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Review article

Exploring the impact of integrating telehealth in obstetric care: A scoping review

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ABSTRACT

Background: The use of telemedicine has spread to all areas of medicine, including obstetrics, over the last few decades.
Objective: To identify and map the diversity and applicability of telemedicine in the obstetric literature, in the antenatal, intrapartum or postnatal period. To assess patient satisfaction and possible areas for future development.
Methods: This scoping review was conducted following the Joanna Briggs Institute (JBI) methodological guidelines for scoping reviews and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and its extension for scoping reviews (PRISMA-ScR). We searched the databases PubMed (Medline), CINAHL, CENTRAL (Cochrane Library), EMBASE Ovid and Scopus. We also searched Google Scholar, clinicaltrial.gov, the WHO International Clinical Trials Registry Platform (ICTRP-WHO) and the reference lists of the included studies. We included any primary study design that focused on a population of women in the antenatal, intrapartum or postnatal period. Studies selection and data extraction were performed blindly and independently by two authors. We summarised the results narratively and used graphs and tables to present key concepts thematically.
Results: We included 66 studies. We categorised the studies according to population, type of intervention, outcomes and user satisfaction. Most of the studies involved pathological (36%) and physiological (30%) pregnancy management, the type of intervention was mainly divided into televisits or video calls with professionals (43%) and the use of specific apps or devices (40%). The maternal outcomes studied were mainly quantitative, i.e., improvement in blood chemistry tests or vital parameters (65%) and treatment adherence (frequency of follow-up visits or keeping appointments, 27%). Patient satisfaction was positive in the majority of cases.
Conclusions: There is still little international agreement on the concept and possible applications of telemedicine in obstetrics, although it is increasingly being used in clinical practice. Studies have shown positive results in terms of improved care, particularly in terms of treatment adherence and as an alternative strategy in the management of pregnancy, postpartum and abortion care. Both patients and health professionals were satisfied with it, especially when offered as a complement or alternative to the traditional method of face-to-face visits. Future developments seem to be the time and cost-saving potential of telemedicine and its application to couples' infertility.

Abbreviations: WHO, World Health Organisation; ACOG, American College of Obstetricians and Gynecologists; ACNM, American College of Nurse-Midwives; JBI, Joanna Briggs Institute; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; PRISMA-ScR, Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews; RCT, randomised controlled trial; NRCT, nonrandomised controlled trial.

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Introduction

Telemedicine, defined by the World Health Organization (WHO) in 1997 as "the provision of health services where distance is a critical factor and where it is necessary for practitioners to use information and communication technologies to exchange information useful in the diagnosis, treatment, and prevention of diseases" [1], has garnered significant global attention in recent years. This form of healthcare has permeated various branches of medical science, demonstrating its versatility and effectiveness [2]. Obstetrics, in particular, has seen significant integration of telemedicine over the past 15 years [3–8]. The advent of the COVID-19 pandemic has further accelerated the adoption and use of telemedicine, resulting in exponential growth and innovative applications within obstetric care [9].

Telemedicine has been highly valued by users, with both patients and healthcare providers expressing a willingness to continue its use beyond the COVID-19 pandemic [10,11]. In obstetrics, telemedicine has made a significant contribution to women's empowerment in pregnancy management, enabling them to address their own needs through the simplicity, speed and anonymity of connectivity [12].

The applications of teleobstetrics are diverse, including specialised support for ultrasound examinations in both store-and-forward and real-time formats, which is beneficial for rare and serious conditions [13]. In addition, these technologies play a critical role in addressing rural–urban health disparities by improving access to specialists and facilitating home monitoring of vital signs, thereby reducing transportation barriers [14,15]. During the postpartum period, telemedicine is critical for maintaining physiological health by facilitating communication between new parents and paediatric and gynaecological specialists, which is often hindered by distance and the challenges associated with travelling with a newborn [16].

Although there is currently no clear evidence and further research is needed, preliminary evidence suggests that telemedicine in midwifery is cost-effective and beneficial, depending on the type of services offered and the digital literacy of patients [17]. The potential of teleobstetrics is inextricably linked to the global dissemination of the necessary devices to bridge the gap between technical capabilities and user needs. The obstetric population, which tends to be young, tech-savvy and often digital natives, is particularly well suited to adopting these telematic and technological solutions [18].

The scientific literature reflects a global interest in the use and effectiveness of telemedicine tools in obstetrics, underscoring the need for healthcare systems worldwide to establish and maintain integrated policies that provide comprehensive primary care services during pregnancy [19,20]. This is essential to reduce the risk of adverse maternal and fetal outcomes [21]. Adopting new approaches, such as teleconsultation, is crucial to modernising healthcare. However, the expanding field of telemedicine poses challenges in synthesising research due to its breadth [22].

Both the American College of Obstetricians and Gynaecologists (ACOG) and the American College of Nurse-Midwives (ACNM) state that the significant impact of telemedicine in obstetric care should be guided by patient preference and access, with appropriate informed consent. These technologies are seen as tools to augment rather than replace the current standard of care [23,24].

The objectives of this scoping review are to identify and map the different telehealth interventions described in the obstetric literature, to assess patient satisfaction with the use of telehealth technologies in obstetrics, and to identify areas that remain unaddressed or show promise for further investigation.

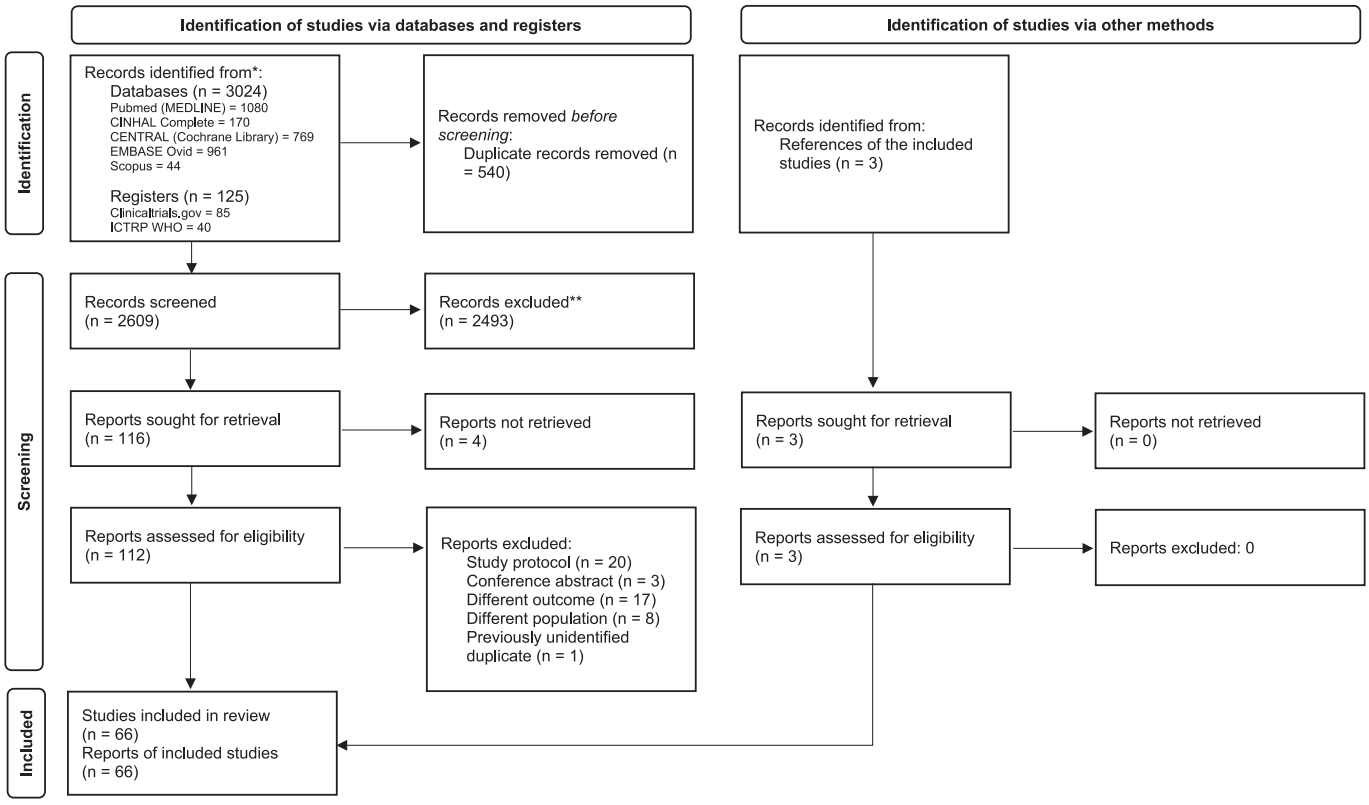

Fig. 1. *Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers). **If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools. From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. https://doi.org/10.1136/bmj.n71.

Material and methods

We conducted this scoping review following the Joanna Briggs Institute (JBI) methodological guidelines for scoping reviews and reported it in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and its extension for scoping reviews (PRISMA-ScR) [25–28]. The study protocol was registered online on the Open Science Framework on 14 June 2024 [29].

Eligibility criteria

We selected eligible articles for inclusion if they met the following population, concept and context (PCC) criteria:

- Study design: any primary study design. Reviews, editorials, expert opinions and conference abstracts were excluded.
- Participants: women in the antenatal, intrapartum or postnatal period.
- Concept: any study investigating and reporting on telehealth interventions in obstetric care, any study investigating and reporting on maternal or neonatal outcomes or patient satisfaction in relation to telehealth interventions.
- Context: any context.

Information sources

We searched the literature in the following databases: PubMed (Medline), CINAHL, CENTRAL (Cochrane Library), EMBASE Ovid and Scopus. See the search strategy for each database in Appendix A. We also searched Google Scholar, clinicaltrial.gov, the WHO International Clinical Trials Registry Platform (ICTRP-WHO) and the reference lists of all identified studies. We included English-language articles with no geographical, temporal or setting restrictions.

Selection of sources of evidence

Rayyan online software was used to detect and eliminate duplicate records and to select eligible studies [30]. Two authors blindly screened the articles by title and abstract and then by full text. Disagreements were resolved by a third author. We reported the number of retrieved studies and the number of included and excluded articles at each step in the results section, using the PRISMA 2020 flowchart (Fig. 1) [27]. The reasons for excluding full-text sources are given in Appendix B.

Data charting process

Two blinded reviewers independently extracted data using a standard Excel spreadsheet following the PCC model, which included specific details about the study author, publication year, study design, country, participant demographics and setting, details of the telehealth intervention, maternal and neonatal outcomes, and patient satisfaction measures.

Synthesis of results

We summarised the results narratively and used tables to present the main concepts thematically. We grouped the studies according to population characteristics and the type of telehealth intervention analysed, and we summarised the type of setting, study design and clinical outcomes for each group.

Results

Selection process

We found 3149 records from the databases, from which 540 duplicates were removed. We screened 2609 records and included 63 full-text reports. In addition, we identified 3 reports from the references of the included studies, for a total of 66 included studies. See the flowchart of the selection process in Fig. 1, the reasons for exclusion in Appendix B and the citations of the included studies in Appendix C.

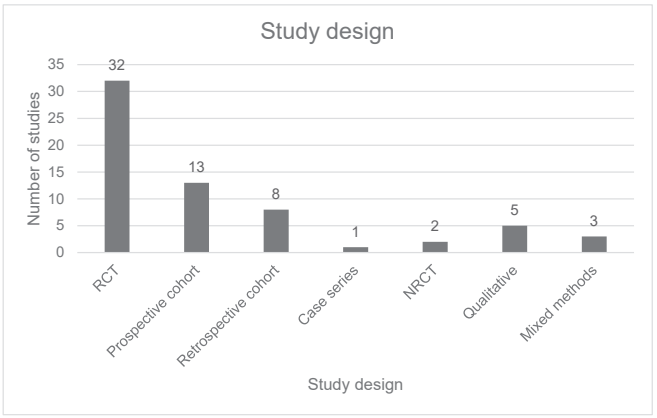

Fig. 2. Distribution of included studies by study design.

Characteristics of the individual studies

The included studies design was 32 randomised controlled trial [3,4,7,31–59], 24 observational studies [5,8,60–81], 2 non-randomised controlled trial[53,82], 5 qualitative studies [83–87] and 3 mixed methods studies [6,88,89] (Fig. 2).

The studies were conducted worldwide, but most of them were in North American [3,5,7,8,33,34,36,37,41,42,48,53,55,56,60–63,68,70–72,75,79,81–84,86–90] and Europe [31,35,38,43,45,64,67,69,74,76,78,80,85,87] (Appendix D and E).

The population consists mainly of women with a pathological pregnancy: most commonly gestational diabetes and obesity or excessive weight gain [7,31,36–39,43,44,46,47,53,54,69,72,74,91], but also hypertension or pre-eclampsia [3,41,90] and fetal abnormalities [62,67]. The other studies were conducted in populations with low-risk pregnancies [4,5,33–35,41,42,49,58–60,66,71,73,77,78,84,85,88,89], in women with emotional fragility or psychiatric disorders [48,56,82,83], in postpartum women [55,65,70,79] and in women requiring medical abortion[50,51,63,76]. The review included studies proposing the use of telemedicine for infertility and contraception, pregnant women with socioeconomic difficulties or previous obstetric bereavement. The characteristics of the included studies are presented in graphs in Appendix D and in a table in Appendix E.

Telemedicine interventions

The scoping review identified two main types of telemedicine interventions: telehealth consultations via video calls that directly connect patients and practitioners [6–8,34,37,47,48,51,58,60,61,63–65,70,71,76–79,81–85,87–89], and specific applications for monitoring health parameters. The latter included tools for recording blood glucose [3], blood pressure [3,5,31,50,80], fetal heart rate [5], weight and physical activity, often supplemented by targeted feedback [36,38,74]. Some studies integrated these tools with clinic feedback systems to provide timely responses to patients. Six studies used telemedicine to supplement traditional face-to-face visits [33,56,62,72,73,90].

Other interventions included antenatal screening videos [35], information on medical abortion [86], mobile clinic interventions for rural patient transfer [66], and remote diagnostic assessment using transmitted ultrasound and video reports for suspected fetal abnormalities [67]. The comparison group in most studies was traditional care or a mix of e-visits and traditional methods. See Fig. 3 for the categories of

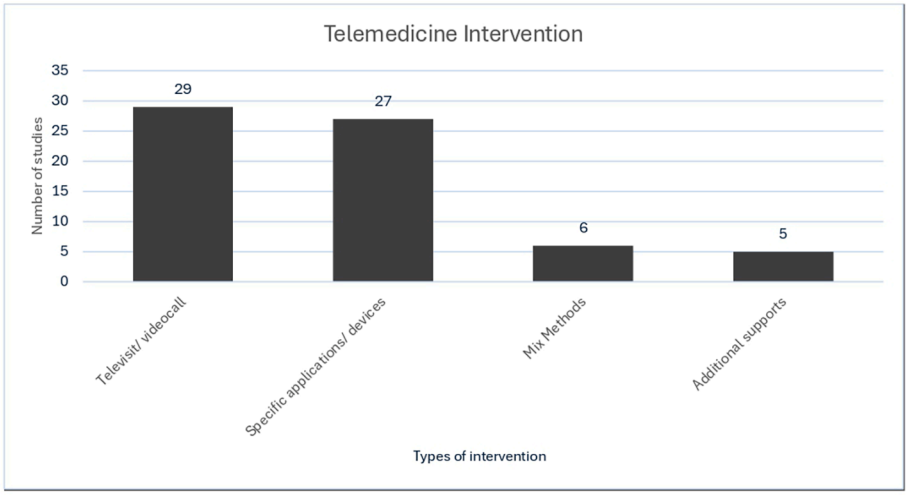

Fig. 3. Distribution of included studies for the considered telemedicine intervention.

interventions, which are reported in detail in Appendix F.

Maternal outcomes

Key maternal outcomes assessed included perceived quality of care, adherence to care plans, cost reduction, time savings, effective communication between providers and quantitative health improvements. These health improvements were mostly measured in terms of blood pressure, blood glucose levels, weight gain, hospitalisation rates, risk of postpartum depression, metabolic measures, adverse obstetric outcomes, and maternal morbidity and comorbidity.

The most commonly investigated topics were maternal weight gain and gestational diabetes, which were addressed in about half of the studies [5,7,31,36–41,43,44,46–49,54–57,67–70,74–77,80,81,90,91]. For example, Chao et al. evaluated weekly diet calls from 16 to 36 weeks' gestation and assessed weight gain during pregnancy and six weeks postpartum [34]. Kennelly et al instead focused on the incidence of gestational diabetes in overweight women using a nutrition and exercise support app [38].

Therapeutic adherence was another key outcome, assessed by metrics such as frequency of blood pressure monitoring in hypertensive patients and rates of appointment postponement and cancellation [3,61]. Overall, telemedicine interventions have shown positive results, particularly in improving adherence and pregnancy monitoring, especially in regions with long travel distances to healthcare centres, thereby reducing self-perceived stress [33].

Remote medical management of abortion has been positively received in terms of convenience, privacy and reduced stigma [51], and the effectiveness of non-surgical abortion has also been supported because of the speed of the proposed treatment [63]. Some studies have aimed to complement traditional visits with additional educational resources on pregnancy and health improvement strategies: this mixed modality succeeds in providing women with a higher quality and quantity of information, increasing their knowledge and empowerment [35].

Two studies investigated the use of teleconsultation support in early labour to improve management of labour at home and reduce early hospitalisation, showing maternal satisfaction when the technology was easy to use [85] and positive feedback from midwives about the use of visual cues to improve assessment and confidence [87]. Teleconsultation also facilitated specialist consultations, improving access to necessary care [64,66]. The study by Katharaki et al. highlighted a reduction in hospital bed use and staffing requirements through better integration of remote and central health services [78].

See the categories of the main maternal outcomes in Appendix D and the details of each study in Appendix F.

Neonatal outcomes

Most studies did not assess fetal and neonatal outcomes. Among those who did it [4,5,31,33,34,38–40,42,44–46,57–59,62,66,67,69,74–76,80–82], outcomes were generally unchanged with telemedicine intervention, demonstrating that telemedicine does not pose a risk to fetal and neonatal health. Only one study reported worse outcomes in terms of the incidence of high-risk pregnancy (244 vs 688, p-value $<$ 0.001), infections (133 vs 399, p-value $<$ 0.001) and neonatal deaths associated with very low birth weight in the telemedicine group, which may have been confounded by the impact of the COVID-19 pandemic on healthcare delivery [81]. See the neonatal outcomes of the included studies in Appendix F.

Patient satisfaction

39 studies focused on patient satisfaction, with 33 reporting positive feedback [3,31,33,39,43–45,47–49,51,53,54,56,57,61–63,65,68–74,76,83,85–88,90], three found no significant differences between the face-to-face and the online consultations [35,60,89] and three showing negative perceptions, particularly during the COVID-19 pandemic [6,8,84]. The issues raised included feelings of abandonment and a preference for face-to-face visits. See the categories of the main patient satisfaction outcomes in Appendix D and the details of each study in Appendix F.

Discussion

Principal results

This scoping review aimed to systematically map the landscape of telehealth interventions in obstetrics and uncovered a wide range of applications. The most common interventions included video calls and teleconsultations, which facilitate direct communication between patients and healthcare providers or specialists. These tools were often used to supplement traditional face-to-face visits or to remotely monitor health indicators that may signal obstetric complications. Mobile device applications specialising in pregnancy monitoring have also had a major influence. In this case, although their adherence to the definition of telemedicine is controversial, several researchers have pointed out how the absolute usability of this tool invests it with an unrepeatable potential for all those contexts in which the lifestyle adopted by the pregnant woman proves to be the needle in the balance of the health

outcomes of the pregnancy itself. These technologies have shown potential for improving maternal health outcomes, although the improvements are often modest and context dependent. Another theme identified is the perceptions of users – both patients and healthcare professionals – of digital health technologies and their willingness to adopt these tools. The overall sentiment across studies was that patients, their families and healthcare professionals are overwhelmingly positive. While some studies highlighted privacy concerns, these are generally effectively addressed through the implementation of secure platforms and clear communication of privacy policies. A preference for a mixed modality approach – combining digital tools with traditional methods – was consistently observed among users. This preference persists despite a small proportion of respondents reporting a perceived sense of distance from healthcare providers. However, perceived distance is significantly outweighed by the benefits of these technologies, including improved accessibility, adaptability, convenience and safety.

The positive feedback is particularly strong in specific contexts. For instance, women who face challenges in accessing antenatal care due to long distances or lack of transport, or in scenarios where rapid response to health inquiries is critical, have found significant benefits in these technologies. Cases of 'patient activation' and subsequent community empowerment have also been reported, particularly in neonatal care and self-care practices. This includes cases involving women at risk of postpartum depression, where the availability of a direct line of communication to health professionals is seen as a valuable resource that contributes to better health outcomes in sensitive situations.

Limitations

This scoping review, although comprehensive, has some methodological limitations. First, despite a broad search strategy covering multiple databases and other literature sources, the inclusion of English-only articles may have resulted in the exclusion of relevant studies published in other languages. Secondly, the review focused exclusively on primary studies, excluding reviews, editorials, expert opinions and conference abstracts. While this approach ensures that the findings are based on original data, it may also exclude valuable insights and comprehensive syntheses of existing evidence that could provide a wider understanding of telehealth applications in obstetrics.

In addition, the review highlighted several limitations inherent in the current research environment. A key issue is the lack of a standardised definition and framework for telehealth in obstetrics, leading to variability in how studies categorise and evaluate these interventions. In addition, while the majority of research focuses on maternal outcomes, there is a notable lack of data on fetal and neonatal outcomes. This gap suggests that while telemedicine is increasingly being used for maternal health monitoring and management, its impact on fetal and neonatal well-being is not as well understood. A further limitation is the under-researched area of cost and time savings from the provider's perspective, which is crucial for evaluating the wider economic viability of telemedicine.

Comparison with prior work

To the authors' knowledge, this is the first scoping review to comprehensively address the use of telemedicine in different areas of obstetrics. The literature includes two scoping reviews of telemedicine models in obstetrics specific to the COVID-19 period [92,93]. However, these reviews identified significantly fewer studies than the present review and provided a partial perspective limited to the pandemic context.

The findings of this review are consistent with those from other areas of research that emphasise the benefits of telemedicine in improving patient engagement, accessibility and continuity of care, particularly in underserved areas [94–98]. This review builds on these findings by highlighting specific obstetric contexts where telemedicine is particularly beneficial, such as the management of gestational diabetes or support for early assessment of labour [7,31,37,44–47,69,85].

Conclusions

Telemedicine represents a promising tool in obstetrics, offering benefits such as increased convenience, potential cost savings and improved patient adherence to care protocols. Despite these benefits, the review highlights the importance of establishing clear definitions and guidelines for telemedicine in obstetrics in order to realise its full potential and integrate it seamlessly into healthcare systems worldwide. The positive feedback from both patients and healthcare providers indicates a strong foundation on which to build, but further research is needed to realise the true potential of telehealth in this field. In addition, the future development of telehealth technologies appears to hold significant promise in terms of time and cost savings, although these aspects have not been extensively explored or quantified from both the user and provider perspectives. In an era of constrained economic resources in healthcare, the use of blended telemedicine modalities can be a highly effective solution. Such an approach can efficiently deliver high quality services and ensure rapid and universal access to healthcare, particularly in underserved areas.

Future studies should focus on exploring the effectiveness of telemedicine in less studied areas, such as infertility treatment, and assessing its impact on fetal and neonatal outcomes. Filling these gaps will not only improve our understanding of the role of telemedicine in obstetrics, but will also support the development of best practices and policies to ensure its optimal use.

Other suggested directions for future research are the use of telemedicine to support the physiological aspects of childbirth, with the aim of supporting women in the prodromal phase at home and determining the optimal time for hospitalisation during active labour, and to support breastfeeding by providing timely advice and recommendations to new mothers.

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Telemedicine is gaining traction in obstetrics. A scoping review of 66 studies shows benefits in pregnancy management, treatment adherence, and patient satisfaction. It's a promising complement to traditional care, with a potential not yet fully explored.

CRediT authorship contribution statement

Tormen Mara: . **Toniolo Barbara:** Writing – original draft, Investigation, Data curation. **Pecci Lucia:** Investigation, Data curation. **Soraci Giulia:** Investigation, Data curation. **Taliento Cristina:** Investigation, Data curation. **Pantaleo Greco:** Supervision, Resources. **Salvioli Stefano:** Supervision, Project administration, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ejogrb.2024.09.031.

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