Original article

Outcomes of a Rapid Adolescent Telehealth Scale-Up During the COVID-19 Pandemic

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A B S T R A C T

Purpose: To describe the first 30 days of rapid adolescent telehealth scale-up in response to the coronavirus (COVID-19) pandemic at a single academic medical center and assess for disparities in visit completion rates by patient characteristics.
Methods: Visit outcome and patient demographic data were obtained via electronic health record (EHR) reports. Telehealth visit completion rates were compared by patient characteristics using the chi-square test and t-test. We used zip code data to generate latitude- and longitude-based maps of the range and density of service delivery. Patient cases highlighting challenges and opportunities for adolescent telehealth were summarized.
Results: Between March 16 and April 15, 2020, 392 telehealth visits were scheduled in 331 unique patients, with an 82% appointment completion rate. Video visits were conducted for eating disorders (39%), contraception/menstrual disorders (22%), gender-affirming care (17%), general adolescent medicine (15%), HIV treatment (6%), and substance abuse (1%). The majority of telehealth patients were female Caucasian minors with private insurance. There were no significant differences in telehealth visit completion rates by age, sex, gender, or insurance. Patients coded as non-white (African-American, Asian, or other) in the EHR had lower visit completion rates than white patients ($p = .003$). Telehealth patients were distributed across five states, with the highest concentration in the zip codes nearest to the clinic.
Conclusions: Rapid scale-up of telehealth for Adolescent Medicine was achieved at this large academic medical center. Future implementation research is needed to assure telehealth reaches adolescents without widening health disparities.

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IMPLICATIONS AND CONTRIBUTION

Our data demonstrate that rapid telehealth scale-up for adolescent medicine was achievable in response to the COVID-19 pandemic, suggesting a critical need for ongoing implementation and evaluation research to grow and sustain telehealth efforts safely and equitably across vulnerable adolescent populations.

In the early months of 2020, the novel coronavirus SARS-CoV-2 rapidly evolved from a looming threat into the COVID-19 pandemic, dramatically transforming health care delivery across the globe. Health systems were forced to efficiently innovate in response to calls for social distancing, personal

protective equipment (PPE) conservation, and health care workforce preservation. At the time of this writing, there are >800,000 COVID-19 cases in the U.S. and incidence continues to grow [1]. While COVID-19–related mortality and hospitalization rates among adolescents and young adults have been low, youth may face serious health consequences stemming from delayed or deferred health care [2].

In response to the pandemic, health systems have needed to briskly transition from in-person visits to telehealth. For adolescent medicine (AM) practitioners, this directive is fraught with unique challenges. First, AM practitioners have a critical mandate to protect patient confidentiality which can be difficult when considering virtual or digital communication. Second, many adolescent conditions, such as substance abuse, contraception, eating disorders, and gender-affirming health care, are also rife with psychosocial complexity, and rely on multidisciplinary care teams, creating additional challenges in a video format. Finally, patient assessments and medical decision making often rely on weights, vital signs, and genitourinary examinations which may be difficult to obtain via telehealth [3,4].

Importantly, it remains unknown how the rapid scale-up of telehealth services will affect health care disparities. Prior research demonstrates that patient participation in telehealth has differed by race, socioeconomic status, and literacy level [5]. Successful engagement in video visits requires stable Internet access and a mobile device or computer. Data from patients in underserved U.S. communities, including homeless youth, demonstrate that nearly all have cellphone access [6,7]. However, in addition to equipment, the requisite access to private space, Internet service, and health literacy may differ among populations of youth requiring telehealth services.

These challenges came instantly to the forefront when Governor Tom Wolf issued an emergency disaster declaration for Pennsylvania on March 6, 2020. A mandatory "stay at home" order followed shortly thereafter. In response to these policies, the Children's Hospital of Philadelphia (CHOP) Division of Adolescent Medicine swiftly converted to delivering most services through telemedicine. We aim here to present detailed descriptions, real-time data, and case vignettes from the first month of our telehealth scale-up, assessing the feasibility of telehealth across a variety of complex adolescent health conditions.

Methods

Setting

The CHOP AM specialty clinical program provides nonprimary care management of gender-affirming care, eating disorders, HIV, adolescent gynecology and contraception, general AM, and substance abuse disorders. The program consists of a high-volume, pediatric hospital-based clinic in a major city, the site of primary emphasis for telehealth conversion, and two smaller suburban satellite sites.

Participants

Patients/parents/guardians. All patients and their parents/legal guardians were eligible to receive video visits starting March 16, 2020. "Essential" conditions requiring in-person visits were excluded from telehealth including placement of long-acting reversible contraception, severe/persistent gynecologic complaints, significant risk of mental health decompensation, and/or eating disorder with concern for medical instability. Parent/guardian proxies or patients (≥13 years) required an EHR portal account and a mobile device or computer.

Providers. All clinic providers participated and required an EHR smartphone or tablet application (Epic Systems, Verona, WI). Patients/guardians and providers required Internet access and a private area for visits.

Telehealth scale-up process

Telehealth infrastructure before COVID-19. Telehealth infrastructure existed before COVID-19 but was typically unused because of lack of insurance reimbursement. Small numbers of telemedicine visits (5–10/day) occurred across the entire hospital enterprise. Each CHOP Division had an EHR SuperUser (SU) clinician. The AM SU, who had 10% full-time effort dedicated to EHR support, and senior AM fellow had "builder" access, allowing them to rapidly create EHR tools independently of information technology staff approval.

Timeline. On March 13th, the Division held a leadership meeting to discuss telehealth pandemic preparations. On March 14th, CHOP issued guidance to reschedule all elective admissions and outpatient visits that could be safely postponed. Only essential visits were then seen in-person at our central clinic. On March 16th, the SU successfully piloted the first Division telehealth visit; additional Division providers piloted telehealth over the following 3 days. On March 19th, the SU hosted a 2-hour virtual Division training, after which all Division clinicians started telehealth visits. The Division then had weekly telehealth update meetings, and the SU disseminated a weekly telehealth tip sheet.

Optimizing telehealth for adolescent care. Providers interacted with patients/guardians by video via the mobile EHR application and could synchronously access charts via computer for review and documentation. Initially, two providers and one patient/guardian could attend visits simultaneously. However, system updates subsequently allowed up to five individuals to attend visits simultaneously, increasing access for interpreters, trainees, multidisciplinary team members, and parents in separate households.

The senior AM fellow created EHR tools to ensure compliance with documentation and billing standards unique to telemedicine, including note templates, referring provider letters, and electronic after-visit summaries. A clinical decision support tool was created using Centers for Disease Control and Prevention (CDC) criteria to assist safe initiation of contraception and gender-affirming hormones without pregnancy testing [8].

Confidentiality. Parent/guardian proxy accounts for patients ≥13 had limited information available. Specifically, medications, problem lists, and past appointments were hidden in proxy access but available to the patient via portal access. Progress notes and sensitive test results (e.g., pregnancy, HIV) were not viewable in the portal. Previously, certain sub-subspecialty departments such as HIV were hidden from the portal to prevent confidentiality breaches. During the COVID-19 pandemic, this was modified to allow video visit access from the portal for patients, but not

their parents/guardians. During video visits, providers verified that patients were alone before sensitive history taking.

Patient flow. Portal access was given to patients ≥18 years or parent/guardian proxies at the time of scheduling. One day before visit, schedulers called for appointment verification and confirmation of portal account activity. Thirty minutes before appointments, medical assistants called to virtually "room" patients, verify allergies, reconcile medications, and document home vital signs if available. Video visit consent was completed at the time of log-in. Providers were alerted by automatic EHR messages when patients were ready.

Legal/Regulatory process. After the Pennsylvania state of emergency was declared, the Office of Medical Assistance Programs issued guidance allowing telehealth reimbursement for Medicaid patients; private insurers quickly followed [9,10]. On March 31, the Drug Enforcement Agency issued guidance allowing telehealth prescription of controlled substances, including testosterone and buprenorphine, without a prior in-person visit [11]. Restrictions requiring separate state licensures were relaxed in many states and other states expedited emergency temporary licensure applications. CHOP issued guidance allowing advanced practice nurses to independently see patients for telehealth with collaborative physician supervision, obviating the previously required direct supervision.

Data collection and analysis

Visit outcome metrics and patient demographics were obtained via EHR registry reports and verified by billing and compliance visit counts. Completed visits were defined as those in which patients were seen by a provider. Noncompleted visits were defined as no-shows, cancellations without rescheduling, and visits in which patients left without being seen. Insurance data were obtained at the time of registration and categorized as private versus public (Medicaid). Race and ethnicity were derived from EHR data which are captured in a variety of ways including self-report and observed race at registration by patient service representatives. We further categorized race as white (Caucasian) versus nonwhite (African American, Asian and Pacific Islander, Native American, and "Other"). Sex was defined as sex at birth. Gender identity was self-reported and categorized as gender minority (transgender, gender nonconforming, or gender nonbinary) versus cisgender.

We assessed implementation feasibility, the extent to which telehealth could be successfully carried out within our system as defined by Proctor et al., by (1) comparing absolute number of completed patient visits between our implementation period and the same 30-day interval in the preceding year; and (2) comparing no-show rates between these periods [12]. We used no-show visits, rather than no-shows plus cancellations, to better capture lost revenue because cancellation slots may have been filled with other patients and no-show slots could not. We compared telehealth visit completion rates by demographic characteristics between patients using chi-square test and t-testing. To assess telehealth adoption, we created scatter plots with linear estimates of in-person and telehealth visits during the implementation period. Zip code data were utilized to generate latitude- and longitude-based maps illustrating the geographic range and density of service delivery (Tableau Software, Inc., Mountain View, CA).

Summative cases

Patient cases highlighting challenges and opportunities for adolescent telehealth, and demonstrating the scope of telehealth services, were identified by consensus of the authors. Patient names were replaced by pseudonyms.

The CHOP Institutional Review Board deemed these evaluations of quality improvement and did not require formal review.

Results

Between March 16 and April 15, 2020, there were 484 scheduled AM visits, of which 392 (80%) were telehealth visits with 331 unique patients. During this period, 324 telehealth visits (82% of scheduled) and 75 in-person visits were completed for a total volume of 399 visits (Figure 1). Less than 1% of telehealth visits were converted to telephone due to technical challenges. In the same period in 2019, 618 visits were completed at the central and satellite clinics, representing a 36% volume loss for the central clinic and a 36% overall volume loss. Compared to the 2019 no-show rate (11%), the telehealth no-show rate (6%) was significantly lower ($p = .01$).

Most scheduled telehealth patients (n = 331) were female Caucasian minors with private insurance (Table 1), consistent with the overall demographics of adolescents served by adolescent specialty sites. Race was identified as 20% African-American, 62% white, 2% Asian and Pacific Islander, and 15% "Other." Ethnicity was identified as 2% Hispanic/Latino, 58% non-Hispanic/Latino, and 38% missing. There were no significant differences in telehealth visit completion rates among patients by age, sex, gender, or insurance. However, white patients, compared to nonwhite patients, had a significantly higher rate of visit completion (89.7% vs. 78.0). Telehealth patients were distributed across five states, with the highest concentration in the zip codes nearest our urban clinic (Figure 2). There were no known instances of patients who needed and were unable to have confidential time during visits, and no known confidentiality breaches.

Youth were seen for video visits for eating disorders (39%), contraception and menstrual disorders (22%), gender-affirming care (17%), general AM (15%), HIV treatment (6%), and
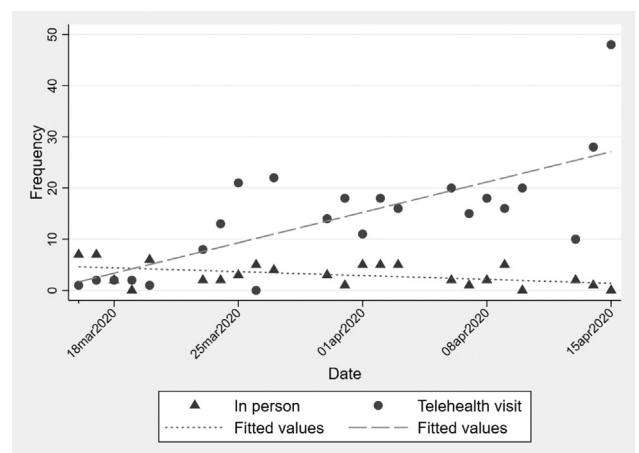

Figure 1. Telehealth versus in-person visits during the first 30 days of implementation.

Table 1
Characteristics of scheduled telehealth patients (n = 331)

Patient characteristic	All telehealth patients (n = 331)	Completed a telehealth visit (n = 282) (85%)	Never completed a telehealth visit (n = 49) (15%)	*p*-value
Age in years, mean (SD)	16.3 (2.9)	16.3 (2.8)	16.1 (3.2)	.72
Sex[a], n (%)				.57
Female	254 (78%)	215 (85%)	39 (15%)	
Male	71 (22%)	62 (87%)	9 (13%)	
Race[b], n (%)				.003
White	204 (62%)	183 (90%)	21 (10%)	
Nonwhite	125 (38%)	99 (79%)	26 (21%)	
Gender, n (%)				.23
Gender minority	45 (14%)	41 (91%)	4 (9%)	
Cisgender	286 (86%)	241 (84%)	45 (16%)	
Insurance[c], n (%)				.25
Private	236 (72%)	204 (86%)	32 (14%)	
Public	91 (28%)	74 (81%)	17 (19%)	

[a] Missing n = 6 (2%).
[b] Missing n = 2 (<1%).
[c] Missing n = 4 (1%).

substance abuse (1%). Visits were conducted by 23 unique providers, consisting of one endocrinology and 13 AM attending physicians, and three nurse practitioners. Six AM fellows attended 23% of telehealth visits. Providers had a mean of 10.3 (SD 3.4) years in practice. Visits were conducted collaboratively with registered dieticians (n = 22 visits), behavioral health providers (n = 12), social workers (n = 43), nurses (n = 10), and interpreters (n = 2). An additional n = 48 gender assessment visits were completed independently by behavioral health providers.

Patient Cases

Vignettes demonstrating the scope of AM telehealth services and highlighting key telehealth challenges and solutions are delineated below and summarized in Table 2.
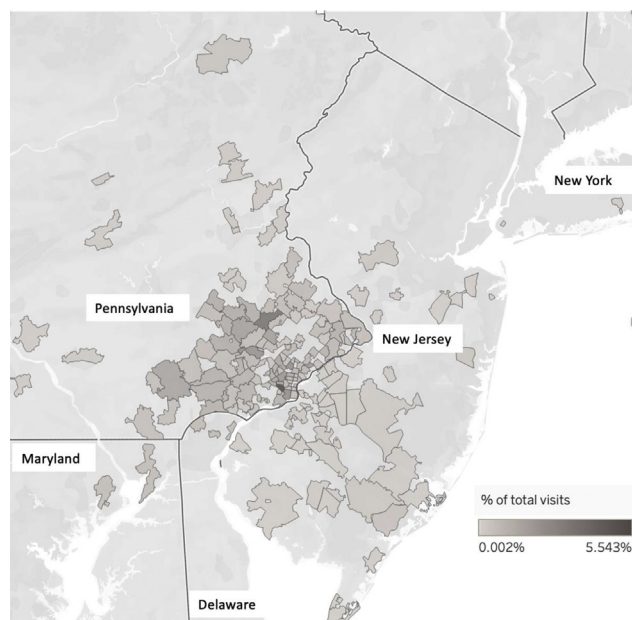

Figure 2. Geographic reach of adolescent telehealth pilot.

Case #1: long-acting reversible contraceptive management in an immune suppressed patient

Brianna was an 18-year-old woman with a remote history of liver transplantation for congenital biliary atresia who presented with pain at her etonorgestrel implant site. Brianna's implant removal visit had been canceled to mitigate the risk of COVID-19 exposure given her post-transplant immunosuppression. Brianna was frustrated and felt removal should happen emergently. Brianna's transplant team was consulted; her team felt that her symptom-related distress may lead her to seek emergency department care, further increasing her COVID-19 exposure risk. A video visit was completed with Brianna, and the provider ascertained that her pain was intermittent and had been present for months. On video examination, the arm demonstrated no erythema or swelling, and Brianna could manipulate the proximal device end to demonstrate an intact device with mobility at the distal end. The provider used a reproductive health justice framework to review risks and benefits of removal, highlighting the risk of COVID-19 exposure, while reassuring Brianna that the device could be removed urgently if Brianna felt it necessary. Brianna opted to trial home management with acetaminophen, ice, massage, and topical lidocaine jelly, with a plan to return to clinic for device removal when the pandemic ebbed.

Case #2: buprenorphine/naloxone restart for youth experiencing homelessness

Toni was a 19-year-old woman with opiate use disorder and a long history of polysubstance abuse including tobacco, marijuana, crystal methamphetamine, and heroin. She had been abstinent from heroin for 1 year after using her friend's prescription buprenorphine/naloxone film. Owing to COVID-19, she entered a homeless shelter for youth; her last 2 mg buprenorphine/naloxone dose was 3 days prior. The shelter physician performed her in-person intake examination. Her point-of-care urine drug screen was positive for marijuana and negative for opiates including methadone and her pregnancy test was negative. The shelter physician requested telehealth evaluation to restart buprenorphine/naloxone to limit COVID-19 exposure at the facility. Toni completed her first telehealth visit on her

Table 2
Case examples of key telehealth challenges, solutions, and outcomes

Case	Challenge	Telehealth problem solving	Clinical outcome
18-year-old immune-suppressed patient with LARC[1] complication	• Need to limit clinic exposure because of immune suppression • Need for examination of the device • Patient desire for removal, despite risks from COVID-19	• Development of symptom management plan • Patient directed manipulation of device to assess implant status • Multidisciplinary team involvement, patient education and elicitation of preferences	• Deferral of clinic removal visit until after pandemic • Assurance of intact device without signs of infection • Patient-driven decision making regarding procedure
19-year-old homeless girl with substance abuse disorder	• Limited ability for physical examination • Unstable housing • Need to limit COVID-19 exposure in congregate living facility	• Use of COWS[2] for symptoms scoring • Coordination with shelter medical team to obtain private space for visits and POC[3] specimens • All substance abuse treatment provided remotely	• Rapid initiation of MAT[4] • Improvement in opioid withdrawal symptoms • No COVID-19 cases in the shelter facility to date
15-year-old girl with ADD, anxiety, depression, and anorexia nervosa	• Behavioral health escalations • Food refusal and restriction • Purging behaviors • Possibility that medical hospitalization may be necessary	• Initial telehealth visit performed jointly with behavioral health provider • Heart rate, blood pressure, and weight measured by the parent • Visual inspection to assess behavioral status, overall appearance • Frequent follow-up visits allowed regular assessment of progress	• Achieved prescribed calorie goals • Reduced/eliminated purging • Reduced emotional outbursts • Engagement in care • Avoided rehospitalization and other higher levels of care
22-year-old HIV-positive man with suspected COVID-19	• Limited ability for physical examination • Need for rapid SARS CoV-2 testing • Need for patient self-care instructions • Need to keep patient home	• Visual inspection to assess WOB,[5] neck ROM,[6] pulmonary vital capacity • Multidisciplinary care coordination over video to arrange testing • Nursing education on supportive management	• Rapid triage of acuity level • Linkage to rapid diagnosis of COVID-19 • Maintenance of patient at home to reduce of exposure of patient and community
16-year-old transmale patient for testosterone start	• Consent • Need for injection teaching • Unable to obtain certain labs. including pregnancy status	• Parent/child video visit for consent • Nurse video teaching • Use of CDC[7] pregnancy determination certain criteria	• Initiation of gender affirming hormone therapy

COVID-19 = coronavirus disease-2019.
[1] Long-acting reversible contraception.
[2] Clinical Opiate Withdrawal Scale.
[3] Point-of-care.
[4] Medication-assisted therapy for opiate addiction.
[5] Work of breathing.
[6] Range of motion.
[7] Centers for Disease Control and Prevention.

smartphone. An AM fellow observed the intake. On examination, Toni was thin and anxious, without jaundice or visible track marks. She had multiple dental caries. Blood-based laboratory testing was deferred because Philadelphia was at the COVID-19 outbreak peak and there was no on-site laboratory. Her clinical opiate withdrawal scale (COWS) was 12 and she was started on 2 mg buprenorphine/naloxone, electronically prescribed for shelter delivery. She followed up 72 hours later via video and felt better with a COWS score of four. She has since been followed weekly and has completed three telehealth visits conducted by the fellow under attending virtual observation. She often goes outside to take a walk or smoke a cigarette during visits. She has been maintained on the 2 mg dose with resolution of withdrawal symptoms.

Case #3: eating disorder with acute food restriction

Sarah was a 15-year-old female with a history of attention deficit disorder, anxiety, depression, and a 2-year history of anorexia nervosa, previously requiring medical hospital stabilization. She was discharged from our intensive outpatient program (IOP) the first week of the telehealth conversion and had just begun outpatient behavioral family-based treatment (FBT). Sarah reached her goal weight in IOP but immediately began restricting her food intake on discharge, prompting her parents to call inquiring about hospital admission. A same-day telehealth visit was conducted with Sarah, her parents, an AM attending physician and fellow, and her FBT therapist. The team built a collaborative plan to increase caloric intake and supervision, create contingencies for meal noncompletion, and schedule weekly AM and FBT video visits. On the morning of appointments, parents weighed Sarah before breakfast, in similar clothes. They checked her pulse with a Fitbit monitor and obtained blood pressure with a home cuff, using our in-person visit protocol for orthostatic vital signs. At first, Sarah would wake just before the medical visit, requiring prompting to remove a blanket from her face to interact. The second week, she was eating all meals and meeting caloric goals. The third week, Sarah's mother noted signs of purging in the bathroom. We recommended increased supervision throughout the day and precautions to prevent purging. By her fourth visit, her emotional regulation seemed to improve, with more direct interaction and smiling. She remained in her weight range with no signs of purging or other maladaptive behaviors.

Case #4: COVID-19 evaluation in an HIV+ patient

Chris was a 22-year-old man living with HIV, with a CD4+ count of 650 and an undetectable HIV viral load. Chris connected with the HIV clinic nurse and physician via an urgent video visit from his car after completing work as a nursing aid. Chris reported headache and subjective fevers without respiratory symptoms. Although limited by the video format and the tight space in the car, the team assessed Chris as ill, but nontoxic appearing, with bilateral conjunctival injection and a supple neck. He had no increased work of breathing and could hold his breath for 10 seconds and recite the alphabet without breathlessness. Chris was assessed as having a high probability of COVID-19 infection, but no indication for hospitalization. Chris was referred for drive-through SARS CoV-2 polymerase chain reaction testing, which yielded a positive result within 24 hours. Nurse teaching reviewed supportive at-home care. A work excuse was sent through the patient portal, along with a patient letter detailing symptoms for which he should proceed to the emergency room. Chris was successfully managed with anti-pyretics and oral fluids without complication or hospitalization.

Case #5: initiation of gender-affirming hormone therapy in a minor patient

Allan was a 16-year-old assigned female at birth who identified as male. Allan lived >1 hour from clinic. Allan had been receiving injectable depot medroxyprogesterone acetate for menstrual suppression. He was evaluated multiple times before the COVID-19 pandemic by the clinic's mental health provider, who determined Allan was ready to start testosterone therapy. Allan was becoming increasingly distressed not knowing when he could start his medical transition given COVID-19–related restrictions. In addition to baseline hormonal laboratories and pregnancy testing (given testosterone teratogenicity), the in-person gender clinic protocol required written consent for treatment from minor youth and parents/legal guardians and provided on-site subcutaneous injection teaching before weekly self-administered injections. Fortunately, Allan had baseline laboratories at the initial in-person visit for menstrual suppression and was within 12 weeks of last depot medroxyprogesterone acetate injection, meeting the CDC "reasonably certain not pregnant" criteria [8]. We completed a video visit with Allan and his mother, reviewing the risks, benefits, and alternatives to testosterone. The provider spoke to him privately about any questions or concerns. The family signed and electronically returned the consent form and then completed a separate nurse video visit for subcutaneous injection teaching.

Discussion

Our data show that rapid telehealth conversion is achievable across a broad scope of AM subspecialty care. Despite the complexity of our discipline, we delivered care via telehealth in over 300 patient visits during the first month following limitation of in-person visits due to COVID-19. Importantly, during initial telehealth scale-up, we demonstrated a 36% decrease in scheduled visits from the same 30-day period 1 year prior, with a steadily increasing number of telehealth visits during the observation period. This decrease may be overestimated,

however, when considering that satellite sites were not converted as quickly. In addition, we identified a lower no-show rate among telehealth patients than among in-person patients in the prior 30-day period. Our geographic data suggest that there are also potential unmeasured gains in health care delivery from telehealth as well which should be measured in future studies. Telehealth may yield substantial financial savings to families who can access care while bypassing the costs of travel, lodging, and time encumbered during in-person visits far from home [13,14]. We provided contraceptive care, prescribed buprenorphine/naloxone, avoided higher levels of care in our patients through prompt multidisciplinary intervention, managed mild COVID-19 illness, and delivered gender-affirming care through telehealth. No breaches in confidentiality were reported during the telehealth scale-up, and having an embedded EHR expert in the Division allowed appropriate privacy protections in documentation. Finally, we were able to reach these milestones without sacrificing two essential cornerstones of our practice–multidisciplinary care and trainee education.

We found no differences in telehealth visit completion rates between patients by payor status; however, we did identify potential emerging disparities by race. While the finding of a potential racial disparity may be secondary to the limitations of using EHR data to categorize race, as a large sample of population were categorized as "other," it should not be ignored. While rapid expansion of telehealth innovations may be a rare silver lining of the COVID-19 pandemic, health systems must take the necessary time to engage in rigorous implementation science research to assure that these rapid innovations are safe, equitable, and of high quality. These efforts should include assuring that health systems rigorously collect and report self-reported race/ethnicity data in future studies of telehealth. The COVID-19 pandemic itself has exacerbated racial inequities in our nation [15]. We must be vigilant in assuring that the responding telehealth innovations do not parallel this trend.

As the use of telehealth for adolescents expands rapidly in response to the pandemic, those implementing and evaluating these services must also carefully weigh the potential risks and benefits. While video visits may allow for providers to meet patients in their own homes, thereby potentially improving access to health care and decreasing burden on patients and families, it is unclear whether patient safety and quality of care may be compromised [16]. Furthermore, it is unclear which patients will benefit most from telehealth or in-person visits and therefore clinical decision-making tools will need to be developed and tested to determine which patients may have their needs safely met through telehealth and how to best engage these adolescents in youth-focused digital health care [17–19]. It will be important to establish that telehealth examination findings and outcomes are reliably reproducible between clinicians and equivalent to in-person care to assure consistency in care. Attention must also be paid to technology and staffing costs, as well as scheduling and administrative burden associated with broad implementation of telehealth for practices serving adolescents [20]. For example, our rapid scale-up of telehealth required a substantial investment in administrative staff time, salary coverage for an attending physician, and careful consideration of optimal scheduling templates and visit length.

At the time of this writing, the future of the COVID-19 pandemic is unknown and Pennsylvania remains under "stay at

home" orders. Predictive models demonstrate multiple possible case scenarios, with many suggesting that COVID-19 will continue its evolution in waves, necessitating intermittent periods of social distancing that may disrupt in-person clinical care [21,22]. Given this uncertainty, it is critical that health systems and payors invest in the resources not only for telehealth innovations, but to sustain these innovations and their collective payor reimbursement over time.

Our analyses have limitations as well as strengths. We present descriptive cross-sectional data with no control condition. Our race and ethnicity data, which were derived from EHR registry reports, had a substantial number of patients listed as "other" for race and a high rate of missingness for ethnicity. In addition, our data are from a single AM division within a well-resourced academic medical system with pre-existing telehealth infrastructure. Such a rapid telehealth scale-up may not be feasible in other care settings with fewer resources. However, our data demonstrate that given the proper resources and support, achievement of broad, rapid, telehealth scale-up is achievable.

In conclusion, our data suggest a critical need for funding for implementation and rigorous evaluation of adolescent telehealth services to assure safe and equitable scale up of services. This need will be greatest in low-resource clinical settings, among populations with poor health care access such as rural populations, youth of color, systems-involved youth, and in youth requiring multidisciplinary services for mental health. Investment in these resources will be necessary to sustain adolescent telehealth services during the remainder of the COVID-19 pandemic and beyond.

Acknowledgments

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