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# A Pediatric Telemedicine Research Agenda: Another Important Task for Pediatric Chairs

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**D**riven in part by revised payment systems and the need to maintain social distancing practices, pediatric telemedicine adoption increased dramatically during the Coronavirus disease 2019 (COVID-19) pandemic.<sup>1</sup> Despite the rapid growth of telemedicine and its appealing features as a tool for pediatric health care delivery, many questions remain unanswered regarding the impact of telemedicine on pediatric health care. Although many groups play roles in building telemedicine expertise and capacity, pediatric department chairs are positioned to drive increased attention to this important topic by virtue of their critical role at the interface among children's hospitals, academic departments, health networks, and communities. A call to action from this group could help drive increased attention from all parties to these important questions.

In this article we aim to provide, for pediatric department chairs and others, a focused summary of where pediatric telemedicine research may be most impactful and to highlight the importance of this topic as an academic research focus. We argue that despite a growing literature on telemedicine and the promise of improved outcomes, we lack rigorous, pediatric-focused research on the quality and outcomes of telemedicine integration into pediatric care. In addition to pediatric-centered research on quality and outcomes of telemedicine, a specific focus on the impact of telemedicine on pediatric access and equity is necessary. Inequities in the access to and use of telemedicine, when added to existing inequities in health care, may increase disparities (eg, for low English proficiency populations) or reduce disparities (eg, for rural populations).<sup>2</sup> Consequently, we argue that a research and policy focus on understanding and addressing these disparities is needed.<sup>3-5</sup> While we recognize that telemedicine encompasses a range of approaches and technologies, our focus here is limited (albeit not exclusively) to live audio-video telemedicine, the method of telemedicine delivery most dramatically accelerated in the context of the COVID-19 pandemic.

Overall, we conclude that pediatric department chairs can foster an environment that promotes research to inform a

nuanced understanding of the benefits and potential unintended negative consequences of live audio-visual telemedicine in pediatrics across different conditions, contexts, clinical teams, and patient populations to determine how best to use this approach to maximize child health outcomes and equity. We have delineated some immediate and pragmatic goals that frame this issue and may inform the advocacy and coordination required for their attainment ([Table](#); available at [www.jpeds.com](http://www.jpeds.com)).

## Quality and Outcomes of Care

With the recent rapid expansion of telemedicine, rigorous evaluation is needed to ensure that high-quality patient care is maintained and to determine the best use cases for telemedicine moving forward.<sup>6</sup> Here we first highlight the importance of a pediatric-specific research focus and then provide highlights of the existing literature that reveal opportunities for future research to identify clinical areas in which telemedicine promotes vs impedes quality care and optimal outcomes. Finally, we highlight system- and population-based opportunities to support cross-sector care integration and personalized health care through telemedicine.

## Pediatric-Specific Needs

Although telemedicine tools and technology have many similarities in adult and pediatric health care, many distinct aspects of pediatric telemedicine warrant consideration. Unique approaches may be needed to optimally implement telemedicine for children, including accounting for the patient-caregiver dyad, tailoring aspects of the visit to meet the distinct needs of different age groups (eg, maintaining adolescent confidentiality), and integrating telemedicine into school settings where

AAP	American Academy of Pediatrics
COVID-19	Coronavirus disease 2019
DTC	Direct to consumer

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children spend much of their time. Additionally, certain procedures and diagnoses, including vaccination delivery and attention-deficit/hyperactivity disorder, are more common in pediatric care. Given these unique features, telemedicine quality and outcomes should be assessed separately for children, as there may be key differences compared with adult populations. Advocacy for federal and other funding agencies to support pediatric-focused telemedicine investigation, a key role for departments of pediatrics, will be helpful in achieving these goals.

### Telemedicine Across Clinical Areas: Existing Evidence and Imperatives for Future Research

The expanding telemedicine literature shows promise for pediatric applications. Work in areas related to acute care, vaccination counseling, adolescent care, and chronic conditions is demonstrating potential benefits and suggesting directions for research to best promote quality and outcomes. Given the limited research using rigorous randomized trials, the published studies draw from a range of designs.

In treatment for acute conditions, results suggest that the setting of telehealth delivery matters. Specifically, research has explored the quality of care in direct-to-consumer (DTC) telemedicine services vs those delivered through the medical home. The annual number of pediatric DTC telehealth visits increased from 38 in 2011 to 24 409 in 2016.<sup>7</sup> The pediatric profession raised questions about this growth and its potential impact on care. Specifically, the American Academy of Pediatrics (AAP) noted several risks that can arise from the provision of nonemergency acute pediatric care outside of the medical home—whether via telemedicine or in-person—including the fragmentation of care, lack of access to complete medical records, missed opportunities for identifying needs, inadequate follow-up, and treatments inconsistent with best practice.<sup>8</sup> Concerns raised by the AAP were confirmed by a retrospective cohort study of national claims data focused on the most common condition treated in DTC telemedicine visits: acute respiratory tract infections.<sup>9</sup> Researchers found that guideline-concordant antibiotic management was substantially lower in DTC pediatric telemedicine visits (59%) compared with urgent care visits (67%) and primary care visits (78%),<sup>9</sup> whereas prescribing was more consistent across settings in adult populations.<sup>10</sup> In addition, an analysis of prescribing practices during the early pandemic in a single pediatric primary care network found similar guideline concordance of antibiotic prescribing in telemedicine and in-person visits, in contrast to the DTC setting.<sup>11</sup> These results underscore the potential importance of the clinical practice setting to the quality of telemedicine care delivery for common complaints and highlight the importance of attention to contexts (eg, pediatric populations, continuity of care) in future telemedicine research.

Incorporation of telemedicine into pediatric care requires consideration of not only whether comparable care is received during telemedicine vs in-person encounters, but also how the use of telemedicine impacts the longitudinal delivery of effective care, including crucial preventive services. In this context, researchers have begun to explore tele-

medicine use in primary care with a focus on vaccination and adolescent care. In a national survey of nearly 1000 primary care clinicians, most reported consistently providing vaccine counseling during telemedicine visits.<sup>12</sup> However, much remains unknown, including the specific communication techniques most useful in the context of telemedicine, the effectiveness of virtual vs in-person vaccine counseling on vaccine receipt, and how to best facilitate in-person follow-up for vaccination after telemedicine visits.

In terms of adolescent care, telemedicine for adolescents may offer a promising tool, given that adolescents seek health care less frequently than younger children.<sup>13,14</sup> Telemedicine may improve receipt of recommended care for this age group if it can successfully reduce barriers associated with in-person office visits. Several examples of the feasibility and acceptability of telemedicine in adolescent medicine, including for confidential care, have been published<sup>15-21</sup>; however, we found a lack of studies on the clinical outcomes of this care.

Treatment for chronic conditions is another area that may be particularly amenable to virtual care. There is a large and disparate body of research on clinical outcomes across adult and pediatric age groups in telemedicine chronic care. An older report from the Agency for Healthcare Research and Quality that summarized findings from 58 systematic reviews published between 2007 and 2015 on the effectiveness of telemedicine concluded that research consistently supports the benefits of telemedicine used for direct patient-clinician interaction in the treatment of chronic conditions overall, but that a gap remains in evaluating the management of serious pediatric conditions using telemedicine.<sup>22</sup>

The small number of randomized trials in this area demonstrate favorable outcomes. In one randomized clinical trial, children with asthma who received a school-based telemedicine intervention experienced significantly fewer symptoms and hospital visits compared with children who received usual care.<sup>23</sup> Similarly, in a randomized trial, use of an asthma portal to support shared decision making between families and pediatricians resulted in fewer child asthma flares and fewer parent missed days of work.<sup>24</sup> In another randomized trial involving children with medical complexity, those who were offered telemedicine visits with primary care clinicians in the context of a comprehensive care program had reductions in days of care, risk of serious illness, and health system costs compared with children not offered virtual care.<sup>25</sup>

Many studies of telemedicine for chronic conditions use nonexperimental designs. A study of a recent quality improvement project demonstrated improved follow-up for attention-deficit/hyperactivity disorder when school-based telemedicine was used.<sup>26</sup> Similarly, nonrandomized studies in children and young adults with type 1 diabetes have demonstrated high patient satisfaction,<sup>27,28</sup> increased frequency of clinician contact, and improved hemoglobin A1c levels with the use of telemedicine.<sup>29</sup> An emerging literature also suggests clinical benefits from teledermatology. A retrospective analysis of 1500 children and adults found that 70% of patients had a change in diagnosis, 98% had a

change in management, and 69% with more than one telemedicine visit showed clinical improvement.<sup>30</sup>

These findings highlight the promise of telemedicine in urgent and nonurgent settings that could be strengthened by additional larger-scale randomized studies, comparative effectiveness research, or dissemination and implementation studies. Rigorous randomized designs or designs benefiting from causal inference are essential to assess the effectiveness, risks, and costs of telemedicine across a variety of clinical areas. Large-scale multisite or network-based studies are needed to assess generalizability. From a pragmatic perspective, the field would benefit from work to identify the ideal balance and frequency of in-person visits vs telemedicine visits, the conditions that would benefit most from telemedicine applications, the relative benefit of providing families with devices to enhance telemedicine evaluation, the development of optimal triage protocols to direct families to either in-person or virtual care, and the creation of supportive payment models.<sup>31</sup>

### System and Population-Based Opportunities

Telemedicine creates opportunities for critically needed cross-sector care integration within health care settings and between health care and others (eg, schools, social services) supporting the redesign of preventive and chronic disease care management as well as multiple care practices. Ideally, these efforts should involve multidisciplinary initiatives using telemedicine systems and be rigorously evaluated. For example, chronic disease management through telemedicine technologies needs to have versatile functionality and be able to support patients with multiple diseases. Systems need to provide more options for tailoring to become more patient-specific and personalized. Stratification tools are needed for matching patient preferences and health care providers' recommendations to specific technologies and goals. Guidelines that assist patients in understanding how to use the technology, how the data are analyzed, and how to self-monitor their care are needed to increase patient/family acceptance and build comfort with self-management. Opportunities to partner with payers to determine the effectiveness and cost-effectiveness of payment models and of coverage for devices should be prioritized.

### Access to Care and Health Equity

The AAP recognizes telemedicine as a valuable tool to address access challenges in pediatric care.<sup>31,32</sup> Studies have demonstrated the ability of telemedicine to address such barriers as uneven geographic distribution of pediatric clinicians, shortage of pediatric subspecialists, and lack of effective communication and coordination between pediatric providers. For example, in a rural and medically underserved community, there was high satisfaction among clinicians and parents/guardians with the use of telemedicine consultations for children with special health care needs.<sup>33</sup> Separately, a cluster randomized trial tested a telemedicine-enhanced referral process for children from primary care to community

mental health clinics.<sup>34</sup> Children and their parents assigned to the telemedicine intervention (introductory video and virtual screening visit) were significantly more likely to complete the initial screening visit compared with the usual care control group.<sup>34</sup> These findings indicate opportunities for future trials to examine replicability for other conditions and for measuring the impact of telemedicine use on follow-up and clinical outcomes.

Even though telemedicine has the potential to reduce barriers that disproportionately affect marginalized populations, its use may actually worsen disparities. For example, the technology required to access health care remotely may inequitably limit opportunities to utilize telemedicine services. Inadequate broadband access, which refers to access to a high-speed internet connection, is one key concern.<sup>35</sup> Inadequate broadband access disproportionately affects rural residents, Native Americans living on tribal lands, Black and Hispanic adults, adults aged 65+ years, and those with an annual household income <\$30 000.<sup>36,37</sup> Digital device ownership is another potential source of inequity. An emerging trend shows a sharp increase in smartphone-only internet use, particularly among the lowest-income groups in the United States.<sup>38</sup> Directing research efforts to reducing barriers around using a smartphone for telemedicine visits could improve equitable access to telemedicine. For example, designing and adopting telemedicine platforms that do not require costly data plans or substantial device memory may help improve families' access. Expansion of existing services, such as Lifeline, a Federal Communications Commission program that provides reduced-cost phone or internet service to low-income families, has been proposed to combat these service barriers<sup>39</sup>; assessing the impact of such policy changes may help support sustained funding.

Along with digital device ownership and broadband access, digital literacy is a third requirement for successful use of current telemedicine services. In health care, digital literacy refers specifically to an individual's ability to use health information technology tools to participate in health care.<sup>40</sup> Low digital literacy disproportionately impacts individuals of low socioeconomic status, those with lower educational attainment, and the elderly. There is some evidence that in adults with multiple chronic conditions, digital literacy training can help increase telemedicine engagement.<sup>41</sup> Access to digital literacy training is currently available from multiple sources including libraries, community centers, and others<sup>42</sup>; however, more research is needed to evaluate whether partnerships with these organizations offer sustainable solutions to improving digital literacy in a way that improves health. Parallel research should strive to improve user telemedicine interfaces to accommodate varying literacy levels.

Even among those with digital access, the potential exists for inequities in telemedicine care. For example, inadequate incorporation of interpreter services or of accommodations for children or caregivers with communication disabilities may result in inadequate parent-clinician communication through digital platforms. Multiple frameworks have proposed key steps in designing telemedicine interventions to

advance health equity, including the need to focus on marginalized populations in design, to involve representative patient and family members in the process, and to prioritize linguistic and cultural tailoring.<sup>6,43</sup> We also lack knowledge regarding whether telemedicine platforms modify the impact of implicit biases on clinician decision making. This concern warrants specific attention. Investigating the content and outcome of telemedicine visits is crucial to ensure not only equitable access, but also equitable care through telemedicine.

### Potential Role of Pediatric Department Chairs

The examples highlighted above indicate that for virtual care to successfully evolve and expand, a systematic approach to innovation and research is needed. Recent trends in telemedicine adoption in the context of the COVID-19 pandemic have underscored the importance of addressing salient knowledge gaps as outlined through multiple examples discussed above. To best fill these voids, academic pediatric departments ideally will foster an environment that is conducive to innovation and scholarship in the realm of telemedicine to optimize live audio-video telemedicine across care settings. Further synergy can be achieved by complementing this foundational work with scholarship to create, evaluate, and/or implement remotely captured patient-reported outcomes measures, advanced wearable technologies, smart home and health sensors, and powerful analytics platforms to build a future of evidence-based and highly engaged personalized medicine across the care continuum. In this setting, pediatric department leaders have the opportunity

to promote a future for pediatrics that prioritizes an integrated partnership with children and their families through complementary in-person and remote interactions. Chairs also may support activities to promote research dissemination to payers, policy makers, and health system leaders and research translation to the clinical and operational activities within the department so that evidence-based strategies reach children and families.

### Conclusions

Pediatric department chairs in academic departments can direct faculty and program development as well as scholarship to telemedicine, an area likely to be foundational to a dynamic, personalized, and more accessible and impactful system of pediatric care. Here we have presented examples demonstrating the widespread lack of rigorously designed and conducted longitudinal and equity-focused research to guide telemedicine implementation and use. Results from such studies are urgently needed to inform evidence-based decision making regarding clinical impact, cost-effectiveness, patient perception, and organizational aspects of telemedicine. With concerted focus and leadership initiatives, knowledge gaps may be closed, with children benefiting from the optimal mix of in-person and virtual care. ■

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References available at [www.jpeds.com](http://www.jpeds.com)

## References

- Fiks AG, Jenssen BP, Ray KN. A defining moment for pediatric primary care telehealth. *JAMA Pediatr* 2021;175:9-10. <https://doi.org/10.1001/jamapediatrics.2020.1881>
- Schweiberger K, Hoberman A, Iagnemma J, Schoemer P, Squire J, Taormina J, et al. Practice-level variation in telemedicine use in a pediatric primary care network during the COVID-19 pandemic: retrospective analysis and survey study. *J Med Internet Res* 2020;22:e24345. <https://doi.org/10.2196/24345>
- Metzl JM, Hansen H. Structural competency: theorizing a new medical engagement with stigma and inequality. *Soc Sci Med* 2014;103:126-33. <https://doi.org/10.1016/j.socscimed.2013.06.032>
- Ford CL, Airhihenbuwa CO. Critical race theory, race equity, and public health: toward antiracism praxis. *Am J Public Health* 2010;100(Suppl 1):S30-5. <https://doi.org/10.2105/AJPH.2009.171058>
- Hogan V, Rowley DL, White SB, Faustin Y. Dimensionality and R4P: a health equity framework for research planning and evaluation in African American populations. *Matern Child Health J* 2018;22:147-53. <https://doi.org/10.1007/s10995-017-2411-z>
- Curfman A, McSwain SD, Chuo J, Yeager-McSwain B, Schinasi DA, Marcin J, et al. Pediatric telehealth in the COVID-19 pandemic era and beyond. *Pediatrics* 2021;148:e2020047795. <https://doi.org/10.1542/peds.2020-047795>
- Ray KN, Shi Z, Poon SJ, Uscher-Pines L, Mehrotra A. Use of commercial direct-to-consumer telemedicine by children. *Acad Pediatr* 2019;19:665-9. <https://doi.org/10.1016/j.acap.2018.11.016>
- Conners GP, Kressly SJ, Perrin JM, Richerson JE, Sankrithi UM. Nonemergency acute care: when it's not the medical home. *Pediatrics* 2017;139:e20170629. <https://doi.org/10.1542/peds.2017-0629>
- Ray KN, Shi Z, Gidengil CA, Poon SJ, Uscher-Pines L, Mehrotra A. Antibiotic prescribing during pediatric direct-to-consumer telemedicine visits. *Pediatrics* 2019;143:e20182491. <https://doi.org/10.1542/peds.2018-2491>
- Shi Z, Mehrotra A, Gidengil CA, Poon SJ, Uscher-Pines L, Ray KN. Quality of care for acute respiratory infections during direct-to-consumer telemedicine visits for adults. *Health Aff (Millwood)* 2018;37:2014-23. <https://doi.org/10.1377/hlthaff.2018.05091>
- Ray KN, Martin JM, Wolfson D, Schweiberger K, Schoemer P, Cepullio C, et al. Antibiotic prescribing for acute respiratory tract infections during telemedicine visits within a pediatric primary care network. *Acad Pediatr* 2021;21:1239-43. <https://doi.org/10.1016/j.acap.2021.03.008>
- Gilkey MB, Kong WY, Huang Q, Grabert BK, Thompson P, Brewer NT. Using telehealth to deliver primary care to adolescents during and after the COVID-19 pandemic: national survey study of US primary care professionals. *J Med Internet Res* 2021;23:e31240. <https://doi.org/10.2196/31240>
- Rand CM, Goldstein NPN. Patterns of primary care physician visits for US adolescents in 2014: implications for vaccination. *Acad Pediatr* 2018;18:S72-8. <https://doi.org/10.1016/j.acap.2018.01.002>
- Uddin SG, O'Connor KS, Ashman JJ. Physician office visits by children for well and problem-focused care: United States, 2012. *NCHS Data Brief* 2016:1-8.
- Barney A, Buckelew S, Meshriakova V, Raymond-Flesch M. The COVID-19 pandemic and rapid implementation of adolescent and young adult telemedicine: challenges and opportunities for innovation. *J Adolesc Health* 2020;67:164-71. <https://doi.org/10.1016/j.jadohealth.2020.05.006>
- Carlson JL, Goldstein R. Using the electronic health record to conduct adolescent telehealth visits in the time of COVID-19. *J Adolesc Health* 2020;67:157-8. <https://doi.org/10.1016/j.jadohealth.2020.05.022>
- Wood SM, White K, Peebles R, Pickel R, Alausa M, Mehlinger J, et al. Outcomes of a rapid adolescent telehealth scale-up during the COVID-19 pandemic. *J Adolesc Health* 2020;67:172-8. <https://doi.org/10.1016/j.jadohealth.2020.05.025>
- Onofri A, Pavone M, De Santis S, Verrilli E, Caggiano S, Ullmann N, et al. Telemedicine in children with medical complexity on home ventilation during the COVID-19 pandemic. *Pediatr Pulmonol* 2021;56:1395-400. <https://doi.org/10.1002/ppul.25289>
- Witmans MB, Dick B, Good J, Schoepp G, Dosman C, Hawkins ME, et al. Delivery of pediatric sleep services via telehealth: the Alberta experience and lessons learned. *Behav Sleep Med* 2008;6:207-19. <https://doi.org/10.1080/15402000802371312>
- Tedford SE, Romano L, Gozal D, Medalie L. Digital solutions for sleep problems in children: a pilot study. *Pediatr Pulmonol* 2022;57:1914-20. <https://doi.org/10.1002/ppul.25402>
- Sequeira GM, Kidd KM, Rankine J, Miller E, Ray KN, Fortenberry JD, et al. Gender-diverse youth's experiences and satisfaction with telemedicine for gender-affirming care during the COVID-19 pandemic. *Transgender Health* 2022;7:127-34. <https://doi.org/10.1089/trgh.2020.0148>
- Totten AM, Womack DM, Eden KB, McDonagh MS, Griffin JC, Grusing S, et al. Telehealth: mapping the evidence for patient outcomes from systematic reviews. Rockville (MD): Agency for Healthcare Research and Quality (US). 2016. Accessed January 14, 2022. <http://www.ncbi.nlm.nih.gov/books/NBK379320/>
- Halterman JS, Fagnano M, Tajon RS, Tremblay P, Wang H, Butz A, et al. Effect of the school-based telemedicine enhanced asthma management (SB-TEAM) program on asthma morbidity: a randomized clinical trial. *JAMA Pediatr* 2018;172:e174938. <https://doi.org/10.1001/jamapediatrics.2017.4938>
- Fiks AG, Mayne SL, Karavite DJ, Suh A, O'Hara R, Localio AR, et al. Parent-reported outcomes of a shared decision-making portal in asthma: a practice-based RCT. *Pediatrics* 2015;135:e965-73. <https://doi.org/10.1542/peds.2014-3167>
- Mosquera RA, Avritscher EBC, Pedroza C, Lee KH, Ramanathan S, Harris TS, et al. Telemedicine for children with medical complexity: a randomized clinical trial. *Pediatrics* 2021;148:e2021050400. <https://doi.org/10.1542/peds.2021-050400>
- Milne Wenderlich A, Li R, Baldwin CD, Contento N, Herendeen N, Rand CM. A quality improvement initiative to improve attention-deficit/hyperactivity disorder follow-up rates using school-based telemedicine. *Acad Pediatr* 2021;21:1253-61. <https://doi.org/10.1016/j.acap.2021.04.004>
- Reid MW, Krishnan S, Berget C, Cain C, Thomas JF, Klingensmith GJ, et al. CoYoT1 Clinic: Home telemedicine increases young adult engagement in diabetes care. *Diabetes Technol Ther* 2018;20:370-9. <https://doi.org/10.1089/dia.2017.0450>
- Malasanos TH, Burlingame JB, Youngblade L, Patel BD, Muir AB. Improved access to subspecialist diabetes care by telemedicine: cost savings and care measures in the first two years of the FITE diabetes project. *J Telemed Telecare* 2005;11(Suppl 1):74-6. <https://doi.org/10.1258/1357633054461624>
- Crossen SS, Marcin JP, Qi L, Sauers-Ford HS, Reggiardo AM, Chen ST, et al. Home visits for children and adolescents with uncontrolled type 1 diabetes. *Diabetes Technol Ther* 2020;22:34-41. <https://doi.org/10.1089/dia.2019.0214>
- Lamel S, Chambers CJ, Ratnarathorn M, Armstrong AW. Impact of live interactive teledermatology on diagnosis, disease management, and clinical outcomes. *Arch Dermatol* 2012;148:61-5. <https://doi.org/10.1001/archdermatol.2011.1157>
- Curfman AL, Hackell JM, Herendeen NE, Alexander JJ, Marcin JP, Moskowitz WB, et al. Telehealth: improving access to and quality of pediatric health care. *Pediatrics* 2021;148:e2021053129. <https://doi.org/10.1542/peds.2021-053129>
- Committee on Pediatric Workforce; Marcin JP, Rimsza ME, Moskowitz WB. The use of telemedicine to address access and physician workforce shortages. *Pediatrics* 2015;136:202-9. <https://doi.org/10.1542/peds.2015-1253>
- Marcin JP, Ellis J, Mawis R, Nagrampa E, Nesbitt TS, Dimand RJ. Using telemedicine to provide pediatric subspecialty care to children with special health care needs in an underserved rural community. *Pediatrics* 2004;113(1 Pt 1):1-6. <https://doi.org/10.1542/peds.113.1.1>

34. Coker TR, Porras-Javier L, Zhang L, Soares N, Park C, Patel A, et al. A telehealth-enhanced referral process in pediatric primary care: a cluster randomized trial. *Pediatrics* 2019;143:e20182738. <https://doi.org/10.1542/peds.2018-2738>
35. Bauerly BC, McCord RF, Hulkower R, Pepin D. Broadband access as a public health issue: the role of law in expanding broadband access and connecting underserved communities for better health outcomes. *J Law Med Ethics* 2019;47(2\_Suppl):39-42. <https://doi.org/10.1177/1073110519857314>
36. Perrin A. Mobile technology and home broadband 2021. Pew Research Center. 2021. Accessed January 7, 2022. <https://www.pewresearch.org/internet/2021/06/03/mobile-technology-and-home-broadband-2021/>
37. Federal Communications Commission. FCC Annual Broadband Report shows digital divide is rapidly closing. 2021. Accessed January 7, 2022. <https://www.fcc.gov/document/fcc-annual-broadband-report-shows-digital-divide-rapidly-closing>
38. Pew Research Center. Internet/Broadband fact sheet. 2021. Accessed January 21, 2022. <https://www.pewresearch.org/internet/fact-sheet/internet-broadband/>
39. Roberts ET, Mehrotra A. Assessment of disparities in digital access among Medicare beneficiaries and implications for telemedicine. *JAMA Intern Med* 2020;180:1386-9. <https://doi.org/10.1001/jamainternmed.2020.2666>
40. Smith B, Magnani JW. New technologies, new disparities: the intersection of electronic health and digital health literacy. *Int J Cardiol* 2019;292:280-2. <https://doi.org/10.1016/j.ijcard.2019.05.066>
41. Williams K, Markwardt S, Kearney SM, Karp JF, Kraemer KL, Park MJ, et al. Addressing implementation challenges to digital care delivery for adults with multiple chronic conditions: stakeholder feedback in a randomized controlled trial. *JMIR Mhealth Uhealth* 2021;9:e23498. <https://doi.org/10.2196/23498>
42. Public Library Association. 2020 Public library technology survey: summary report. Accessed January 21, 2022. <https://www.ala.org/pla/sites/ala.org/pla/files/content/data/PLA-2020-Technology-Survey-Summary-Report.pdf>
43. Rodriguez JA, Clark CR, Bates DW. Digital health equity as a necessity in the 21st Century Cures Act era. *JAMA* 2020;323:2381-2. <https://doi.org/10.1001/jama.2020.7858>

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**Table. Immediate priorities for pediatric departments in supporting telemedicine**

1. Ensure that telemedicine research involves a focus on the unique aspects of telemedicine in pediatrics; advocate for this focus in federal and other research funding.
2. Prioritize research that identifies clinical areas (eg, care delivery setting, conditions, specialties) where telemedicine promotes quality and beneficial outcomes and should be promoted vs may impede these goals and should be curtailed.
  - a. Support the use of rigorous randomized designs or designs benefiting from causal inference to assess the effectiveness or risks/costs of telemedicine use.
  - b. Promote multisite or network-based pediatric studies to promote generalizability.
3. Support telemedicine research that encourages system and population-based telemedicine solutions, including cross-sector care integration, patient-specific tailoring, and optimal implementation of multiple digital tools and visit modalities.
4. Prioritize research that assesses and advances equity in telemedicine access and quality and that commits to partnership with communities and patients in the conduct and translation of research.
5. Support activities to promote research dissemination to payers, policy makers, and health system leaders and to promote research translation to the clinical and operational activities within the department so that evidence-based strategies reach children and families.