

Review Article

Telemedicine for pediatric physiatry: How social distancing can bring physicians and families closer together

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Abstract. The coronavirus (COVID-19) pandemic triggered wide scale implementation of telemedicine in the United States. The government response, Coronavirus Aid, Relief, and Economic Security (CARES) Act, permitted loosening of existing restrictions on telemedicine enabling its rapid incorporation into the delivery of medical care for children and adults. Prior to COVID-19, few pediatric physiatrists had opportunities to access high fidelity telemedicine platforms to provide health care for patients with special needs, mobility impairments, developmental delays, neuromuscular disorders or other complex medical conditions. This literature review will explore how telemedicine can optimize health care delivery options for pediatric physiatrists in various inpatient and outpatient settings such as consultations, acute inpatient units, outpatient clinics and long-term care facilities. Detailed analysis of the current research in telemedicine applications as well as a critical review of the limitations and barriers for its use offers a plethora of opportunities for enhancement of continuity and coordination of care. Telemedicine may decrease healthcare disparities and increase access of care for children with special needs. Additional research is needed to assess the efficacy of telemedicine when addressing complex medical conditions in children.

Keywords: Telemedicine, physical medicine and rehabilitation (PM&R), pediatric rehabilitation medicine (PRM), pediatric physiatrist, COVID-19, CARES Act, children with special needs

1. Introduction

The concept of telemedicine first came about in the 1970s with the realization that the patient and the doctor did not need to be in the same location [1]. With the evolution of technology and digitization of medical information over the past several decades, telemedicine has slowly integrated into the workflow of physicians around the world. Most recently, the WHO has initiated

the “Global Strategy on Digital Health 2020–2024” to promote and accelerate telehealth worldwide to increase access to healthcare [2].

The implementation of telemedicine has gradually increased over time, specifically targeting patients with complex medical needs, mobility limitations, and poorly accessible residential settings [3]. For clarity it is important to define the telemedicine terminology that will be used in this review. According to the American Telemedicine Association (ATA), telemedicine is the remote delivery of health care services and clinical information using telecommunications technology [4]. Organizations such as the ATA and Centers for Medicare and Medicaid Services (CMS) no longer delineate differences between telehealth and telemedicine

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and treat the terms synonymously. Per CMS, telehealth and telemedicine refer to the exchange of medical information from one site to another through electronic communication to improve a patient's health [5]. Data transmission may be asynchronous, where information is "stored and forwarded" such as a clinical image that is electronically transmitted, or synchronous where the patient and clinician interact in real time via digital information technology (IT) that is Health Insurance Portability and Accountability Act (HIPAA) compliant [6].

Physiatry telemedicine exchanges can occur in various forms, including those between a clinician and the patient/caregiver, between physicians, or between clinician and non-rehabilitation provider (teacher, school nurse, etc.). This review will focus on the aspects and scenarios of telemedicine health care delivery provided by the pediatric physiatrist across these settings by describing a variety of plausible clinical scenarios where telemedicine can potentially serve to enhance current health care delivery options.

The use of telemedicine rapidly evolved as a viable option for almost all health care providers during the Coronavirus Disease of 2019 (COVID-19) outbreak [7]. In response to this pandemic, a vast majority of clinical practices were required to implement social distancing guidelines and other epidemiologic measures such as limiting outpatient visits and postponing elective surgeries to reduce potential spread of the virus. Strict epidemiologic rules and regulations were rapidly implemented based on the Centers for Disease Control and Prevention (CDC) guidelines and recommendations from local health departments. Furthermore, on March 1, 2020 the Coronavirus Aid, Relief, and Economic Security (CARES) Act was passed by the US Government. CMS, whose guidelines and regulations many private insurers follow, liberalized restrictions on telemedicine [8] (Table 1). Although there are still limitations of licensure by states, many have relaxed these requirements for inter-state health care delivery. The COVID-19 pandemic has had a significant impact on the delivery of pediatric rehabilitation medicine (PRM) care delivery worldwide. Children who are followed by a pediatric physiatrist often require a higher level of care and are more readily affected by issues that impede accessibility [9]. Some pediatric inpatient rehabilitation units, especially within the "pandemic epicenters" of the US, were temporarily repurposed in order to provide essential continuum of care for adult patients with COVID-19 [10]. Outpatient pediatric rehabilitation medicine clinics have had to scale down their pa-

Table 1
Key telehealth changes in the CARES Act as a result of the COVID-19 Pandemic [8]

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- Medicare reimburses physicians for telehealth services at same rate as regular office visits
 - Patients can receive telehealth care in their home, and not just in rural areas
 - Physicians can reduce or waive Medicare patient cost-sharing for telehealth visits
 - Consent for telehealth services can be obtained by a physician or staff once per year
 - Physicians licensed in one state can provide services to Medicare beneficiaries in other states (state licensure laws still apply)
 - Patients no longer had to have been seen within the preceding 3 years
 - DEA permits physicians to prescribe controlled substances based on telehealth visits
 - Allows flexibility of audio-only telehealth
 - Allows for consumer audio/visual communication tools
-

tient encounters to "essential visits" only, leaving many children without care for an undetermined amount of time.

While the CARES Act provides funding and loosens telemedicine restrictions, it does not specifically mention children with special needs. In total, it aims to provide \$175 billion in relief to hospitals and health care providers. Pediatricians and children's hospitals will be included in an additional allocation of funding to support those who rely on Medicaid revenue. Fortunately, due to the benefits the CARES Act imbues in the realm of telemedicine, children still can receive remote rehabilitative health care delivery [11].

Although the CARES Act has temporarily lifted many rules and regulations, the variability of technology within and between healthcare systems prior to COVID-19 posed certain challenges. Present day advanced technology, such as video conferencing (VTC) is not just supported, but expected, in the consumer market. However, it still requires careful consideration when incorporated in medicine. To deliver health care remotely, a certain minimum processing speed is required for both audio and video to not misconstrue or misinterpret what is relayed by either the patient or provider. Phone and internet service providers, in response to quarantine and social distancing orders, have temporarily reduced pricing and removed data usage caps [12]. Before COVID-19, many lower income families would have had to consider these factors and still may have been unable to participate in telemedicine. This remains a barrier for lower income families despite the temporarily reduced pricing.

Commonly identified technological barriers include patient devices capable of transmitting high quality au-

diovisual data, internet speeds and connection integrity. These bare-minimum requirements do not consider fall-back measures in case of equipment failure, interpreter needs, physical exam limitations, and consideration of impersonal care. For example, the camera is often mirrored in telemedicine video visits. Many cellular phones flip the front-facing camera to act like a mirror to limit disorientation. Due to this, the provider must clarify if the patient is raising their left or right hand when evaluating range of motion as one cannot assume which laterality is being observed.

In the case of the pediatric population, a proxy (the parent/legal guardian) is required to conduct a telemedicine encounter, the format of which may be health system specific. Special considerations must be given to both caregivers and providers for telemedicine training including tip sheets, e-learnings that address the procedures and technical requirements, help desk contact information and etiquette. A recently published article described the benefits and lessons learned when establishing telemedicine in a pediatric infectious disease service [13]. Familiarity with the software being used for the video visit is critical and the provider should understand the most basic troubleshooting steps before involving the help desk in order to avoid delaying the visit. Billing workflows need to be identified and constantly updated as the expansion of telemedicine increases opportunities for reimbursement and should be included in provider training. In the years to come, hopefully CMS will maintain and expand upon the new policies established by the CARES Act.

In general, medical communities were somewhat reluctant to accept and implement telemedicine capabilities into practice prior to the COVID-19 pandemic. In 2019, only 8% of physicians in the US were using telemedicine regularly [14]. A systematic review in 2018 identified that the most common barrier to telemedicine worldwide was technically challenged staff [15]. Therefore in many ways COVID-19, an unforeseen international public health crisis, became a catalyst for the rapid evolution of telemedicine implementation in the fields of pediatrics and specifically pediatric rehabilitation. There have been a few studies highlighting telemedicine in pediatric subspecialties and children's health. With respect to telemedicine in the field of pediatric rehabilitation medicine, there is a paucity of literature.

2. Telemedicine in children's health

In 2015, the American Academy of Pediatrics released a policy statement detailing the positive im-

pacts of increased telemedicine services in areas such as physician shortage, cost, access to care and quality of care [16]. The main pediatric subspecialties that established telemedicine practices prior to COVID-19 were neurology, psychiatry, cardiology, neonatology and critical care medicine [6]. Pediatric cardiologists and endocrinologists frequently used asynchronous telemedicine to record changes in heart rhythm and blood sugar with positive feedback from the caregivers [9,17]. The primary reason for telemedicine in those specialties was to provide care for patients in remote areas, which was often characterized as living greater than 90 minutes from a clinic. The frequency of telemedicine visits varied based on geographic and sociodemographic factors. Patients living in large metropolitan areas were less likely to be referred for telemedicine [18]. This hesitancy might pose a barrier to care for those who live closer to the medical center and might have difficulties with transportation. Additionally, patients whose parents are not fluent in English were less likely to have telemedicine referrals due to limited interpreter availability [18]. In 2017, a review article highlighted the use of telemedicine in pediatrics and described the results from the Supporting Pediatric Research on Outcomes and Utilization of Telehealth (SPROUT) network [6]. SPROUT, founded in 2015, helped gather more information about telemedicine in the pediatric field. Initially there was concern that telemedicine could reduce the quality of care delivered to the patient as there is limited evidence on the comparative advantage of evaluating a patient through a screen. A few studies have also compared virtual evaluations to in person visits and noted a high level of accuracy when attempting to assess medical concerns [19–22].

Over the past 20 years, the use of telemedicine for children with complex medical needs has grown. For example, developmental and behavioral pediatricians have attempted to use telemedicine for patients in rural areas. This subspecialty, along with pediatric rehabilitation medicine, takes care of patients with a variety of cognitive, communication and motor challenges. A shortage of qualified providers in both subspecialties often can lead to prolonged time for initial evaluations [1,23]. A survey published in 2001 demonstrated that the 4 main domains where telemedicine had been utilized for children with special health care needs were physical health care, developmental/cognitive evaluations, behavioral health care and social/family concerns [24]. Another interesting attempt to describe the benefits and challenges for pediatric providers who

use telemedicine comes from a recent study published in 2019. In this pilot study, hospitalists incorporated telemedicine to connect with primary pediatricians before medically complex children were discharged from the acute care hospital. The video teleconference included the patient, caregiver, primary pediatrician, discharging physician and case manager. A home nurse and interpreter were also involved if needed. These conferences took place in the patient's hospital room on a hospital computer. Although the sample size was small, the primary pediatrician expressed increased comfort in caring for the child after discharge, however prior regulations did not allow billing for the encounter and there were frequent scheduling conflicts [25]. "Telepractice" can refer to providing virtual medical care to a child who is not located in their home. Some pediatricians conduct video visits with children at schools, child-care centers and summer camps [20,26]. There are additional studies describing the possibility of integrating telemedicine into the school system for children with complex medical needs such that the school nurse could connect virtually with a physician to address an acute medical issue [17,27].

3. Telemedicine in pediatric PM&R

Out of 43 pediatric subspecialties in the United States, Pediatric Physical Medicine & Rehabilitation (PM&R) had the least established telemedicine services in 2017 [6]. Rapid evolution of telemedicine during the COVID-19 pandemic provided an opportunity for pediatric physiatrists to deliver care for a vulnerable and diverse population by effectively managing or co-managing acute and chronic conditions and health care needs. Around 20% of children in the US have special health care needs [28]. Pediatric physiatrists are frequently involved in the health care delivery continuum of children with special needs, notably participating in the delivery of rehabilitative and habilitative care in acute, subacute, and outpatient settings. The pediatric physiatrist integrates the clinical management and co-management of a variety of medical conditions ranging from traumatic brain injuries, spinal cord injuries, post-operative complex orthopedic conditions, neuromuscular disorders, inherited congenital conditions, and genetic abnormalities in children at various developmental stages.

A literature search conducted in adult PM&R identified opportunities for telemedicine in conditions such as stroke, spinal cord injury, traumatic brain injury,

chronic pain, and burn rehabilitation [29–34]. Certain telemedicine technology, such as telestroke programs allow neurologists to remotely assess and deliver emergent stroke treatment [tissue plasminogen activator (t-PA)] for adult patients, and is not applicable in the pediatric setting [35]. Conceivably, pediatric physiatrists could adopt, modify, and utilize advances in telemedicine from adult rehabilitation medical care. For example, video teleconferences involving adult patients in acute rehabilitation settings, physiatrists and burn consultants resulted in decreased transportation costs, increased patient satisfaction and less time away from the rehabilitation unit [36].

There are unique features of pediatric physiatry health care delivery such as an emphasis on family-oriented, patient-specific care, and a multidisciplinary focus:

- Pediatric physiatrists should:
 - * exercise a compassionate and empathetic bedside manner while diligently working with the families that underwent a significant degree of psychosocial insult as a result of the child's ailment or condition.
 - * work with an extremely diverse group of children and their families coming from a multitude of socioeconomic backgrounds, requiring treatment in various clinic settings.
 - * be at the forefront of issues associated with lack of access to care, health care disparities, and insurance limitations.

Pediatric physiatrists inherently work within the framework of interdisciplinary and multidisciplinary goal-oriented teams with predominantly pediatric trained healthcare providers who are trained to recognize and treat functional impairments of infants, toddlers, young children, adolescents, and adults with childhood disabilities. This skill set requires several years of added training along with clinical exposure to pediatric populations and various aspects of children's health.

The COVID-19 pandemic led to a significant disruption of workflow in hospitals and other healthcare facilities. The challenges of patient care for pediatric physiatrists in both inpatient and outpatient settings are directly linked to the inherently collaborative, team and family-oriented nature of work. Pediatric physiatrists have daily interactions with patients, caregivers, rehabilitation and habilitation providers, nursing staff, social workers, and mental health care providers. The most recent evidence suggests that children can be carriers

of COVID-19 and subsequently increase community transmission of the virus for a prolonged period of time. Emerging evidence suggests that the symptom complex of COVID-19 can have variable presentations in children when compared to adults [37,38].

In addition to potentially enhancing and strengthening the transdisciplinary pediatric healthcare delivery model, telemedicine can also prevent the spread of COVID-19 to these patients and their families. To continue to provide care for the patients within the pediatric rehabilitation community, it is important to adhere to the ever-evolving epidemiologic guidelines to decrease the rate of viral transmission. Therefore, appropriate utilization of asynchronous and synchronous telemedicine should be on the agenda for any medical facility engaged in pediatric care. Early adoption and rapid implementation of telemedicine capabilities for inpatient rehabilitation units are essential in preventing the spread of COVID-19 and are of utmost importance for infection control. Seasonal outbreaks of “flu-like illnesses” and or a potential second wave of COVID-19 will complicate, and most likely accelerate, the implementation of telemedicine in inpatient and outpatient settings. Therefore, pediatric physiatrists should not only adhere to infectious disease guidelines but also exercise their own clinical judgment on the need for the use of telemedicine versus in-person clinical examination.

Currently, we do not have any solid scientific evidence that reinfection cannot occur with COVID-19, hence the new normal will be use of rigorous epidemiologically prudent measures. No technology can completely substitute a detailed physical examination performed by the skilled physician, especially for children with special needs and/or complex medical needs. In the “Post COVID-19 era,” risk of exposure can and should be significantly reduced for both initial and follow-up visits with the use of telemedicine. Virtual stages of physical examination can be achieved with simple steps such as the use of mobile connection with caregivers to a more sophisticated use of evolving peripheral devices including body posturing sensors, commercial gaming motion sensors and wireless medication bottles or pill boxes [39]. Therefore, the introduction of telemedicine holds promise as a solution for both caregivers and providers to optimize care and eliminate some of the barriers in overall health care delivery.

Below we will entertain several hypothetical scenarios on how telemedicine can potentially enhance the practice of pediatric physical medicine and rehabilitation.

4. Inpatient PRM telemedicine scenario

Jack is a 10-year-old boy who sustained a severe multi-vector trauma after a motor vehicle accident. He is in the pediatric intensive care unit (PICU) for several weeks making a slow recovery. The primary team consults pediatric physiatry to determine if Jack has potential for an inpatient rehabilitation admission. Unfortunately, the pediatric physiatrist is located a few miles away and is able to travel to the children’s hospital for the initial evaluation and determines that Jack has potential for restorative and goal-oriented rehabilitation in the acute inpatient unit but he is not yet clinically stable and functionally appropriate for immediate transition to acute rehabilitation. The pediatric physiatrist can ask for follow-up consult visits via telemedicine by using synchronous and asynchronous telemedicine IT platforms adopted by the referring facility.

Jack is transitioned to an inpatient rehabilitation facility (IRF), which is 50 miles from his home. His mother is present for the first family meeting with the multidisciplinary team. His father is at work, but can be present via video teleconference and is pleased that he can participate in the meeting. Jack is having poor wound healing at his surgical sites. A wound care specialist evaluates him in real time through a telemedicine synchronous video visit and provides recommendations to the medical team led by the pediatric physiatrist. Jack has spent a few weeks at the IRF demonstrating steady recovery but due to a variety of both clinical factors and barriers for discharge, the medical team and his family determine that a subacute pediatric facility stay is required for continuation of his clinical rehabilitation. A multidisciplinary video teleconference is set up with the physiatrist, case manager, caregivers and medical team at the subacute facility to discuss his medical course to ensure effective communication and continuity of care. The pediatrician at the subacute facility requests telemedicine consults with the pediatric physiatrist to enhance functional and clinical management as well as address further aspects of care coordination for outpatient services prior to Jack’s discharge.

In this plausible scenario, pediatric physiatrists can utilize telemedicine capabilities in different roles: as consultants for a tertiary care facility, as attending physicians in an acute inpatient rehabilitation unit, and as consultants for a subacute facility. Telemedicine provides a timely, accessible, and family-oriented approach for clinical situations with many uncertainties brought by illness, impairment, disability, or physical/emotional handicap [20,40]. Pediatric patients with complex med-

ical needs often require prolonged hospitalizations and can face socioeconomic barriers. A pediatric physiatrist can help families navigate through these difficult times to help maximize function and decrease caregiver burden [10]. The involvement of a pediatric physiatrist can span the continuum of care from the emergency room to PICUs to pediatric wards to inpatient rehabilitation units and outpatient care [41–43]. Further studies in access to telemedicine services with pediatric physiatrists can be viewed as tools for optimization of multidisciplinary care in PICU settings. The above-mentioned IRF scenario is one of many that pediatric physiatrists confront in their line of duty. Discharge planning in children with acquired or complex medical needs is notoriously difficult, and any enhancements in care delivery will be embraced and appreciated [44].

In an attempt to analyze the potential of telemedicine use, several outpatient telemedicine scenarios are described below. This limited sample could underscore the practicality and potential of telemedicine.

5. Outpatient PRM telemedicine scenarios

Alex is a 5-year-old girl with spastic diplegic cerebral palsy (Gross Motor Function Classification System [GMFCS] III). She continues to have scissoring gait and recently established care with a pediatric physiatrist in a tertiary care center that serves the needs of children in three states. Alex lives in a rural area that is two hours away from the clinic. She receives chemodenervation to her bilateral lower extremities and attends outpatient physical therapy twice weekly in the community. The pediatric physiatrist can observe the physical therapy session through a video visit, but the physical therapist uses a different electronic medical record (EMR) platform that is not seamlessly integrated into the physician's platform. Both synchronous and asynchronous (including video recordings of gait) telemedicine health care provided by the pediatric physiatrist may serve as a valuable resource to the family of this child if the child requires follow up for chemodenervation procedures.

Frequently, children with cerebral palsy will require serial casting and equipment assessments by local providers. Therefore, care coordination provided by the pediatric physiatrist equipped with telemedicine should be viewed as a sound approach in the post COVID-19 era where social distancing is paramount to reduce potential viral exposure.

Furthermore, contemporaneous observation of outpatient therapy sessions or assessments and review of

the home environment by means of video telemedicine may shed light on the abilities and resources of the rehabilitation providers to achieve goals of treatment.

Michael is an 11-year-old boy with Duchenne muscular dystrophy and other associated medical conditions. He usually maintains multidisciplinary neuromuscular clinic visits (physiatry, neurology, cardiology, and pulmonology) every four months. He can no longer ambulate and uses a manual wheelchair for mobility. His family has difficulty with transportation to medical appointments. They are relieved that he can participate in synchronous telemedicine followup visits with each provider of his multidisciplinary clinic instead of traveling to multiple appointments. Michael's home nurse acts as a "telepresenter" to assist the physicians with the physical exam.

Pediatric physiatrists are integral members of neuromuscular clinic teams. In this case, telemedicine can be advantageous for the continuity of care for patients with neuromuscular disorders [39]. In the framework of these clinics, there are children with numerous neuromuscular disorders such as dystrophinopathies, spinal muscular atrophy, myopathies and rare genetic disorders. Previously published studies in neuromuscular literature explicitly point out the numerous benefits of telemedicine applications [39,45,46].

Another advantage of telemedicine visits can come from use of the "telepresenter" who is at the same location as the patient and can help facilitate the physical exam with instructions from the physician [39,47]. They could also help in virtual wheelchair evaluations by taking measurements of the equipment [48]. It is important to recognize this role although there are still uncertainties about who can act in this capacity.

Zoe is a 9-year-old girl who sustained a concussion during soccer practice 3 days ago. She is seen by a pediatric physiatrist in clinic for the initial history, physical exam and assessment. It is determined that she can return to school but should refrain from gym class and playing soccer. She continues to see the pediatric physiatrist weekly via synchronous telemedicine visits to monitor her symptoms. Since the followup visits are via telemedicine, Zoe does not have to miss a significant amount of time at school. Also, with parental consent and participation, the video visits can be performed at school with the school nurse present.

A multidisciplinary approach throughout a patient's care is instrumental for pediatric traumatic brain injury patients [49]. Concussions are mild traumatic brain injuries that can have persistent symptoms lasting longer than one month. Common symptoms include headache,

Table 2
Barriers to telemedicine prior to COVID-19 [2,14,24,25,39,47]

For physicians	For patients/caregivers
Limited ability for comprehensive physical exam	Reliable mobile device and/or internet access at home
Upfront costs – infrastructure, hardware, tech support	Inability to integrate interpreter services, limited options for software in different languages
Desire for in-person visits to build rapport	Troubleshooting concerns and availability of tech support
Provider acceptance into routine practice	Privacy concerns (hacking, cyber crimes, immigration status)
High quality internet/broadband availability	Preference for in-person visits for sensitive psychosocial topics
Variations in protocols, billing, insurance, liability, state regulations and institutional policies	Availability of adaptive hardware for those with hearing, visual or physical impairments
Scheduling conflicts	Variety of IT platforms and potential incompatibility
Potential for over/underprescribing (tests and antibiotics due to limited interaction)	Cost of mobile service and affordability
Limited research/evidence for efficacy in certain medical conditions	Challenging for patients with lower educational levels and limited health-care literacy

dizziness, photophobia, difficulty concentrating, and fatigue [50]. Also, they can also require frequent doctor visits to monitor the progression of symptoms. A Canadian study investigated the use of telemedicine for children with concussions after an in-person clinical evaluation and assessment. Telemedicine expanded the access of specialized concussion care to regions that previously had none. Also, it can also allow for multidisciplinary video visits with the primary care physician who might not be familiar with specific assessments. Since certain physical exam maneuvers cannot be performed virtually (reflexes, pupil dilation, motor strength, and sensation) there is also a low threshold for brain imaging and in-person clinic visits [47]. Telemedicine access of care can be essential in the continuity of care for pediatric traumatic brain injury victims.

6. Positives of telemedicine

Telemedicine provides significant advantages as a supplement to traditional healthcare. Prior studies have shown that patients can be in favor of video visits as an alternative, but not a replacement, for in-person consultations [14,51]. Some benefits include increased access to health care providers, decreased time in transit, higher patient satisfaction, and increased cost effectiveness for healthcare systems and patients [20]. Many in urban settings rely on public transportation or wheelchair accessible transportation through insurance benefits. This often results in late clinic arrivals, premature conclusions of clinic visits, or missed visits, which increases frustration for both caregivers and providers. To be able to decrease the frequency of in-person visits while still maintaining a continuity of care for patients, especially those with complex medical needs, can ease the caregiver burden and improve quality of life. Chil-

dren will not have to miss school for frequent visits and parents can decrease their time away from work. Often families with children with special health care needs experience significant financial burdens due to additional medical costs and inability for the caregivers to sustain full-time jobs [20]. Telemedicine can lessen this financial load.

A few studies have investigated the possibility of remote wheelchair evaluations for patients who have difficulty leaving home. Often a family member or rehab technician had to be present to assist with measurements. Many children with special needs spend several hours in their wheelchair each day. Frequently it can take weeks or months to have wheelchairs evaluated or adjusted and in that time, poor posture or skin breakdown can occur. Although remote wheelchair evaluations can prove to be beneficial, more research is needed on their efficacy for widespread acceptance by physicians and therapists [39,48].

From a physician's point of view, telemedicine can allow for more flexibility in the work schedule [39]. A virtual visit can happen from anywhere if there is a stable internet connection for both the patient and the physician. Physicians can connect with colleagues from other specialties to have a simultaneous appointment with a patient at home to expand multidisciplinary clinics to multiple regions. One main concern for physicians is the inability to perform a complete physical exam [47]. Telepresenters can help ease that fear if they are trained medical professionals.

Video teleconferences have been used for educational purposes in the past amongst different levels of learners [3,16,24]. One way to give medical student exposure to the special needs population is to use telemedicine when evaluating a child with special needs. Educational information also can be discussed with patients and their families to ensure carryover of previously de-

scribed information and/or delivery of new material. Lastly, teleresearch can be used to expand research studies to desired populations and community physicians [26].

Physicians in the field of rehabilitation often encounter patients with diverse impairments. When using technology for medical care they must take certain factors into consideration. For example, a person with upper extremity weakness or poor fine motor skills might need to mount their phone on the table or wheelchair to participate in video visits [3]. There must also be adequate video quality to assess non-verbal cues for pain or discomfort. Over time there have been several barriers to telemedicine, which had previously hindered its progression into mainstream medicine (Table 2).

7. Future directions

The introduction of telemedicine in the practice of pediatric physiatry as a standard of care can be viewed as a significant value-added quality tool. One main factor that limits the acceptance of telemedicine by clinicians is the lack of evidence in efficacy [24,39]. Further research is needed to establish more clinical guidelines and protocols for different patient populations. Soon, asynchronous telemedicine could potentially be used for patients to log their home exercises, record therapy sessions, conduct research or even interrogate intrathecal baclofen pumps. One way to eliminate variability between institutions would be to provide the patient with a universal video device that can be used for any telemedicine encounter across all healthcare systems. Telemedicine provided by pediatric physiatrists and the rapid evolution of IT platforms and applications could enable providers and patients to efficiently coordinate rehabilitation services provided by physical therapists, occupational therapists, speech therapists and neuropsychologists. Both academic centers and private industries should embrace the technological changes that are resulting from the COVID-19 pandemic. This momentum could lead to the potential collaboration of bioengineers, physician informaticists and IT developers to create devices and products that can better serve practicing pediatric providers including pediatric physiatrists. The expansion of physician driven telemedicine capabilities will inevitably lead to proliferation of telerehabilitation services to enhance home-based, virtual treatments.

This is an important and urgent initiative from a public health point of view. Paradoxically this public health crisis creates opportunities to eliminate disparities of

care in rural, suburban and metropolitan communities. The immediate impacts of COVID-19 on the expansion of telemedicine are obvious. Hospitals are using audiovisual devices on inpatient units, adjusting electronic medical records and adopting new telemedicine workflows. Changes to policy and procedures and overall acceptance of telemedicine are on the rise. With time and availability of resources, telemedicine advancements from academic centers and private institutions can extend to pediatric long-term care facilities, home care agencies and other settings where care for chronic/complex medical conditions and children with special needs, both physical and emotional, is being provided.

8. Conclusion

The COVID-19 pandemic has forced health care professionals to rely on telemedicine more than ever before. Ideally, the changes that the CARES Act had on telemedicine in the United States should remain in place in order to continue to provide the same level of remote health care. With more experience, the process can be streamlined to decrease barriers. As pediatric physiatrists we value the physical exam as a key part of developing treatment plans for patients. Therefore, telemedicine will not completely replace the traditional office visit. Paradoxically the current public health crisis created opportunities for the evolution of a novel model of health care delivery for pediatric physiatrists by hybridizing both in person and virtual evaluations. Regardless of how physiatrists see their patients, they must ensure optimization of the care for these children wherever they might be.

Conflict of interest

The authors have no conflict of interest to report.

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