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Meeting families where they are: institution, evaluation, and sustainability of telemedicine prenatal neonatology consultation in the COVID-19 pandemic health emergency

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Introduction

The COVID-19 pandemic health emergency (COVID-19 PHE) caused by SARS-CoV-2 forced a rapid restructuring in the provision of basic health care; healthcare systems were tasked with assuring the safety of both patients and medical providers, while still maintaining the basic standard of healthcare. Abrupt changes within healthcare systems included the institution of physical distancing policies and tightening of in-hospital visitor restrictions to decrease viral spread. In addition, non-urgent services, including many outpatient visits, were canceled. Though these measures were a well-intentioned effort to decrease viral spread, this sudden change in access to medical services deemed non-emergent derailed the standard of care medical systems are accustomed to providing, particularly in the realm of preventative and routine medicine. Undoubtedly, patients were left feeling anxious about the impact of this sudden change on their overall health.

The obstetrical patient population is particularly vulnerable to issues stemming from delayed or altered health care; these patients require close longitudinal monitoring and multiple health care appointments in succession. Though most patients in this population are young, healthy women with non-complicated pregnancies, there are occasions where a fetal anomaly or complex maternal condition is diagnosed, requiring multi-subspecialty consultation for care. At our large referral center which has nearly 10,000 deliveries per year, we have a well-established Center for Advanced Fetal Diagnostics (CAFD) with a mission to provide care to such patients. Our CAFD team conducts a thorough evaluation of patients with suspected fetal anomalies and constructs a perinatal treatment plan customized to the needs of the

individual patient. The team is a partnership between divisions at our delivery and regional children's hospitals consisting of representatives from Maternal-Fetal medicine/Fetal intervention, Fetal imaging, Genetics, Neonatology, and multiple Pediatric subspecialties. On average, the Neonatology team performs more than 250 prenatal consultations per year for patients through this clinic with conditions ranging from mild to life-limiting (Table 1). These appointments are essential so the family can meet with members of the neonatology team, participate in a shared decision-making process when there is uncertainty, and work with the neonatologist to create a care plan that will be communicated to the pediatric subspecialists prior to the birth of their baby. In addition, these consultations often alleviate some parental anxiety about the anomaly, and in some instances, are crucial to identify parental goals of care for their infant.

With significant restrictions being placed on in-person consultation, the COVID-19 PHE threatened to derail this important medical service at our institution. Moreover, unlike many other outpatient consultations, these cannot be delayed until COVID-19 restrictions are lifted, as these consultations are time sensitive as pregnancies progress. However, the restrictions also provided an opportunity to shift the mechanism of healthcare provision, and one of the major ways that this shift occurred has been through the implantation of telehealth programs.¹ The idea of using telehealth as an alternate means of supplying healthcare when routine care provision is unachievable is not a novel concept,^{2,3} and the COVID-19 PHE sparked more widespread development of telehealth services. To enable ongoing care for patients through implementation of telehealth programs, the United States Department of Health and Human Services (HHS) and individual states lifted many requirements for establishing

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Table 1 – Types of fetal diagnoses for which prenatal consultation was provided at our institution since the addition of telemedicine services (total n = 186).

Diagnosis	Number(%)
Pulmonary	12(6.4)
Congenital pulmonary airway malformation	5
Congenital diaphragmatic hernia	5
Other	2
Renal	50(26.8)
Ureteral tract dilation	36
Multicystic dysplastic kidney	5
Lower urinary tract obstruction	3
Unilateral renal agenesis	4
Bilateral renal agenesis	1
Other	1
Genetic	24(12.9)
Trisomy 21	5
Trisomy 13 or 18	3
Skeletal dysplasia	3
Other	13
Gastrointestinal	15(8.0)
Gastroschisis	4
Other	11
Neurologic	20(10.7)
Neural tube defect	2
Ventriculomegaly	9
Other	9
Cardiac	36(19.4)
Single ventricle	4
Multiple anomalies or other	19
VSD/AVSD	4
Transposition of the great arteries	2
Tetralogy of Fallot	2
Coarctation	4
Shones complex	1
Multiple congenital anomalies	7(3.7)
Maternal issues	7(3.7)
Multiples/Twin-to-twin transfusion syndrome	8(4.3)
Fetal anemia or isoimmune hemolytic anemia	5(2.6)
Craniofacial anomalies	2(1.1)

telehealth services including the temporary suspension of penalties for using non-HIPPA compliant technology. Pre-pandemic surveys have demonstrated that patients, particularly those who are younger, are interested in using telehealth, primarily due to convenience.⁴ We acknowledge that prenatal neonatology consultation is a unique type of consultation, as neither assessment of patient vital signs nor physical examination are required to perform this service. Nonetheless, as fetal status changes throughout pregnancy, multiple consultation appointments are often required to address evolving issues and solidify the postnatal plan of care. For these reasons, this is a provider-patient interaction that easily lends itself to telemedicine consultation.

Herein we first expand upon the details of the process by which our Neonatology group rapidly and effectively implemented a telemedicine program to continue prenatal consultation services to our patients within the COVID-19 PHE restrictions. We then describe some observed outcomes of implementing telehealth for these consults. Lastly, we explore the patient population for which this type of consultation could be extremely beneficial beyond the confines of

the COVID-19 PHE, with an emphasis on improving access to care and health equity.

Steps to rapid implementation of telemedicine

Establishing realistic goals, anticipating potential barriers, and setting a timeline

As with any new initiative, outlining specific and attainable goals from the outset is mandatory. Our overarching goal was clear: to rapidly establish a telemedicine service to provide Neonatology consultation to women whose pregnancy was affected by fetal anomalies, such that our established service to these patients was not disrupted during the pandemic. However, we outlined additional goals as well: to create a model that allowed us to continue to uphold the highest standard of care for our patients, achieved our expectation of compassionate consultation for our patients, and was sustainable beyond the COVID-19 PHE, particularly for patients in need of multiple consultations throughout pregnancy and/or patients who live an appreciable distance from our referral center making it challenging to physically come to the hospital.

Anticipating potential barriers from the outset was essential to achieve the goal of rapid telemedicine implementation. Some potential obstacles we anticipated with the process included a back-log in our Information Technology (IT) department to grant providers access to the new system due to high demand, difficulties supporting multiple computer/device types on which providers could complete the consult, and the ability to educate all providers on the new system quickly. Lastly, setting a realistic timeline accounting for anticipated and potentially unanticipated barriers was important. To rapidly implement telehealth neonatology prenatal consults, we decided to tackle many of the issues below in parallel, rather than in series.

Identifying an implementation team

Clearly identifying an implementation team was vital to the success of rapidly establishing telemedicine services. The team consisted of: (1) an IT representative with expertise in both telemedicine and the platform to be used, (2) a division leader, preferably a physician with expertise in IT and/or telemedicine, (3) an additional physician representative of the division who would be utilizing the technology, and (4) an administrative assistant. The IT representative walked the team through the appropriate steps to establish access and then was available to troubleshoot all technical issues that arose. The division leader worked directly with the IT representative to assure that the telehealth and Electronic Medical Record (EMR) platforms supported the divisional goals. The physician representative acted as the first provider to test the system to assure quality, troubleshoot workflow, work with the division leader and IT representative to improve processes, and ensure the platform was able to fully accomplish the goals of the prenatal neonatology consultations. Lastly, and importantly, the administrative assistant managed the logistics of ensuring EMR and platform access for providers, managed patient scheduling, contacted patients to

assure they were aware that the visit would be conducted via Telemedicine, and provided guidance to the patients about how access the platform and use the patient interface. The administrative assistant also served as the point of contact for patients if they had questions.

Setting up the technology

Although the Office for Civil Rights relaxed HIPPA regulations during the COVID-19 PHE and allowed health care providers to provide needed medical care for patients via telehealth regardless of platform security,⁷ establishing the prenatal neonatology consult telemedicine service with a HIPPA-compliant platform was determined to be the most judicious use of time and resources at our institution. However, an abrupt transition to telehealth necessitated initial use of non-HIPPA compliant platforms to provide uninterrupted care for our patients while establishing and escalating our EMR based HIPPA-compliant secure e-visits through the patient portal. Provider access to the telehealth platform involved adequate training to use the software and often, downloading an application onto the user's mobile device. Institutions will typically require a minimal set of security provisions on the device as well as adequate memory for the application.

The most important initial and rate-limiting step was establishing access and functionality to the chosen platform for all necessary providers. This process varies between institutions but has the potential to be complex and time consuming. Key details included ensuring the appropriate type of privileges, obtaining appropriate usernames and passwords, aligning patient and provider schedules, and integrating advance functions that can improve the encounter experience. Because EMR systems are often tailored to the individual health system and functions within the systems allocated differently amongst different types of providers, this process may be unique for each health system. At this juncture, it is also important to inquire specifically about the limitations of various devices on which the telemedicine platform can be used. Particularly during COVID-19 PHE conditions, providers may be conducting telemedicine visits from a personal device at home. Often, additional security clearances and software downloads are needed to grant access to the platform of choice from a personal device and this must be addressed upfront. In addition, it is important to clarify which types of devices support the platform and what software or clearance is needed for each one. If personal devices are not supported by the platform or institution, healthcare system-provided computers equipped with cameras may be necessary to request as well.

Though Health Insurance Portability and Accountability Act (HIPPA) laws have been relaxed during the pandemic,⁵ the institution should clarify which other platforms can be used if the primary platform malfunctions, as protecting patient confidentiality remains a top priority. In the event technology fails, a feasible backup option is prudent such as completing the encounter using telephone or other technologies.

Educating providers and patients

Education of the provider and the patient on using the technology and telemedicine etiquette is important to avoid

errors, and improve the individual experience. For the providers, we found it helpful to create step-by-step tutorials that was available online to faculty, from which they can access and complete anytime, from anywhere. This was particularly effective because larger classroom-style learning was not feasible due to physical distancing restrictions, nor would it have supported our timeline. The individual physicians would then bring questions or issues encountered back to the division leader who could help to troubleshoot. In addition, creation of a "test patient" allowing the physician to perform a test-run of the software is helpful and could be established with aid from the IT representative.

Patient education begins with the first notification phone call from the departmental administrative assistant or clinic coordinator, which occurred at least one week in advance of the appointment, if possible. Creating a checklist for the administrative assistant or coordinator to utilize when calling patients was helpful. It included: (1) notification that the consultation will be provided virtually rather than in-person, (2) assessment of the patient's ability to reliably access a strong wireless connection (either through cell phone or WIFI), (3) clear instructions for how the patient should establish the connection from their end (downloading an application, access via link sent to them through e-mail, etc.), (4) recording a reliable phone number and/or e-mail address for the patient, and (5) supplying a phone number that can be called if the patient experiences connectivity issues at the time of the consult. Patients were asked to complete the consult from a private location with a reliable connection (i.e. not from a moving vehicle, etc.). Ideally, the administrative assistant again contacted the patient 1-2 days in advance of the consult to address any additional questions. Once the video visit appointment was scheduled and the patient was contacted by the administrative assistant, an instruction document was shared with the patient to provide a review of the required steps. Again, if a particular patient did not have smartphone or computer access, and/or was unable to establish a reliable connection, an audio-only consult was provided.

Ensuring secure and effective consultation

In our experience, ensuring consult effectiveness involved addressing issues that fell into two categories: providing a secure, reliable tele-connection and creating a therapeutic relationship in the digital environment. Barriers to effective consultation tended to involve technological challenges. Poor connection leading to loss of communication was frustrating for both patients and providers. Connectivity was variable and no clear pattern was discernible. Though there were some encounters that had to transition from a video synchronous visit to an audio-only synchronous visit due to technical issues on the patient side of the encounter, no telehealth visits were unable to be completed due to technical issues. It was crucial for the provider to continually assess the patient's ability to receive the information throughout the visit and especially when there were connectivity issues.

The effectiveness of the consultation was also affected by the patient and provider surroundings, especially since consultations were occurring from home. The physicians were

trained to follow the proper telemedicine etiquette to the best of their ability in pandemic conditions where multiple members of their household may be at home with them. For patients, the environment for the consultation was more difficult to control. During some encounters, patients struggled to find a quiet and private space, and interruptions or distractions could disrupt the appointment. In general, consults functioned best when a non-distracting, private location for the consult was sought by both providers and patients.

Documentation

During the COVID-19 PHE, Centers for Medicare and Medicaid (CMS) and the state issued temporary measures expanding coverage for various health care services by utilization of telehealth services.⁶ Relaxing state restrictions allowed more neonatology prenatal counseling services to occur via telemedicine. Guidance for documentation and billing was provided by CMS and then specified within our system. The documentation included a statement confirming patient consent to teleconsultation, the location from which the patient completed the visit, the modality of synchronous virtual visit, and the need for telehealth due to the pandemic conditions.

Program assessment

Telehealth programs can be evaluated on clinical outcomes, quality and cost of healthcare delivery, as well individual experiences with the telehealth encounter.⁸ Previous analyses of large patient cohorts using telemedicine services in the general population showed that patients are predominately satisfied with telemedicine services.⁷ In our program, patient satisfaction was initially evaluated by the provider before the conclusion of the visit; these questions included "do you have any remaining questions I have not yet answered?" and "do you feel as though this consultation was helpful to you today?"

Preliminary qualitative feedback from patients during the initial months of telehealth services for neonatal prenatal consultation was favorable. Multiple patients stated that in addition to limiting their risk of potential exposure to COVID-19, telehealth consultations were more convenient than in-person appointments. Some patients also mentioned that they felt more comfortable talking about difficult topics from the comfort of their own homes, and it was helpful for them to be able to have other family members present. Some patients were able to have their partners or support people attend from separate locations whereas they would not have been able to attend an in-person appointment. Patients also stated that they did not have to miss as much work and appreciated not having to arrange childcare for their other children. Several patients commented that the telehealth visit improved their access to an appointment because it allowed them to get prenatal counseling sooner. Other patients who were having follow-up appointments explained that it was nice to be able to have their in-person appointments, have a break to allow for "digestion of information" and time to formulate questions, and avoid a "marathon" day at the clinic. Patients reported

that the primary detractors from the telehealth visits were technical issues.

Provision of consultation via telemedicine has allowed for shorter wait times for appointments, and increased access to specialty consults for perinatal palliative care and multispecialty group consultation. An emerging benefit of the use of telehealth for neonatology prenatal consultation is a greatly improved no-show rate since institution of telemedicine (Fig. 1). This is an encouraging observation that potentially supports improved continuity of care in this vulnerable and high-risk patient population.

At our institution, a telehealth specific Press Ganey survey was sent to patients to assess the delivery of consults and care through telemedicine visits. These results are helpful to ascertain, in general terms, the service quality, technical problems, and patient experience. Ideally, prior to the outset of performing teleconsultations, a brief but comprehensive survey assessing the specific experience of the telehealth neonatology prenatal consult would have been created that could be sent to the patient shortly after a consultation finished; however, due the rapid escalation of our program, focus on process implementation, and need for IRB approval, there was a delay in the implementation of a patient survey focusing on the specific experience of telehealth for neonatology prenatal consults. Collecting data on distance that would have been travelled to in-person consultation, assessing barriers to attending in-person consultation, barriers to telehealth consultation, and whether one format may be preferred over the other in the future will be part of the ongoing assessment of this program. These assessments will help address ongoing process improvement and the sustainability of the program, even when not mandated by the pandemic.

Assessment of provider opinion on feasibility, usability, satisfaction and preferences for telehealth vs. in-person encounters for specific features of patient care is important. This should address if the visit was effective for delivering prenatal consultation in terms of parental engagement, clarifying the care plan and expectations, and recommendations should be requested on how to improve the program moving forward.

Providing prenatal consultation via telemedicine beyond the COVID-19 PHE

While the COVID-19 PHE allowed escalation of telehealth services, there is potential benefit in maintaining the ability to serve patients with telehealth. Due to the catchment area of our large health system with centralization of subspecialty services, patients face traveling long distances for in-person appointments. Some patients travel to the city the night before and stay in a hotel to be present for their early and ongoing appointments throughout the day. Others travel from over 130 miles away (approximately 4 hours driving time, more if by bus) from centers within the healthcare system that provide their primary obstetrical care to meet with the subspecialty teams in the CAFD clinic. The potential costs associated with the loss of a day's wages, money to travel, food and parking while attending appointments, and childcare expenses are formidable. These factors place a high burden on families living in rural areas, patients who live far

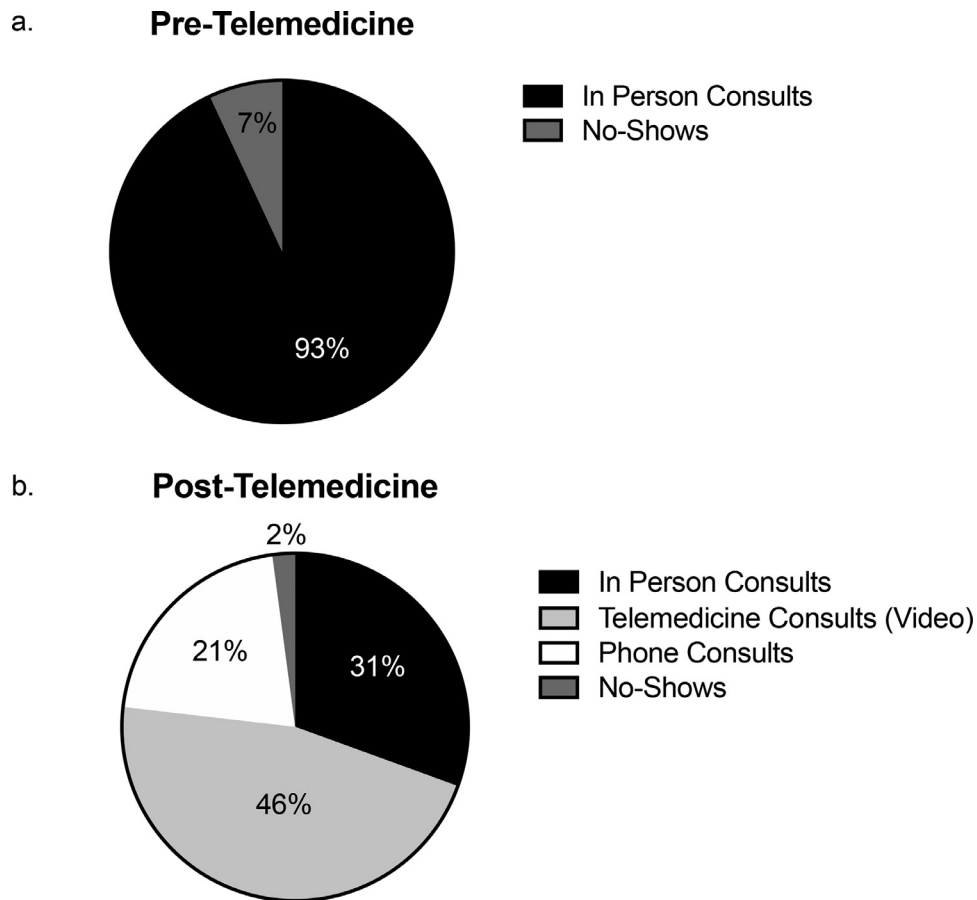


Fig. 1 – The way in which prenatal consultation was performed at our institution (a) pre-telemedicine institution, over the course of 12 months from January through December 2019, and (b) post-telemedicine institution, from March through October 2020.

from the subspecialty center, and patients with social determinants of health that already place them at increased risk for inequitable care. The cost and time associated with travel can place a higher burden on patients and contribute to health inequity. Telehealth appointments could prove a powerful tool in addressing health inequity and to increase access and followup for high-risk patients already adversely affected by social determinants of health. Increased support for vulnerable mother-infant dyads due to improved access to subspecialty care is a potential benefit of sustained use of and support for neonatology prenatal consultation telehealth services.

Conclusion

The COVID-19 pandemic forced the medical community to consider alternate ways in which we could continue to provide outpatient medical care to our patients, while keeping both the providers and patients safe. Many institutions turned their attention to telemedicine to help fulfill this goal. However, telemedicine is a complex, multifaceted system that may normally take years to set-up and perfect. Herein, we described the strategic, yet accelerated implementation that we used to create a sustainable program. It is our hope that with continuous

process improvement and research about outcomes associated with the telehealth consults, our neonatology prenatal consult telemedicine program will serve as a foundation for continued services for this population, especially when physical examination is rarely necessary. Moreover, future use of this cost-effective and efficient service shows promise as a means to address disparities and improve access. We will continue to develop metrics and study the outcomes of the program with a goal to improve patient and provider satisfaction, enhance access to consultation and follow up appointments, and decrease time, cost, and travel burden for patients. In this way, the program described above can serve patients and health systems during their time of need now, and for many years into the future.

Declaration of Competing Interest

The authors have indicated they have no potential conflicts of interest to disclose.

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REFERENCES

1. HHS, Health Resources and Services Administration (HRSA). Telehealth Programs. [Available from: <https://www.hrsa.gov/rural-health/telehealth/index.html>].
2. Lurie N, Carr BG. The role of telehealth in the medical response to disasters. *JAMA Intern Med.* 2018;178(6):745–746.
3. Augusterfer EF, Mollica RF, Lavelle J. Leveraging technology in post-disaster settings: the role of digital health/telemetal health. *Curr Psychiatry Rep.* 2018;20(10):88.
4. Telehealth index: 2019 consumer survey. [Available from: <https://static.americanwell.com/app/uploads/2019/07/American-Well-Telehealth-Index-2019-Consumer-Survey-eBook2.pdf>].
5. (HHS) OfCROatUSDoHaHS. OCR Announces Notification of Enforcement Discretion for Telehealth Remote Communications During the COVID-19 Nationwide Public Health Emergency 2020 [Available from: <https://www.hhs.gov/about/news/2020/03/17/ocr-announces-notification-of-enforcement-discretion-for-tele-health-remote-communications-during-the-covid-19.html>].
6. Physicians and Other Clinicians: CMS Flexibilities to fight COVID-19. [Available from: <https://www.cms.gov/files/document/covid-19-physicians-and-practitioners.pdf>].
7. Martinez KA, Rood M, Jhangiani N, Kou L, Rose S, Boissy A, et al. Patterns of use and correlates of patient satisfaction with a large nationwide direct to consumer telemedicine service. *J Gen Intern Med.* 2018;33(10):1768–1773.
8. Chuo J, Macy ML, Lorch SA. Strategies for evaluating telehealth. *Pediatrics.* 2020;146(5):e20201781. <https://doi.org/10.1542/peds.2020-1781>: November.