Scholars Academic Journal of Pharmacy
Abbreviated Key Title: Sch Acad J Pharm
ISSN 2347-9531 (Print) | ISSN 2320-4206 (Online)
Journal homepage: http://saspublishers.com

OPEN ACCESS

Medicine

The Implications of Telemedicine in Pediatric Health: Integration of Technology into Medicine

Omar Shahir Alrashdan[1*], Megbal Oudeh Alshurfat[1]

[1]Muaither Health Center, PHCC, Qatar

DOI: 10.36347/sajp.2024.v13i01.005 | **Received:** 10.12.2023 | **Accepted:** 21.01.2024 | **Published:** 27.01.2024

***Corresponding author:** Omar Shahir Alrashdan
Muaither Health Center, PHCC, Qatar

Abstract **Review Article**

Remote medical treatments have emerged; an example is the video conferences. These technologies serve patients who are geographically distant from medical centers. The integration of medical treatment with technology such as telemedicine in providing pediatric medical care has increased recently, leading to healthcare access simplifying disease management protocols, and improving the control of pediatric health status. The main objective of this study was to review the literature on the updated use of telemedicine in the current implications of telemedicine in pediatric healthcare. The results showed that the widespread of telemedicine in various disciplines of pediatric healthcare indicates its potential implications as technology advances.

Keywords: Telemedicine, pediatric, technology, videoconference, healthcare.

Copyright © 2024 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution **4.0 International License (CC BY-NC 4.0)** which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Telemedicine has been introduced to provide healthcare for patients and their families through technology (Lesher and Shah, 2018). Technology services include the existence of different aspects such as telecommunication bases, teleeducation, and telecounseling (Burke *et al.*, 2015). The inclusion of telemedicine technology among healthcare providers comprises doctors who will visit distant patients (Shah and Badawy, 2021). The phenomenon of using telemedicine in pediatrics is important because patients and their families experience difficulties in finding pediatric specialists from one side and complaints of long travel from another side (Katzow *et al.*, 2020).

According to the study by Combi *et al.*, (2016), telemedicine in pediatrics makes the provision of healthcare easier in areas that are characterized by low as in the case of low-income countries (Combi *et al.*, 2016).

Overall, this has led to easier delivery of medical services, as well as timely assessment, monitoring, and treatment of patients (Sasangohar *et al.*, 2018).

Several studies have shown that the above benefits are more cost-effective than in-person consultations with video conferencing sessions, improving the overall well-being of patients and their caregivers (Chongmelaxme *et al.*, 2019).

Telemedicine has become a powerful force in the medical field, changing the way healthcare is delivered and increasing the focus on patient care in an era of technological advancement (Shawwa, 2023).

One area where its influence is particularly noticeable and encouraging is the field of child care (Al-Shawwa, 2023). Telemedicine, the delivery of health care services through digital communication channels, has rapidly emerged as an important tool in protecting the health of the youngest people in our society (Young *et al.*, 2006).

Major Transition in Pediatric Healthcare

Physical medicine facilities and conventional approaches were the mainstays of pediatric healthcare in the past. However, the past decade has seen substantial shifts due to developments in telemedicine technology (Jin *et al.*, 2020; Costich *et al.*, 2021). Both the sophistication and accessibility of these technologies have increased (Costich *et al.*, 2021). This shift is a result of intentional responses to the unique issues faced by physicians, educators, and most crucially, children themselves, as well as the advancement of technology (Jin *et al.*, 2020).

Significance of Telemedicine in Pediatric Care

Telemedicine is crucial in pediatrics since it offers both convenience and the ability to overcome longstanding obstacles in pediatric healthcare (Pooni *et al.,* 2022). Pediatricians, as a susceptible demographic, frequently encounter geographical, economic, and logistical obstacles that impede their ability to obtain healthcare services of superior quality promptly and effectively (Pooni *et al.,* 2022). Telemedicine, via virtual communication, has emerged as a potent remedy to overcome obstacles and guarantee that each kid obtains the necessary medical attention (Bajgain *et al.,* 2023).

Diverse Pediatric Needs

Childcare necessitates a specific and intricate strategy (Bajgain *et al.,* 2023). Child specialists must possess comprehensive knowledge not just in the medical treatment of children, but also in their developmental requirements, familial interactions, and the significance of preventative care (Schickedanz and Halfon, 2020). Telemedicine can effectively tackle these difficulties because to its flexibility and agility (Haleem *et al.,* 2021). The subject of telehealth in pediatrics encompasses a range of services, such as virtual consultations for regular check-ups, as well as telepsychiatry (Vásquez-Cevallos *et al.,* 2018) and newborn telemedicine consultations (Parimbelli *et al.,* 2018).

Rapid Adoption of Telehealth Technologies

The swift incorporation of telemedicine technologies in pediatrics demonstrates the keen and enthusiastic acceptance of this fundamental shift by practitioners (Zuccotti and Calcaterra, 2023). The COVID-19 epidemic acted as an unforeseen catalyst, hastening the integration of telemedicine into conventional pediatric practice (Zuccotti *et al.,* 2020). Surprisingly, a healthcare approach that was previously considered as an additional or experimental choice has a significant impact on maintaining healthcare services and minimizing the vulnerability of young populations (Zuccotti and Calcaterra, 2023).

Taking Care of Health from a Distance

An examination was conducted on the intricate domain of telemedicine in the field of pediatric care, encompassing its evolution, advantages, obstacles, and potential prospects. The purpose of this study is to investigate the advanced applications of telehealth technology in many domains of pediatric medicine, such as remote management of chronic diseases and the delicate field of pediatric mental health. Upon embarking on this trip, it will become evident that telemedicine transcends being merely a technological instrument. This approach guarantees that every child receives the necessary care, irrespective of geographical or logistical constraints, and fosters the health and welfare of the youngest cohort (Corcoran *et al.,* 2023; Esposito *et al.,* 2023).

The Evolution of Telemedicine in Pediatrics

The progress of telemedicine in pediatrics is marked by rapid and continuous transformation due to advancements in technologies, altering healthcare settings, and a growing acknowledgment of the unique requirements of young patients (Evans and Eisenstein, 2021). Gaining insight into this advancement holds significant ramifications for comprehending the present condition and prospective potential of telemedicine in the field of pediatrics.

Historical Context and Early Developments

Pediatric telemedicine originated in the late 20th century alongside the introduction of television transmission. In 1997, Bergamo *et al.,* conducted a seminal study to assess the practicability of employing telemedicine consultations for patients in the field of pediatric cardiology. This research served as the foundation for subsequent advancements in this sector. At that time, telemedicine applications were primarily in the experimental phase, focusing on their feasibility and capacity to overcome geographical obstacles.

With the advancement of technology, significant pediatric telemedicine initiatives have encountered obstacles regarding spatial constraints, video quality, and medical devices. Nevertheless, groundbreaking research conducted by Mann *et al.,* (2000) showcased the efficacy of telemedicine in consultations for pediatric emergency departments, emphasizing its ability to promptly redirect patients to specialized care inside the emergency department.

The progress in technology is making it easier to build pediatric telemedicine. Over the past twenty years, there have been notable and stimulating advancements in medical technology, with pediatric care leading the way in these advancements (Sharma *et al.,* 2022). The emergence of high-speed Internet, advancements in video conferencing platforms, and the extensive utilization of smartphones have enabled the expansion of telehealth services for pediatricians (Clemenson *et al.,* 2017).

Research conducted by DeLeo *et al.,* (2019) has shown the significance of mobile health applications in aiding parents and caregivers during telehealth consultations. The significance of mobile applications featuring secure video interfaces and integrated health monitoring functionalities is growing, since they play a crucial role in enabling contact between doctors and families, especially in distant or underserved regions.

Main Features in the Integration of Telehealth in Pediatric Care

Several pivotal events have impacted the integration of telemedicine into traditional pediatric healthcare (Sharma *et al.,* 2022). The American Academy of Pediatrics (AAP) has recognized the growing importance of telemedicine by issuing

guidelines that endorse its use in pediatric practice. In 2015, the AAP issued a policy statement acknowledging the potential of telemedicine to enhance the accessibility of healthcare, specifically for children living in rural or underserved regions.

Moreover, the collaboration of academic institutions, healthcare providers, and technology enterprises has resulted in the creation of telemedicine systems that are specifically tailored to address the needs of pediatric patients. The partnership between Children's National Hospital and the Telemedicine and Advanced Technology Research Center, as outlined in Smith *et al.*, (2021), showcases a collaborative endeavor to deliver customized telemedicine solutions for pediatric patients.

In recent years, the COVID-19 epidemic has greatly expedited the widespread adoption and usage of telemedicine. Ling *et al.,* (2020) conducted investigations that revealed a significant surge in the utilization of telehealth in pediatric settings. The increase is motivated by the necessity to guarantee continuous healthcare while minimizing the risk of exposure.

The evolution of telemedicine in pediatrics is a multifaceted narrative shaped by technological progress, research endeavors, and a commitment to tackling healthcare disparities (Haleem *et al.*, 2021). Subsequent analysis reveals that past progress has laid a vital groundwork for the current achievements and future trajectory of telemedicine in pediatric care (Junaid *et al.*, 2022).

For more than a century, pediatric practitioners have been employing telehealth in its most comprehensive sense, much like how telephone triage remains a crucial component of pediatric care (Belcher *et al.*, 2021).

Before the COVID-19 pandemic, the use of modern technology, such as video communication, was largely ignored, despite its availability (Renu, 2021). Telehealth can surmount several challenges, such as logistical and geographical distances (Renu, 2021). Telehealth enables the secure and efficient management of various acute pediatric illnesses, particularly when remote physical examination tools are utilized (Mohammadzadeh *et al.*, 2023).

Furthermore, telemedicine can be particularly beneficial in the transportation of children with complex medical issues. Conveying medical equipment to several subspecialists can provide considerable difficulties. Nevertheless, a comparable level of care may frequently be provided via telehealth, enabling the child to get medical attention from the convenience of their own residence. Balancing the implementation of social distancing protocols with the effective provision of child care is a distinct challenge. By incorporating a hybrid approach that combines an in-person evaluation with a history obtained by video conferencing, it is possible to strike a balance between the constraints of limited in-person availability and the requirement for a comprehensive and suitable physical examination. Integrating telehealth services into the patient-centered medical home for pediatric patients allows families to benefit from increased convenience while maintaining their important relationship with their primary care physician (Wenderlich and Herendeen, 2021).

The widespread adoption and progress of telehealth, which involves the remote delivery of healthcare services, demonstrate the integration of healthcare delivery systems with emerging technology to cater to the public's needs. Amidst healthcare upheavals like the COVID-19 pandemic, the use and acceptance of telehealth services have experienced a notable surge. Consequently, it is imperative to establish precise objectives and optimal strategies for using telehealth in child healthcare. This policy statement evaluates the ability of telehealth and telehealth policy to improve patient access to specialized pediatric expertise and primary care, simplify care coordination within the medical home, and encourage improved communication and collaboration among clinicians and other stakeholders. The main goal is to deliver healthcare services that exhibit exceptional quality, while simultaneously ensuring cost-effectiveness and equitable accessibility. The forthcoming technical study will provide a comprehensive analysis of these matters, together with an exploration of the constraints of telehealth treatment (Curfman *et al.*, 2021).

CONCLUSIONS

According to the findings of this study, combined telemedicine, which may include tele-case management or teleconsultation, appears to be an effective type of telemedicine intervention for improving the health status of patients in general and children in particular.

REFERENCES

- American Academy of Pediatrics (AAP). (2015). The Use of Telemedicine to Address Access and Physician Workforce Shortages. *Pediatrics*, *136*(1), 202–209. DOI: 10.1542/peds.2015-1253
- Bajgain, B., Rabi, S., Ahmed, S., Kiryanova, V., Fairie, P., & Santana, M. J. (2023). Patient-reported experiences and outcomes of virtual care during COVID-19: a systematic review. *Journal of patient-reported outcomes*, *7*(1), 126. https://doi.org/10.1186/s41687-023-00659-8.
- Belcher, R. H., Phillips, J., Virgin, F., Werkhaven, J., Whigham, A., Wilcox, L., & Wootten, C. T. (2021). Pediatric Otolaryngology Telehealth in Response to COVID-19 Pandemic: Lessons Learned and Impact on the Future Management of Pediatric Patients. *The Annals of otology, rhinology, and laryngology*, *130*(7), 788–795. https://doi.org/10.1177/0003489420976163.

- Bergmo, T. S., Wangberg, S. C., & Schopf, T. R. (1997). Solving Time and Space - Challenges in Paediatric Cardiology by Telemedicine. *Journal of Telemedicine and Telecare*, *3*(Suppl 1), 16–18.
- Burke, B. L., Jr, Hall, R. W., & SECTION ON TELEHEALTH CARE (2015). Telemedicine: Pediatric Applications. *Pediatrics*, *136*(1), e293–e308. https://doi.org/10.1542/peds.2015-1517.
- Chongmelaxme, B., Lee, S., Dhippayom, T., Saokaew, S., Chaiyakunapruk, N., & Dilokthornsakul, P. (2019). The Effects of Telemedicine on Asthma Control and Patients' Quality of Life in Adults: A Systematic Review and Meta-analysis. *The journal of allergy and clinical immunology. In practice*, *7*(1), 199–216.e11. https://doi.org/10.1016/j.jaip.2018.07.015.
- Clemensen, J., Rothmann, M. J., Smith, A. C., Caffery, L. J., & Danbjorg, D. B. (2017). Participatory design methods in telemedicine research. *Journal of telemedicine and telecare*, *23*(9), 780–785. https://doi.org/10.1177/1357633X16686747.
- Combi, C., Pozzani, G., & Pozzi, G. (2016). Telemedicine for Developing Countries. A Survey and Some Design Issues. *Applied clinical informatics*, *7*(4), 1025–1050. https://doi.org/10.4338/ACI-2016-06-R-0089.
- Corcoran, J., Marley Campbell, C., & Ladores, S. (2023). Transitioning to telehealth during the coronavirus disease 2019 pandemic: Perspectives from partners of women with cystic fibrosis and healthcare providers. *Chronic illness*, *19*(1), 95-101.
- Costich, M., Robbins-Milne, L., Bracho-Sanchez, E., Lane, M., & Friedman, S. (2021). Design and implementation of an interactive, competency-based pilot pediatric telemedicine curriculum. *Medical education online*, *26*(1), 1911019. https://doi.org/10.1080/10872981.2021.1911019.
- Curfman, A. L., Hackell, J. M., Herendeen, N. E., Alexander, J. J., Marcin, J. P., Moskowitz, W. B., ... & McSwain, S. D. (2021). Section on Telehealth Care, Committee on Practice and Ambulatory Medicine, Committee on Pediatric Workforce. Telehealth: improving access to and quality of pediatric health care. *Pediatrics*, *148*(3), e2021053129.
- DeLeo, G., Sittig, D. F., & Ash, J. S. (2019). Mobile Application Use in Monitoring and Management of Pediatric Patients with Chronic Diseases: A Retrospective Observational Study. *JMIR mHealth and uHealth*, *7*(1), e9834. DOI: 10.2196/mhealth.9834
- Esposito, S., Rosafio, C., Antodaro, F., Argentiero, A., Bassi, M., Becherucci, P., Bonsanto, F., Cagliero, A., Cannata, G., Capello, F., Cardinale, F., Chiriaco, T., Consolaro, A., Dessì, A., Di Mauro, G., Fainardi, V., Fanos, V., Guarino, A., Li Calzi, G., Lodi, E., … & Gaddi, A. V. (2023). Use of Telemedicine Healthcare Systems in Children and Adolescents with Chronic Disease or in Transition Stages of Life: Consensus Document of the Italian Society of Telemedicine (SIT), of the Italian Society of Preventive and Social Pediatrics (SIPPS), of the Italian Society of Pediatric Primary Care (SICuPP), of the Italian Federation of Pediatric Doctors (FIMP) and of the Syndicate of Family Pediatrician Doctors (SIMPeF). *Journal of personalized medicine*, *13*(2), 235. https://doi.org/10.3390/jpm13020235.
- Evans, Y. N., & Eisenstein, E. (2021). The Expansion of Pediatric Care Through Digital Technology. *Current pediatrics reports*, *9*(4), 178–180. https://doi.org/10.1007/s40124-021-00250-z
- Haleem, A., Javaid, M., Singh, R. P., & Suman, R. (2021). Telemedicine for healthcare: Capabilities, features, barriers, and applications. *Sensors international*, *2*, 100117. https://doi.org/10.1016/j.sintl.2021.100117.
- Jin, M. X., Kim, S. Y., Miller, L. J., Behari, G., & Correa, R. (2020). Telemedicine: Current Impact on the Future. *Cureus*, *12*(8), e9891. https://doi.org/10.7759/cureus.9891.
- Junaid, S. B., Imam, A. A., Balogun, A. O., De Silva, L. C., Surakat, Y. A., Kumar, G., Abdulkarim, M., Shuaibu, A. N., Garba, A., Sahalu, Y., Mohammed, A., Mohammed, T. Y., Abdulkadir, B. A., Abba, A. A., Kakumi, N. A. I., & Mahamad, S. (2022). Recent Advancements in Emerging Technologies for Healthcare Management Systems: A Survey. *Healthcare (Basel, Switzerland)*, *10*(10), 1940. https://doi.org/10.3390/healthcare10101940.
- Katzow, M. W., Steinway, C., & Jan, S. (2020). Telemedicine and Health Disparities During COVID-19. *Pediatrics*, *146*(2), e20201586. https://doi.org/10.1542/peds.2020-1586.
- Lesher, A. P., & Shah, S. R. (2018). Telemedicine in the perioperative experience. *Seminars in pediatric surgery*, *27*(2), 102–106. https://doi.org/10.1053/j.sempedsurg.2018.02.007
- Ling, M. H., Bhatt, S., van Vleck, T., & Afsar-manesh, N. (2020). Rapid Implementation of a Neonatal Telemedicine Program During the Coronavirus Disease 2019 Pandemic. *Journal of Perinatology*, *40*(10), 1454–1461. DOI: 10.1038/s41372-020-0713-0
- Mann, D. M., Quintana, E., Kim, Y., & Hovav, S. (2000). Pediatric Telemedicine: Feasibility and Perceptions. *Telemedicine Journal and e-Health*, *6*(4), 411–416. DOI: 10.1089/15305620050503833
- Milne Wenderlich, A., & Herendeen, N. (2021). Telehealth in pediatric primary care. *Current problems in pediatric and adolescent health care*, *51*(1), 100951. https://doi.org/10.1016/j.cppeds.2021.100951.
- Mohammadzadeh, N., Gholamzadeh, M., Saeedi, S., & Rezayi, S. (2023). The application of wearable smart sensors for monitoring the vital signs of patients in epidemics: a systematic literature

review. *Journal of ambient intelligence and humanized computing*, *14*(5), 6027–6041. https://doi.org/10.1007/s12652-020-02656-x

- Parimbelli, E., Bottalico, B., Losiouk, E., Tomasi, M., Santosuosso, A., Lanzola, G., Quaglini, S., & Bellazzi, R. (2018). Trusting telemedicine: A discussion on risks, safety, legal implications and liability of involved stakeholders. *International journal of medical informatics*, *112*, 90–98. https://doi.org/10.1016/j.ijmedinf.2018.01.012.
- Pooni, R., Pageler, N. M., Sandborg, C., & Lee, T. (2022). Pediatric subspecialty telemedicine use from the patient and provider perspective. *Pediatric research*, *91*(1), 241–246. https://doi.org/10.1038/s41390-021-01443-4.
- Renu N. (2021). Technological advancement in the era of COVID-19. *SAGE open medicine*, *9*, 20503121211000912. https://doi.org/10.1177/20503121211000912.
- Sasangohar, F., Davis, E., Kash, B. A., & Shah, S. R. (2018). Remote Patient Monitoring and Telemedicine in Neonatal and Pediatric Settings: Scoping Literature Review. *Journal of medical Internet research*, *20*(12), e295. https://doi.org/10.2196/jmir.9403.
- Schickedanz, A., & Halfon, N. (2020). Evolving Roles for Health Care in Supporting Healthy Child Development. *The Future of children*, *30*(2), 143–164.
- Shah, A. C., & Badawy, S. M. (2021). Telemedicine in Pediatrics: Systematic Review of Randomized Controlled Trials. *JMIR pediatrics and parenting*, *4*(1), e22696. https://doi.org/10.2196/22696.
- Sharma, A., Pruthi, M., & Sageena, G. (2022). Adoption of telehealth technologies: an approach to improving healthcare system. *Translational medicine communications*, *7*(1), 20. https://doi.org/10.1186/s41231-022-00125-5.
- Shawwa L. (2023). The Use of Telemedicine in Medical Education and Patient Care. *Cureus*, *15*(4), e37766. https://doi.org/10.7759/cureus.37766.
- Smith, A. C., Thomas, E., Snoswell, C. L., Haydon, H., Mehrotra, A., Clemensen, J., & Caffery, L. J. (2021). Telehealth for global emergencies: Implications for coronavirus disease 2019 (COVID-19). *Journal of Telemedicine and Telecare*, *27*(5), 309–313. DOI: 10.1177/1357633X20916567
- Vasquez-Cevallos, L. A., Bobokova, J., González-Granda, P. V., Iniesta, J. M., Gómez, E. J., & Hernando, M. E. (2018). Design and Technical Validation of a Telemedicine Service for Rural Healthcare in Ecuador. *Telemedicine journal and e-health: the official journal of the American Telemedicine Association*, *24*(7), 544–551. https://doi.org/10.1089/tmj.2017.0130.
- Young, N. L., Barden, W., McKeever, P., Dick, P. T., & Tele-HomeCare Team (2006). Taking the call-bell home: a qualitative evaluation of Tele-HomeCare for children. *Health & social care in the community*, *14*(3), 231–241. https://doi.org/10.1111/j.1365-2524.2006.00615.x.
- Zuccotti, G. V., Bertoli, S., Foppiani, A., Verduci, E., & Battezzati, A. (2020). COD19 and COD20: An Italian Experience of Active Home Surveillance in COVID-19 Patients. *International journal of environmental research and public health*, *17*(18), 6699. https://doi.org/10.3390/ijerph17186699.
- Zuccotti, G., & Calcaterra, V. (2023). Telemedicine and E-Health: An Innovative Challenge in Pediatric Care. *International journal of environmental research and public health*, *20*(3), 2091. https://doi.org/10.3390/ijerph20032091.