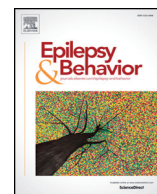




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## Review

# Telehealth in pediatric epilepsy care: A rapid transition during the COVID-19 pandemic

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## ABSTRACT

Telehealth's first literature reference is an article in 1879 in the Lancet about using the telephone to reduce unnecessary office visits (Institute of Medicine & Board on Health Care Services, 2012). However, providers have been slow to adopt telehealth into their clinical practice secondary to barriers such as cost and reimbursement (Kane and Gillis, 2018) [2]. The advent of shelter in place orders combined with the ongoing need defined by the Centers for Medicare & Medicaid Services (CMS) Administrator Seema Verma "for all Americans, and particularly vulnerable populations who are at heightened risk, to be able to access their providers" has resulted in the rapid implementation of telehealth across multiple specialties. The goal of this paper is to provide a practical framework for translating quality care in epilepsy as defined by the American Academy of Neurology (AAN) guidelines into a virtual care environment. We will also discuss the use and limitations of point of care testing in epilepsy management.

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## 1. Telehealth in neurology

Telehealth's first reference is an article in 1879 in the Lancet about using the telephone to reduce unnecessary office visits [1]. In the setting of the Covid-19 pandemic, telehealth has rapidly evolved into a method of completing the most necessary office visits. Historically, the lack of pediatric and adult neurologists in rural settings has resulted in significant financial and logistical challenges for people with epilepsy (PWE). People with epilepsy and their families may need to travel long distances to obtain care and face significant burdens including: finding childcare services, costs associated with travel and lodging, lost work, and navigating large medical centers with limited and at times expensive parking [3]. This unmet clinical need has been a driver for the development of multiple successful telehealth programs [2,4].

Neurology telehealth programs have been able to show significant satisfaction and quality from both the patient and physician standpoint. In a study that surveyed 1100 rural veterans that were receiving chronic neurology services through telehealth, 90% perceived they received good care, 91% felt there was good communication, 88% liked the convenience, and 87% reported they desired to continue teleneurology care. Ninety-six percent reported saving time, money, or both. Physicians felt that they could deliver excellent care through teleneurology. Other

quality metrics such as emergency room visits for neurologic problems were similar when compared with standard in-person clinic visits [5]. In another study of adults focused on telehealth for chronic epilepsy, the investigators compared the demographics and outcomes between the traditional model of in-person care and the virtual visits and found no significant differences in outcome data (number of seizures, hospitalizations, and emergency room visits) and medication compliance [6].

Additionally, in pediatrics, there have been multiple examples of successful telehealth programs in both school-based settings and tertiary clinical services provided to rural patients [7]. Many of these programs were thoughtfully planned and integrated into the existing physician and clinical workflows. With the current healthcare emergency, clinical practices have to rapidly implement telehealth care while maintaining quality services. A recent survey published online by the National Epilepsy Centers (<https://app.smartsheet.com/b/publish?EQBCT=a52af85ca2244bc3a667aaf072c0248a>) highlighted the enormity of the gap in care pre- and post-Covid-19 pandemic. Seventy-five percent of outpatient clinics reported seeing only urgent and emergent in-person visits. At the same time, more than 75% reported no significant telemedicine infrastructure prior to Covid-19. More than 50% of centers reported using standard video conferencing or ad-hoc solutions rather than electronic medical record (EMR)-integrated products leading to poorly organized and variable quality of care. There was also significant concern regarding access for vulnerable populations including low socioeconomic status and non-English speakers. The goal of this article was to assist in the rapid implementation of telemedicine in pediatric epilepsy management by focusing on the translation of the

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quality metrics in epilepsy care as detailed by the American Academy of Neurology (AAN) into the telemedicine environment.

Additional resources are available online including the following: (1) General Provider Telehealth and Telemedicine Tool Kit published by the Centers for Medicare & Medicaid Services (CMS): <https://www.cms.gov/files/document/general-telemedicine-toolkit.pdf>, (2) From the American Academy of Pediatrics (AAP): <https://www.aap.org/en-us/professional-resources/practice-transformation/telehealth/Pages/Provider-to-Patient-Visits.aspx>, and (3) From the AAN: <https://www.aan.com/siteassets/home-page/tools-and-resources/practicing-neurologist-administrators/telemedicine-and-remote-care/20-telemedicine-and-covid19-v103.pdf>.

This review is based on published articles identified via searches in PubMed and Google Scholar and last searched on May 01, 2020. Only peer-reviewed articles in English are included.

## 2. Epilepsy & telemedicine

Epilepsy is the 4th most common neurological disorder and is frequently accompanied by other medical conditions. Approximately 70% of PWE become seizure-free on antiseizure medications, while 30% have pharmacoresistant epilepsy. Regardless if they are well-controlled or refractory to medications, all struggle with the stigma of epilepsy, a chronic disease that is accompanied by unpredictable seizures, medical comorbidities, and medication side effects. In order to improve delivery of care and outcomes for PWE, the AAN formed a multidisciplinary workgroup that reviewed and modified quality measures for management of patients with epilepsy over the years. The goal was to standardize measures for use in quality improvement initiatives, public reporting, payment, and Maintenance of Certification (MOC) performance. We will focus on the most recent updated measure, which was accepted in 2017 [8]. [Table 1](#) lists the updated epilepsy quality measurement set published in 2018.

The revised goal of the AAN guidelines is to provide a measurement standard for proper education of PWE, specifically in women of child-bearing age, quality of life assessment, depression and anxiety screening, and access to treatment at a comprehensive epilepsy center. It therefore asks physicians to obtain the following information at each encounter: seizure frequency for each seizure type, querying and intervention for side effects of antiseizure therapy, and screening for psychiatric or behavioral disorders. In addition, an annual assessment of individualized epilepsy safety issues and education, counseling of women of childbearing potential is recommended. Most of the emphasis is to assess the quality of life of PWE. Seizure intervention and etiology of seizures was retired as it was felt it did not improve patient outcomes. The final recommendation has been to consider referral of treatment-resistant epilepsy to a comprehensive epilepsy center every 2 years. The AAN measurement set has been accepted by the American Epilepsy Society, Child Neurology Society, and the Epilepsy Foundation of America and has been applied in clinical practice by neurologists across the country ([Table 2](#)).

The AAN guidelines were developed for in-person clinic visits. One of the fundamental concepts of telehealth is that “the standard of care for any given condition is the same regardless of whether care is provided in-person or via telehealth” [7]. We will address how the guidelines can be translated into a telehealth environment to maintain the same quality of care.

Telehealth as defined by the Center for Connected Health Policy has multiple components including the following: (1) live video – a two-way interaction between a person (patient, caregiver) and a physician using audiovisual telecommunications technology, (2) mobile health, applications can range from targeted text messages that promote healthy behavior to wide-scale [9] alerts, for example, about disease outbreaks, (3) remote patient monitoring (RPM) uses digital technologies to collect medical and other forms of health data from individuals in one location and electronically transmit that information securely

to healthcare providers, and (4) Store-and-forward technologies that allow for the electronic transmission of medical information, such as digital images, documents, and prerecorded videos through secure email communication. There are complete telemedicine solutions that integrate with the EMR, but currently, these solutions remain unavailable to the bulk of neurologists providing epilepsy care. As a result, this article will focus on the conversion of the in-clinic in-person epilepsy visit into a live video visit. Outside of the scope of this article are the recent changes to licensing, billing, and prescribing practices recently implemented by CMS (clinical medical societies) to encourage the use of live video visits.

In addition to the AAN guidelines, we will also incorporate the “Operating Procedures for Pediatric Telehealth” published by the American Telemedicine Association endorsed by the AAP. The operating procedures cover the provision of healthcare by providers to children, from the time of birth through the legal age of majority, using telehealth [10].

In order to convert a clinical visit to a remote video visit, the clinical barriers of telehealth as they affect epilepsy care needs to be identified and mitigated. These include (1) changes to the quality of the patient-physician relationship, (2) the quality of the examination, and (3) the quality of care [11].

The patient-physician relationship, historically built on in-person visits, is the foundation of clinical care, a health partnership that assists in treatment adherence, improves health status, and maintains patient satisfaction. In-person visits build trust through physical touch such as a handshake or physical exam and allows for more complete nonverbal communication [35]. The remote nature of telehealth visits has the potential to undermine the quality of the patient-physician interaction in several ways. The ability to engender trust is more difficult remotely than in-person, particularly if this is a new relationship. Trust is a key element of the patient-physician relationship and develops with recurring encounters resulting in patients being more amenable to revealing potentially stigmatizing information about health-related behaviors such as missing medication doses, sexual behavior, substance abuse, and depressed mood. Patients expect their physicians to be competent, compassionate, to make patients welfare their highest priority, to be reliable, and have the ability to take responsibility and control [12].

In epilepsy care, discussion of comorbidities including depression, anxiety, other psychiatric disorders, behavioral disorders, and lifestyle habits relies heavily on the patient-physician interpersonal trust. These topics can be more challenging to broach without a basis for trust established prior to the telehealth visit and may be missing input from people who would otherwise provide information during an in-person clinic visit. Furthermore, many of these comorbidities can be exacerbated by the current social isolation, and without supporting family members, friends, and teachers, it may not be brought to the physician's attention. An additional barrier is the physical space, particularly for adolescents, to feel secure in the confidentiality of the patient-physician relationship to address topics related to sexual activity and safety. To overcome the changes in the relationship with conversion to video conferencing, neurologists may want to reassess their interview styles and leverage their medical staff and directed questionnaires.

While telehealth applications continue to evolve, they have been primarily focused on conditions for which the physical examination is absent (e.g., teleradiology), less important (e.g., mental health), or principally assessed visually (e.g., dermatology) [11]. The neurological exam relies on observation and interaction, which are limited in a telehealth setting. Certain functions cannot be tested via telemedicine and will require an in-person visit if deemed to be important: ophthalmologic, vestibular exam, muscle tone, and subtle weakness or sensory deficits. For follow-up visits for patients with epilepsy, the neurological exam focuses primarily on side effects and medication toxicity, which can be assessed to some degree with a remote exam. As for new patients, the physical exam is used to aid in the diagnosis of epilepsy versus another etiology and identify underlying etiology such as acute versus remote symptomatic etiology. Of newly diagnosed epilepsy cases, 18% result

**Table 1**  
AAN Epilepsy quality measurement set 2017 update [8].

Title	Numerator	Denominator	Exclusions
Counseling for Women of Childbearing Potential with Epilepsy	All females, including all individuals of childbearing potential (age 12–44) with a diagnosis of epilepsy	Patients or caregivers counseled at least once a year about how epilepsy and its treatment may affect contraception and/or pregnancy. Measure is met if patient has documented if they are premenstrual, postmenopausal, surgically sterile, or reproductive organs absent	None
Comprehensive Epilepsy Care Center Referral or Discussion for Patients with Intractable Epilepsy	Patients with an order for referral to a comprehensive epilepsy center, who had a discussion of evaluation at a comprehensive epilepsy center, or who received treatment at a comprehensive center during the measurement period	Patients diagnosed with intractable epilepsy or patients diagnosed with epilepsy who were prescribed 3 or more distinct antiseizure medications in the past 2 years	None
Quality-of-Life Assessment for Patients with Epilepsy	Patients with age-appropriate, condition-specific quality of life assessed at least once in the measurement period	Patients aged 4 years and older diagnosed with epilepsy	Patients who are unable or decline to complete the instrument and for these patients, a caregiver is not present to provide proxy report
Quality-of-Life Outcome for Patients with Epilepsy	Patients whose most recent QOLIE-10-P score is maintained or improved from the prior QOLIE-10-P score obtained in the measurement period	Patients aged 18 years and older diagnosed with epilepsy who had 2 office visits during the 2-year measurement period that occurred at least 4 weeks apart	None
Depression and Anxiety Screening for Patients with Epilepsy	Patients aged 12 years and older diagnosed with epilepsy	Patients with epilepsy who were screened for both depression and anxiety at every office visit	Patients who are unable or decline to complete epilepsy specific screening tool Patient has a diagnosis of depression or anxiety on active problem list
Seizure Frequency for Patients with Epilepsy	All visits for patients with a diagnosis of epilepsy	Patient visits with current seizure frequency documented for each seizure type	Caregiver is unavailable for a patient who is noncommunicative or has an intellectual disability Patient or caregiver declines to report seizure frequency

**Table 2**  
Retired 2014 Epilepsy Quality Measurement Set [8].

2014 Epilepsy Quality Measurement Set Update
Seizure frequency
Seizure intervention – retired
Etiology, seizure type, or epilepsy syndrome – retired
Querying and intervention for side effects of antiseizure therapy – retired
Personalized epilepsy safety issue and education provided – retired
Screening for psychiatric or behavioral health disorders for patients with epilepsy – retired
Counseling for women of childbearing potential with epilepsy – updated
Referral to comprehensive epilepsy center – retired

from remote symptomatic etiologies. The most frequent causes were pre- and perinatal insult, cerebrovascular disease, and head injury [13], which may be suggested by a detailed physical exam.

We are defining quality of care by the AAN guidelines. The remainder of this paper will examine maintaining quality of care in a remote setting. Even without a dedicated clinical system to manage telehealth, the team can maximize the likelihood of a successful transition by leveraging the entire clinical care team to communicate with the patient prior to the visit, using published validated surveys and the functionality of the EMR. We suggest defining and documenting a telehealth workflow and EMR templates for the entire team interacting with the patients to increase the likelihood of a high quality visit in this relatively new setting.

### 3. Clinic visit preparation

The goal of a telehealth visit is to provide the same level of care as an in-person visit. The clinical team can maximize the success of the telehealth visit by developing a workflow to assist the provider in gathering enough evidence from the history, physical examination, and/or

established prior relationship that the provider is confident in their clinical decisions. If technical difficulties occur or, for the provider's comfort level, the provider is unable to comply with the standard of care for diagnosis and management, then the patient should be referred for an in-person evaluation [10].

When scheduling the telehealth appointment with the patient's family, the provider team should clearly express the need for the child to participate in the video call, selecting a time when the child is most likely to be cooperative (i.e., after naps for young children) and in an appropriate space for the encounter. We also recommend that the telemedicine link be tested prior to the appointment, and backup plans including a telephone number should be available if the connection fails. Quality care needs to be provided in the patient and their families' primary language, and translation should be arranged prior to the visit. The use of phone translators can be incorporated into video telemedicine visit by providing them access to the video call via telephone from a remote site or with the use of in-office live translators. The medical staff should also review the patient's preferred pharmacy and medications prior to the telemedicine visit. After scheduling the appointment, an information sheet should be emailed to the family or reviewed verbally to prepare for the visit.

During the scheduling process, the staff can begin building trust by dispelling fears and misconceptions: educating the patient about telemedicine, assure the patient the video will be transmitted on a secure line to the specialist only (i.e., this will not appear on YouTube), and give the patient a demonstration of what will happen during their consultation [14]. Once the family and patient understand the nature of a telehealth visit, consent based on state law and assent of the pediatric patient participating in the telehealth service can be requested in a manner that is appropriate to their understanding [10]. We suggest a previsit preparation checklist to be sent to families by asking them to have the patient's favorite toys and a flashlight for the telemedicine visit.

Previsit questionnaires can be tailored by the nursing staff to monitor the efficacy of medications, compliance to treatment, identification

of side effects, and screening for behavioral and psychiatric disorders. There are several health-related quality of life in epilepsy (QOLIE) surveys for adult patients including QOLIE-30 (a survey about distress the patient feels related to epilepsy) and QOLIE-10 (a brief version that includes 10 questions about health and daily activities related to epilepsy). The 2017 AAN guidelines recommend the use of QOLIE-10 in patients 18 years and older. The QOLIE-48 is a survey of health-related quality of life for adolescents age 11–18 years with epilepsy that consists of 48 questions. A long written survey is unlikely to result in a high response rate. Therefore, the authors propose a previsit questionnaire that would include Patient Health Questionnaire-2 (PHQ-2) screening for depression [15] and Generalized Anxiety Disorder-7 (GAD 7) [16]. If any question regarding mood from the previsit questionnaire is present, then the QOLIE-48 can be sent to the family and asked to be completed for further assessment. In addition, the office nurse or medical assistant can complete the PHQ-9 [16,17] at the beginning of the telemedicine visit, when obtaining vitals. If there is an active concern for self-harm, social workers can join the video call visit for further assessment. If the social worker identifies a risk of suicide, 911 can be contacted, and the patient can be brought to the emergency room.

The previsit questionnaire should also include questions about vitamin D and folic acid supplementation, which can guide the physician to counsel accordingly considering Vitamin D levels, calcium supplementation, and periodic measurement of bone mineral density [18].

Prior to the visit, the provider should minimize environmental distraction and background noise that may affect the quality of the encounter. The space should meet standards for privacy and confidentiality for the patient involved, and personal health information not specific to the patient should not be visible [10].

#### 4. History and examination via telehealth

At the start of the visit, the medical team should document all persons present on the patient end [10]. The staff can provide instructions for the family to obtain vital signs such as weight, height, heart rate, and respiratory rate. Once the provider has started the call and introductions are complete, we recommend starting with the physical exam in case the video connection fails and the visit switches to the telephone. In addition, starting with the exam can relieve stress and allow the family to focus on the visit.

In order to provide a thorough examination, the participation of parent and child is crucial. From the beginning of the visit, the parent should have the child in the view of the camera, in a well-lit room, so the physician has the opportunity to observe behavior and mannerisms. We would ask that they allow the child to play with their favorite toys preferably on the floor to have the view of the whole body. A flashlight could be used to check pupillary size, shape, and reactivity to light. Extraocular movements can be observed with the camera zoomed to the face while the parent moves a toy to track eye movements. For young children, the majority of the exam can be done by observation of the child playing with their toy on the ground. Interacting with the patient and asking them to smile and blow bubbles can allow us to observe facial movements. Depending on their age and their abilities, the child can be asked to extend arms and close eyes, testing for upper extremity weakness (pronator drift), rapidly stand from sitting on the floor (gower sign) to assess proximal hip muscles strength. They can jump in place, hop on each foot, and run, which can provide further assessment of strength and balance. Coordination can be tested by asking the child to reach for objects. If you are not comfortable with a portion of the exam, forgo that portion and document as to why. There is not a reliable way for the remote neurologist to test sensation, reflexes, tone, strength, or fundoscopy via telemedicine [19]. Given the limitations of the exam, it is the authors' recommendation that all new patients be seen at least once in person to confirm exam findings and assess tone, reflexes, and perform a fundoscopic exam if indicated. The neurological exam for follow-up visits focuses on side effects and medication

toxicity; testing for nystagmus, finger-to-nose and tandem walking for coordination, inspection for postural tremors, gait assessment, and speech assessment for dysarthria and word finding difficulties are all possible through a video visit [20].

The next portion of the visit should focus on the history. A templated EMR note with incorporation of the AAN guidelines will assist in clear documentation and review of pertinent information. The note should include categorization of the seizures as focal or generalized and attempts to identify an epilepsy syndrome and genetic evaluations if appropriate, in particular in patients with pharmacoresistant seizures. Although review of diagnostic studies such as electroencephalogram (EEG) and magnetic resonance imaging (MRI) has been retired from the AAN quality metric, this information is important to document to support the seizure type and epilepsy syndrome particularly to identify patients for epilepsy surgery evaluations. Imaging studies and EEG can be reviewed with family by sharing your screen on video chat platforms such as zoom, if indicated.

During this time of limited contact, additional information can still be obtained from EEG studies done in an office setting with set precautions for Covid-19. There are also multiple companies offering in-home EEG testing. There are no diagnostic devices currently available to replace EEG.

Seizures are the primary symptom of epilepsy. However, self-reported seizure counts are known to be >50% inaccurate [21] and may be further limited by current social distancing guidelines. Efforts should be made to understand the context of how seizures are counted particularly given changes in childcare and school settings. Medical devices have the potential to assist by continuously detecting seizures in real time or close to real time and inform treatment decisions [22]. A number of devices have been developed to detect seizures or track seizure frequencies [23,24]. In a recent article published in *Epilepsia on Seizure Detection at Home*, the authors' review of the literature suggests that the few studies that have looked at seizure detection technology consider a sensitivity above 90% and the false alarm rate limited to one per week to be acceptable. There are no devices on the market that currently meets this standard particularly for focal seizures. However, in the context of a clinical visit, the clinician needs to know whether there has been objective evidence of a change in seizure occurrence rate, which requires only that a change in seizure rate can be reliably detected rather than accurately detecting every event without false alarms [22]. At this point, there remain key evidence gaps in the use of seizure detection devices for clinical management purposes.

In addition to devices, there are paper diaries that can facilitate discussion of seizure burden and pattern during a remote visit. There are also mobile applications that can assist the patient or family to document seizures such as Seizure tracker, My Epilepsy Seizure Diary, Seizalarm, Seizure log, and more. The information stored in these applications can be shared with the physician. Many of these applications also provide medication reminders.

Health-related QOLIE particularly in individuals with pharmacoresistant epilepsy is most impacted by adverse effects (AEs) related to medication and depressive symptoms more so than seizures themselves [25]. To address these concerns, the clinic visit needs to focus on AEs and comorbid psychiatric symptoms. Patients taking antiepileptic drugs (AEDs) commonly report more than one AE. In a study of AEs by Perucca et al. in which approximately 50% of subjects were treated with polytherapy, 83% reported two or more AEs [26]. Somnolence/sedation and behavioral changes, like irritability and nervousness, are among the most commonly observed associated with almost all AEDs. Antiepileptic drugs may cause dose-related AEs (i.e., drowsiness, fatigue, dizziness, blurry vision, and incoordination) that, in most cases, may be obviated by lowering the dosage, reducing the number of drugs, or switching to a better-tolerated AED. Antiepileptic drugs also have the potential of precipitating idiosyncratic AEs (i.e., serious cutaneous, hematological, and hepatic events), which are more common in children

and usually require withdrawal of the AED [27]. Urgent telemedicine appointments will allow for the physician to quickly assess patients and be able to see any cutaneous reaction that requires urgent attention and suspension of the drug.

Psychiatric comorbidity is a recognized additional burden associated with chronic epilepsy. It has been demonstrated that lifetime depression and anxiety are common in epilepsy and are frequently underdiagnosed and undertreated in both adult and pediatric populations [28]. Suicidality should additionally be specifically queried followed by appropriate referrals for acute or chronic treatment.

Social distancing may exacerbate underlying comorbidities. Children with special educational needs may not be receiving services in the current environment, placing them and their families at increased risk for stress and anxiety. Social isolation can impact caregivers and sleep. Particular attention should be made to discussing changes that place the family at additional risk. Additionally, significant financial changes should be queried and families referred to appropriate services.

Per AAN guidelines, an annual assessment of individualized epilepsy safety issues and education needs should be performed. Attention should be paid particularly to changes in childcare arrangements that may result in added risk of injuries. Seizures resulting in falls increase the risk of concussion and other injuries. Given the high morbidity and mortality of submersion injury, those with active epilepsy should bathe or swim only with supervision; however, showering is a reasonable option. Higher seizure frequency, lack of a prolonged seizure-free interval, comorbid attention-deficit disorder, or cognitive impairment may also increase the risk of injury. While some restrictions are necessary to protect the safety of the person with epilepsy, undue limitations may further limit achievement of independence.

Counseling about sudden unexpected death in epilepsy (SUDEP) and women's health (folic acid supplementation and methods of birth control) can be addressed using Short Message Service (SMS)-based epilepsy education system similar to Lua et al., which showed education through SMS messages are feasible and well received by patients [29]. Lua et al.'s SMS-based epilepsy education system was developed with reference to the Modular Service Package Epilepsy (MOSES), which covers topics about living with epilepsy, epidemiology, basic knowledge, diagnostics, therapy, self-control, prognosis, psychosocial aspects, and network epilepsy. The Modular Service Package Epilepsy educational aims for patients is to get to know and understand the disease, learn to cope with the disease, understand the diagnostic and therapeutic measures and be an active part of the treatment process, gain better understanding of psychosocial problems, become autonomous, and lead a life with few limitations. Lua et al.'s SMS system was modified to suit the poorly educated population and asked the patients to complete a module every week for a 3-month period. The current electronic health records systems have the capability to send secure text messages to the patient or family cellphone with basic information about seizure safety, current rules about driving, medication side effects, vitamin supplementation, and SUDEP. These can be established with assistance from the hospital information technologists (IT).

## 5. Advantages of telehealth

Telehealth has many advantages during this time of social distancing. The limitations need to be recognized and addressed. Additionally, leveraging the functionality of the EMR and the clinical support team can be very helpful in creating a virtual epilepsy clinic that provides appropriate lifestyle and seizure safety counseling while testing and identifying psychiatric comorbidities. Though the most recent AAN measurement set [30] has excluded EEG results and MRI/computed tomography (CT) scan results in addition to seizure type/epilepsy syndrome, it is still prudent to review the past studies and consider if further testing is indicated for better characterization of seizures and attempting to identify etiology and/or epilepsy syndrome. Images and EEG studies can be reviewed with the family by sharing the information

using the video conference applications. If there are any videos showing concerning events, the family is able to share and allow the provider to view them during the telemedicine visit. Medication changes can be sent to the preferred pharmacy electronically. Electronic education SMS messages that would be automatically generated at the end of the visit should be used, emphasizing safety issues in epilepsy and providing education. The use of vitamin D supplementation as well as folic acid for adolescents with childbearing potential should also be included. The postvisit EMR summary can also include any suggested diagnostic testing, such as EEG, MRI, and/or laboratory studies as well as any medication modifications to prevent any miscommunication. Genetic testing is possible to be done at home by using saliva kit samples, which can then be mailed back for analysis. Referrals to epilepsy centers can be initiated even remotely. The use of telemedicine also allows for closer follow-ups with patients with the use of nurses and other office staff.

## 6. Limitations of telehealth

One main limitation of telehealth for the adolescent population is the absence of confidential and private discussions about lifestyle habits and mood. Though most facilities will provide access to electronic health records to the patient after the age of 12, the child will not be able to communicate private matters discreetly. Parents of children with epilepsy have a tendency to be more controlling and limit independent activities for their children. A private conversation via video call will be challenging. The use of headphones for the conversation and the use of a room without the parents do not guarantee that the conversation remains confidential. The provider should document if the parent or legal representative is asked to leave the room but is unwilling or if the pediatric patient is uncomfortable without them present in a similar manner as in-person visits [10]. In addition, not all adolescent children have a personal phone that we can SMS or email questionnaires about lifestyle and mood.

The second limitation as mentioned is the physical exam, and we are recommending at least 1 in-person visit for assessment of tone, reflexes, motor strength, and sensation. Finally, the third limitation is poor connections when using video call. Many technical and bandwidth issues can result in the video feed being poor in quality or being lost. For that reason, we recommend having backup telephone numbers available and starting with the physical exam, the more video sensitive portion of the visit. Bahrani et al. conducted a prospective randomized study of telephonic review for outpatient patients with epilepsy and showed that telephonic review is as effective as in-person visits for documenting breakthrough seizures and medication compliance and showed patients were very satisfied. To ensure continuity of care for follow-up patients, the telehealth visit should ideally be performed with their primary neurology providers [5,31].

## 7. Conclusion

Telehealth has become a necessity during the Covid-19 pandemic in order to reduce the physical encounters and limit exposure for patients, their families, medical staff, and physicians. It is a resource that has been shown to be effective in the population with epilepsy and can reduce the challenges of transportation and child care for the patients and their families. It will allow for more frequent communication and check-ins by the medical staff for those in need and can be a very useful method in engaging and providing counseling and education to the adolescent population with epilepsy. There are additional patient and health provider resources that can be accessed through the American Academy of Pediatrics [32], Health Resources and Services Administration [33], and the National consortium of Telehealth Resource Centers [34]. Telehealth is here to stay, and with the above recommendations, medical practices can optimize its use to make sure that they provide the best care possible for patients with epilepsy.

## Declaration of conflicting interest

There is no conflict of interest.

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