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Application of telemedicine video visits in a maternal-fetal medicine practice at the epicenter of the COVID-19 pandemic



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BACKGROUND: Telemedicine in obstetrics has mostly been described in the rural areas that have limited access to subspecialties. During the COVID-19 pandemic, health systems rapidly expanded telemedicine services for urgent and nonurgent healthcare delivery, even in urban settings. The New York University health system implemented a prompt systemwide expansion of video-enabled telemedicine visits, increasing telemedicine to >8000 visits daily within 6 weeks of the beginning of the pandemic. There are limited studies that explore patient and provider satisfaction of telemedicine visits in obstetrical patients during the COVID-19 epidemic, particularly in the United States.

OBJECTIVE: This study aimed to evaluate both the patients' and the providers' satisfaction with the administration of maternal-fetal medicine services through telemedicine and to identify the factors that drive the patients' desire for future obstetrical telemedicine services.

STUDY DESIGN: A cross-sectional survey was administered to patients who completed a telemedicine video visit with the Division of Maternal-Fetal Medicine at the New York University Langone Hospital—Long Island from March 19, 2020, to May 26, 2020. A 10-question survey assessing the patients' digital experience and desire for future use was either administered by telephone or self-administered by the patients via a link after obtaining verbal consent. The survey responses were scored from 1—strongly disagree to 5—strongly agree. We analyzed the demographics and survey responses of the patients who agreed to vs those who answered neutral or disagree to the question “I would like telehealth to be an option for future obstetric visits.” The providers also answered a similar 10-question survey. The median scores were compared using appropriate tests. A *P* value of <.05 was considered significant.

RESULTS: A total of 253 patients participated in 433 telemedicine visits, and 165 patients completed the survey, resulting in a 65% survey response rate. Overall, there were high rates of patient satisfaction in all areas assessed. Those who desired future telemedicine had significantly greater agreeability that they were able to see and hear their provider easily (5 [4.5, 5] vs 5 [4, 5]; *P*=.014) and that the lack of physical activity was not an issue (5 [4, 5] vs 5 [4, 5]; *P*=.032). They were also more likely to agree that the telemedicine visits were as good as in-person visits (4 [3, 5] vs 3 [2, 3]; *P*<.001) and that telehealth made it easier for them to see doctors or specialists (5 [4, 5] vs 3 [2, 3]; *P*<.001). The patients seeking consults for poor obstetrical history were more likely to desire future telemedicine compared with other visit types (19 (90%) vs 2 (10%); *P*=.05). Provider survey responses also demonstrated high levels of satisfaction, with 83% agreeing that they would like telemedicine to be an option for future obstetrical visits.

CONCLUSION: We demonstrated that maternal-fetal medicine obstetrical patients and providers were highly satisfied with the implementation of telemedicine during the initial wave of the COVID-19 pandemic and a majority of them desire telemedicine as an option for future visits. A patient's desire for future telemedicine visits was significantly affected by their digital experience, the perception of a lack of need for physical contact, perceived time saved on travel, and access to healthcare providers. Health systems need to continue to improve healthcare delivery and invest in innovative solutions to conduct physical examinations remotely.

Key words: COVID-19, maternal-fetal medicine, practice management, telehealth, telemedicine, video visit

Telemedicine (TM) encompasses the use of voice and video communication technology to provide direct patient health services when the medical provider and patient are separated by physical distance.¹ Telehealth (TH) is a similar concept, but it can provide any

EDITOR'S CHOICE

health-related service through communication technology to deliver services to a patient in a remote or mobile setting.^{1,2} These modalities have been implemented within obstetrics and gynecology to provide prenatal care and genetic counseling. They have also been used for colposcopy, management of medical abortion, fetal echocardiography, and maternal monitoring of chronic conditions.^{2,3,4} One of the first reports of remote fetal heart rate tracing was described by Vintzileos et al⁵ through telephone transmission from community

hospitals to a university hospital to get specialist consultation on further antepartum or intrapartum management. However, most of these programs have been implemented to serve rural areas, where patients have difficulty accessing these obstetrical services otherwise.^{2,6} Not only has telemedicine provided subspecialty care to remote areas, but it has also proven to be more cost-efficient to both the patients and the providers through conservation of travel time and money and saving of clinic staff time and infrastructure.^{1,6}

The rapidly advancing and diversified application of telemedicine in the urban

Cite this article as: Tozour JN, Bandremer S, Patberg E, et al. Application of telemedicine video visits in a maternal-fetal medicine practice at the epicenter of the COVID-19 pandemic. *Am J Obstet Gynecol MFM* 2021;3:100469.

2589-9333/\$36.00

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<http://dx.doi.org/10.1016/j.ajogmf.2021.100469>

AJOG MFM at a Glance

Why was the study conducted?

To identify the factors that affect the patients' and providers' desire for future maternal-fetal medicine telemedicine visits in a metropolitan setting at the epicenter of the COVID-19 pandemic.

Key findings

Maternal-fetal medicine patients and providers demonstrate high satisfaction with the use of telemedicine.

What does this add to what is known?

The patients' desires for future maternal-fetal medicine telemedicine visits is significantly affected by their digital experience, the perceived need for physical contact, and the time saved on travel.

arena has been accelerated because of COVID-19.⁷ In response to the COVID-19 pandemic, health systems have been forced to rapidly expand and scale telemedicine services for urgent and nonurgent healthcare delivery. Centers for Medicare & Medicaid Services also expanded access to telehealth services by granting regulatory flexibilities and waivers, no longer imposing geographic or location restrictions, and broadening reimbursements for virtual visits.⁸ The US Department of Health and Human Services Office for Civil Rights has also waived the enforcement of the Health Insurance Portability and Accountability Act against healthcare providers who serve patients using consumer communication technologies, paving the road for transformation.⁹ US insurers have also expanded coverage to include all telemedicine visit types, including those from home. In this medical and legal climate, the New York University (NYU) Health system implemented a prompt systemwide expansion of video-enabled telemedicine visits using already established infrastructure, in response to the COVID-19 pandemic, with up to 8000 unique patients participating in TM visits in a day within the first 6 weeks.¹⁰

The primary objective of this study was to assess the factors associated with the satisfaction of patients toward telemedicine through a patient satisfaction survey. The secondary objectives included an evaluation of patients' attitudes toward their digital experiences

and patients' and visit characteristics that influence their desire for future telemedicine visits in addition to an assessment of the providers' digital experience and their attitudes toward telemedicine visits, by administering a separate survey to the providers conducting the visits.

Materials and Methods

This was a cross-sectional survey of patients who completed telemedicine video visits through the maternal-fetal medicine (MFM) division at the NYU Langone Hospital—Long Island from March 19, 2020, to May 26, 2020. NYU Langone Health, a large academic healthcare system in the New York metropolitan area, expanded telemedicine video visits to all ambulatory settings on March 19, 2020, at the epicenter of the COVID-19 pandemic in the United States. This study was approved by the NYU Institutional Review Board. The waiver of written consent was obtained, and all the patients who completed telemedicine visits with MFM within this time frame were identified using the electronic medical records (Epic, Verona, WI).

The survey questions were modified from previously published surveys (Figure 1).^{11,12} The patients were contacted by healthcare personnel who conducted telephone-administered surveys or provided patients with a Research Electronic Data Capture (REDCap) web-based application link to the online survey after obtaining verbal consent by

telephone. The patient demographics were collected from the electronic health records (Epic), which included age, gestational age, gravity, parity, race, ZIP code, faculty vs private obstetrician-gynecologist (OBGYN), diagnoses for requiring MFM care, and the types of visits (new vs follow-up). If the patient had >1 diagnosis for MFM consultation or management, the diagnosis that was first or required the most visits for management was used as the primary diagnosis. The survey was designed to assess the patient's digital experience with the sign-up or check-in process and the technological tools and the overall satisfaction with the telemedicine visits (Figure 1). The survey response scores were converted to a numeric value for quantitation and comparison among survey questions as follows: strongly disagree—1, disagree—2, neutral—3, agree—4, and strongly agree—5. We performed an analysis of the demographics and survey responses of 2 groups on the basis of the response to the following question: "I would like telehealth visit to be an option for future obstetric visit," which distinguished those who agreed vs those who answered neutral or disagree with the statement. Median scores were then used for these comparisons. A total of 11 physicians and 1 nurse practitioner from the MFM Division at the NYU Langone Hospital—Long Island, who conducted both in-person and telemedicine encounters were also administered the provider survey through a REDCap link.

Statistical analysis

The differences in demographics according to the survey responses were measured using the Fisher exact test. The Mann-Whitney U test was used to determine the significance between the survey response and the visit types or diagnoses for MFM visits. The Kruskal-Wallis test was used to determine the significance of the survey response in addition to the distance to the closest MFM location, the month of the telemedicine visit (TMV), and the relationship between other survey responses. The comparison of the survey responses

FIGURE 1
Patient and provider survey questions and corresponding answer scores

<i>Patient Survey</i>	<i>Provider Survey</i>
<ul style="list-style-type: none"> • Telemedicine sign-up process was easy to follow. • Telemedicine check in process was easy to follow. • I had no difficulties with my cellular/wifi connection. • I was able to see and hear the provider easily. • I felt the technology was secure. • Lack of physical contact was not a problem. • I think the telehealth visits are as good as in-person visits. • Telehealth visits saved my time traveling to a hospital or specialist clinic. • Using telehealth made it easier for me to see doctors and specialists. • I would like telehealth to be an option for future obstetrical visits. 	<ul style="list-style-type: none"> • Telehealth visits improved patient access to healthcare needs for my patients. • Telehealth visits are an acceptable way to provide healthcare services. • I was able to see and hear my patient easily. • I felt the technology was secure. • Lack of physical contact was not a problem. • The telehealth system is a convenient way for my patient to access medical, obstetrical, and neonatal specialists. • I think the visits provided over the telehealth system are an adequate replacement when in-person visits are difficult or impossible. • Remote patient monitoring tools (i.e., blood pressure and blood glucose) enhances the telehealth visit. • I like using the telehealth system. • I would like telehealth to be an option for future obstetrical visits.
<p><i>Strongly Disagree (1) – Disagree (2) – Neutral (3)– Agree (4)– Strongly Agree (5)</i></p>	

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for each survey question in relation to the answer choice for question 10, “I would like telehealth to be an option for future obstetrical visits” was performed using the Mann-Whitney U test. When there were 3 pairwise comparisons (agree vs neutral, neutral vs disagree, agree vs disagree), a *P* value of <.0167 was considered significant. In all other comparisons, a *P* value of <.05 was considered significant.

Results

From March 19, 2020, to May 26, 2020, 253 patients participated in 433 TMVs with MFM providers. The average patient age was 33 years (± 5 years), and the median gestational age was 26 weeks and 5 days (14 weeks and 5 days, 30 weeks and 5 days). The 3 most common MFM TM visits were for maternal comorbidities, poor obstetrical history, genetics, and preconception counseling.

The types of visits included the following: 37% consultations (new patient visit), 48% follow-up visits, and 15% genetic, preconception, and nutrition counseling. Of the 253 patients who participated in TMVs, 165 patients participated in the survey, resulting in a 65% survey response rate. Besides the gestational age and marital status, there were no other significant differences in the responders vs the nonresponders. The responders had a slightly earlier mean gestational age of 25 weeks and 6 days vs 28 weeks and 1 day for nonresponders (*P*=.03) and were more likely to be married at 83% vs 73% (*P*=.04) (data not shown).

The response rates to each patient survey question are detailed in [Table 1](#). Overall, there was a high rate of patient satisfaction in the areas assessed. More than 80% of patients agreed that sign-up and check-in for their TMVs was

easy, with no issue regarding the internet connection or the ability to see and hear their provider. Similarly, 90% of patients agreed that the lack of physical contact was not an issue. The patients also reported that TMVs saved travel time and made it easier to see providers 95% and 87% of the time, respectively. In accordance with the overwhelmingly positive response to the ease and applicability of the TMVs, 73% reported that they would like telehealth to be an option for future obstetrical visits.

To identify factors that contribute to the patient’s desire for future telemedicine visits, for further analysis, we used the survey responses from patients who answered that they desire future TM vs those who answered neutral or disagree. The comparisons of demographic data and visit characteristics are shown in [Table 2](#). Age, gravidity, parity, and ethnicity had no association with the

TABLE 1
Distribution of patient survey answers by question

Survey question	Agree	Neutral	Disagree
"Telemedicine sign-up process was easy to follow."	157 (95)	4 (2.5)	4 (2.5)
"Telemedicine check-in process was easy to follow."	157 (95)	5 (3)	3 (2)
"I had no difficulties with my cellular/WiFi connection."	136 (83)	15 (9)	14 (8)
"I was able to see and hear the provider easily."	142 (86)	10 (6)	13 (8)
"I felt the technology was secure."	146 (88.5)	15 (9)	4 (2.5)
"Lack of physical contact was not a problem."	148 (90)	10 (6)	7 (4)
"I think the telehealth visits are as good as in-person visits."	94 (57)	44 (27)	27 (16)
"Telehealth visits saved my time traveling to a hospital or specialist clinic."	157 (95)	3 (2)	5 (3)
"Using telehealth made it easier for me to see doctors and specialists."	143 (87)	17 (10)	5 (3)
"I would like telehealth to be an option for future obstetrical visits."	120 (73)	30 (18)	15 (9)

Data are expressed as number (percentage).

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desire for future TM visits. There was no difference in marital status, type of insurance, primary OBGYN, distance to MFM office, number, or type of TM visits. Although there was no statistical difference in the distribution of diagnoses necessitating MFM services, there was a trend for patients with poor obstetrical history to desire future TM ($P=.05$) (Table 3). Furthermore, there was no difference in agreeability based on when the TMV took place from March to May (data not shown). No significant differences were found when similar comparisons were evaluated between those who agreed that they desired future TM vs those who disagreed alone (data not shown).

A detailed classification of how patients answered the remaining survey questions in relation to whether they desired future TM vs answering neutral or disagree was performed and is shown in Table 4. The patients who desired future TM had significantly increased agreeability that they were able to see and hear their provider easily (5 [4.5, 5] vs 5 [4, 5]; $P=.014$) and that lack of physical activity was not an issue (5 [4, 5] vs 5 [4, 5]; $P=.032$). They were also more likely to agree that TMVs are as good as in-person visits (4 [3, 5] vs 3 [2,

3]; $P<.001$). In addition, they had higher agreeability scores that telehealth visits saved them traveling time (5 [5, 5] vs 4 [3, 5]; $P=.001$) or that telehealth made it easier for them to see doctors or specialists (5 [4, 5] vs 3 [2, 3]; $P<.001$). Although some median scores were similar, the distribution of scores for those who desired future TM were typically less broad than other patients (Figure 2).

The assessment of providers in MFM practice who participated in TM visits was also surveyed and provider survey responses too demonstrated high levels of satisfaction (Table 5). More than 83% of the providers agreed that telehealth is an acceptable and convenient method to provide healthcare and it improves access to patients. There were no significant technological barriers identified, with 83% agreeing that they could see and hear their patient without difficulty and 100% of providers felt that the technology was secure. All providers agreed that remote patient monitoring enhances telehealth visits and 75% agreed that the lack of physical examination was not a problem. Thus, 67% of providers agreed that telemedicine visits are an adequate replacement to in-person visits and 83% agreed they

would like telehealth to be an option for future obstetrical visits.

Discussion

Principal findings

We present the results of a large patient and provider survey study administered to an obstetrical population who completed MFM telemedicine video visits in one of the epicenters of the COVID-19 pandemic. We demonstrated high levels of satisfaction and indicated that more than 70% patients and 80% providers would like obstetrical telehealth visits in the future. Through our analysis comparing patients who desire future TM visits compared with others, we found that the patients' digital experience, perception of need for physical contact, time saved on travel, and ease of accessibility to their healthcare provider were the drivers for desiring future TM visits.

Results

Before the COVID-19 pandemic, the use of TM in obstetrics had been described in a rural setting as providing specialized care such as MFM consults to patients geographically distant from specialized clinics with great satisfaction rates.⁶ With the restraints of social distancing during the pandemic, TM was

TABLE 2

Patient characteristics for patients who answered agree, neutral, or disagree for “I would like telehealth to be an option for future obstetrical visits”

Characteristic	Desires TM (n=120)	Neutral or disagree (n=45)	P value
Age ^a (y)	33.0±4.8	32.8±5.8	.70
GA at visit ^b	23 wk 5 d (13 wk 0 d, 30 wk 0 d)	27 wk 1 d (18 wk 2 d, 29 wk 3 d)	.33
Gravity ^c			
Nulligravida	1 (1)	1 (2)	.49
Primigravida	35 (29)	12 (27)	
Multigravida	84 (70)	32 (71)	
Race or ethnicity ^c			
African American	16 (14)	9 (20)	.37
Asian	14 (12)	2 (4)	
Hispanic or Latino	12 (10)	4 (9)	
Indian	9 (8)	2 (4)	
Other	5 (4)	0 (0)	
White	59 (52)	28 (62)	
Marital status ^c			
Married	99 (85)	35 (80)	.48
Single	18 (15)	9 (20)	
Primary OBGYN ^c			
Faculty	57 (47)	27 (60)	.17
Private	63 (53)	18 (40)	
Insurance type ^c			
Private	99 (85)	40 (91)	.44
Public	18 (15)	4 (9)	
Distance to MFM office (miles) ^c			
<5	19 (16)	5 (11)	.79
5–10	56 (47)	23 (51)	
>10	45 (37)	45 (38)	
Number of TMV ^b	1 (1, 2)	2 (1, 2)	.85
Visit type ^c			
New patient	52 (43)	21 (47)	.41
Follow-up	68 (57)	24 (53)	

GA, gestational age; MFM, maternal-fetal medicine; OBGYN, obstetrician-gynecologist; TM, telemedicine; TMV, telemedicine visit.

^a Mean±standard deviation;; ^b Median (25th, 75th percentiles);; ^c Number (percentage).

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obstetrics and gynecology.^{2,6} No differences in the sign-up or check-in process are likely owing to both groups reporting high levels of satisfaction with the use of a mature technological system as previously reported.¹⁰ A patient's desire for future TM obstetrical visits was also significantly influenced by their perception of the importance of physical contact during the visit, easier accessibility to providers, and time saved from travel. Demographic characteristics did not influence the patient's desire for future telemedicine obstetrical visits. The types of visits, both new consults and follow-up MFM visits, were amenable to TM as well as the diversity of diagnoses that are typically seen in common MFM clinical practice. Interestingly, for patients being seen for fetal indications for MFM care, they were more likely to disagree that TMVs saved them time. This is likely because they still require in-person fetal monitoring services that are not available in current mainstream telehealth modalities.

Clinical implications

COVID-19 poses a significant health risk to both pregnant women and neonates.^{13,14} The COVID-19 pandemic is a debilitating and frightening time for all patients, including patients and physicians in the field of obstetrics. Given that obstetrics has a uniquely defined system for prenatal care, often incorporating at least 8 to 10 visits with additional ultrasound and fetal monitoring, the field had to quickly modify a majority of this program into telehealth. Aziz et al¹⁵ describes the implementation of telehealth in a New York City (NYC) hospital and clinic system during the pandemic and provides recommendations on how to structure in-person and telehealth prenatal care during times requiring social distancing. NYU Langone Health rapidly implemented the shift to telemedicine quickly and efficiently in many different specialties, and here we see that the patients' and providers' digital experiences correlate with high satisfaction with telehealth in obstetrical visits.

Although TMVs have been critical in the setting of the pandemic, especially

implemented widely and rapidly within the metropolitan and surrounding suburban settings. Despite this rapid implementation, our results demonstrate

high overall satisfaction rates with TM visits among both patients and providers. This is in line with previous studies evaluating telehealth in

TABLE 3

Diagnosis for maternal-fetal medicine visits comparing patients who desire telemedicine vs those who answer neutral or disagree

Diagnosis for MFM visits	Desires TM (n=120), n (%)	Neutral or disagree (n=45), n (%)	P value
Maternal comorbidities (n=121)	87 (72)	34 (28)	.69
Fetal indications (n=7)	4 (57)	3 (43)	.39
Poor obstetrical history (n=21)	19 (90)	2 (10)	.05
Genetics or preconception counseling (n=16)	10 (63)	6 (37)	.38

MFM, maternal-fetal medicine; TM, telemedicine.

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in metropolitan areas such as those where our study was performed, we demonstrate that the majority of obstetrical patients desire future TMVs. Although COVID-19 may be the stimulus for the rapid transformation of telehealth, both the patients' and providers' desire for telemedicine services after the pandemic need to be anticipated. In today's obstetrical clinical care model, TM can continue to provide access to obstetrical care and allow for an easier method to see a provider through increased flexibility for both patient and provider. Although a majority of the

patients in our study population lived within 10 miles to an ambulatory office, even those <5 miles away had a similar perception of saved time and desire for future TM visits. The trend for patients with poor obstetrical history to desire future TM indicates that easier access to the provider through a telemedicine visit does not only save time but also offers a convenience for patients to access providers without needing to be surrounded by other obstetrical patients; this may serve as a reminder of the hardships these patients have experienced.

Another facet to telehealth use is the concern for access and availability for patients of all socioeconomic levels. The study by Chunara et al¹⁶ identifies health disparities as an important aspect of telemedicine that should be addressed as it becomes more integrated into routine medical practice.

A recent study from our institution assessing health disparities and telemedicine demonstrated that although there was an increase in the number of Black patients accessing TM, they were still less likely to access TM compared with White patients (0.6 Odds Ratio).¹⁶ This emphasizes the need to focus efforts to increase accessibility to telemedicine services to minimize health disparities and increase telemedicine usage. Our study demonstrates that when a TMV is conducted, there is an equally high degree of satisfaction or agreeability to the telemedicine features between White and Black patients.

Research implications

There are limited studies of substantial quality on the implementation of telehealth in obstetrics and gynecology. A review by Lassens et al (2017) assessed 9 randomized controlled trial studies for quality and bias indicators, revealing intermediate-to-high bias in a majority

TABLE 4

Median survey answers for those who desire telemedicine vs those who answer neutral or disagree

Survey question	Desires TM	Neutral or disagree	P value
"Telemedicine sign-up process was easy to follow."	5 (4.5, 5)	5 (4, 5)	.43
"Telemedicine check-in process was easy to follow."	5 (4, 5)	5 (4, 5)	.17
"I had no difficulties with my cellular/WiFi connection."	5 (4, 5)	5 (3, 5)	.014 ^a
"I was able to see and hear the provider easily."	5 (4, 5)	4 (4, 5)	.023 ^a
"I felt the technology was secure."	5 (4, 5)	4 (3, 5)	.001 ^a
"Lack of physical contact was not a problem."	5 (4, 5)	5 (4, 5)	.032 ^a
"I think the telehealth visits are as good as in-person visits."	4 (3, 5)	3 (2, 3)	<.001 ^a
"Telehealth visits saved my time traveling to a hospital or specialist clinic."	5 (5, 5)	5 (4, 5)	.001 ^a
"Using telehealth made it easier for me to see doctors and specialists."	5 (4, 5)	4 (3, 5)	<.001 ^a

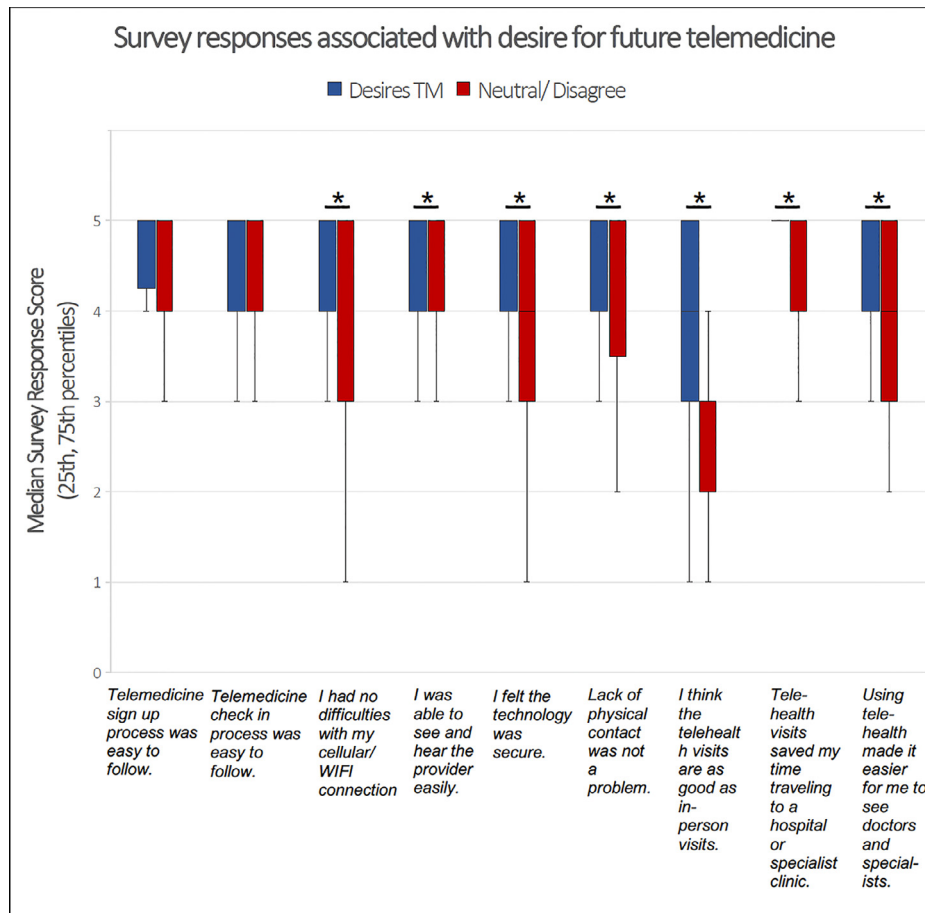
Each row corresponds to each patient survey question found in Figure 1. Values are represented as median (25th, 75th percentiles).

TM, telemedicine.

^a P values of <.05 were estimated by the Mann-Whitney U test.

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FIGURE 2
Median survey scores for patients who desire TM vs neutral/disagree



The values are represented as median (25th, 75th percentiles); black bar (median), vertical bars (minimum, maximum values). Desires telemedicine (blue), neutral or disagree (red). The *asterisk* indicates a P value of $<.05$ estimated by the Mann-Whitney U test.

TM, telemedicine.

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of the studies. The evaluation of only low bias studies demonstrated a significant decrease in low birthweight births and a reduction in neonatal intensive care unit admissions in pregnancies managed with telemedicine. Thus, evaluating the pregnancy outcomes of patients who participated in TM during their obstetrical care through the COVID-19 epidemic would be an informative future research.

In our study, we found that patients are less likely to desire TM for future obstetrical visits when they feel that lack of physical examination is an issue. In addition, our data suggests that patients

with a fetal indication were less likely to agree that telehealth saved them time traveling to medical offices. Although conclusions cannot be made from this small sample of patients, it does highlight aspects of telemedicine that require optimization, such as increased surveillance and fetal monitoring required for fetal indications. Currently, a physical visit for ultrasound and fetal testing is required to safely assess both maternal and fetal well-being. However, there are evolving enhancements to telehealth that may address these issues. Mhajna et al¹⁸ has shown comparable performance of remote fetal and

maternal monitoring systems within 8 beats per minute compared with standard of care cardiotocography. In addition, the utilization of technological tools to allow providers to conduct a physical examination virtually and more comprehensively is becoming increasingly more available. The implementation of telehealth applications such as integrated physical examination devices equipped with video and auditory aids,¹⁹ remote patient monitoring of vital signs and blood glucose, or fetal monitoring such as electronic fetal monitoring or even ultrasound may help augment and improve patient

TABLE 5
Distribution of provider survey answers by question

Survey question	Agree	Neutral	Disagree
"Telehealth visits improved patient access to healthcare needs for my patients."	10 (91)	1 (9)	0 (0)
"Telehealth visits are an acceptable way to provide healthcare services."	10 (83)	1 (8)	1 (8)
"I was able to see and hear my patient easily."	10 (83)	2 (17)	0 (0)
"I felt the technology was secure."	12 (100)	0 (0)	0 (0)
"Lack of physical contact was not a problem."	9 (75)	2 (17)	1 (8)
"The telehealth system is a convenient way for my patient to access medical, obstetrical, and neonatal specialists."	11 (92)	0 (0)	1 (8)
"I think the visits provided over the telehealth system are an adequate replacement when in-person visits are difficult or impossible."	8 (67)	2 (17)	2 (17)
"Remote patient monitoring tools (ie, blood pressure and blood glucose) enhances the telehealth visit."	12 (100)	0 (0)	0 (0)
"I like using the telehealth system."	11 (92)	0 (0)	1 (8)
"I would like telehealth to be an option for future obstetrical visits."	10 (83)	2 (17)	0 (0)

Data are expressed as number (percentage).

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outcomes and satisfaction. For instance, a prospective cohort study using telehealth for postpartum blood pressure monitoring in a rural setting demonstrated 95% retention rate, 0% hospital readmission rate, and 86% patient satisfaction rate.²⁰ Similar applications are being suggested for antepartum blood pressure monitoring and glucose management in pregnancy.

Strengths and limitations

This is a large patient and provider survey for obstetrical telemedicine visits conducted in the New York metropolitan and surrounding areas, which is an epicenter of the COVID-19 pandemic. The surveys were performed no more than 7 weeks from the initial telehealth visit, thereby decreasing recall bias.

The greatest strength of this study is our detailed analysis distinguishing patients who desired future telemedicine vs those who were neutral or disagreed with the option. This led to the identification of both modifiable and perceived factors that drive a patient's desire for future telemedicine visits. There are also limited provider satisfaction assessments of telemedicine applications in obstetrics and gynecology. Similar to previously described studies, we also find that our provider-

administered survey demonstrates a similarly high degree of satisfaction in all areas reviewed, which correlates with a desire for future telemedicine visits.

Furthermore, this study is not without limitations. Survey studies have inherent levels of bias at varying levels, including response decline, question design, and extremes in patient opinions, which can skew survey answering.²¹ With a response rate of 65%, it is unclear whether the patient responses represented in this study could be skewed more negatively or positively. However, we found only minor differences in the gestational age and marital status in our responders compared with nonresponders, indicating a good overall representation of the target population. Our survey did not include open-ended questions for suggestions from patients on what would improve the telemedicine experience, which is one suggested approach to reduce bias. This was not done because of the extensive time and resources needed to further analyze this type of information. Most of the patient surveys were completed over telephone calls. Therefore, the patients may have felt the need to answer more favorably, which may be another potential bias. To minimize this bias, telephone surveys were not

conducted by the provider who conducted the telemedicine visits, and some patients chose to complete the survey through the provided survey link on their own. Indeed, we assessed a large obstetrical cohort. However, we did not have adequate numbers in some of the subgroups to provide robust statistical analyses. Therefore, future studies may attempt increased numbers in some of the groups such as patients with fetal indications for MFM care to further improve this modality for their care. Finally, although this study assesses the satisfaction and implementation of TM in obstetrical care, it does not assess quality and safety. Future studies on maternal and fetal outcomes based on those included in this study may help to elucidate the safety and future of TM in obstetrical care.

Conclusions

The COVID-19 pandemic initiated a rapid increase in the use of telehealth in all areas of medicine. We assessed the patient and provider satisfaction with telehealth use within a large suburban region surrounding the NYC metropolitan area from a MFM practice during the height of the COVID-19 pandemic. We found that, overall, the patients and providers were satisfied with the TM

visits and the majority desired TM to be an option for future visits. We also found that the patients' digital experiences, perception to not need physical contact, perceived time saved on travel, and access to healthcare providers significantly affected their desire for future telemedicine visits. This study highlights the need for health systems to continue to improve telehealth delivery and invest in innovative solutions to conduct physical examinations and other assessments remotely. Our MFM practice will continue to offer telehealth services moving forward to compliment in-person visits. ■

Supplementary materials

Supplementary material associated with this article can be found in the online version at [doi:10.1016/j.ajogmf.2021.100469](https://doi.org/10.1016/j.ajogmf.2021.100469).

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Received Apr. 9, 2021; revised July 20, 2021; accepted Aug. 18, 2021.

The authors report no conflict of interest.

This study was funded by the Department of Obstetrics and Gynecology, NYU Langone Hospital—Long Island.

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