

Telemedicine and Digital Health in Maternal and Family Healthcare: Transforming Patient-Centered Care

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ABSTRACT: The use of telemedicine and digital health technologies is a rapidly changing landscape that has transformed the delivery of maternal and family health services, especially since the onset of the COVID-19 pandemic and is supported by the increasing clinical evidence of its benefits, cost-effectiveness, and acceptability to patients. A review of literature published from 2020 to 2025 on the use of telemedicine, mobile health (mHealth), remote monitoring or virtual referral systems for the maternal and family-care continuum (antenatal, postnatal care, postpartum mental health, paediatric follow-up, and primary/family medicine). Three themes are explored in this review, using peer-reviewed evidence from BMC, JMIR, Frontiers, MDPI, Elsevier, and Nature-portfolio journals: (i) Telehealth-delivered antenatal and perinatal care and maternal and neonatal

outcomes; (ii) The role of remote monitoring, mHealth applications, and telehealth-delivered postpartum mental health support in extending patient-centred surveillance beyond the clinic; (iii) Equity and access, and Workforce-competency considerations that can drive either an expansion or narrowing of disparities in family and primary care. The evidence suggests that telemedicine can contribute to a reduction in missed antenatal visits, the timely referral of mothers in low-resource areas, extend mental health services to postpartum women, and enhance access to family and primary care, but may also risk worsening existing disparities when issues of broadband connectivity, digital literacy, and reimbursement are not addressed. Three comparative tables summarise antenatal/perinatal telehealth outcomes studies, remote-monitoring and mHealth interventions, and equity/family-medicine telehealth evidence; and three authors' conceptual figures are suggested to visualise the maternal-family telehealth care continuum, the remote antenatal monitoring and escalation pathway, and a digital health equity framework. The review also finds that deliberate investment in connectivity, maternal and family telehealth competencies among the healthcare workforce, and reimbursement policy is needed to achieve patient-centred, equitable maternal and family telehealth, with ongoing clinical evaluation.

Keywords: *Telemedicine, Digital health, Maternal health, Family medicine, mHealth, Telehealth equity, Patient-centred care.*

1. Introduction

Continuity of care is essential for maternal and family health services from pregnancy through childbirth, postpartum, infancy and primary care. Barriers to this continuity have been increasingly reduced by the introduction of telemedicine and digital health technologies, which allow patients to consult, monitor their condition and be referred to specialists from a distance, a process that has been accelerated over the past few years during the COVID-19 pandemic as face-to-face visits became limited and health systems moved quickly to create new offerings using video, phone and mobile apps [1,2]. It was started in the great majority because of the COVID-19 pandemic and has since become a scientifically supported element of maternal and family health care service provision: systematic reviews have shown that it has significant impacts on attendance, referral timeliness and mental health outcomes [3,4].

This change has been unevenly distributed along the maternal-family care continuum. Telehealth in antenatal and perinatal health has been assessed mainly for its impact on attendance at care visits, on the health of mothers and neonates, and on referrals to specialist health care [4,5]. In mental health, specifically postpartum and family mental health, the delivery of evidence-based psychological interventions (EBPIs) has been examined as a mode of delivery for telehealth [3]. With respect to the family and primary care more generally, telehealth has been assessed less on its clinical outcomes and more on its equity implications, particularly the fact that there are documented concerns that digital-first care could benefit the already well-connected, who have the devices and digital skills to access care, while simultaneously leaving behind those who do not [1,2,6]. This review combines these three elements and attempts to answer one patient-centred question: what impact does the combination of telemedicine and digital health have on the delivery of maternal and family health services, and when is this positive, and when is it negative, for health equity?

In particular, this review focuses on three questions: (1) What is the evidence for telehealth delivered antenatal and perinatal care regarding maternal and neonatal outcomes and the effectiveness of referrals? (2) How are remote monitoring and mHealth applications such as telehealth delivered postpartum mental health services leveraged to further patient centred monitoring beyond scheduled clinic visits? (3) What are the equity, access, and workforce competency considerations in relation to digital health that help or hinder to reduce inequalities in family and primary healthcare?

2. Review Methodology

This narrative review aims to consolidate peer-reviewed literature published in the last 6 years (2020-2025) in the PubMed/MEDLINE, BMC, JMIR, Frontiers, MDPI, ScienceDirect (Elsevier), and Nature-portfolio journals. The search terms were used in the title, abstract, and keywords to look for combinations of "telemedicine", "telehealth", "digital health", "mHealth", "maternal health", "antenatal care", "postpartum depression", "family medicine", "primary care", "health equity", and "remote monitoring". To ensure traceability of citations, only studies published in peer-reviewed indexed journals with a verifiable digital object identifier (DOI) and only systematic reviews, meta-analyses, and empirically validated intervention studies were included.

3. Telehealth-Delivered Antenatal and Perinatal Care

Ante- and perinatal health care is the most widely researched area of maternal telehealth. A 2023 systematic review of telehealth in the antenatal period reported a transition from telehealth as a substitute for face-to-face visits to a hybrid approach, where selected visits, such as routine follow-up and low-risk monitoring, were done remotely and higher risk visits in person, and where attendance did not decrease despite the use of telehealth and service detection of complications was maintained or improved.[5] Comparative assessments of prenatal care prior to and during COVID-19 also find that, when prenatal care services were restricted by the pandemic, continuity of care was also maintained with obstetric management patterns being largely similar across modalities [4]. In a hybrid model of ANC used during the pandemic in Colombia, the use of telemedicine ANC was found to have the lowest risk profile for perinatal outcomes compared to fully in-person methods in the same health system, indicating that a hybrid model may be best with regards to outcomes [7].

Apart from high income and upper middle-income countries, the use of mHealth in antenatal care has proven to be of great value in LMICs, with a systematic review and meta-analysis demonstrating that women with mHealth-supported antenatal monitoring were significantly more likely to attend scheduled antenatal care visits than those without mHealth alone [8]. In addition to clinical-outcome evidence, an economic systematic review of mHealth interventions in pregnancy was also conducted, and, when full economic evaluations were available mHealth interventions were consistently reported as cost-effective, albeit the evidence base was limited due to the heterogeneity in the costing methodology used [9]. A 10-year review of the scoping of pregnancy-related telehealth interventions in the United States also documents this trend of expansion and fragmentation, identifying a diversity of interventions from prenatal routine follow-up to high-risk pregnancy monitoring to programmes to facilitate access to services for rural populations and highlighting the relative under-evaluation of provider-level outcomes compared to patient-level outcomes [10]. Figure 1 presents the Telemedicine Across the Maternal-Family Care Continuum. Table 1 gives the Selected Evidence on Telehealth-Delivered Antenatal and Perinatal Care 2020-2025.



Figure 1. Telemedicine and digital health across the maternal-family care continuum, from preconception and antenatal care through postpartum mental health support, paediatric follow-up, and ongoing family/primary care.

Sources: Adapted from references [1,2,5,7].

Table 1. Selected Evidence on Telehealth-Delivered Antenatal and Perinatal Care (2020-2025)

Study Focus	Setting/Population	Telehealth Modality	Key Reported Outcome	Ref.
Hybrid antenatal telehealth model	General antenatal population, high-income setting	Mixed video/in-person follow-up	Maintained attendance and complication detection under hybrid model	[5]
Pre- vs pandemic prenatal telehealth	Mississippi, USA obstetric population	Telephone/video prenatal visits	Comparable obstetric management maintained across pandemic transition	[4]
Mixed antenatal care with telemedicine	Southwestern Colombia, COVID-19 period	Mixed telemedicine/in-person antenatal care	Improved perinatal outcomes versus fully in-person care	[7]
mHealth antenatal monitoring in LMICs	Pregnant women, low- and middle-income countries	SMS/mobile-app-supported ANC monitoring	Significantly higher antenatal check-up attendance (RR = 1.66)	[8]
Cost-effectiveness of mHealth in pregnancy	Pregnant women, multiple high-income settings	Various mHealth applications	mHealth interventions consistently reported cost-effective were evaluated	[9]
10-year US telehealth scoping review	Pregnancy-related telehealth, USA (2013-2023)	Multiple (video, remote monitoring, apps)	Growth and diversification of applications; provider outcomes under-studied	[10]

4. Remote Monitoring, Mhealth, and Telehealth-Delivered Postpartum Mental Health Support

In addition to scheduled antenatal consultation, digital health is becoming more prevalent in order to reach the patient's home environment. Late pregnancy feasibility and patient acceptability studies have been performed with wearable foetal electrocardiogram (wFECG) monitors, wearable sensors, and with non-invasive remote monitoring devices,

and generally favourable comfort and satisfaction scores and high patient interest in continuous and home-based foetal monitoring have been reported, with a need highlighted for smaller and more discreet device designs [11]. These are some indications of the growing willingness of pregnant patients to receive non-clinic-based monitoring throughout their pregnancy, in addition to the visit-based models of telehealth that are discussed in Section 3.

Telehealth has also been intensively studied as a way of providing postpartum mental health services. Systematic review and meta-analysis of RCTs showed that interventions delivered via telehealth for PPD showed significantly lower scores than control condition for both depressive and anxiety symptom scores, so offering an effective and more accessible alternative to face-to-face perinatal mental health services [3]. Digital referral and triage systems have shortened a related but different process: mobile-technology-based obstetric referral systems, such as a structured mobile referral system and a WhatsApp-based triage and transfer system that was tested in rural Liberia, have been shown to enhance the timing, organization, and documentation of emergency obstetric referrals among frontline health workers, filling a critical gap between remote antenatal monitoring and access to higher-level emergency obstetric care [12,13]. Figure 2 presents the Remote antenatal/perinatal monitoring and escalation pathway. While Table 2 shows the Remote-Monitoring and mHealth Interventions Supporting Maternal and Family Care.

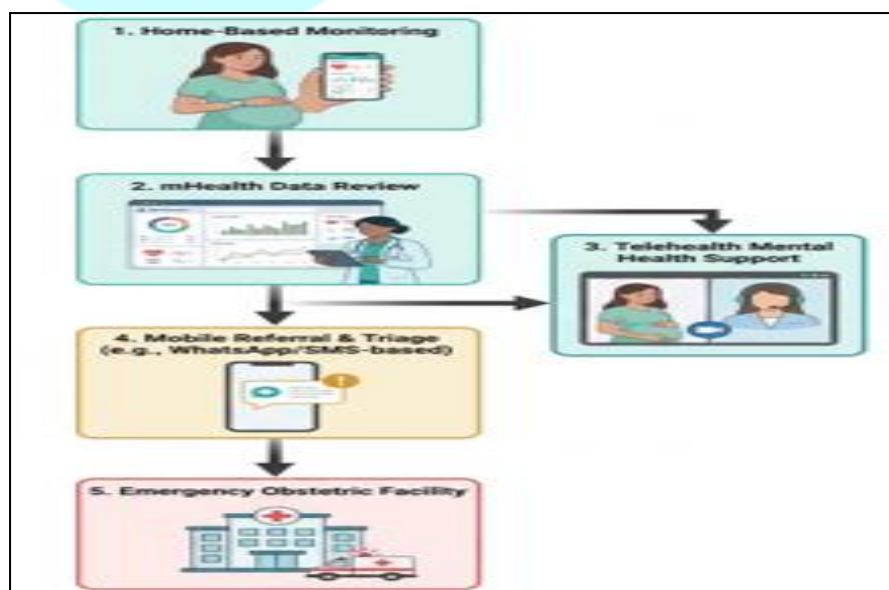


Figure 2. Remote antenatal/perinatal monitoring and escalation pathway, showing home-based mHealth and wearable data capture, telehealth-delivered mental health support, and mobile referral/triage escalation to emergency obstetric care.

Sources: Adapted from references [3,11,12,13].

Table 2. Remote-Monitoring and mHealth Interventions Supporting Maternal and Family Care

Intervention Type	Technology/Modality	Target Population	Reported Benefit	Ref.
Wearable foetal ECG monitoring	Non-invasive wearable ECG device	Pregnant women, late gestation (36+ weeks)	High patient interest and satisfaction with continuous home monitoring	[11]
Telehealth-delivered postpartum mental health care	Video/telephone-delivered psychological interventions	Women with postpartum depression/anxiety	Significant reduction in EPDS and anxiety scores vs control	[3]
Mobile obstetric referral system (MORES)	Structured mobile-technology referral platform	Health workers, rural Liberia	Improved structure and quality of emergency obstetric referrals	[13]
WhatsApp-based obstetric triage/transfer	Messaging-app-based triage and transfer coordination	Obstetric patients, rural Liberia	Improved acceptability and coordination of emergency transfers	[12]

5. Equity, Access, and Workforce Competency in Family Telehealth

Structural factors outside of the technology are crucial to determining whether telemedicine enhances or detracts from patient centred, equitable family healthcare. Initial studies from the family medicine sector found broadband access problems and the lack of standardised reimbursement for telehealth as important impediments to continued equitable telehealth expansion beyond the acute phase of the pandemic and the potential for telehealth to increase access for populations that had not kept up regular engagement in primary care previously [1,2]. These equity concerns have also been supported by empirical evidence; a retrospective cohort study of primary care visits in 46 practices revealed ongoing and changing inequities in the use of telehealth and in-person visits during the initial year of the COVID-19 pandemic, suggesting that the transition to telehealth was not equally effective for all patient groups and in some analyses, increased existing disparities in access [6].

Another often overlooked factor for equitable and effective family telehealth is provider readiness. A scoping review of competency in telehealth identified that formal training in virtual communication, remote physical assessment, and technology use is important to the quality and safety of care delivered via telehealth and recommended that formal competency in telehealth should be added to medical education and continuing professional development, rather than be a skill acquired solely through practice [14].

Combined with the equity results discussed above, this literature indicates that there are three levers to consider for patient-centred transformation in family telehealth paradigms: infrastructure and reimbursement policy, workforce training, and continuous monitoring of who is thriving and who is not in a digital-first-care paradigm. [1,2,6,14]. Figure 3 presents the Digital health equity framework for family and maternal telehealth. Table 3 shows the Equity and Workforce-Competency Evidence in Family and Primary Care Telehealth.

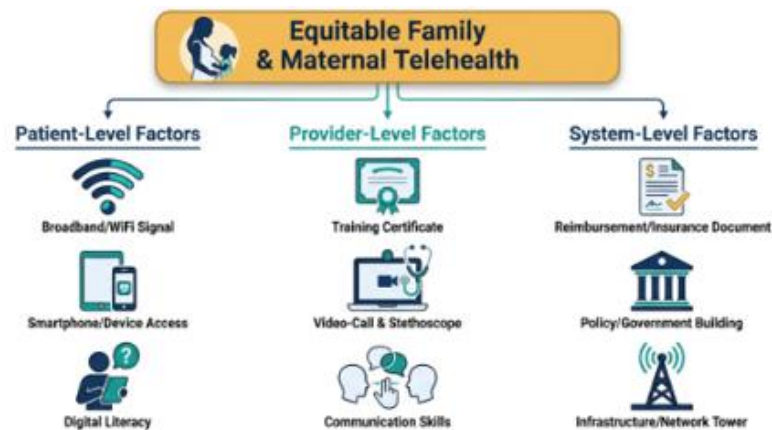


Figure 3. Digital health equity framework for family and maternal telehealth, showing patient-level (connectivity, digital literacy), provider-level (telehealth competency and training), and system-level (reimbursement and infrastructure policy) determinants of equitable access

Sources: Adapted from references [1,2,6,14].

Table 3. Equity and Workforce-Competency Evidence in Family and Primary Care Telehealth

Determinant Category	Key Finding	Study Design/Setting	Implication for Practice	Ref.
Connectivity and reimbursement barriers	Inconsistent broadband access and lack of standardised reimbursement limit sustained equitable telehealth	Commentary, US family medicine practice	Policy investment needed in broadband access and reimbursement parity	[1,2]
Persistent sociodemographic disparities	Telehealth vs in-person visit-use disparities persisted and evolved across pandemic year 2020	Retrospective cohort, 46 US primary care practices	Ongoing disparity monitoring needed as telehealth use stabilises	[6]
Provider telehealth competency	Structured training in virtual communication/remote assessment improves telehealth care quality	Scoping review, multiple settings	Telehealth competency should be embedded in medical education/CPD	[14]

6. Discussion and Future Directions

From this review three cross-cutting observations arise. First, evidence in favour of hybrid models is greater than for fully-remote models: hybrid antenatal telehealth and hybrid or mixed-modality perinatal care, with maintained or improved outcomes, while more limited and context-dependent evidence exists for fully-remote substitution [5,7]. Secondly, efforts to move beyond the visit-based model for patient monitoring that has been assessed in most antenatal telehealth studies have been paralleled by investments in referral and escalation pathways, such as mobile obstetric referral system in rural, low-resource communities [11,12,13]. Third and most importantly for patient-centred care, the equity evidence suggests that digital health transformation is not inherently equitable; if it is not intentionally designed to eliminate and/or reduce disparities in family and maternal health care access, the expansion of telehealth could exacerbate disparities, rather than narrowing them, as noted [6,14].

Future research and practice should focus on: (i) doing comparative evaluations between hybrid and fully-remote models of antenatal and family-care, rather than comparing between telehealth and no-telehealth alone, and across diverse health-system settings; (ii) connecting the remote-monitoring data to a structured referral and escalation system, especially in low-resource settings where the value of the monitoring relies on what can be done with the information; (iii) formalizing the inclusion of telehealth competency training within medical and midwifery education; and (iv) sustaining, disaggregated monitoring of telehealth access and outcomes by sociodemographic group so that patient-centred digital transformation benefits all families, and the one that does not necessarily benefits those who already have digital advantage. [15,16]

7. Conclusion

Telemedicine and digital health have significantly transformed maternal and family health service delivery, resulting in higher antenatal attendance, postnatal mental health services, remote physiological monitoring, and improved referrals for obstetric care, especially in low-resource areas. This transformation is truly patient-centred only if it intentionally considers equity: access to broadband and devices, reimbursement policies for telehealth, and provider training in telehealth skills. The information presented here indicates that a

hybrid care model, which leverages the benefits of digital health with the security of face-to-face evaluation and referral, is currently the best model for achieving clinical benefit and equity of access to maternal and family health services and should inform future steps toward integrating telemedicine into the healthcare system.

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