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Full Length Research Paper

TELEMEDICINE IN PAEDIATRIC INFECTIOUS DISEASES

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Abstract

Telemedicine is the remote practice of medicine through the use of information and communication technologies for the prevention, diagnosis, treatment and the management of various communicable and non-communicable diseases related to paediatrics. There is widespread use of telemedicine for the management of the acute and chronic infectious diseases. It is particularly found in those countries in which the majority of the population are living in the rural areas, far away from the third-level hospital center that are located in large urban areas. Obviously, telemedicine is being used in the developing countries. Telemedicine is increasingly representing the future and the beginning of the new era of healthcare system that will redefine the medical care for the treatment of infectious diseases, both acute and the chronic conditions in children.

Keywords: Paediatric Infectious Disease; Telemedicine; Digital Health Technology; Patient Diagnosis; Rural Patients; New Medical Treatment

Introduction

The global prevalence of paediatric infection is affecting the several communities of the Indian people. These diseases are entailing the considerable economic and public health burdens worldwide, therefore encompassing the respiratory and gastroin- testinal issues, along with the vaccine-preventable conditions. The collapse of public health services, particularly in resource-limited settings, poses a hindrance to the effective management of paedi- atric infectious illnesses. Inadequate access to healthcare facilities exacerbates the transmission of communicable diseases, compli- cating efforts in identification and control. Despite transformative changes in healthcare delivery over recent decades, the pursuit of universal access remains an ongoing global objective, grappling with disparities within and between nations. Barriers to health- care access, encompassing economic constraints, geographic loca- tion, and limited education, result in delayed diagnoses with severe consequences. Missed appointments, influenced by factors like gaps in health insurance and transportation issues, detrimentally impact practice efficiency and patient health outcomes. Effectively addressing these challenges necessitates a vigilant healthcare ap- proach and tailored strategies. Digital health comprises various classifications, such as mobile health (mHealth), health informa- tion technology (IT), wearable devices, telehealth, telemedicine, and personalized medicine [6]. Within this spectrum, technologies such as telemedicine and telehealth assume to play a pivotal role in surrounding barriers to the management of paediatric infec- tious diseases. These digital health solutions not only overcoming the geographical constraints but also amplifying the access to the timely interventions without much delay. Through facilitating the real-time communication for various types of disease surveillance, they provide cost-effective alternatives, particularly benefitting the vulnerable communities and people of low- and middle-income

groups. The review is trying to aim and assess the utilization of telemedicine programs specially in the paediatric infectious dis- ease management, emphasizing their pivotal role in the diagnosis, treatment, disease surveillance, and healthcare delivery models. Through synthesizing this comprehensive information, this review is trying to seek and underscore the substantial potential of tele- medicine technologies in advancing the paediatric care and health- care strategy of the rural as well as urban people.

Digital health technologies in paediatric infections Impact on the diagnosis and treatment

Digital health and telemedicine are crucial for the early diagno- sis of paediatric infections, providing remote access to healthcare services. These technologies enable parents to consult provid- ers in real-time, prompt evaluations, and continuous tracking of vital signs and health data. These advancements improve health- care accessibility, enabling early identification and management of infections, and reducing complications. It facilitates healthcare providers to remotely evaluate and diagnose paediatric infections, reducing the need for in-person visits. It allows parents to con- nect with professionals quickly, enabling early intervention and minimizing complications. Digital health platforms offer access to a wide range of paediatricians, especially beneficial for remote or limited areas. Telemedicine also allows convenient follow-up con- sultations, especially for managing chronic or reinfections, allow- ing doctors to adjust treatment plans accordingly. Telemedicine plays a significant role in reducing infections which are spread by avoiding the need for in-person visits to healthcare facilities, where the risk of exposure to other infectious agents may be high- er. By performing remote consultations, healthcare providers can effectively screen, diagnose, and treat paediatric infections while lowering the risk of viral or bacterial transmission. Digital tools for remote monitoring can give useful information about symptoms, vital signs, and treatment compliance enabling healthcare pro- viders to make informed decisions. Wearable devices, smart sen- sors, and mobile apps collect real-time data to remotely assess a child's health status. This data helps healthcare providers to make informed decisions about treatment plans, detect early warning signs, and provide timely interventions. Remote communication with patients and caregivers allows for guidance, education, and necessary modification to medications or therapies. This proactive approach can prevent complications, improve the treatment effi- cacy, and enhance the paediatric health outcomes.

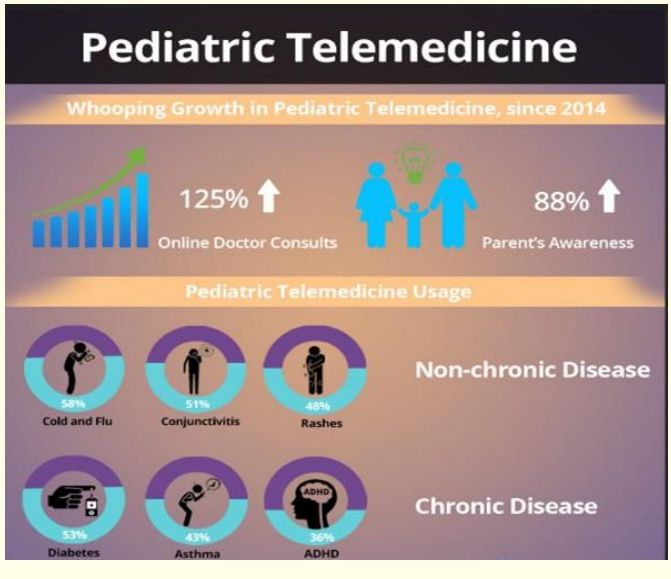

Figure 1: Showing the Impact on the Diagnosis and Treatment in paediatric infections.

Access to care and geographical disparities

With the aid of telemedicine, healthcare professionals and com- munity frontline workers could triage paediatric patients and re- fer them to the emergency services, treat the minor illness of the patients, must perform investigations, receive reports, conduct follow-up consultations for the patients, impart health education, conduct research and access to continue the medical education. Through remote monitoring and virtual consultations, paediatri- cian can identify symptoms or abnormalities at a very early stage and initiate timely interventions without delay. This proactive ap- proach can prevent complication and improve long-term health outcomes. Rural or remote area patients can be directly benefited by the help of telemedicine, where access to healthcare provid- ers is very much

limited. It can also be useful for patients who are having mobility issues or disability issues. Telemedicine and tele- health are the key applications that enable remote consultations between healthcare providers and patients, bridging the access gap for the specialised medical expertise people. The regionaliza- tion of paediatric services has been resulted in differential access to care, sometimes creating the barriers to those people living in underserved and rural communities. These disparities in access contribute to inferior healthcare outcomes among infants and the children. The use of tele-health technology to connect with various patients has expanded significantly over the past several years. Humans are constantly being exposed to numerous kinds of viruses but the consequences of infection are different in case of different individuals. The outcome of the host–virus interactions basically

depend on the dose and the route of infection, viral virulence properties, as well as several host factors that mainly involve in innate and adaptive immunity.

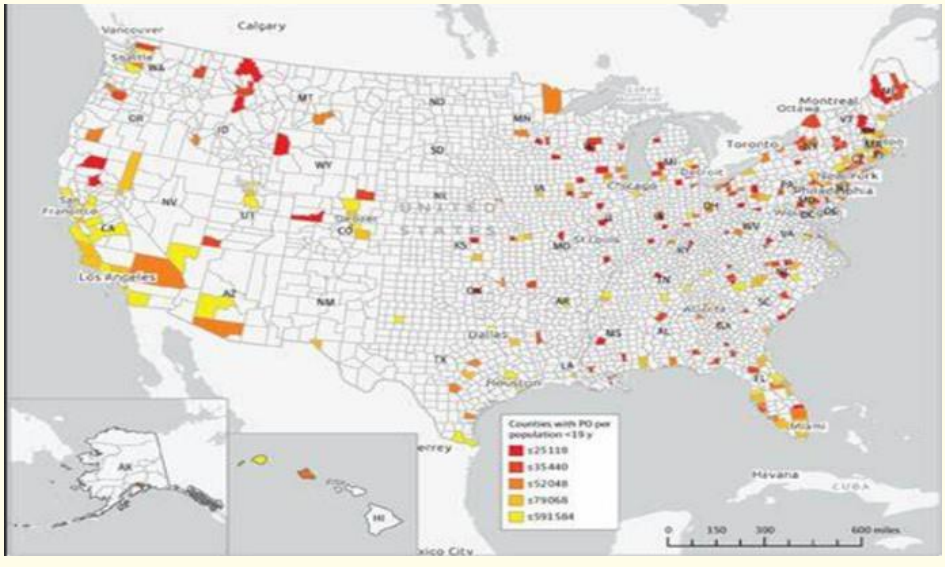

Figure 2: Showing Access to care and Geographical Disparities.

Patient and caregiver perspectives

Children often have difficulty in accessing speciality and sub- specialty care, and telemedicine may provide easier access to these, but there is a lack of information on how to implement tele- medicine efficiently to maximize the impact on patients and their families. It has potentially diverse viewpoints from both paediat- ric patients and their caregivers, from the patient's perspective it may be having a doctor's visit from home and thereby making the experience less intimidating and stressful [6]. Parents or caregivers on the other hand may appreciate the convenience of virtual consultations, saving them from the challenges of travelling with a sick child and possibly disrupting their work and daily activities [5,6]. It could also provide enhanced communication between the patient, caregivers and multiple physicians at the same time that can help in shared decision making [1,2,4]. The physicians also considered telemedicine as an educational opportunity to manage the patients' diseases and a way to increase the awareness about certain conditions [5]. It is beneficial for both pre-hospitalization and post hospitalization care [1-3].Telemedicine has enabled the caregivers with effective triage and guidance which can augment the current situation of in-person visits by assessing the condition of the patients effectively to determine if an in-person visit is required as not every patient require the same or equally intensive activities and investigations and hence reducing the burden on the healthcare system in the country [1,3,5]. It should be noted that the usage of telemedicine can also reduce the infection rates as it avoids the need for in-person visits and hence avoiding sources of nosocomial infections, especially in situations like the COVID-19 pandemic with high infection rates [6- 8].

Studies have shown that the application of telemedicine was ac- cepted as a safer option than in person visits by the healthcare providers and caregivers, it was described as individualized, thorough, and increased caregiver self-efficacy in management of the paediatric patients at home and further reducing the burden of healthcare access [2,3,5]. The caregivers described telemedicine as superior as it provided them with the feeling of independence, it was convenient, cost-effective, comprehensive, and acceptable. Furthermore, it supported caregiver decision-making and problem-solving and fosters delivery of family-centred approach [3-5]. The caregivers have indicated their intention to avail themselves for telehealth services more frequently in subsequent instances [4]. In a study conducted by Rea., *et al*. [4], it was noted that the caregivers prefer an immediate action rather than a referral to a specialist or prior to it and the attitude towards telemedicine is influenced by exter- nal considerations and specific experiences with the mode of tele- medicine practices [4].

The integration of telemedicine may encounter challenges, notably within paediatric care, where reservations about patient

safety and provider confidence in conducting thorough assess- ments via virtual visits may hinder widespread adoption [2]. Some of the challenges faced in the adoption of telemedicine practices include, the quality of the technology, the reliability of technology, the privacy of the patients and doctors, cost of implementation, ac- cessibility, time limitations, limitations in doing physical examina- tions, limitations in proper tools etc. [1,2,4]. There are other chal- lenges such as increased prescriptions of antibiotics for paediatric patients for acute respiratory infections rather than following a guideline-concordant antibiotic management in telemedicine con- sultations and professional organizations like American Academy of Paediatrics and the American Telemedicine Association has raised their concerns regarding the same [9].

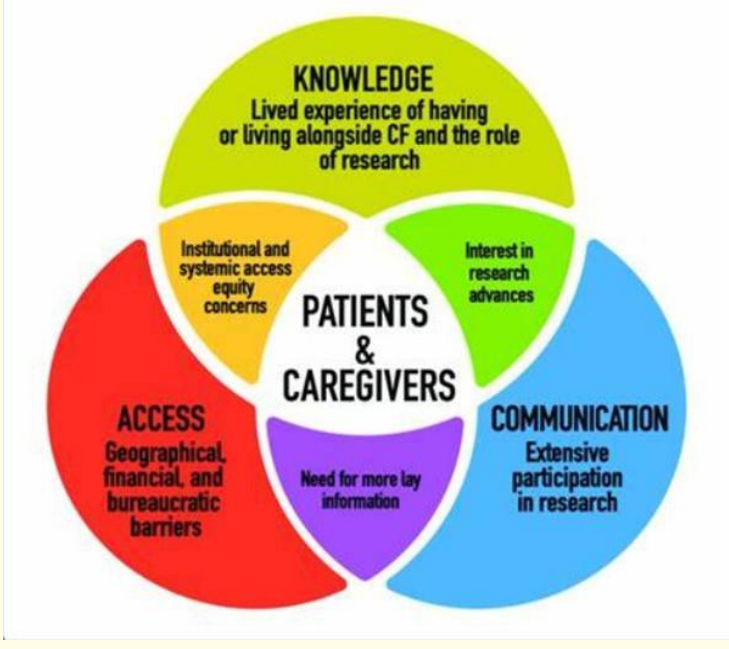

Figure 3: Showing the Patient and Caregiver Perspectives.

The treatment work flow process used in the telemedicine care.

Telemedicine and other technology improve clinical and ad- ministrative operations by telecommunication. It is a multifaceted technique that provides emergency care in both critical and non- critical situations. In general, it is used to treat patients who are suffering from chronic diseases. On the other hand, a hospital with an appropriate ambulance crew or other personnel can compensate for telemedicine. Telemedicine solutions for healthcare improvement in terms of the quality of treatment for both patients and doctors. This step is further associated with the setting up of the doctoral assistant to the patient and then after the diagnosis process is over, the appropriate treatment offered to the person un- der the utmost care.

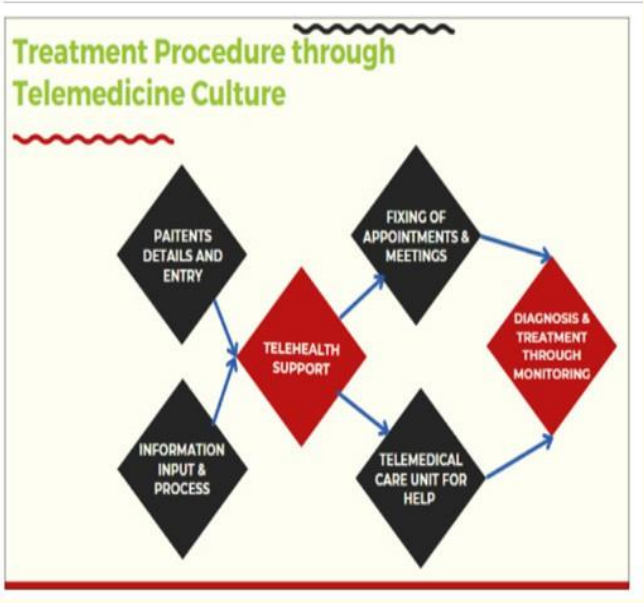

Figure 4: Showing the treatment work flow process used in telemedicine car.

Future of telemedicine in the paediatrics

Things are bound to change in the future. That is a constant. The practice of paediatrics will be very much different in the future. The pandemic has changed a lot of things for the future endeav- ours; mostly it has accelerated some challenges, advancements, improvements, and losses that were already occurring in this field of healthcare system. Telemedicine will play the most prominent role in the future for the betterment of healthy life. Although the future of paediatrics is very uncertain. Telehealth represents the evolution of health care delivery systems to adapt the new technologies and the needs of the paediatric population, offering them a strategic system to invest in the health of the children. To maximize the potential of the telemedicine and eliminate the barriers to its use, future research is very essential and initiatives are very much necessary to improve the cost-effectiveness of the telemedicine services. Telemedicine will find an important role in several pae- diatric medical specialties to maintain the constant follow up with the chronic patients. Telehealth mainly represents the evolution of health care sector in the delivery systems with the new technolo- gies.

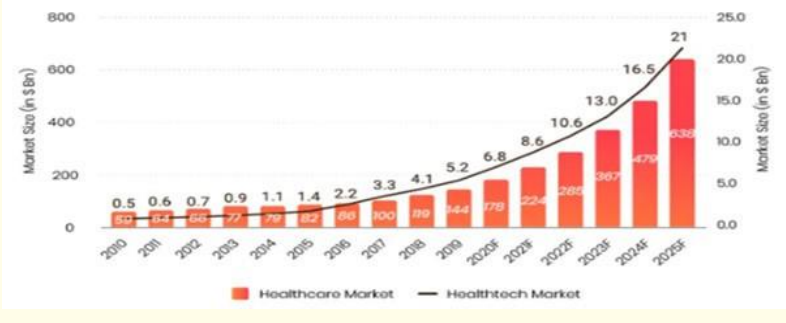

Figure 4: Showing the treatment work flow process used in telemedicine car.

Conclusion

Telemedicine cannot replace the traditional health-care system concerning the doctor–patient relationship, but it integrates to improve the effectiveness, efficiency and the appropriateness of the health care system. Finally, telehealth care will not be possible without the technological infrastructure to support the system. There are not enough professionals in the industry, hospitals and the healthcare system. Investments into the technology sector will support the growth in the telehealth, and it will further reduce the pressure on the workforce and it will potentially allow them to pro- vide better care to the patients. Telemedicine has proved not only to be more convenient for patients but it has been provided with the potential for further benefits which includes the improving public healthcare of the patients, improving access to care of the patients, relieving the pressure of the healthcare workforce and helping in reducing the financial stress of the health-care workers.

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