

Utility of telemedicine in pediatric rheumatology during the COVID-19 pandemic

Ashley Perdue (✉ adperdue@mix.wvu.edu)

West Virginia University School of Medicine

Charles Mullett

West Virginia University

Amna Umer

West Virginia University

Paul Rosen

West Virginia University

Research article

Keywords: Pediatric, Rheumatology, COVID-19, telemedicine, telehealth

Posted Date: April 12th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-387993/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: During the COVID-19 pandemic, telemedicine has provided an alternative to in-person visits for patients practicing social distancing and undergoing quarantine. During this time, there has been a rapid expansion of telemedicine and its implementation in various clinical specialties and settings. In this observational study we aim to examine the utility of telemedicine in a pediatric rheumatology clinic, for 3 months during the COVID-19 pandemic.

Methods: A review of outpatient pediatric rheumatology telemedicine encounters were conducted from April-June 2020. Telemedicine visits (n=75) were compared to patients seen in practice over the prior year in office-based visits (March 2019-March 2020) (n=415). Patient characteristics, information on no-show visits, completed visits, new patient or follow-up status, and if new patients had received a visit within 2 weeks of calling to schedule an appointment were analyzed by chart review. An independent sample t-test and Chi Square statistic was used to determine statistical significance between the two groups. A two-proportion z-test was used to compare visit metrics.

Results: The percentage of new patients utilizing telemedicine (60%) was lower and statistically significant compared to the percentage of new patient office visits (84%) the previous year ($p < 0.0001$). There was no change in no-show rate between groups and patient characteristics were similar.

Conclusions: This study demonstrates a statistically significant decrease in new patient visits during the pandemic with telemedicine-only appointments compared to in-office visits over the previous year. This suggests a possible hesitation to seek care during this time. However, there was no significant difference among patient characteristics between telemedicine visits during the pandemic and during in-office visits in the previous year. In our experience, patient visits were able to be conducted via telemedicine with a limited physical exam using caregiver's help during the pandemic. However, further studies will need to ascertain patient satisfaction and preference for telemedicine in the future.

Introduction:

The coronavirus disease 2019 (COVID-19) was declared a pandemic by the World Health Organization (WHO) on the 11th of March 2020 [1]. Since the pandemic started, there has been a rise in the usage of telemedicine. Telemedicine provides an alternative way to care for patients who are social distancing and/or undergoing quarantine. It provides a substitute to office visits for patients, and limits exposure, while preserving personal protective equipment and avoiding patient travel. The use of smartphones and tablets makes real-time audio-visual communication easily accessible to both physicians and their patients. However, the application of telemedicine can be limited by broadband access in rural and underserved communities.

Telemedicine prior to the COVID-19 pandemic had begun to grow in the United States but was not widespread. Telemedicine or tele-visit usage doubled in use from 2016 to 2019 [2]. However, while telemedicine has grown in recent years it was still under-utilized. A 2019 survey on telehealth reported

that only 8% of consumers had participated in a video visit with a doctor [3]. In both general and subspecialty pediatrics, telemedicine was under-utilized before the pandemic. In pediatric rheumatology, in 2014, only seven pediatric rheumatology clinics had telemedicine capability, with only three clinics ever reporting using it [4]. Considering there are several states without a pediatric rheumatologist, there are patients who could benefit from telemedicine services. However, many barriers to telemedicine still exist, such as concerns about privacy, preference for in-person care, and provider reimbursement [3].

Telemedicine has been used successfully in a variety of ways across specialties before the COVID-19 pandemic. Telemedicine has been described previously in subspecialties of pediatrics such as pediatric psychiatry, pediatric cardiology, and neonatology [5][6][7]. Telemedicine with videoconferencing has previously been successful with rural populations for chronic disease management allowing for increased access and convenience [8]. Aside from use in rural settings, telemedicine has been described for disaster relief. In 2017, Nemours Children's Hospital in Orlando, Florida used pediatric telemedicine during Hurricane Irma [9]. This implies that telemedicine can be used when access is limited during a public emergency, which has been seen as the trend with telemedicine usage during the pandemic this past year.

The Covid-19 pandemic has sparked a rapid expansion of telemedicine and its implementation in various clinical specialties and medical settings. Telemedicine is an alternative to in-person visits when patients may be wary of coming to a medical office during a pandemic. During the Covid-19 pandemic the number of ambulatory visits declined nearly 60% by early April 2020. Simultaneously, telemedicine visits increased rapidly to 14% of visits over the month of April [10]. While there has been a recent rebound in in-person visits, the recovery has been lowest among certain specialties including sub-specialty pediatrics, with school-age children showing the smallest number of rebound visits [10]. This lack of rebound in visits may be due to caregivers' continued precaution to travel to clinics and potentially expose their children to the virus. This illustrates the importance of how telemedicine can be utilized in sub-specialty pediatrics, such as pediatric rheumatology during the pandemic.

Prior to the pandemic, there were few studies on the use of telemedicine in pediatric rheumatology. In one pre-pandemic survey, 95% of families with pediatric rheumatology patients reported they had a preference for in-person visits over telemedicine [11]. Interestingly, this preference was similar regardless of patient viewpoint on travel being inconvenient or convenient to the clinic [11]. While the previous survey found that patients had a preference for in-person visits, another study found that telemedicine-based clinics in pediatric rheumatology have statistically significant decreases in median distance traveled to clinic, amount of money spent on food while traveling, and less time missed from work and school when compared to in office encounters [12]. Previous studies of telemedicine in pediatric rheumatology have focused on patient travel and cost reduction with an emphasis on telemedicine-based clinics as opposed to telemedicine visits conducted from the patient's home [11][12]. In this study, we examine telemedicine in pediatric rheumatology conducted from the patient's home as opposed to telemedicine-based clinics previously described.

It is important to understand how best to utilize telemedicine in a post-pandemic healthcare setting. With the recent expansion of telemedicine use, lessons learned on how to integrate a virtual platform into practice should be shared. This study is the first study comparing patient populations who utilized telemedicine in pediatric rheumatology during the COVID-19 pandemic to patient populations with office-visits in the prior year. In our academic pediatric rheumatology clinic, visits were changed from all office based to all telehealth in April 2020. We report our three-month experience with telehealth in pediatric rheumatology during the period of April-June 2020.

Methods:

Telemedicine

A review of outpatient telehealth encounters was conducted in an academic pediatric rheumatology practice. Patient encounters were conducted via telehealth only from April-June 2020. These visits were compared to patients seen in the practice over the prior year in office-based visits. In order for patients to participate in telehealth visits patients were given an instructional video before their appointment on how to download and access the MyChart Epic Health Systems app on their smartphone or tablet. Once the app was downloaded patients accepted a user agreement and logged in with their MyChart account. Patients had an E-check-in where they consented to a telemedicine visit. Patients were then able to access their video appointment through the MyChart app using video and audio linking themselves and the physician. For patients who could not connect, or did not have video capabilities, audio only was used for the appointment. During telehealth-only visits from April to June of 2020 patients were located in their own homes during the visit. Patients had access to a University-based technology helpline if they had difficulty accessing the telehealth visit.

During telehealth visits, the physician met the patient and family and documented the history. A physical exam was then performed by visualization. The adult caregiver was an active participant by helping to point the camera on the specific joints or to help bend the joints for the physician. An assessment was provided and orders for laboratory tests, imaging, or referrals were entered as well as any necessary prescriptions. The family was able to ask any questions and were provided the doctor's contact information for any follow-up questions.

Chart Review

Patient characteristics were analyzed by chart review in the EPIC electronic medical records (EMR), system comparing office visits (conducted March 2019-March 2020) and telehealth visits (conducted April-June 2020). The chart review included pediatric patients who had made appointments with the pediatric rheumatology outpatient practice. Charts were analyzed to obtain information on no-show visits, completed visits, new patient or follow-up status, and if new patients had received a visit within 2 weeks of calling to schedule an appointment. Charts were also reviewed for patient characteristics such as age, diagnosis, and zip code.

From March 2019 to March 2020 (pre-pandemic), there were 415 unique patients identified who completed office visits. One patient was excluded from analysis because of an invalid home address. Two patients were excluded from analysis because the address listed was several states away, making them outliers. Only unique patient visits were included; repeat visits were not included in order to avoid duplicate counting of demographic information.

From April-June 2020 (during the pandemic), 75 unique patients were identified who completed telemedicine visits. No in-office visits were completed during this time. Two visits were conducted by audio only, due to limited internet bandwidth. One visit was conducted with a nurse practitioner, with the patient located in a rural clinic site close to the patient's home.

Patient zip codes were obtained from the chart review and used to estimate average household income. Patient addresses in the chart were used to calculate miles from the clinic to determine distance traveled. To determine if patients lived in a medically underserved area (MUA) their zip codes were entered into the "Am I Rural?" tool from the Rural Health Information Hub to determine their rural status. This tool is supported by the United States Health Resources and Services Administration (HRSA) and the United States Department of Health and Human Services (HHS) [13].

The information obtained from telehealth visits during April-June 2020 was then compared to the information obtained from in-office visits from the previous year, March 2019 – March 2020, to examine if there was a statistically significant difference in the population of patients utilizing telemedicine compared to in-office visits during the COVID-19 pandemic. The study was approved by the institutional review board of West Virginia University.

Statistical Analysis:

An independent samples t-test was used to determine statistically significant difference between the means of the two groups (office visit pre-pandemic and tele-visit during pandemic) for the continuous variables. The continuous variables included patient's age, distance from the clinic, and annual income. The Chi Square statistic was used to determine whether there is a statistically significant association between the two groups (office visit pre-pandemic and tele-visit during pandemic) and categorical variables. The categorical variables included rural designation by zip code, juvenile idiopathic arthritis diagnosis, and pediatric fibromyalgia diagnosis. A two-proportion z-test was used to examine the difference between two population proportions for data available in aggregate form (% new patients, new patient visits < 2 weeks, and no-show rate). Alpha was set at 0.05 for all statistical tests.

Results:

Patient characteristics comparing office visits to telemedicine visits are shown in Supplemental Table 1. For telemedicine encounters, 97% used both video and audio.

The average age of patients utilizing office visits and telemedicine visits showed no statistical difference. The average age of patients using telemedicine was 11.71 years with an age range of 2 to 19 years. The

average age for office visits was 11.94 years with an age range of 1 to 21 years. Both groups of patients lived similar distances away from the clinic with telemedicine visits living a mean distance of 100.3 miles and in-office visits living 95.71 miles. Rural designation and mean annual income were not significantly different as well, with telemedicine being 52.78% rural and in-office visits being 51.57% rural. Mean annual family income was \$57,195 for the telemedicine group and \$55,556 for the in-office group. There were 47 diagnoses seen over the previous year of in-office visits and 16 diagnoses seen during telemedicine only encounters for the three months into the pandemic. The diagnoses can be seen in Supplemental Table 2. The most common diagnoses seen with the telemedicine visits were juvenile idiopathic arthritis (JIA), followed by pediatric fibromyalgia. A statistically significantly higher percentage of children with JIA were seen in telemedicine visits (29.17% $p = 0.001$) compared to in-office visits the previous year (13.73%). The percentage of fibromyalgia patients were not significantly different for office visits and telemedicine visits, 24.10% and 22.22% respectively. The most common diagnosis seen in the office the previous year was fibromyalgia (24.10%) followed by JIA (13.73%).

Practice metrics comparing the two different time frames are shown in Supplemental Table 3. The percentage of new patients utilizing telemedicine was lower and statistically significant compared to the percentage of new patient office visits ($p < 0.0001$). During the time of telehealth only visits for the first three months into the pandemic there were 60% new patients, while there were 84% new patients for in-office visits during the one pre-pandemic year. The percentage of patients who received an appointment within two weeks of calling for a new consultation for office visits and telemedicine was similar at 61% and 69.30% respectively. The no-show rate for office visits and telemedicine were not significantly different at 6% and 6.7% respectively.

Discussion:

This is the first study to compare patients who utilized telemedicine for pediatric rheumatology during the public health emergency caused by the COVID-19 to patients who had in-office visits in the prior year. We found no change in no show rates with telemedicine compared to office visits. Percentage of new office visits in the office setting decreased from 83–60% in the telemedicine setting. This decrease in new patient visits could be due to various reasons. One potential reason could be that families decided to defer care during the beginning of the pandemic all together. Another potential reason could be that families did not believe telemedicine would be able to address their concerns. Families might have also been uncomfortable with trying to use telemedicine and instead deferred care until in-office visits resumed. Family preferences regarding telemedicine during the pandemic will require further study. Based on patient demographics such as distance from clinic, family's annual income, patient age, and rural status, patients utilizing telemedicine during the pandemic were similar to those using office visits before the pandemic. The pandemic may have made families more amenable to trying telemedicine for the first time for their children with pediatric rheumatology concerns. However, families may have used telemedicine during this time out of necessity as in-office visits were not available, which could explain why demographics and patient characteristics were not significantly different compared to in-office visits over the previous year pre-pandemic.

With telemedicine visits offered during the COVID-19 pandemic, we were able to garner experience with its benefits and limitations. One advantage is that telemedicine allows for small children to be relaxed during the exam in the confines of their own home. Physicians can make a game out of the exam over audio-video communication by playing Simon Says. This setting also allows the physician the ability to get a general sense of the patient's home environment when visits are conducted from the patient's kitchen or living room. The downside to using audio-video communication is some limitations of the physical exam. An important aspect of the pediatric rheumatology exam is an examination of the joints including palpation, which can be done indirectly by training the caregiver how to assist. The telemedicine exam facilitates the physician to coach the caregiver as an assistant and makes the caregiver an active participant in the exam. The caregiver can help position the child, move the joints, and report the child's pain level. In this way, the family has a more active role during the child's visit.

The pediatric rheumatology group at Stanford Children's has begun a multiphase pilot study that examines the clinical gap in video visits. From their preliminary data they have found that the rheumatologic physical exam, vital signs, modes of communication between provider and patient, need for immediate laboratory work or imaging, and the need for nursing or social work support are all barriers to the adoption of telemedicine when compared to the in-person clinic visits [14]. This describes the several barriers that physicians and patients encounter on the telemedicine platform that will need to be addressed.

In addition to some of the limitations that telemedicine can create, physicians will also have to become comfortable with the lack of formality telemedicine can engender. In our experience, some families arrived to their telemedicine visits in pajamas. Other visits were conducted with the child in the car with the parent driving. Clearer instructions about what to expect during the telemedicine visit should be given to families ahead of the visits. The patient-physician relationship has to be established on the screen. Optimizing this virtual relationship is something both patients and physicians will have to learn going forward together.

Technology barriers to telemedicine also remain. Patients are required to learn how to use the technology in order to participate in a telemedicine visit. There must be appropriate access to technology and internet for patients to participate, which in rural areas may be limited. Families may also have devices without camera capabilities, limiting their ability to utilize video communication further hindering the ability to try to conduct a physical exam virtually. It will be important to assess a family's ability and comfort utilizing technology prior to a telemedicine visit. Patients in the future could also benefit from an instructional video on how telemedicine visits are conducted in order to set expectations and to show how the platform is operated. In our study, clinic patients were provided an instructional video prior to their visit on how to operate the telemedicine platform.

A recent article in *Pediatric Rheumatology* discussed the potential glitches with telehealth utilization during the COVID-19 pandemic, with one potential limitation being the inability to ask pediatric patients about psychosocial matters such as depression and smoking while a parent may be in the room or

helping to operate the telehealth visit [15]. This poses another challenge with telehealth for providers who need to assess important psychosocial factors that may contribute to their patient's disease or their compliance with treatment. This is important in pediatric rheumatology as many diagnoses are chronic and psychosocial factors should be assessed. Healthcare professionals will have to learn how to navigate these conversations over a screen in order to maintain the patient-provider relationship and the patient's confidentiality.

A recent study in an Alaskan population assessed the outcomes and quality of care for rheumatoid arthritis in telemedicine. They found that telemedicine did not improve rheumatoid arthritis activity or quality of care over a 12-month period, however it was found that it was not inferior to in-person care. Perceptions of telemedicine were also addressed using a telemedicine perception survey. They found that individuals using telemedicine still expressed a preference to be seen in-person, however those using telemedicine were more likely to feel that the care given was as good as in-person visits. Both telemedicine patients and office visits patients felt that technical difficulties were a limitation to its use (16). This study suggests that telemedicine may offer another option of care to patients that is as good as in-person visits. This study also shows that those utilizing telemedicine have more positive perceptions about its use as an alternative method of care.

Further studies will need to ascertain patient satisfaction with telemedicine in pediatric rheumatology. The growth of telemedicine during the COVID-19 pandemic has rapidly transformed the way providers deliver care. Some families may feel more comfortable with telemedicine after trying it for the first time. Other families may feel most comfortable in the office setting only. It would also be important to understand why some patients may have deferred care during the pandemic and whether it was due to their perceptions about telemedicine. Exploring family preferences for modality of care will be an important area for future study.

Some valuable lessons were learned during the first three months of our telemedicine experience. Beyond the pandemic, telemedicine will have a place in pediatric rheumatology care where access issues persist. With less than 500 pediatric rheumatologists in the United States, there are still nine states lacking access to pediatric rheumatology care. If telehealth could be utilized further, than patient access could be enhanced across the country. This would include rural areas, underserved areas, and areas where families have to travel long distances to receive care. The Covid-19 pandemic is an event that will stimulate physicians to evaluate how they can expand care within a small subspecialty. More families may choose to try a telemedicine visit if given the option. The pediatric rheumatology workforce should be ready to embrace telemedicine as part of the future of serving the patient population. Learning a digital physical exam and interacting with families over video will be the new normal in many instances. How to best leverage technology for the care of pediatric rheumatology patients requires further study.

Conclusions:

This study found that there was a statistically significant decrease in the number of new-patient visits during telemedicine-only visits during the COVID-19 pandemic from April-June 2020 when compared to office visits in the previous year. This study also reports no significant change in no-show rate or patient characteristics during telemedicine in April-June 2020 when compared to in-office visits the previous year. This is the first study to compare patient characteristics and office visit metrics in a pediatric rheumatology practice during the COVID-19 pandemic with telemedicine usage. With the increase in telemedicine usage during the pandemic it will be important moving forward to understand how both patient and providers view and incorporate telemedicine into their care. The decrease in new-patient visits may be due to caregiver hesitancy to utilize telemedicine, which will need further study in order to elucidate caregiver perception and satisfaction.

Abbreviations:

COVID-19: Corona Virus Disease 2019

WHO: World Health Organization

EMR: Electronic Medical Records

MUA: Medically Underserved Area

HRSA: United States Health Resources and Services Administration

HHS: United States Department of Health and Human Services

JIA: Juvenile Idiopathic Arthritis

Declarations:

Ethics approval and consent to participate: This study was approved by the West Virginia University Institutional Review Board.

Consent for publication: Not applicable.

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

Funding: Not applicable. No funding provided.

Author's contributions: AP performed the chart review on patients regarding telemedicine and in-office visits, and was a major contributor in writing the manuscript. CM performed data review regarding

practice metrics and was a contributor in writing the manuscript. AU performed statistical analyses and was a contributor in writing the manuscript. PR was a major contributor in writing the manuscript.

Acknowledgements: Not applicable.

References:

1. World Health Organization. WHO Director-General's opening remarks at the media briefing on COVID-19 11 March 2020. March 11. 2020. Available at: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19--11-march-2020>. Accessed 30 Mar 2020.
2. American Medical Association. AMA Digital Health Research. Physician's motivation and requirements for adopting digital health—adoption and attitudinal shifts from 2016 to 2019. [AMA Web Site]. February 2020. Available at: <https://www.ama-assn.org/system/files/2020-02/ama-digital-health-study.pdf>pdf iconexternal icon Accessed 30 Mar 2020.
3. AmericanWell. Telehealth Index: 2019 Consumer Survey. [AmericanWell Web site] 2019. Available at: <https://static.americanwell.com/app/uploads/2019/07/American-Well-Telehealth-Index-2019-Consumer-Survey-eBook2.pdf> Accessed 30 Mar 2020.
4. Rietschleger MP, Tootoo J, Mroczek A, et al. Alternative mechanisms of care delivery in pediatric rheumatology: to what extent do they expand the reach of pediatric rheumatologists? *Arthritis Rheumatology*. 2014;66:211–1.
5. Garingo A, Friedlich P, Tesoriero L, Patil S, Jackson P, Seri I. The use of mobile robotic telemedicine technology in the neonatal intensive care unit. *J Perinatol*. 2012;32(1):55–63.
6. Vander Stoep A, McCarty CA, Zhou C, et al. The Children's Attention-Deficit Hyperactivity Disorder Telemental Health Treatment Study: Caregiver Outcomes. *J Abnorm Child Psychol*. 2017;45(1):27–43.
7. Sable CA, Cummings SD, Pearson GD, et al. Impact of telemedicine on the practice of pediatric cardiology in community hospitals. *Pediatrics*. 2002;109(1):E3.
8. Orlando JF, Beard M, Kumar S. Systematic review of patient and caregivers' satisfaction with telehealth videoconferencing as a mode of service delivery in managing patients' health. *PloS One*. 2019;14(8).
9. Murren-Boezem J, Solo-Josephson P, Zettler-Greeley CM. A pediatric telemedicine response to a natural disaster. *Telemedicine E-Health*. 2020;26(6):720–4.
10. Mehrotra A, Chernew M, Linetsky D, et al. The impact of the COVID-19 pandemic on outpatient visits: a rebound emerges [The Commonwealth Fund Web site]. May 19, 2020. Available at <https://www.commonwealthfund.org/publications/2020/apr/impact-covid-19-outpatient-visits>. Accessed 20 Nov 2020.
11. Bullock DR, Vehe RK, Zhang L, et al. Telemedicine and other care models in pediatric rheumatology: an exploratory study of parents' perceptions of barriers to care and care preferences. *Pediatric*

Rheumatology. 2017;15:55.

12. Kessler EA, Sherman AK, Becker ML. Decreasing patient cost and travel time through pediatric rheumatology telemedicine visits. *Pediatric Rheumatology*. 2016;14:54.
13. Am IR – Tool. Rural Health Information Hub. 2021 <https://www.ruralhealthinfo.org/am-i-rural#>. Accessed 20 Jul 2020.
14. Pooni R, Sandborg C, Lee T. Building a viable telemedicine presence in pediatric rheumatology. *Pediatric clinics of North America*. 2020;67(4):641–5.
15. Balmuri N, Onel KB. Glitches in the utilization of telehealth in pediatric rheumatology patients during the COVID-19 pandemic. *Pediatric Rheumatology*. 2020; 18(1):N.PAG.
16. Ferucci E. Evaluation of the Impact of Telemedicine on Management of Rheumatoid Arthritis - Final Report. Prepared by the Alaska Native Tribal Health Consortium under Grant No. R21 HS024540. Rockville, MD: Agency for Healthcare Research and Quality, 2019. <https://digital.ahrq.gov/sites/default/files/docs/citation/r21hs024540-ferucci-final-report-2019.pdf>. Accessed 15 Mar 2021.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [TelemedicinepaperTable1.docx](#)
- [SupplementalTable2tele.docx](#)
- [Table3tele.docx](#)