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### Authors

Rosenthal, Jennifer L

Sigal, Ilana S

Kammerman-Kretzmer, Rory

et al.

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# Increasing Use of Ambulatory Video Visits for Pediatric Patients by Using Quality Improvement Methods

Jennifer L. Rosenthal, MD, MAS\*; Ilana S. Sigal, MPH†; Rory Kamerman-Kretzmer, MD\*; Daphne S. Say, MD\*; Bianca Castellanos, MD\*; Stephanie Nguyen, MD, MAS\*; Natasha A. Nakra, MD\*; Bibiana Restrepo, MD\*; Stephanie S. Crossen, MD, MPH\*

## Abstract

**Introduction:** Live video visits for ambulatory encounters offer potential benefits, including access to remote subspecialty services, care coordination between providers, and improved convenience for patients. We aimed to increase the utilization of video visits for pediatric patients at our medical center using an iterative quality improvement process. **Methods:** A multispecialty improvement team identified opportunities to increase video visit utilization and prioritized interventions using benefit-effort analyses. Interventions focused on 6 key drivers. The outcome measure was the percentage of ambulatory encounters conducted by video. The process measure was the percentage of ambulatory pediatricians conducting video visits. The balancing measure was the percentage of no-shows among scheduled video visits. All measures were analyzed using statistical process control. **Results:** Interventions were associated with increases in our outcome and process measures from 0.1% to 1.2% and 0.6% to 6.3%, respectively, during the first 8 months. Subsequently, the novel coronavirus (COVID-19) pandemic was associated with further increases in these measures to 41.8% and 73.5%, respectively, over 3 months. The balancing measure increased from 0% at baseline to 14.7% with no special cause variation during the intervention period. The most impactful interventions included clinician training outreach, providing equipment, and streamlining MyChart patient enrollment. **Conclusions:** This improvement project effectively increased pediatric ambulatory video visit utilization, although the most significant driver of utilization was the COVID-19 pandemic. Project interventions implemented before COVID-19 facilitated rapid video visit adoption during the pandemic. A similar improvement process may be beneficial for other medical centers aiming to improve video visit utilization. (*Pediatr Qual Saf* 2021;6:e424; doi: 10.1097/pq9.000000000000424; Published online June 23, 2021.)

## INTRODUCTION

Live video visits for ambulatory encounters involve real-time videoconferencing between patients and their healthcare providers. This clinical care delivery system is a form of telehealth, which uses medical information exchanged via electronic communications to support and provide healthcare.<sup>1</sup> Telehealth offers numerous benefits to patients and their families by mitigating access barriers related to geography,



time, finances, and unique circumstances (eg, travel challenges for technology-dependent children or behavioral challenges for neurodiverse children outside their home environments).<sup>2</sup> As such, telehealth reduces the burdens associated with in-person visits.<sup>3</sup> Also, telehealth can increase access to subspecialty care for residents of rural areas,<sup>4,5</sup> to facilitate improved care coordination by clinicians in different locations,<sup>6</sup> and improve self-management and clinical

From the \*Department of Pediatrics, University of California at Davis, Sacramento, Calif.; †Center for Health and Technology, University of California at Davis, Sacramento, Calif.

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\*Corresponding author. Address: Jennifer L. Rosenthal, MD, MAS, Department of Pediatrics, University of California at Davis, 2516 Stockton Blvd, Sacramento, CA 95817

PH: 916-734-4719

Email: rosenthal@ucdavis.edu

outcomes in patients with chronic conditions.<sup>7,8</sup> Given these benefits, the American Academy of Pediatrics has published a policy statement supporting telehealth as a potential strategy to increase continuity, efficiency, and quality in pediatric healthcare.<sup>5</sup>

Our medical center's pediatric telehealth program has provided specialty consultations to healthcare providers at remote hospitals and clinics throughout our region for nearly 2 decades. In 2019, our executive leadership prioritized patient-to-provider video visits within appropriate clinical scenarios across all ambulatory settings. Our medical center prioritized video visits to make healthcare more convenient and accessible to our patients and families. Despite the rich history of our pediatric telehealth program, the adoption of video visits for ambulatory pediatric encounters was initially slow and limited. Prior research has suggested barriers to telehealth adoption include usability of the technology, clinician and organizational readiness, and financial considerations.<sup>9-13</sup> However, prior research has not adequately demonstrated successful strategies to increase telehealth utilization for pediatric ambulatory encounters.

Furthermore, quality improvement (QI) methods—which can effectively increase uptake and sustainability of interventions by permitting rapid-cycle process adaptations<sup>14</sup>—are underutilized by telehealth programs.<sup>15</sup> Therefore, we aimed to use QI processes to increase the percentage of pediatric ambulatory visits conducted by video from a mean monthly baseline of 0.1% to a goal of 1% within 11 months. We chose the timeframe and goal of 1% to align with our medical center's executive leadership's established targets.

## METHODS

### *Context*

This improvement project took place at a quaternary care academic medical center in Northern California. The baseline project period was March 1, 2019, through June 30, 2019. The intervention period began July 1, 2019, and continued through May 31, 2020. All ambulatory pediatric clinics located on the medical center campus were included in the project; we excluded satellite and outreach clinics. Ambulatory pediatric clinics included general pediatrics, urgent care, adolescent medicine, allergy and immunology, cardiology, endocrinology, gastroenterology, genetics, hematology-oncology, infectious disease, nephrology, pulmonology, rheumatology, and developmental and behavioral pediatrics. More than 120 physicians provided ambulatory care to pediatric patients who resided in 33 counties during the project period, covering a region of 65,000 square miles.

In March 2019, pediatricians began conducting direct-to-patient video visits for ambulatory patient encounters using the telehealth platform Epic MyChart (Epic Systems, Verona, Wis.). The decision to schedule an ambulatory visit as a video visit versus in-person was at the discretion

of the treating clinician in collaboration with the parent or guardian (referred to as “parents” hereafter). Initial guidelines required video visits to use the MyChart platform; they were limited to English-speaking patients and families because interpreting services were not initially available through this platform. Parent requirements to conduct a video visit included establishing a MyChart proxy account for the child and having a video-enabled smart device with WiFi or cellular access. The clinician requirements to conduct a video visit included having an iOS smart device with WiFi or cellular access.

When this project began, state and federal regulations prohibited a clinician from conducting video visits with physically located patients in states where the clinician was not licensed. Many pediatric subspecialists care for patients from neighboring states, but could not offer these patients video visits due to this restriction. During the novel coronavirus (COVID-19) pandemic, the federal government and multiple states suspended this restriction. When this project began, video visit coverage was not standard across payors, leading to uncertainty about whether clinician time would be adequately reimbursed. Furthermore, “facility fees”—typically used to cover the efforts of providers who cannot bill independently—were not universally allowed by insurers for video visits. Our medical center's initial video visit guidelines required video visits only to be conducted with established patients. Clinicians were encouraged to see more complex patients in-person to engage nonphysician providers in coordinated team care. These limitations were lifted during COVID-19, with federal regulations requiring equal coverage for telehealth compared with in-person care, allowing the patient's home to serve as an “originating site” for encounters, and allowing providers to charge facility fees for telehealth.

### *Measures*

For this improvement project, eligible ambulatory visits included all follow-up visits scheduled for established patients with a physician, nurse practitioner, physician assistant, or psychologist in the department of pediatrics during the provider's on-site clinic sessions. We excluded appointments scheduled with these providers at a satellite clinic located outside of the medical center because improvement processes related to supporting infrastructure, and workflow processes could not be uniformly applied at those locations. We excluded new patient visits, as the medical center's leadership did not uniformly consider these visits appropriate for telehealth application when this project began.

The outcome measure for this project was the percentage of all pediatric ambulatory visits conducted as video visits. We calculated this measure by dividing the monthly number of pediatric ambulatory visits completed via video by the total number of eligible visits. The process measure was the percentage of ambulatory pediatricians conducting video visits. We calculated this measure by

dividing the number of ambulatory pediatric clinicians who completed at least 1 video visit by the total number of ambulatory pediatric clinicians. We chose this measure because increased proportions of clinicians engaging in video visits provide increased opportunities for patients to benefit from this resource. The balancing measure was the percentage of no-shows among scheduled video visits. We calculated this measure by dividing the monthly number of no-show pediatric video visits by the total number of scheduled pediatric video visits. We chose this measure to monitor the potential gaps in care created by the uptake of a new care modality with accompanying demands on clinical and technical support staff. We wanted to monitor for increases in the percentage of no-shows to quickly respond to unforeseen needs related to pediatric video visits.

**Analysis**

We used statistical process control in SPCforExcel<sup>16</sup> to analyze the outcome, process, and balancing measures. We defined upper and lower control limits as greater than or less than 3 sigmas.<sup>17</sup> The University of California Davis Institutional Review Board determined this project to be not human subjects research and exempt from formal review.

**Planning the Interventions**

We assembled a QI team that included a parent, ambulatory telehealth program manager, pediatric telehealth project manager, telehealth medical director, and 9 pediatric physicians from various subspecialties. This team met monthly to review project data and to develop iterative tests of change. Initially, the team developed a

key driver diagram (Fig. 1) and a PICK chart [Figure 1, **Supplemental Digital Content 1**, which displays PICK (Possible, Implement, Challenge, Kill) Chart, <http://links.lww.com/PQ9/A265>] to prioritize interventions with the highest potential benefit and lowest projected effort. Key drivers of increasing video visit use included clinician/staff knowledge of policies and processes, clinician/staff buy-in, video visit equipment availability, patient MyChart enrollment, technical usability, and identifying video visit opportunities.

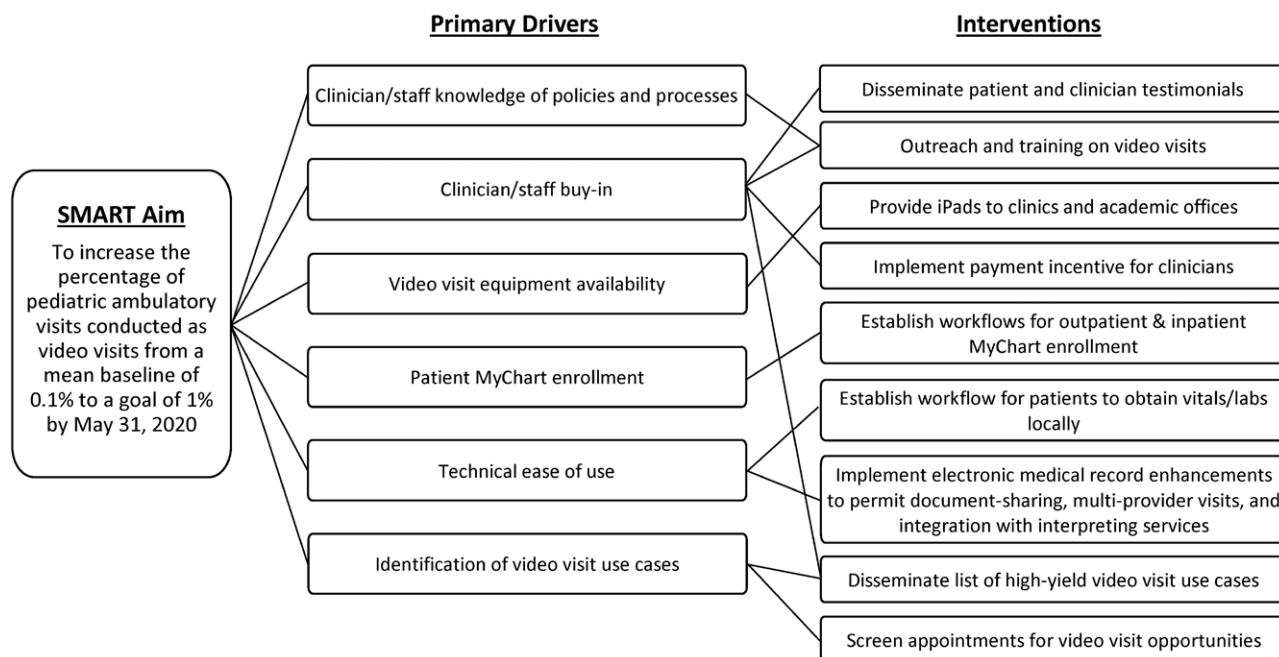
**Improvement Activities**

We tested interventions through a series of sequential plan-do-study-act (PDSA) cycles. Throughout the PDSA cycles, the QI specialist collected the feedback via email from clinic nurses and physicians. The multispecialty improvement team members also collected feedback from their respective clinic staff, clinician colleagues, and patients' parents. The improvement team compiled all feedback data and used these data to guide iterative improvements.

The improvement activities are described below. Table 1 presents the interventions and their key driver categories, start dates, and outcomes of the associated PDSA tests of change. To identify which interventions were most impactful, the QI team reviewed and discussed the primary outcome measure p-chart data at the monthly team meetings.

**Outreach and Training**

At the launch of this improvement project, the telehealth project manager contacted pediatric division chiefs to offer one-on-one or group training. The project manager subsequently offered training to clinicians who had not adopted video visits and scheduled their first video visit



**Fig. 1.** Key driver diagram summarizing the project aim and interventions implemented.

appointment. Further training efforts emphasized the value of video visits and were delivered at department faculty meetings. Ultimately, we used email alerts from the department chair to share video visit policy and procedure updates.

**Payment Incentive**

Clinicians received \$50 payment incentives from the health system for each video visit conducted outside their scheduled clinic time. In this way, clinicians received payments for conducting video visits during their administrative time. This intervention was abandoned once video visit uptake increased during COVID-19 because ongoing payments were too costly.

**Providing Video Visit Equipment**

We deployed iPads to clinicians’ academic offices to facilitate the conduction of video visits outside of clinic space. Additional iPads were deployed to pediatric divisions with high video visit utilization because access to shared iPads became an issue as video visit use increased.

**Reducing Barriers to MyChart Patient Enrollment**

The telehealth project manager monitored scheduled video visits to ensure MyChart enrollment successfully occurred before the visit date, identifying and addressing any problems. Streamlined workflows were implemented for same-day enrollment to facilitate urgent video visits. We deployed additional on-call personnel resources for pediatric MyChart enrollment and training. Adolescent MyChart enrollment issues continued to be a significant barrier despite the added resources and new workflows;

**Table 1. Description, Timing, and Status of Interventions**

Key Driver	Start Date	Intervention Description	Status
Knowledge of policies and processes	July 15, 2019	Individual outreach to all division chiefs; presentations at division meeting; offers of one-on-one provider trainings	Abandoned—low interest
	August 1, 2019	Outreach and additional training/support offered to all first time video visit providers	Abandoned—low interest
	August 28, 2019	Presentation at departmental faculty meetings	Adapted—present new processes
	September 11, 2019	E-mails sent to pediatric faculty by department chair to disseminate information on new policies and processes	Adopted
Buy-in	January 30, 2020	Tip sheet on how to flag follow-up visits to be scheduled as video visits distributed to QI team to disseminate in clinics	Adopted
	August 8, 2019	Presentation to division chiefs on video visit value and hospital executive leadership goals	Adopted
Equipment availability	August 2, 2019	Clinician \$50 payment incentive for each video visit conducted outside scheduled clinic time	Abandoned—ineffective during COVID-19
	July 30, 2019	Deployed iPads dedicated to video visits to academic offices for clinicians to use outside of clinical space	Adapted—see next intervention
MyChart enrollment	October 31, 2019	Deployed additional iPads to high-utilizing divisions during COVID-19 to support social distancing and remote care	Adopted
	August 1, 2019	Pediatric telehealth project manager monitored scheduled video visits for MyChart enrollment issues	Adapted—IT support assumed role during COVID-19
	October 23, 2019	Requested clinicians to report issues with MyChart enrollment to identify and address barriers	Adopted
	November 4, 2019	Permitted clinicians to grant adolescent patients full MyChart access, bypassing prior requirement for health information management team involvement	Adopted
	December 11, 2019	Clinic staff received in-person training to review how to enroll patients in MyChart	Adopted
	January 2, 2020	Clarified workflow for MyChart adolescent access by disseminating training sheet via a health system-wide EHR newsletter	Adopted
	March 16, 2020	Deployed additional on-call personnel for same-day pediatric MyChart enrollment to enable video visits	Adopted
Ease of use	March 21, 2020	Full access made default for adolescent MyChart accounts, waiving prior requirement to obtain formal consent	Adopted
	November 4, 2019	EHR enhancement permitting clinicians and staff to send documents/ attachments to patients securely in MyChart	Adopted
	December 3, 2019	Created and disseminated specialty-specific video visit dot phrases to facilitate usability of note-writing in the EHR	Adopted
	February 10, 2020	EHR enhancement to make provider EHR interface for video visit encounters mimic that for office visit encounters	Adopted
	April 2, 2020	EHR enhancement to permit pre-charting, SmartSets, improved after-visit summary, and seamless conversion of in-person to video visits	Adopted
Identification of use cases	April 8, 2020	Multiprovider video visits (eg, physician and nurse and dietitian and social worker) enabled to facilitate team care	Adopted
	April 13, 2020	Medical interpreting services enabled within video visits	Adopted
	September 1, 2019	Pediatric telehealth project manager screened in-person appointments for opportunities to convert them into video visits	Adapted – clinic staff assumed role during COVID-19
	December 6, 2019	Emailed list of high-yield video visit use cases (eg, report of laboratory, endoscopy, or sleep study results; chronic disease or mental health management) to pediatric faculty	Adapted – also posted list in resident workrooms

IT, information technology.

thus, we revised the adolescent MyChart policy to waive the requirement to obtain formal consent to grant adolescent patients full MyChart access in the electronic health record (EHR).

### EHR Enhancements

First, we implemented an enhancement that allowed providers to send documents and attachments to patients in MyChart. Next, we created specialty-specific video visit dot phrases to facilitate the note-writing process. We also implemented an enhancement that gave clinicians the ability to review patient information within the EHR while charting during video visits. Further enhancements gave clinicians the ability to chart before the encounter; provided SmartSets for charting; improved the after-visit summary functionality to mimic the in-person process more closely; made it possible to convert a scheduled in-person visit to a video visit easily, and enabled multi-provider video visits.

### Screening for High-yield Video Visit Opportunities

We developed a list of high-yield video visit use cases (eg, medication management, test results review, chronic disease management, and mental health follow-up). The telehealth project manager screened scheduled in-person appointments for high-yield use cases and reached out to physicians to propose converting them to video visits. We subsequently distributed the list of high-yield use cases to pediatric faculty via email and to pediatric residents via workroom flyers.

## RESULTS

There were 7,046 eligible pediatric ambulatory visits during the 4-month baseline period, of which 7 were video visits. Over the 11-month intervention period, there were 19,000 eligible pediatric ambulatory visits, of which 2,010 were video visits. The number of eligible visits per month decreased from 1,762 visits per month in the baseline period to 1,727 visits per month in the intervention period. The percentage of pediatric ambulatory visits that were completed as video visits increased from the baseline mean of 0.1%–1.2% during the first 8 months of the intervention period before a statewide COVID-19 shelter-in-place order on March 19, 2020. This COVID-19 event was associated with an increase in a mean percentage to 41.8% in the subsequent 3 months.

The statistical process control chart showed a stable process in the baseline period and special cause variation in the postintervention period (Fig. 2). Figure 3 (top) shows the p-chart for the percentage of video visits per month in the baseline and pre-COVID-19 intervention period, annotated with implemented interventions. After the initial project interventions, video visit use achieved the goal of 1%. However, the most significant improvement in video visit use occurred at the onset of

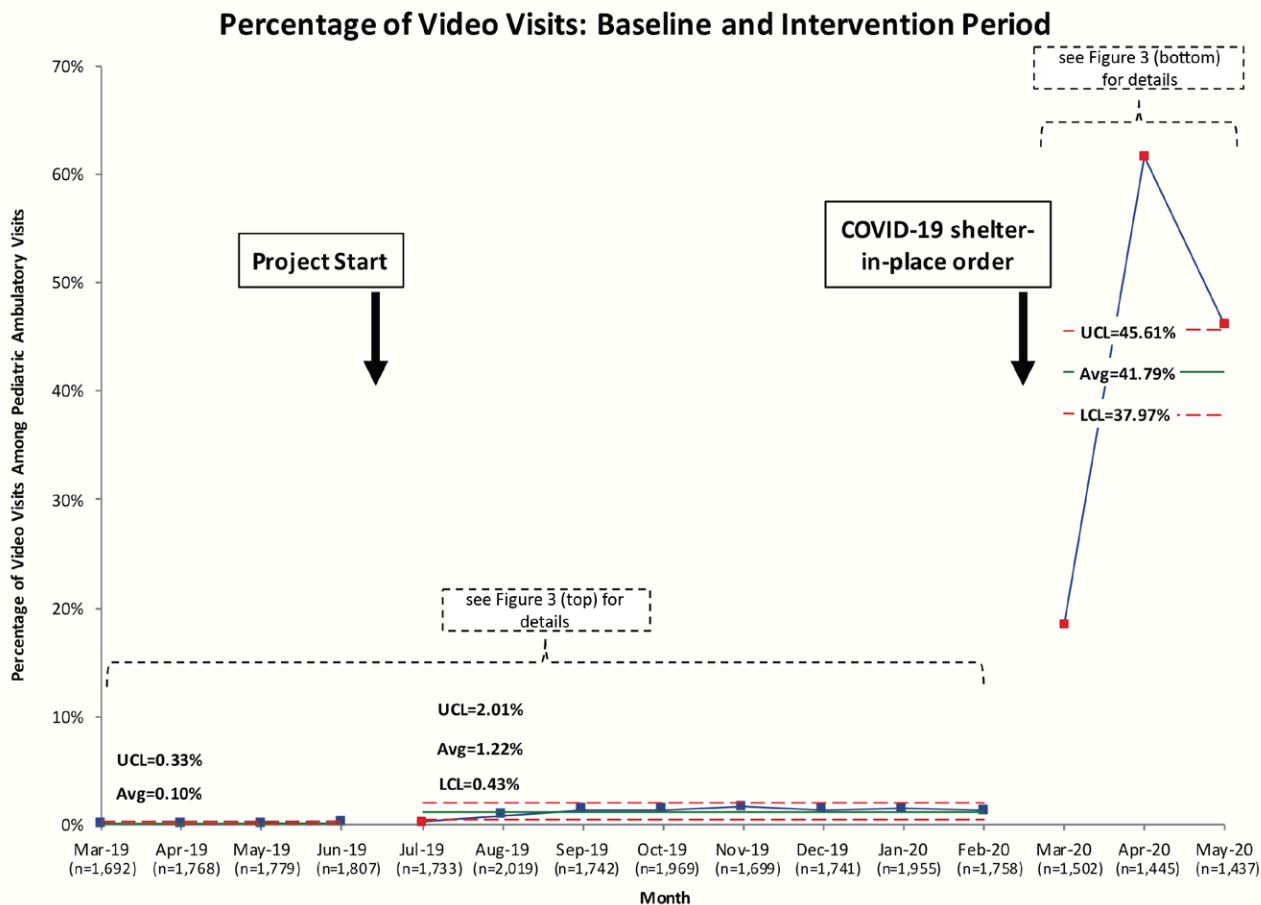
the statewide shelter-in-place order implemented for the COVID-19 pandemic. Figure 3 (bottom) shows the p-chart for the percentage of video visits per week in the intervention period during COVID-19, annotated with implemented interventions.

The process measure of the percentage of ambulatory pediatricians conducting video visits increased from the baseline mean of 0.6% to 6.3% (pre-COVID-19) and 73.5% (COVID-19), with special cause variation in the postintervention period (Fig. 4). Again, the most significant improvement in the process measure occurred at the onset of the COVID-19 shelter-in-place order. Regarding the balance measure, the percentage of no-shows among scheduled video visits increased from a baseline mean of 0% to a postintervention mean of 14.7% (Fig. 5). Statistical process control showed no significant variation in the balancing measure during the postintervention period. The onset of COVID-19 and the associated increase in scheduled video visits had no significant impact on the percentage of video visit no-shows. Regarding pediatric ambulatory in-person visits, the pre-COVID-19 and COVID-19 no-show percentages were 14.0% and 20.6%, respectively.

Among the interventions implemented, the most impactful interventions included clinician training outreach. Although these training efforts were abandoned due to minimal interest in training, these outreach efforts increased awareness about video visits and increased buy-in among early adopter clinicians. A second impactful intervention was providing video visit equipment. This intervention addressed fundamental technical and logistic limitations: (1) video visits could only be performed on an iOS smart device and (2) private space in the clinical setting was limited to in-person examination rooms, which were already fully utilized. A third impactful intervention focused on reducing barriers to MyChart patient enrollment. In the setting of COVID-19, a fourth impactful intervention was deploying additional on-call personnel resources for pediatric and adolescent MyChart enrollment and training.

## DISCUSSION

This quality improvement project showed that an iterative improvement process could increase video visits for pediatric ambulatory care delivery. Initial interventions achieved the institutional goal of 1% video visits among ambulatory encounters; however, the dramatic increase in video visit use to 41.8% occurred in association with the COVID-19 pandemic and a statewide shelter-in-place order. Although the relatively high postintervention percentage of pediatric ambulatory video visits primarily resulted from external factors, the project interventions facilitated the rapid adoption of home-to-clinic telehealth in the setting of COVID-19 because our improvement team had identified key drivers and implemented interventions addressing those barriers. We first trialed

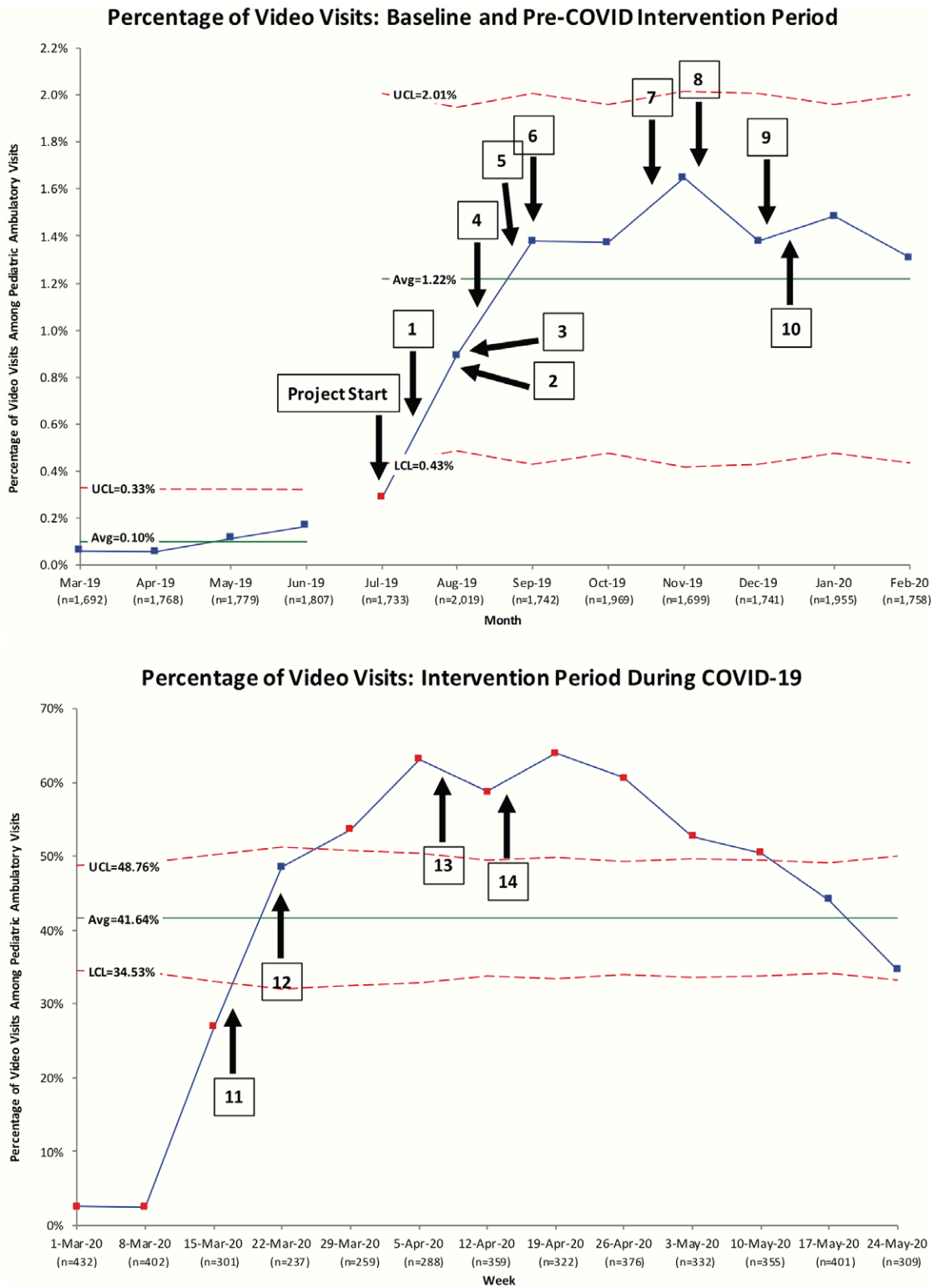


**Fig. 2.** P-Chart of the percentage of video visits among pediatric ambulatory visits. Top, The start of intervention period. Bottom, The start of COVID-19 shelter-in-place order. Avg, average; LCL, lower control limit; UCL, upper control limit.

interventions rated on our PICK chart to have the highest potential benefit and lowest projected effort. However, as the need to further expand ambulatory video visits emerged with COVID-19, we subsequently implemented the high payoff interventions that required more significant effort to implement. These interventions included providing MyChart enrollment resources, waiving the adolescent MyChart consent process, enabling multiprovider video visits, and enabling video visits to medical interpreting services. Without this QI project and its corresponding identification of local key drivers and interventions before COVID-19, ambulatory video visit use in our health system during COVID-19 might not have seen such a swift and dramatic rise.

Before COVID-19, our process measure demonstrated that most pediatric video visit use resulted from early adoption by a few clinicians. Initial interventions during the first three months of the intervention period were associated with increased pediatricians conducting video visits, but this percentage subsequently plateaued. Additional interventions between October 2019 and COVID-19 did not produce more gains, suggesting we could not get buy-in among late adopter

clinicians. In the pre-COVID-19 stage of our intervention period, widespread utilization of ambulatory video visits was mainly limited by the lack of use among a significant proportion of clinicians. Prior publications have highlighted the instrumental role clinicians play as the gatekeepers of telehealth utilization.<sup>11</sup> Research has also highlighted the barriers to telemedicine adoption by pediatricians, commonly citing the technology’s usability, workflow changes, and insufficient payment for telehealth services as barriers to uptake.<sup>16–18</sup> As shown in our key driver diagram, these previously published barriers were similar to those identified by our improvement team. Despite efforts to implement interventions to increase clinician adoption, COVID-19 proved to be the ultimate driver of new telehealth users. This finding raises concerns about the long-term stability of our improvement once the pandemic subsides. Additional interventions might be needed to sustain high video visit use, including ongoing EHR enhancements and streamlined MyChart enrollment processes. Regardless, we are confident that the percentage of pediatric ambulatory visits conducted by video will remain well above our initial goal of 1%.



**Fig. 3.** P-Chart with interventions of the percentage of video visits among pediatric ambulatory visits, before COVID-19 (top) and following COVID-19 (bottom). 1, clinician training outreach; 2, deployed iPads; 3, monitored for MyChart enrollment issues; 4, payment incentive; 5, faculty presentations and emails; 6, screened scheduled appointments to convert to video visits; 7, solicited MyChart enrollment barriers; 8, EHR enhancements and adolescent MyChart access; 9, distributed high-yield use cases and EHR dot phrases; 10, MyChart enrollment training; 11, MyChart enrollment resources; 12, waived adolescent MyChart consent process; 13, multiprovider video visits; 14, video visit medical interpreting services; Avg, average; LCL, lower control limit; UCL, upper control limit.



### Percentage of Providers Conducting Video Visits

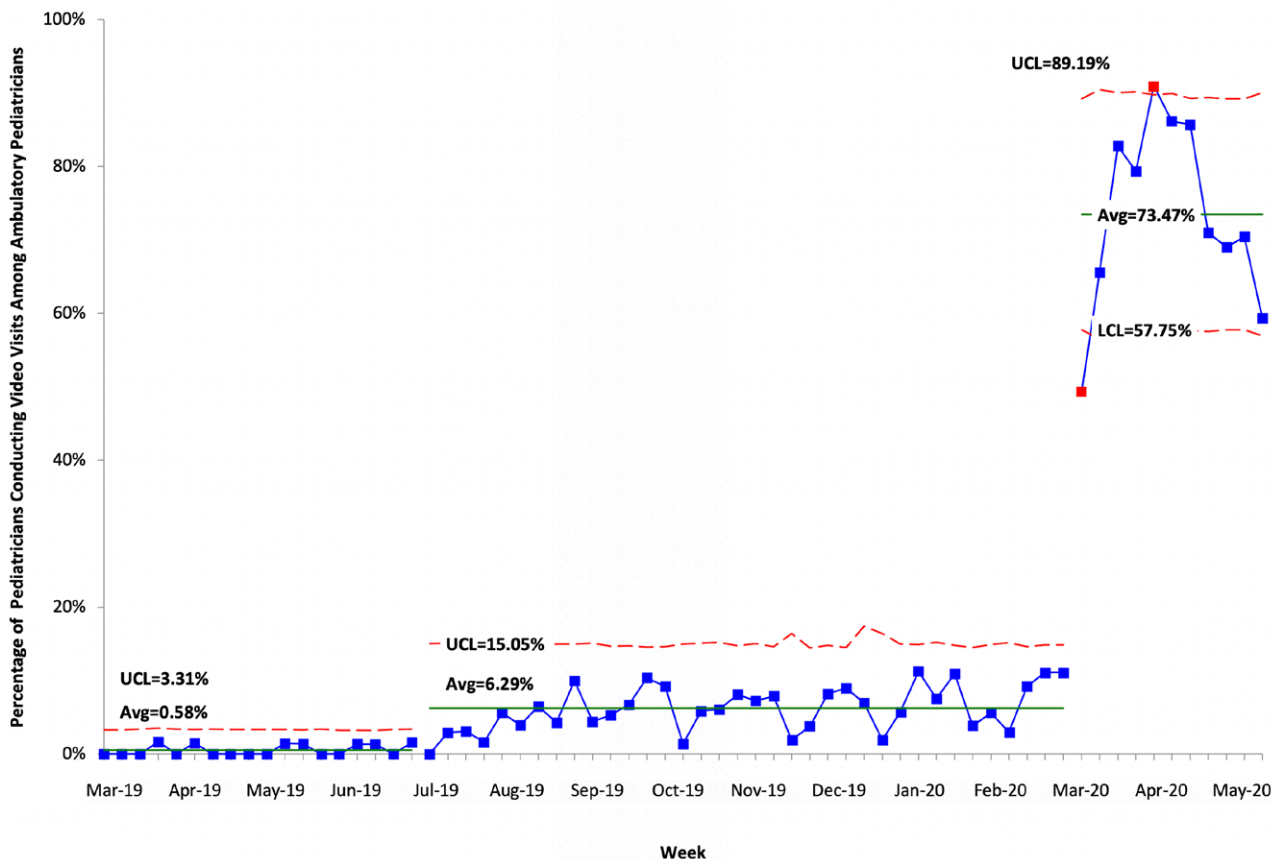


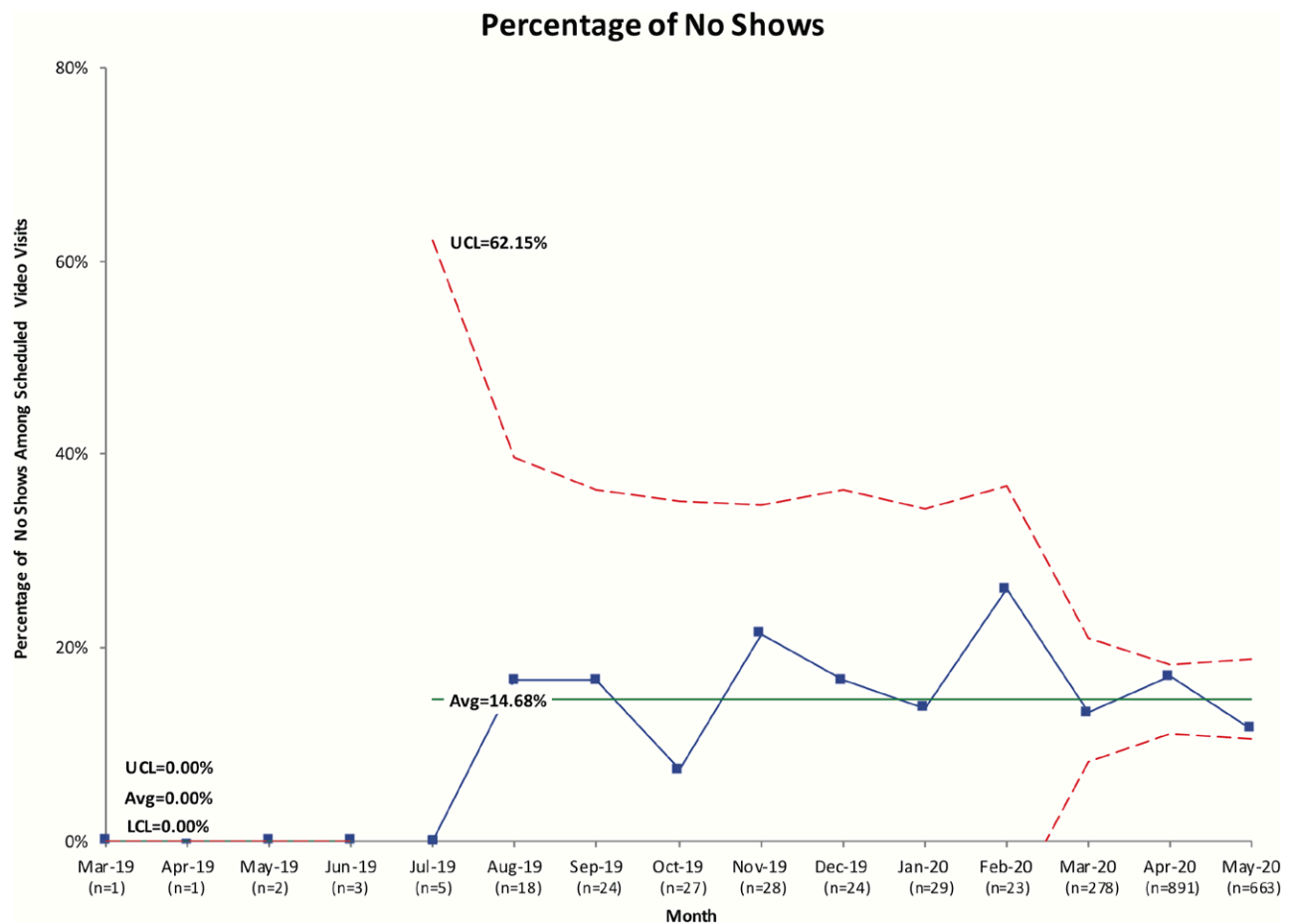
Fig. 4. P-Chart of the percentage of ambulatory pediatricians conducting video visits (process measure). Avg, average; LCL, lower control limit; UCL, upper control limit.

Because we conducted this project at a single medical center, the generalizability of its specific findings may be limited. However, individuals working in other ambulatory settings could use QI methods and implemented interventions. This improvement team mainly consisted of physicians and did not have representation from patients or additional disciplines such as nursing and other clinic staff. However, the physicians represented 9 diverse specialties, and the team also included administrators and a parent. Finally, our balancing measure of the percentage of no-shows among scheduled video visits could not comprehensively capture the potential overload on the clinic and video visit technical staff in supporting a rapid transition to a new care modality. Despite these limitations, this improvement project supports the use of QI to test strategies for increasing video visit use for pediatric ambulatory visits.

Telehealth use for ambulatory encounters in the setting of COVID-19 is rapidly expanding across the nation as a means to support social distancing and minimize disease spread.<sup>19-21</sup> The replacement of in-person visits with video visits was supported by the American Academy of Pediatrics<sup>22</sup> and facilitated by changes in reimbursement, HIPAA (Health Insurance Portability and Accountability

Act), and licensure regulations.<sup>23-25</sup> Nevertheless, ongoing barriers include logistical concerns such as clinician training, the usability of the technology, and access to equipment,<sup>26</sup> and not all health systems have quickly converted in-person visits to video visits.<sup>27</sup> Before COVID-19, our health system had already invested in installing and supporting our ambulatory telehealth care delivery system. However, the uncertainty around the future of telehealth policies has left some healthcare practices unable to invest time or money into implementing robust telehealth systems.<sup>28,29</sup> Future studies are needed to examine the impact of video visits on patient outcomes during the COVID-19 pandemic and determine the implications of these differences in access to video visits across healthcare systems on population health and patient experiences during this time.

Future studies are also needed to monitor the sustainability of ambulatory video visits. The ongoing use of telehealth will likely adjust as the disease spread, shelter-in-place orders, and regulations continue to change over time. The application of QI methods to conduct rapid-cycle tests of change as the contextual factors evolve will be a valuable strategy for telehealth researchers and program leaders. With the rapid expansion of telehealth during



**Fig. 5.** P-Chart of the percentage of no-shows among scheduled video visits (balance measure). Avg, average; LCL, lower control limit; UCL, upper control limit.

COVID-19, access to telehealth is driven by whether or not the healthcare practice offers telehealth and patient-level characteristics. Specifically, lack of technology, digital literacy, and reliable internet are recognized barriers to accessing telehealth.<sup>30</sup> Developing methods to mitigate this digital divide and examining telehealth's potential to exacerbate specific health disparities must be priority areas.

## DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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