

Pediatric Endocrinology in the Time of COVID-19: Considerations for the Rapid Implementation of Telemedicine and Management of Pediatric Endocrine Conditions

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Keywords

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Abstract

Background: Pediatric endocrine practices had to rapidly transition to telemedicine care at the onset of the novel coronavirus disease 2019 (COVID-19) pandemic. For many, it was an abrupt introduction to providing virtual healthcare, with concerns related to quality of patient care, patient privacy, productivity, and compensation, as workflows had to change. **Summary:** The review summarizes the common adaptations for telemedicine during the pandemic with respect to the practice of pediatric endocrinology and discusses the benefits and potential barriers to telemedicine. **Key**

Messages: With adjustments to practice, telemedicine has allowed providers to deliver care to their patients during the COVID-19 pandemic. The broader implementation of telemedicine in pediatric endocrinology practice has the potential for expanding patient access. Research assessing the impact of telemedicine on patient care outcomes in those with pediatric endocrinology conditions will be necessary to justify its continued use beyond the COVID-19 pandemic.

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Introduction

Until recently, in the USA, telemedicine has had limited applications due to lack of payer acceptance. With the onset of the novel coronavirus disease 2019 (CO-

VID-19) pandemic, many pediatric endocrine practices have been forced to rapidly transition to virtual visits; this served as a practical solution to reduce risks for infection by allowing patients and families to access care from their homes. The implementation of telemedicine has led to positive experiences and acceptance by many patients, families, and providers. Telemedicine reduces costs of transportation, time missed from work and school, and anxiety felt by patients and families because they are seen in their familiar home environment [1–3]. Following the COVID-19 pandemic, it seems likely that telemedicine will be permanently integrated into clinical practice [1, 4]. Most providers in the pediatric endocrinology community have experience reviewing blood glucose logs for diabetes over the phone or via patient portals, but many have limited experience with remote physical examinations and best practices for telemedicine. Even those who previously utilized video telemedicine prior to the pandemic had to adjust to patients being at their home, rather than in clinics with trained medical professionals available to obtain vital signs and anthropometric measurements. There are limited data to provide evidence for best practices with respect to telemedicine and the practice of pediatric endocrinology. We aim to summarize the considerations related to the broader implementation of telemedicine into pediatric endocrine practices and provide our expert opinion regarding processes for providing patient care.

Practical Implementation of Telemedicine into Clinical Practice

Effective implementation and reimbursement for telemedicine require Health Insurance Portability and Accountability Act (HIPAA)-compliant platforms (in the USA, HIPAA ensures the security of private patient medical information), availability of technology for providers and patients, and an understanding of payer requirements. The Centers for Medicare and Medicaid Services (CMS) issued an interim final rule on March 30, 2020, that extends temporary regulatory waivers to healthcare providers to facilitate safe and effective care; however, the duration of the waivers is unclear. The regulations aimed to increase hospital capacity, expand the healthcare workforce, improve access to telehealth services, and reduce the regulatory burden on providers. These regulations became retroactively applicable beginning on March 1, 2020. Although these changes are accepted by Medicare, private insurers are not mandated to

adopt them. Areas relevant to endocrine practices include the following:

- Expansion of covered telehealth services
- Reducing or waiving beneficiary cost-sharing for telehealth and certain other services
- Coverage of remote monitoring services for new patients
- Coverage of telephone evaluation and management (E/M) services
- Waiving of the requirement for the face-to-face visit for patients with insulin pumps
- Simplification of the documentation requirements for E/M services delivered via telehealth
- Provision of additional flexibility to deliver Medicare Diabetes Prevention Program services [5]

Telehealth implementation requires a comprehensive understanding of eligibility, terminology, and billing. It is important to be aware of state- and institution-specific licensing requirements prior to implementation, as well as both insurance and malpractice coverage of the visits. Eligibility and documentation requirements differ for telemedicine visits according to their classification. Understanding of the requirements is essential for compliance with coding and billing. Virtual services include telehealth visits, virtual check-ins, and e-visits [6]. Until the COVID-19 pandemic, state medical licensure regulations limited some telehealth services that crossed state lines and included requirements for end-to-end HIPAA-compliant hardware and software. Historically, providers had to be licensed in the state the patient was in at the time of the visit, at least for new patient consultations. With the onset of the pandemic, CMS waived this requirement for Medicare patients, and the Department of Health and Human Services has requested states to modify licensure requirements to facilitate interstate practice, although this has only occurred to a limited degree. Because rules are changing quickly and may revert once the pandemic resolves, it will be important to remain informed and adjust practices accordingly [7] (Table 1).

Telemedicine encounters also require patients and families to have the resources to allow for successful visits. The introduction of telehealth has brought to the forefront concerns about patient privacy and security of communication platforms. HIPAA violation penalties against healthcare workers have been waived temporarily to allow for use of widely available video-calling services, such as FaceTime®, Skype®, Google Duo®, and WhatsApp®, but institutions appropriately continue to encourage use of HIPAA-compliant platforms, for example, Zoom

Table 1. Classification of virtual services

Virtual service, patient type	Visit length, min	Billing code	Relative value unit
E-visit, established	5–10	99421	0
	11–20	99422	0
	>21	99423	0
Remote evaluation of image/video, established	Not applicable	G2010	0.18
Virtual check-in, established	5	G2012	0.25
Phone visit, new or established	5–10	99441	0.25
	11–20	99442	0.5
	21–30	99443	0.75
Telehealth (video), new ^a	10	99201	0.48
	20	99202	0.93
	30	99203	1.42
	45	99204	2.43
	60	99205	3.17
Telehealth (video), established ^a	5	99211	0.18
	10	99212	0.48
	15	99213	0.97
	25	99214	1.5
	45	99215	2.11

^a Length of visit is used based on counseling, discussion, and/or coordination of care being >50% of the visit. Visits may also be billed based on complexity. Table modified from Smith et al. [6], with permission from Elsevier.

Health[®], Doximity[®], Amwell[®], and MyChart[®] (The list of applications, both HIPAA-compliant and non-HIPAA-compliant, is not intended to be inclusive, but to provide examples of applications in current use. Use of various platforms and disclaimer information is partly dictated by Medicare and by individual institutional guidelines.). Table 2 highlights practical considerations for telemedicine visits.

Pediatric Diabetes Mellitus

The COVID-19 pandemic has presented unique challenges in the care of pediatric patients with diabetes in the inpatient setting, outpatient clinics, and in the application of current screening recommendations for ongoing care.

New-Onset Diabetes Mellitus and Inpatient Diabetes Management

For patients with new-onset diabetes mellitus, especially those presenting in diabetic ketoacidosis (DKA) or

Table 2. Practical necessities for successful telemedicine encounters

Stable and affordable internet connection
Appropriate room lighting
Camera positioned on patient
Both patient and caregiver present for appointment ^a
Established private space for adolescents to answer confidential questions
Follow-up communication of after visit summary
Patient portal
Secure e-mail
Access to testing facilities

^a For patients 18 years and older, only patient needs to be present.

in institutions where all new-onset diabetes education is done in an inpatient setting, teams faced several barriers with respect to safety, access, and patient-centeredness [8,

9]. Often the inpatient teams comprised multiple members, including but not limited to trainees, nurses, diabetes educators, dietitians, and social workers, thus increasing exposure to and from multiple personnel. One of the initial modifications for family-centered team rounds has been to limit the number of team members entering the patient's room. Aside from the initial history, physical examination, and initial discussion with the endocrinologists, the roles of the diabetes care team, which includes diabetes educators, dietitians, and social workers, typically involve prolonged face-to-face education and discussion time. These processes are more complex to modify and often rely on individual institutional guidelines. The use of video platforms to complete some of the tasks has been implemented at many institutions, although some do not allow telehealth for inpatient care, and the efficacy of telemedicine for new-onset diabetes education is unknown at this time.

Restrictions on the number of family members (often only one caregiver) allowed with each child either admitted to the hospital or visiting the clinic further complicate care and discharge planning. Diabetes education most often is a "family affair"; multiple family members and caregivers typically require diabetes education in order to care for the child. Consequently, a limitation on the number of visitors requires additional time for diabetes team members to set up virtual or outpatient clinic trainings. Hospital- and clinic-issued tablets and virtual meetings have been used by physicians and diabetes team members to connect to other family members while providing inpatient face-to-face diabetes education [9, 10]. Finally, the use of continuous glucose monitors (CGM) in the inpatient setting has been recognized as an alternative to reduce the time spent with patients during the COVID-19 pandemic [11, 12]. However, the safe implementation of CGM systems in the inpatient setting might be challenging and requires the creation of CGM protocols by hospitals and availability of trained personnel [12].

Remote Outpatient Monitoring and Televisits

Remote monitoring technologies such as wireless standalone glucose meters, CGM, and insulin pumps integrated with CGM can transmit data via a cloud-based platform to a website, a patient's smart phone, or to a provider's clinic [13, 14]. During the pandemic, these technologies have played a central role in ensuring access to remote healthcare for children with diabetes [8, 14, 15]. Simultaneously, the technology has brought forth challenges with respect to the remote training of patients and caregivers and led to new processes for communication

with patients, which require consideration for data privacy and confidentiality. In addition, clinic workflow has had to change to account for the transition from in-person glucose meter, CGM, and insulin pump downloads to telehealth uploads [8, 14].

In an ideal setting, centers with a dedicated diabetes clinic can have staff (e.g., medical assistants, nurses, and diabetes educators) assume the role of connecting and transmitting patient data to the provider prior to and after an appointment. As an example of a process followed by some centers, patients were contacted by the clinic team member to check if they had a device compatible with software, such as Dexcom Clarity[®], Glooko/Diasend[®], Medtronic CareLink[®], t:connect[®], and Tidepool[®]. Clinic staff provided technological support to patients who had a device that was not yet synchronized with the clinic. Approximately 2 business days before the visit, the patient is instructed to "upload" or "synchronize" their device. The data are then downloaded by the diabetes support staff, and the report was incorporated into the patient's chart. Patients who use an independent application or a non-cloud compatible device are instructed on how to download a report and send to clinic by various methods, including an electronic secure portal for enrolled patients and fax/e-mail for others. For patients with limited English proficiency and/or no access to the above mentioned resources, the diabetes educators obtain data via phone for a 3–5-day period and provide that via a "logbook" to the provider. In centers utilizing a shared model of staffing or providers in solo practice, there is a significant variation in delegation of this support role and often the burden for obtaining records falls on the provider. Availability of training in these technologies for ancillary staff and patients is vital to sustaining remote monitoring programs for diabetes during and after the pandemic [13, 16, 17]. Integration of remote monitoring technology into modern electronic health records may help mitigate privacy and confidentiality concerns over transmission of data via non-HIPAA approved modalities, such as e-mail.

Telemedicine visits for pediatric and adolescent patients with diabetes pose several specific challenges, but also can provide an opportunity for providers to better understand social concerns in patients' home environments. Anecdotally, adolescent patients may be more open to engaging with video technology, although ensuring their privacy during interviewing may be more difficult. Sending questionnaires, such as a depression screen, either through a secure patient portal or e-mail prior to the visit may help facilitate visits, but safety procedures

need to be put in place to ensure timely follow-up of concerning responses [18]. Home medications and supplies can be checked via video. Teaching hands-on skills, such as injections and glucose monitoring, may be more difficult without a provider's hand to guide the patient and caregiver. Physical examinations specifically to assess for neuropathy and lipohypertrophy at insulin injection sites, as well as pubertal examinations and blood pressure monitoring (see discussions below), are also likely to be limited by telehealth capabilities and should be prioritized when patients are evaluated during in-person visits.

Outpatient Screening for Comorbidities of Diabetes

Diabetic Retinopathy Screening

For those with type 1 diabetes mellitus, the American Diabetes Association (ADA) recommends that after the initial screening (recommended at age 10 years or after puberty, whichever occurs earlier, in patients younger than 18 years with diabetes for 3–5 years), repeat examinations for diabetic retinopathy are recommended annually, but at the discretion of an eye care professional, it may be reasonable to check every 2 years [19]. The International Society for Pediatric and Adolescent Diabetes (ISPAD) recommends screening for retinopathy starting from 11 years with a diabetes duration of 2–5 years. The ISPAD guidelines also support retinal exams every other year in those with diabetes for <10 years and without risk factors (risk factors were defined as poor diabetes control, high blood pressure, dyslipidemia, and high body mass index) [20]. Screening is recommended at diagnosis and annually for those with type 2 diabetes [19, 20]. Digital retinal exams by telemedicine have been used to evaluate adults for diabetic retinopathy and could be a cost-effective alternative in youth with diabetes, but still require access to the technology to image the retina [21]. Some evidence suggests frequent eye examinations might not be universally necessary in youth <18 years of age; thus, in the setting of a pandemic, it may be reasonable to consider deferring the routine screening examination until local infection rates are sufficiently low [22].

Blood Pressure Screening

The ADA and the American Academy of Pediatrics recommend screening youth with diabetes for hypertension at every visit [19, 23, 24]. ISPAD guidelines recommend blood pressure monitoring “at least annually” [20]. Telemedicine has been used for remote monitoring of home blood pressure with the use of certain devices, but their utility to screen asymptomatic youth with diabetes is unclear [25]. Ambulatory 24-h remote blood pressure

monitoring could be used to screen for hypertension in youth with diabetes mellitus at high risk for cardiovascular disease. Other options include in-person drop-in visits to obtain blood pressure along with anthropometric data that can be evaluated during the virtual visit, but this process still requires staff and time to clean equipment for infection control.

Blood and Urine Screening

For patients using CGM, the Glucose Management Indicator is an acceptable alternative to hemoglobin A1c (HbA1c) that can provide information for personalized diabetes management [26]. In a pandemic setting, HbA1c would be more helpful for children who are not adherent with blood glucose monitoring and are not using CGM. Screening tests for celiac disease, thyroid dysfunction, and hyperlipidemia could also be deferred in children who had a normal examination in the last 2 years and continue to be asymptomatic [19]. ADA guidelines recommend annual assessment of urine albumin/creatinine ratios in youth who have had type 1 diabetes for at least 5 years and are either pubertal or >10 years of age, whichever is earlier [19]. ISPAD guidelines suggest screening for albuminuria starting at age 11 years in those with a diabetes duration of 2–5 years [20]. A urine albumin/creatinine ratio test is recommended at diagnosis and annually for those with type 2 diabetes mellitus [19, 20, 27].

Pediatric Endocrine Care

Comprehensive assessment of pediatric endocrine conditions requires evaluation of anthropometrics and laboratory/radiologic assessments in addition to detailed histories and physical examinations. Prior studies show successful use of telemedicine for pediatric obesity, but it can be challenging to translate this process into telemedicine for other endocrine conditions [28–30]. Requesting growth charts from the referring provider along with ordering targeted laboratory and radiologic assessment prior to the visit assists in efficient use of telemedicine and in triaging those who require in-person evaluation. This requires education of scheduling personnel and clinical staff on recommended protocols, identification of local laboratory facilities, urgency of evaluation, and required information to appropriately evaluate each condition. For example, when evaluating a child with concerns for hyperthyroidism, obtaining prior thyroid function tests, vital signs from a recent visit to the referring provider, and directing patients to have any additional laboratory

Table 3. Telemedicine considerations for common pediatric endocrine conditions [35–45]

Endocrine condition	Assessment prior to visit	Management challenges	Management opportunities
Thyroid disease	Virtual assessment feasible? New: yes Return: yes <i>Information to obtain:</i> growth charts, resting heart rate, BP, medication refill history, laboratory evaluation, and thyroid ultrasound	Thyroid (and eye) exam limited to visual inspection Complete assessment is difficult without laboratory evaluation Patients with thyroid cancer require multidisciplinary consultations, counseling, or psychotherapy [35]	Teach thyroid self-exam to patients Explore development of TSH assays using filter paper-dried blood spot for in-home blood sampling by patient/parent [36] Consider developing a multidisciplinary virtual visit where specialists and ancillary staff can collaborate
Amenorrhea/PCOS [37, 38]	Virtual assessment feasible? New: yes with in-person examination if indicated Return: yes <i>Information to obtain:</i> BMI and BP	Reduced access to treatment for disordered eating PCOS features can overlap with normal features of adolescence	Virtual RD visit for low BMI or obesity Use of the Ferriman-Gallwey score to assess hirsutism, an alternative indicator of hyperandrogenism in adolescents
Delayed puberty	Virtual assessment feasible? New: no Return: yes with in-person exam if indicated <i>Information to obtain:</i> growth charts and laboratory evaluation	Difficult to distinguish constitutional delay from other etiologies IM testosterone administration requires visit to healthcare provider if family unable to administer at home	Utilize bone age, ultrasensitive LH/FSH, and karyotype and consider inhibin B and anti-Müllerian hormone to help differentiate etiology [39, 40] Utilize non-IM testosterone or teach caregiver administration for IM or subcutaneous injection therapy [41]
Precocious puberty	Virtual assessment feasible? New: no Return: yes with in-person examination if indicated <i>Information to obtain:</i> growth charts, medication refill or implant insertion history, and laboratory evaluation [42]	Self-exams not reliable [33, 34] No well-studied alternative for laboratory testing Potentially more challenging to remove histrelin implant if left in situ for >1 year [42]	Teach caregiver administration of Depot-leuprolide acetate or obtain visiting nurse support Histrelin implant has shown efficacy for up to 2 years after insertion [42] Use longer-acting 6-month injectable GnRH agonists: leuprolide acetate (newer preparation) or triptorelin
Short stature [43]	Virtual assessment feasible? New: yes if >2 years of age and less than adolescent age, with in-person exam if indicated Return: yes with in-person exam if indicated <i>Information to obtain:</i> growth charts, medication refill history, and laboratory evaluation	Obtaining accurate height and weight may be difficult, especially in an uncooperative child Obtaining bone age image from an external facility	Utilize in-person focused examination and measurements for children <2 years of age Consider scheduling in-office measurement of height and weight before or after completion of virtual visit Utilize facilities able to upload imaging to shared radiology systems or request parents provide CD
Obesity/abnormal weight gain [28, 29]	Virtual assessment feasible? New: yes Return: yes <i>Information to obtain:</i> growth charts, BMI, BP, and laboratory evaluation	Limited access to BP and weight measurement	Prescribe home blood pressure monitor and scale Virtual RD assessment
Gender dysphoria [44]	Virtual assessment feasible? New: yes with in-person examination if indicated Return: yes with in-person examination if indicated <i>Information to obtain:</i> documentation from mental health provider evaluation if available	Caregiver uncomfortable with in-person visits Physical examination needed in some cases to determine onset of puberty Behavioral health may be unavailable virtually Confidentiality/privacy at home Potentially more challenging to remove histrelin implant if left in situ for >1 year [42]	Consider morning LH/T/E2 measurement as alternative for determining onset of puberty Medications can be initiated virtually Collaborate with procedure units and pediatric surgery to coordinate GnRH agonist therapy. Histrelin implant has shown efficacy for up to 2 years after injection [42] Use of 6-month injectable GnRH agonists
Congenital adrenal hyperplasia [45]	Virtual assessment feasible? New: no Return: yes with in-person exam if indicated <i>Information to obtain:</i> growth charts, medication refill history, laboratory evaluation (prior to morning dose), BP, heart rate, and BMI	Limited access to BP, heart rate, weight, and height measurements	Teach parents how to measure pulse and prescribe home blood pressure monitor Dose adjustments can be done virtually if height and weight are able to be obtained

BMI, body mass index; BP, blood pressure; E2, estradiol; FSH, follicle-stimulating hormone; GnRH, gonadotropin-releasing hormone; IM, intramuscular; LH, luteinizing hormone; PCOS, polycystic ovarian syndrome; RD, registered dietitian; T, testosterone; TSH, thyroid-stimulating hormone.

testing prior to the visit can drastically improve the efficiency of a telemedicine visit.

Clinicians can also utilize techniques to improve physical assessment during visits. Parent-measured height and weight is an alternative when in-office measurements are not feasible; parents can be provided with instructions on how to obtain measurements to streamline this process [31, 32]. Pubertal and genital examinations via video are not recommended. Pubertal examinations present a significant challenge; a recent meta-analysis found self-assessment of puberty is most accurate when identifying Tanner stage 1 for pubic hair for both sexes, Tanner stage 1 for breast development, and Tanner stage 5 for male

pubic hair. Accuracy was diminished for the stages in-between [33, 34]. Families may have access to a blood pressure monitor and could measure heart rate manually or via home device if prompted. In addition, disease-specific symptom checklists can be created in the EMR and completed by families prior to their visit to streamline the process.

During telemedicine visits, history-taking remains essentially unchanged compared to in-person encounters. However, sensitive information (i.e., drug use, libido, and sexual history) may be difficult to acquire confidentially. Establishing a routine for adolescents to have a few minutes to answer confidential questions alone in the room

may help. At the provider's discretion, an in-person visit should be requested for a focused examination when evaluating a thyroid nodule, assessing pubertal stage, clitoral size, genitourinary anomalies, and other findings that cannot be effectively assessed virtually. Table 3 details opportunities and challenges in the management and evaluation of common endocrine conditions when access to in-person visits is limited.

Conclusion

Telemedicine has been an essential tool during the COVID-19 pandemic, as it has allowed providers to deliver care to their patients, albeit with some compromises and adjustments. The broad implementation of telemedicine has the potential for expanding access to care and improvement in the management of chronic conditions. Lessons learned during the pandemic should be used as the first step to address the long-term use of telemedicine practices in specific, well-defined scenarios. Research assessing the impact of telemedicine on the care of pediatric endocrinology conditions will be necessary to justify its continued use beyond the COVID-19 pandemic [15]. Institutional policies and procedures will need to be updated to address patient privacy and provider workflow as telemedicine is likely to remain part of pediatric endocrine care. Finally, continued adequate payer reimbursement for care coordination and remote monitoring will be necessary in order to assure long-term viability of telemedicine practices in pediatric endocrinology.

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