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A Systematic Literature Review of Telehealth for Health Equity in Pediatric and Women's Health Care: Promise vs Reality

Sharanya Chandu
sharanya.chandu@uconn.edu

University of Connecticut

Honors Thesis

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Student: Sharanya Chandu

Faculty Mentor: Professor Shane Murphy

UConn School of Business

Department of Healthcare Management and Insurance

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Abstract

Background: Telehealth interventions can transform the healthcare system to improve accessibility, quality of care, and outcomes for women's obstetric health.

Objective: This literature review seeks to summarize current research to understand the effect of telehealth on women's obstetrics and gynecology outcomes.

Methods: A literature review was conducted following the PRISMA methodology to identify a set of papers containing information related to obstetrics and maternal health. The search terms used identified telehealth or telemedicine interventions used for obstetric, maternal, or prenatal care from the period 2013-2023. 19 articles were identified and reviewed.

Results: The literature review considered three primary aspects from the findings of each paper when relevant; accessibility, care, and vulnerable population. Accessibility was assessed to better understand the barriers affecting access to telemedicine services. Care interventions were assessed to better understand how different perinatal care interventions can be provided through telemedicine, including abortion and ultrasound care. High-risk or low-resource populations were assessed to better understand how telemedicine interventions affect different populations.

Discussion: The literature review identified barriers in accessing technology, internet, and interpretation services. The review considered measures that can be taken to reduce barriers to improve access to abortion, ultrasound, and prenatal care for diverse patient populations.

Conclusions: Review demonstrated ways in which telehealth can be an effective intervention in overcoming barriers, addressing prenatal care outcomes, and improving awareness and access in patient populations.

Table of Contents

Acknowledgements 2

Abstract 3

Table of Contents 4

Introduction 5

Covid-19 Pandemic 5

Prenatal Care 6

Accessibility 6

Population 6

Methods 9

Study Selection 10

Results 11

Care 11

Access 14

Population 15

Discussion 19

Conclusion 20

Future Implications 21

Tables 22

References 26

Introduction

Since 2020, providers have utilized more telehealth support and services for managing patient care. When the Covid-19 pandemic began in March 2020, many specialties transitioned patient care delivery to include a remote modality. These changes were made to improve patient safety across each specialty. To accommodate the rapid changes, the American College of Obstetricians and Gynecologists recommended arranging some appointments in the form of telehealth to provide appointments online for pregnant patients.

Covid-19

The standard model for a low-risk pregnancy in the United States includes approximately 12 to 14 in-person visits throughout the duration of the 40-week pregnancy.[1] This includes visits every four weeks from 0-28 weeks and visits every two weeks from 28-36 weeks, in addition to the weeks following. This model of care has remained unchanged since it was established in 1930.[2] Efforts to modify the standard of care were and were implemented after the Covid-19 pandemic was declared in March 2020 in response to the need for social distancing. At a study by Peahl et al. in the Department of Obstetrics and Gynecology at the University of Michigan, a redesigned prenatal care model was implemented to improve the model of care in two metrics. The model was implemented in March 2020 and worked to utilize in-person services for essential care to allow for video visits for other care and creating flexible support services for patients to personalize their needs.[1] The prenatal plan developed was a four by one by four plan where there were four in-person visits, one ultrasound, and four virtual visits. Providing this hybrid framework helps utilize the benefits of in-person and telehealth visits when providing prenatal care to pregnant patients.

Prenatal Care

The Covid-19 pandemic was declared a public health emergency in January 2020 and was declared a pandemic approximately two months later on March 11, 2020, by the World Health Organization. The pandemic caused more providers to look for adaptations to the current standard of care to improve prenatal care for patients and providers. Immediate changes were made to the standard of care as healthcare professionals wanted to limit the exposure of the virus.[3] As healthcare delivery was reshaped, many non-essential procedures were cancelled or moved to a later date. Telehealth was utilized as a method of continuing to provide care in different fields. For low-risk patients, modifications were made to reduce the number of in-person visits and allow for more virtual visits, as described by Peahl et al.[1] However further changes were needed for patients who had high-risk pregnancies. Since high-risk pregnancies require more testing and monitoring, options for telehealth are more limited.

Along with telehealth eHealth interventions were promoted after the start of the pandemic. Interventions utilizing eHealth focus on providing healthcare through the use of electronic systems. Telehealth can be seen as a component of eHealth that is focused on healthcare delivery.[4] A literature review by van den Heuvel et al. found the effect of electronic health (eHealth) perinatal interventions on health outcomes. After looking at 71 publications and understanding the effect on health outcomes, results showed that eHealth outcomes were positive for perinatal interventions.[5] Additionally, results showed high patient and provider satisfaction with eHealth intervention. These results are promising for healthcare providers and institutions to consider implementing eHealth interventions to support prenatal care. These results provide strong evidence that electronic interventions can be successful in providing prenatal patient care.

This paper advances these results to study telehealth specifically to better understand the impacts on prenatal care delivery.

Accessibility

Ensuring that pregnant patients have access to prenatal care services is essential. Without prenatal care maternal mortality, preterm birth, neonatal death, and stillbirth are more like to occur.[5] There are several challenges that restrict access to prenatal care services for pregnant women, including disparities in sociodemographic factors. US Women who identify as Black or Hispanic are less likely to participate in prenatal care and approximately 23% of non-Hispanic Black women and 18% of Hispanic women received inadequate prenatal care.[6] In contrast, 11% of non- Hispanic White women received inadequate care. Overall, 5% of women enter prenatal care late in the pregnancy or not at all. Therefore, a large consideration of telehealth implementation is the disparities that exist in prenatal care access.

A previous literature review performed by DeNicola et al. considered the effectiveness of telehealth interventions for improving obstetric and gynecologic health outcomes.[7] Results from the literature review estimated that remote monitoring and telemedicine can help improve access to care when barriers exist. This review supported evidence that telehealth improved access to early abortion.[7] This includes assessing the safety and effectiveness of telehealth compared to in person care delivery. These results shared similar safety and effectiveness between both modalities. These results clarify how telehealth can be further explored and implemented to increase access to abortion services and to help overcome barriers. This review builds on the DeNicola paper by focusing on more recent work and considering further implications of telehealth for diverse populations.

Population

In addition to assessing how telemedicine affects care and accessibility, this paper examines how telemedicine impacts vulnerable patient populations. This literature review includes papers that assess different populations such as high-risk patients, low-resource regions, and low-income women. In Escobar et al. researchers looked at reducing the high maternal morbidity and mortality rates in rural communities. Their study design introduced telemedicine as method of connecting a hospital with low resources to a hospital with more resources.[8] By assessing telehealth within these different patient populations, we are able to better understand how to provide care that is beneficial for all communities.

Prior literature reviews have assessed barriers to accessing healthcare in developing countries. Kruse et al. reviewed over 2,200 studies to assess mHealth initiatives used in developing countries in Africa, Asia, and Latin America.[9] This literature review found 73 individual barriers, which were grouped into 14 main categories. The top three categories were infrastructure, lack of equipment, and technology gap. Healthcare administrators considering telehealth implementation in hospital systems can consider the implications of telehealth interventions. While this review addressed multiple applications for telehealth, results of the study showed that the leading health outcomes with positive improvement include maternal health and infectious disease. Kruse et al. show the promise of maternal health as a field that is shown to improve healthcare outcomes in developing countries. Additionally, the literature review assessed how barriers of equipment, technology, and infrastructure can be addressed by working with government organizations to address infrastructure and funding.

Feroz et al. provided a literature review of 19 paper to explore how digital health interventions impact maternal health outcomes for high-risk pregnancies in low-income and

middle-income countries.[10] The literature review provided strong evidence that digital health interventions can be utilized to monitor pre-eclampsia and eclampsia for early diagnosis to improve overall outcomes. Further research was summarized by Colaci et al. studying mHealth interventions in low-income countries specifically.[11] In this literature review, 57 papers were assessed for the use of mHealth in maternal health. Out of these studies, nine papers investigated the effect of mobile phones for data collection, three found support for appointment reminders, four found support for health promotion in addition to appointment reminders and six found support for provider communication. Feroz et al. demonstrate the benefit of mHealth in improving health promotion and communication.

Methods

Study Selection

In order to summarize existing information regarding telehealth or telemedicine for obstetric and maternal health, this paper followed PRISMA Guidelines to complete a literature review. Literature reviews are valuable in providing a summary and understanding of current knowledge within the field for future studies or to answer research questions. The 2020 PRISMA Guidelines recommends a checklist with 27 items recommended when completing a system review.[12] The checklist items provide guidance in writing a title, abstract, introduction, methods, results, discussion, and other information. As recommended by PRISMA, the inclusion and exclusion criteria are identified below alongside the database used, PubMed, and strategies used for screening.[12]

To synthesis the material found in the literature review articles were categorized based on separate taxonomies. These subgroups include 1) the type of care studied in the research, 2) the barriers to access studied in the research, and 3) the subpopulations focused on in the research.

Appendix Table 1 shows the final set of articles included in the literature review. Each of the subgroups are included in the table sharing specific information about the taxonomies. The first subgroup was broken down into abortion, ultrasound and prenatal care, the second subgroup shared type of new prenatal care models and barriers to overcome, the third subgroup shared three different type of populations (high-risk, low-income, and low-resource) and assessed how telehealth interventions impacted different populations. The flowchart and exclusionary criteria used to select the final articles for the literature review are shown in Figure 1 below.

Figure 1: Literature Review Flowchart

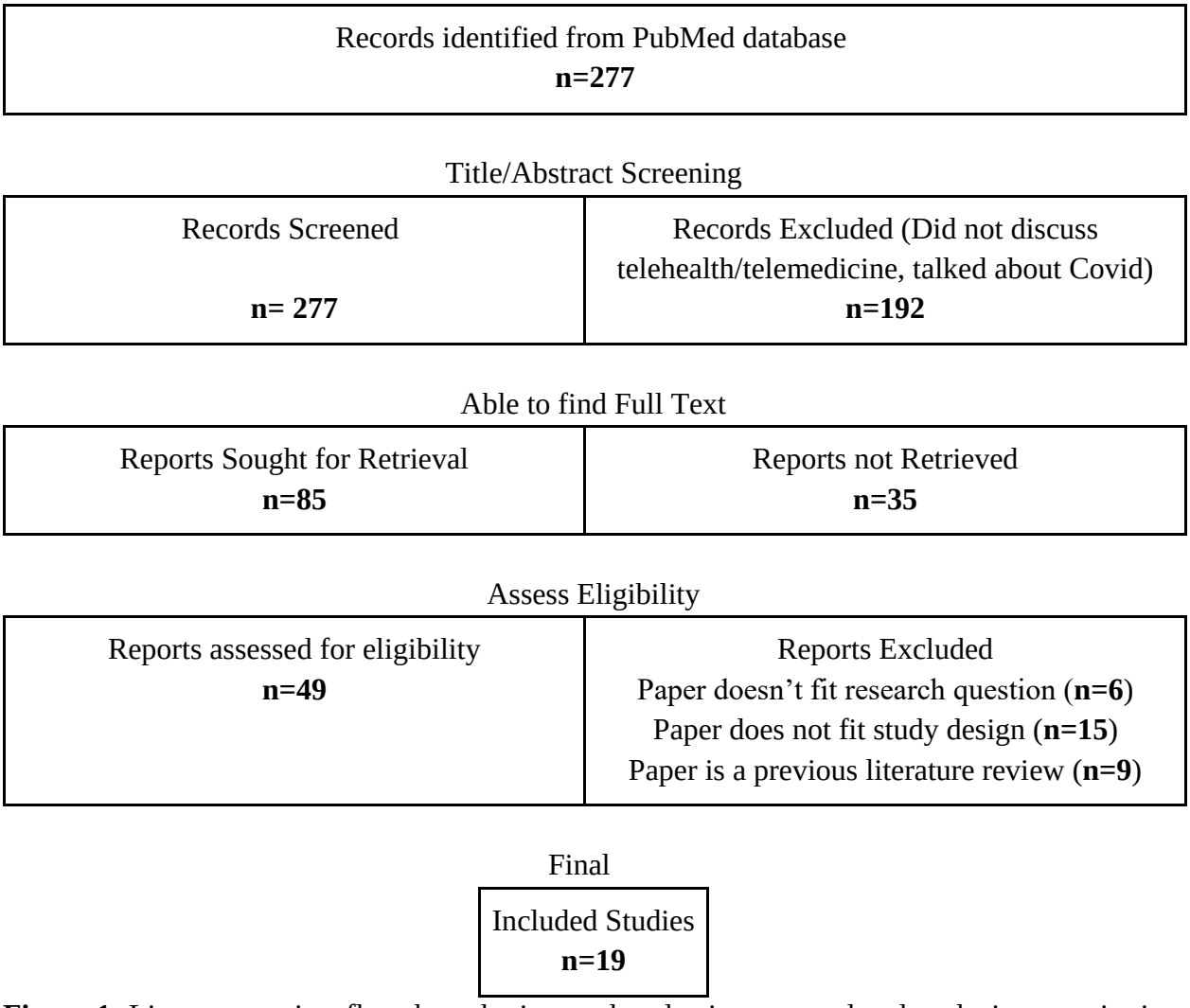

Figure 1: Literature review flowchart sharing study selection protocol and exclusionary criteria.

The paper used in this literature review was identified using PubMed and the search strategies used included filters for time as all of the articles were published within 2013 to 2023. Articles were selected based on their relevance to the research question of whether telemedicine is an effective method of delivering prenatal care. Articles that described a potential study design or articles that summarized existing literature were excluded from this literature review.

Results

Care

The first subgroup identified is the access to care group which works to understand and identify the type of care telehealth services provides for pregnant woman for their antenatal care. Three categories were measured under care including access to abortions, ultrasound, and general prenatal care using telemedicine.

Abortion

In a retrospective cohort study by Kerestes et al. at the University of Hawai'i researchers identified 334 patients who had a medication abortion between April and November 2020. The purpose of this study was to identify patients who have had a medication abortion after the implementation of telemedicine and the "no-test protocol" during the Covid-19 pandemic. A no-test protocol meant that eligible patients were able to access medication abortion without prior labs or ultrasounds. Further information describing intervention protocols for providing remote abortion care is described by Kerestes et al. in the paper. [13] This study provided strong evidence that telemedicine is an effective method of delivering abortion care safely and effectively. The completed rate of medication abortions without surgical intervention was 95.8%. They estimated the success rates of clinic pickup, mail, and clinic visit groups to be 96.8%, 97.1%, and 93.6%

respectively.[13] Further results from care models that predicted the risk of adverse events are included in the study. Overall results of this study have shown medication abortion and no-test protocol to be effective as a method of delivering telemedicine care.

Ultrasound

Aziz et al. studied how prenatal care, obstetric ultrasounds, diagnostic procedures, and fetal therapy are adapted to fit Covid-19 guidelines. The American College of Obstetricians and Gynecologists established guidelines that "elective or non-indicated ultrasounds were not performed for normal patient conditions."[14] The only ultrasounds performed were to help answer any relevant clinical questions. In order to reduce the risk of exposure for patients, providers, ultra-sonographers, and staff. Modifications were made to prior ultrasound and antenatal testing approaches. Two things stayed the same, the timing of the first trimester scan and second trimester anatomy scan, however the first trimester anatomy ultrasounds and early fetal echocardiograms were deferred. While the necessary ultrasounds occurred at the time expected, many non-emergent or non-clinical ultrasounds were deferred.

In addition to understanding how to separate necessary ultrasound appointments and ones that can be deferred, a research article by Smith et al. further understood how fetal medicine can complete ultrasound through telemedicine. Smith et al. looked at 297 women who had a telemedicine consultation over a 4-year period from October 2015.[15] This treatment protocol was further described in the paper for the two phases described to collect patient experience data. The results demonstrated that the telemedicine service for fetal ultrasounds could be implemented successfully in a remote obstetric fetal medicine center.

Prenatal Care

The majority of studies in this review assessed prenatal care for pregnant women after providing a telehealth intervention. The Avercenc et al. study, in particular, used a questionnaire to develop a score to assess prenatal care outcomes after comparing telehealth prenatal visits (experimental) with in-person visits (control).[16] This information was collected using surveys and perinatal outcomes in a single center quasi experimental approach. These results did not indicate a statistically significant difference between the two groups care across the six metrics measured: information sharing, anticipatory guidance, sufficient time, approachability, availability, and support and respect.

A qualitative study by Farrell et al. assessed prenatal care healthcare by comparing telehealth at the beginning of the Covid-19 pandemic between pregnant women in their first and second trimesters of pregnancy.[17] By interviewing patients in separate trimesters of pregnancy, results can be compared at a closer level to understand how remote care affects prenatal care at separate trimesters. The qualitative data showed four main themes: the perceptions of the benefits of telehealth visits during the pandemic, the need for reassurance that comes from in-person clinical visits with an obstetric provider, added concerns about responsibility for determining the wellbeing of the pregnancy, and the impact of telehealth on patient experience.[17] The first theme was evident in both first and second trimester participants. The second theme was more preferred in the first trimester group as there are no visible changes with pregnancy so there was an associated reassurance with an in-person visit. This study was conducted at the beginning months of the pandemic when telehealth models had just been introduced as a method to reduce the spread of the Covid-19 virus. Therefore, many participants shared that they preferred to have the telehealth modality for safety preferences.

Reneker et al. assessed the effect of telemedicine on prenatal care at a Maternal Care Center in Mississippi using a retrospective cohort study for 1,894 women.[18] Changes were assessed between the pre-pandemic group and pandemic group. There was a statistically significant difference between the number of patients who had hypertension during pregnancy before and after the pandemic. The pre-pandemic cohort showed 21.19% of total pregnant patients had been diagnosed with hypertension during pregnancy. The pandemic cohort showed that 33.84% of pregnant patients had been diagnosed with hypertension. Overall results showed no significant differences in maternal pregnancy related outcomes between the two groups.

Marshall et al. collected survey results from 1,496 prenatal care patients and 482 postpartum care patients from the pandemic in a research study analyzing telehealth implementation for pregnancy related care.[19] The respondents for prenatal care shared high levels of quality regarding their telehealth appointments as "80% shared that it felt safe, easy, and provided good information." These results were similar to members of the postpartum group as they felt cared for in their telehealth appointments. This study also considered patients' willingness to continue with telehealth appointments in the future. 35% of prenatal respondents and 43% of postpartum respondents shared that they would open to participating in telehealth visits in the future.

Overall, these studies have demonstrated a similar access to care between telemedicine and in person visits when providing prenatal care. Two of these studies showed improvement in care outcomes when utilizing telehealth.[15,17] Pregnant women participating in the research studies mentioned feeling safe and finding high satisfaction when utilizing telehealth implementation compared to in person.[13,19] Other studies showed no significant change when

providing telehealth prenatal care as there was no change in outcome between the two groups.[16,18]

Access

Research studies have worked towards developing prenatal models that redesign the standard model of care. These revised models have been created to improve access and patient satisfaction. The study performed by Peahl et al. from the University of Michigan assessed the results through a survey of their 4-1-4 plan. Survey results showed that 96.1% of providers believed that telehealth improved access to care, 83.1% reported provider satisfaction, and 92.2% providers were interested in continuing the revised care model after the pandemic.[1] Providers in this survey study also assessed the barriers that could provide trouble for patients accessing prenatal telehealth care. These barriers include difficulty with accessing technology, interpreter services and inequitable access to care depending on technology and internet use. Another survey completed by Peahl, Powell, et al. indicate that 68.8% of patients and 96.1% of providers provided strong evidence that virtual visits have been shown to improve access to care.[20]

Craighead et al. completed a survey study at an outpatient prenatal care clinic in Cleveland Ohio, administering a Coronavirus Perinatal Experience - Impact Survey to assess telehealth as an opportunity for providing prenatal care.[21] This study provided strong evidence that a majority of participants preferred in-person visits as it allowed patients to build a "more personal rapport with the provider and the telehealth modality affected the level of trust they felt with the provider." This study was conducted at the beginning of the Covid-19 pandemic and results were affected by patients' concern for reduced contact to reduce spread and unfamiliarity of video conferencing. This study estimated a concern with the barriers to "healthcare communication through telehealth offered opportunities for clinical and ethical

communications". In addition to communication barriers, Craighead et al. showed concern with technology barriers as patients were not familiar with virtual platforms during the time of this study.

Gao et al. studied telehealth use in the Covid-19 pandemic by performing a retrospective study to better understand prenatal care at a single hospital.[22] The retrospective study of over 4500 patients, reported that telehealth prenatal visits were statistically more likely to be received by women 26 years and older, whereas younger women utilized telehealth services less. Additionally, Gao et al. showed strong evidence demonstrating that Hispanic women utilized telehealth services significantly less than non-Hispanics and Black women utilized telehealth services significantly less than White women. This retrospective study demonstrated that telehealth was more likely to be used by women in rural areas than woman who lived in large metropolitan areas. This suggests there are sociodemographic factors such as race and geographic location that affect rates of telehealth utilization.

Overall, many of these studies have shown an improvement in access to care by utilizing telemedicine interventions. These studies asked patients and providers to share their thoughts regarding access to care, and a majority of responses showed strong evidence that telemedicine interventions increase access to care.[1,20,21] Additionally, these studies showed evidence of barriers that arise from telehealth implementation. The barriers that the studies discuss in their findings include sociodemographic factors, technology concerns, and communication barriers.[20,21,22] These results suggest that healthcare systems should consider barriers that arise when implementing telemedicine in healthcare settings. While a majority of these studies estimate an increase in access to care and patient satisfaction, these studies take into consideration the barriers that may arise from telehealth implementation.[20] These findings show

that overcoming barriers in accessing technology, providing equitable healthcare and communication is possible to overcome by acknowledging and developing solutions to address each barrier.

Population

Access and care are important considerations for effectiveness of telehealth however population-based considerations advance our current understandings by introducing diverse perspectives. The lack of access to technology in rural and low-resource communities increases barriers to telemedicine. One article assessing accessibility in northern New England during early 2020 showed that 47% of people living in rural communities in New Hampshire have access to adequate broadband service compared to 70% of people who live in urban communities.[23] Futterman et al. published results from their ecological study in 2022, to estimate results and assess a telemedicine obstetric emergency care intervention between a secondary care center to a referral center. This study indicated that there was a statistically significant decrease of 78% in perinatal mortality. These results are significant in understanding the benefits of telemedicine as a service for improving accessibility for a hospital with more resources.

Futterman et al. considered telehealth outcomes for the Hispanic patient population in East Harlem, New York.[24] Futterman et al. shared how Hispanic patients are at a higher risk for reduced access to care. Telehealth is used as a modality for improving access and continuation of prenatal care. To improve access for this population, telehealth services can reduce the risk for access to care. Short Assessment of Patient Satisfaction surveys were used to assess for patient satisfaction in a study sample of 140 patients. These patients received both in-person and virtual prenatal care, with 74% of patients self-identifying as Hispanic and 54% reporting that Spanish was their primary language. Results from the assessment showed that telehealth was a useful tool

to provide prenatal care for "Hispanic patients who are at risk for decreased access to care." The satisfaction scores compared similarly between in-person and telehealth visits which demonstrates that telehealth is satisfactory in providing prenatal care, as there is no negative outcome.

Nakagawa et al. performed a research study in Japan to assess for the effectiveness of telemedicine for pregnant women who are at higher risk for having an underlying disorder or fetal abnormality.[25] The retrospective study was performed for 122 pregnant women, of which 44 pregnant women received telemedicine sessions. Complications in the participants included "9 had twins, three had fetal growth restriction, three had signs of preterm labor, three had disorders at risk of fetal anemia, two had psychiatric disorders, two had fetal abnormalities requiring frequent ultrasonography, two had social problems, and one had a disorder of the placenta."[25] Despite these complications, this study indicated that patients can still undergo remote prenatal care safely.

Jeganathan et al. looked at the adherence of telehealth appointments for high-risk obstetric patients during the beginning of the pandemic.[26] Two surveys were administered; one was for patients (n=91) and the other was for providers (n=33) to assess their responses to telehealth implementation at the start of the pandemic. The results showed that out of the 91 patient surveys collected, 86.9% were satisfied with 78.3% recommending telehealth as a modality of healthcare deliver for others. The provider survey results showed that out of the 33 collected, 87.8% of providers had positive experience with 90.9% believing that telehealth is increasing the access of care for patients. Over 70% of patients reported that they preferred a combination of in-person and telehealth whereas providers preferred in-person to telehealth. Implementation of telehealth in this patient population has shown to improve access to high-risk

care. The study also reported that telehealth provides a different modality that decreases the rate of missed appointments.

In addition to assessing high-risk pregnancies, Murthy et al. considered a sample of low-income pregnant women in India.[27] 2,016 women were enrolled in the study assessing if mobile health can be effective in increasing "uptake of recommended maternal services." The mobile health intervention provided in this study is a message intervention where participants receive educational voice messages. The effect of the intervention was compared against a control group and showed that a phone-based message system can be successful in sharing knowledge in populations with limited resources. Over 60% of the women who received the intervention estimated that it increased their "health awareness" as they were able to share that information with the people around them. Additionally, they shared that it allowed them to take better care of themselves.

Discussion

Covid-19 increased utilization of telehealth as a measure to address patient safety in delivering prenatal care for pregnant patients. This paper reviews literature on the effectiveness of telehealth as a method to help address and overcome barriers, improve care outcomes, and provide support for diverse populations. Some of the studies in this literature review demonstrated that telehealth could produce barriers in accessing technology, interpreter services, and inequitable access to care.[1] These studies helped understand existing barriers to accessing telehealth care and included considerations for how telehealth can be taken to address the barriers. For example, the study reported how approximately 68% of patients and 96% of providers indicated that telehealth increased accessibility though offering virtual visits.[1] Measures can be taken to address existing barriers by finding alternative technology platforms

and providing virtual interpretive services so that patients are able to access equitable prenatal care.

The second metric in this study assesses care outcomes for remote prenatal care in comparison to in-person care. The research articles in this literature review took place after the start of the pandemic as many people were considering telehealth platforms. This metric considers the advances being made in care outcomes to provide virtual monitoring utilizing ultrasound and abortion care to effectively deliver prenatal care. The study assessing remote abortion medication care provided strong evidence for a high success and completion rate for medication abortions without surgical interventions. During the pandemic, ultrasound procedures were deferred if they were non-emergent procedures. Emerging telehealth plans for prenatal care show ways to incorporate telemedicine service for fetal ultrasounds and reducing the number of regular ultrasounds to only those necessary. Lastly, prenatal care has been shown to be as effective in-person as it is remote, in improving patient satisfaction, outcome, and safety.

The third metric assesses how remote care has shown similar care outcomes to in-person care and has provided high-risk pregnancies and low-resource regions with support to provide safe and effective prenatal care. Results from studies with high-risk and low-income patient populations have shown that telehealth is an effective modality in providing remote care. It provides the opportunity to increase the amount of knowledge shared in low-resource areas as well as providing continuous monitoring to help assess high-risk pregnancies.

Conclusions

This literature review considered three different metrics to assess the effectiveness of telehealth as a method of delivering prenatal care for patients. Many of the studies included were published at the beginning of the Covid-19 pandemic and assessed for effectiveness of

telemedicine in delivering healthcare for patient safety. While patient safety is a necessary and important concern, it is also important to understand the benefits telemedicine can provide in increasing accessibility, care outcomes, and helping meet population needs. The first metric assessed was accessibility which shared barriers produced by telehealth such as access to technology, interpretation services, and other access to care concerns. The second metric assessed the type of care provided amongst abortion care, ultrasound care, and prenatal care. The third metric considered papers studying different population types such as high-risk patients or patients in low-resource geographic regions. Overall, these metrics showed how telehealth can be utilized successfully in improving access to healthcare to prenatal care for diverse patient populations.

Future Implications

This research is relevant for healthcare providers and professionals who are providing obstetric and prenatal care. Information can be used to help implement or redesign perinatal care models that utilize telemedicine to effectively deliver care such as the protocol designed by the University of Michigan healthcare system.[1] Additionally, studying access, care, and population-based perspectives helps researchers and physicians better understand and consider the adverse impacts of telehealth implementation. While telehealth can improve accessibility to care, if existing social inequities aren't considered, more barriers can arise to accessing telemedicine.

Table 1: Literature Review Study Information

Authors	Study Type	Sample Size (n)	Access	Care/ Outcome	Vulnerable Populations
Tian et al.	Multicenter randomized controlled trial	309	Health education and monitoring	Prenatal Care	Women with Gestational Diabetes Mellitus (high-risk)
Peahl et al.	Study Design	-	Hybrid model design	Prenatal Care	-
Escobar et al.	Ecological Study	250	Overcome geographical barriers	Obstetric Emergent Care	Pregnant Women with Obstetric Emergencies (high-risk) in a low-resource region
Morgan et al.	Electronic Survey	164	Overcome geographical barriers	Prenatal Care	Pregnant women in rural communities
Gao et al.	Retrospective Study	4500	-	Prenatal Care	-
Sullivan et al.	Telehealth Assessment	-	Improve access for maternal telehealth services	Prenatal care	High-risk pregnancy patients
Aziz et al.	Adaptations to prenatal care after Covid-19	-	-	Prenatal care and ultrasound adaptations	-
Duryea et al.	Cohort Study	12,607	-	Prenatal Care	Vulnerable obstetric population
Avercenc et al.	Single center quasi-experimental (non-randomized)	107	-	Prenatal Care	Low-risk pregnant women in France
Farrell et al.	Patient Interview Qualitative Assessment	254	-	Prenatal Care	-

Table 1: Literature Review Study Information (Continued)

Authors	Study Type	Sample Size (n)	Access	Care/ Outcome	Vulnerable Populations
Reneker et al.	Retrospective Cohort Study	1894	-	Prenatal Care	-
Futterman et al.	Cross Sectional Survey	140	-	Prenatal Care	Primarily Hispanic patients
Craighead et al	COPE-IS Survey	60	Overcoming Barriers	Prenatal Care	
Marshall et al.	Cross Sectional Survey	1978	-	Prenatal and Postpartum Care	
Nakagawa et al.	Retrospective, Single Institution Study	44		Prenatal Care	Pregnant women at risk for underlying disorder or fetal abnormality
Smith et al.	Retrospective Study	297	-	Ultrasound	-
Kerestes et al.	Retrospective Cohort Study	334	-	Abortion	-
Jeganathan et al	Survey	124	-	-	High-risk obstetrical care
Murthy et al.	Pseudo-randomized controlled trial (single blind)	2016	-	-	Low-income women in India

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