs. in-person appointments; schedules were split to separate well vs. acute appointments and to add

built-in cleaning time; and hours of operation were revised to 24/7 coverage, with telemedicine appointments from 5:00 p.m. to midnight and thereafter by converting call coverage to qualifying visits where appropriate.

(4) **Disseminate scheduling protocols that prioritize telemedicine.** The FQHC developed a Microsoft PowerApp application (app)—SmartSched—with algorithms for determining appropriateness of a visit for telemedicine, including specific scheduling for known or suspected COVID-19 patients. For all appropriate visits, the app defaults to offering a telemedicine visit first. Patients may decline telemedicine if they prefer an in-person visit.

(5) **Train providers and staff, go live, and maintain ongoing IT support.** Providers received training and were supported intensively through the live launch. There is now an ongoing Microsoft Teams Chat thread that crosses service lines on which providers share insights (and common troubleshooting) with one another. IT provides 24-hour, second-line support for telemedicine.

(6) **Support uptake among patients through dedicated telemedicine support team.** The clinics redeployed staff idled by low clinic volume to assist patients with testing their smartphones to ensure sufficient technical parameters for a seamless telemedicine experience. This team began working on failed telemedicine appointments in arrears but progressed to offering real-time assistance at the point of appointment booking.

Telemedicine Support Team

The telemedicine support team intervention consisted of proactive telephonic outreach to patients with upcoming telemedicine appointments. Once a patient was reached by the team, device and connectivity testing was performed using the telemedicine online system's check tool. An appointment-level status field was created in the electronic medical record (EMR) to record the results of the outreach and/or test.

Additional levels of support and escalation pathways were created for when the team could not resolve device or connectivity issues by tapping staff in the FQHC's IT department. The appointment-level status field was replaced by a patient-level status field in the EMR to identify patients who had already successfully completed a telemedicine visit and to indicate patients considered inappropriate for telemedicine visits because of device/connectivity/technical abilities, thereby reducing the volume of patients requiring outreach from the team.

Accordingly, all patient encounters fell into one of three categories: (1) in-person visit, (2) telemedicine visit (no telemedicine support team engagement, i.e., telemedicine alone), (3) telemedicine visit (telemedicine support team conducted successful previsit device and connectivity testing, i.e., telemedicine + support

Table 1. Operational costs, August to December 2020.

COUNT OF ALL VISITS	TELEMEDICINE VISITS	TELEMEDICINE AS A % OF ALL VISITS	STANDARD LEDGER AVERAGE REVENUE PER ENCOUNTER	VARIABLE COSTS	STANDARD-LEDGER AVERAGE REVENUE PER ENCOUNTER LESS VARIABLE COSTS
164 969	31 105	18.9%	$143.63	$14.15	$129.48

team). [A small proportion of encounters (representing 5% of the sample) are not included in this analysis—those with whom the telemedicine support team conducted unsuccessful previsit device and connectivity testing].

Cost assessment

Cost assessment was conducted from the clinic perspective. For the purpose of this study, the operational cost represents the standard-ledger average revenue per patient encounter, less variable costs. This average cost masks reimbursement differences by health care payers and self-pay patients. Variable costs, including costs for worker supplies, patient care supplies, and diagnostic and therapeutic supplies, were accounted for in the final cost estimation.

Missed appointment rates were computed for all three types of patient encounters. We translated these reductions into actual numbers of "averted missed appointments" and then applied the average revenue per encounter, less variable costs, to the number of averted missed appointments: *monthly revenue = averted missed appointments × (average revenue per patient encounter − variable costs).*

Results

Table 1 shows the estimation of operational costs between August and December 2020. Of these, 53 395 were pediatrics appointments, 48 960 were family medicine appointments, 34 288 were for mental health services, 24 680 were for obstetrics/gynecology, and 3646 were for geriatrics. For pediatrics, 11% of all visits occurred via telemedicine, compared to 28% of family medicine visits, 22% of geriatrics, 57% of mental health, and 2% of obstetrics/gynecology. The average revenue per patient encounter, less variable costs, was calculated at $129.

Table 2 shows the missed appointment rates by appointment type for in-person visits, telemedicine-alone visits, and telemedicine + support team visits. The overall missed appointment rate for in-person visits was 21%. Comparatively, visits conducted via telemedicine alone had a 19% missed appointment rate while visits conducted via telemedicine + support team had an overall missed appointment rate of 15%. In other words, telemedicine alone reduced missed appointments by 2 percentage points, while successful engagement with the support team for previsit device and connectivity testing reduced the missed appointment rate by an additional 3.6 percentage points.

We translated the reductions above (−2 percentage points and −3.6 percentage points) into actual numbers of averted

Table 2. Missed appointment rates, averted missed appointments, and average revenue per patient encounter, less variable costs.

In-person missed appointment rate (a)	20.98%
Telemedicine-alone missed appointment rate (b)	18.94%
Telemedicine + successful intervention missed appointment rate (c)	15.33%
Reduced missed appointments due to telemedicine (a − b)	2.04%
Reduced missed appointments due to intervention (a − c)	3.61%
Telemedicine appointments August–December 2020	31 105
Average appointments per month	6221
Monthly appointments saved by telemedicine alone	127
Monthly revenue saved by telemedicine alone	$16 444
Telemedicine appointments August–December 2020	31 105
Average appointments per month	6221
Monthly appointments saved by telemedicine support team intervention	225
Monthly revenue saved by telemedicine support team intervention	$29 134
Overall revenue (telemedicine alone and telemedicine + support team)	$45 578

missed appointments. The number of averted missed appointments was multiplied by the average revenue per encounter ($129 from Table 1). Overall, telemedicine alone reduced missed appointments and saved the FQHC $16 444 per month, while telemedicine + support team reduced missed appointments and saved the clinic an additional $29 134. Together, the total revenue from both telemedicine alone and telemedicine + support team intervention totaled $45 578 per month.

Discussion

In this study, we assessed the cost impact of telemedicine adoption during the COVID-19 pandemic at a large, 55-clinic FQHC network in Texas. Using reductions in missed appointment as a basis for the cost-impact analysis, we found that telemedicine is a financially viable option for community-based clinics, with savings of approximately $46 000 per month. This finding aligns with other studies in the literature that report savings following telemedicine implementation. For example,

Agha et al. found telemedicine to be more cost-effective at $355 per patient per year when compared to in-person care at $1166 per patient per year.[10] Yang et al.[11] also found telemedicine consultations for pediatric critical care in rural emergency departments to be cost-saving and cost-effective. In 2014, Yamamoto reported the average estimated cost for a telemedicine visit as $40 to $50, which was considerably more affordable than the average estimated cost for an in-person visit at $136 to $176.[12] While these earlier studies assessed savings from a paitent perspective, this study adds to the body of literature on the cost impact of telemedicine implementation by providing savings estimates from the clinic perspective.

Despite our positive finding, some studies have observed that telemedicine services are only cost-effective to the clinic to an extent. A randomized, controlled trial in 2019 found that providing remote consultations through telemedicine, rather than in-person appointments, at a specialist hospital is cost-effective from a health-sector perspective, so long as the total number of annual consultations exceeds 183.[13] While our study does not suggest a minimum telemedicine engagement, we realize that the digital divide could impede telemedicine adoption for populations typically served in FQHCs. Unfortunately, the virtual care ecosystem has been traditionally disconnected from the in-person health care ecosystem, and in historically marginalized communities, there is a disproportionate digital health disconnect. Evidence of disparities in technology access underscore the importance of addressing digital health equity to improve health care access.

For this large FQHC, we found that conducting previsit device testing prior to telemedicine consultation improved the likelihood of patients having a successful consultation and further reduced missed appointments. Support of this nature can reduce technological know-how barriers by addressing patients' unique technology needs, troubleshooting common technology issues that could occur, and specifying contact information for technical support.

This study is not without limitations. These results are based on descriptive statistics and do not adjust for patient or clinic characteristics that may be associated with missed appointments. People who use in-person versus the two forms of telemedicine examined may not be the same with regard to demographics, care preferences, social determinants of health, and other factors, and these differences (rather than telehealth per se) may influence no-show rates. Secondly, telemedicine influences the costs and revenues associated with other (non-telemedicine) services, which are not captured in this study. Thirdly, telemedicine adoption rates are lower in this study than in other telemedicine studies.[14] We posit that this might be related to the August to December 2020 timeline examined. In the US, most states lifted stay-at-home mandates in June 2020, so telemedicine as a modality gradually declined, while its substitute, in-person visits, increased.

The benefits of telemedicine may go beyond offering convenience to patients and reducing revenue loss for the clinic. Telemedicine is a promising investment that may prove to be worthwhile in reducing overall health care costs. The COVID-19 pandemic heralded a rapid transformation of analog clinical care into the digital age. As we promote whole-person care, seamless integration of in-person and virtual care can provide tremendous benefits to patients who have been traditionally marginalized. Regulators should continue to support reimbursement mechanisms to promote, maintain, and improve access for these populations.

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Author Contributions

TA conceptualized the study, OA completed the analysis and wrote the initial draft, OMV contributed to framing the study. All authors read and approved the final draft.

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