



## Review Article

# Restructuring maternal services during the covid-19 pandemic: Early results of a scoping review for non-infected women

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## ABSTRACT

**Introduction and objective:** The novel coronavirus outbreak has caused substantial changes in societal norms as well as adjustments in health systems worldwide. To date the impact of these pandemic-related variations has yet to be fully understood also in the field of maternal health for which continuity of care is a proven life-saving preventive measure.

**Design:** Following the PRISMA guidelines for reviews, a literature search was carried out to assess different approaches that combine quality of maternal care with the imposed social-distancing rules. Nine studies were included in the scoping review.

**Findings:** Reduction of in-person visits is the preferred overall solution. Yet, fewer consultations can still guarantee essential services and appropriate care through integration with telemedicine. Referral to epidemic-free community centres is an alternative option and new paths need to include the interdisciplinary contribution of medical consultants and IT experts, among others. In this context, delaying access for symptomatic expectant mothers is still debated since it carries the potential risk of untimely detection of pregnancy complications.

**Key conclusions:** Preliminary experiences provide an overview of the different attempts put in place to reshape health services to contain the pandemic hazards.

**Implications for practice:** These early prototypes may inspire future innovative health solutions compatible with local resources and specific population preferences and needs.

## Introduction

As the novel coronavirus disease (COVID-19) still affects a large proportion of the world population, efforts to limit the spread of infection are progressively put in place introducing changes in the health systems' organization.

Measures adopted to cut patients' exposure to contagious settings have included reducing in-person visits and hospital admissions. Nevertheless, limiting access to health services over time is a sustainable

condition only for a minority of asymptomatic people. There are conditions that imply medical evaluation on a regular basis creating the premises for the spreading of the infection resulting from frequent patient/provider interaction.

Pregnancy is one such condition requiring a regular assessment of the woman's health, involving several clinical and ultrasound examinations whose number varies according to different national guidelines. Scientific evidence has shown that effective prenatal care is associated with a positive childbirth experience and a reduction in perinatal

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mortality (WHO, 2016). Accordingly, antenatal care (ANC) is considered essential to protect foetal-maternal health, through early detection and containment of pregnancy complications.

While the World Health Organization (WHO) recommends a minimum of eight ANC visits during pregnancy (WHO, 2016), each national guideline may propose its own pattern: in the US, women with low-risk pregnancies are advised to undergo an examination every 4 weeks for the first 28 weeks, every 2 weeks until 36 weeks, and weekly thereafter (American Academy of Pediatrics and American College of Obstetricians and Gynecologists, 2012). In Italy, the woman with an uncomplicated pregnancy may be monitored with a minimum of 4 visits and two ultrasound examinations (Istituto superiore di Sanità, 2011).

Presently, the governments' restrictions to avoid viral transmission, often by means of a social distancing strategy, have affected routine access to ANC. On the one hand, the fear of the unknown viral effects on the pregnant woman has caused a lower maternal attendance of prenatal services (Fryer et al., 2020; Reale et al., 2020). On the other hand, health institutions have been compelled to compromise by reducing to a minimum the offer of in-person visits for women with low-risk pregnancies, prioritizing access in case of pregnancy complications (Murphy, 2020). In addition, there is international consensus that supports the adoption of differentiated schedules tailored to the woman's risks and needs (UNFPA, 2020).

In the past months, models of maternal care have been revised worldwide and alternatives combining quality of assistance and personal protection have been proposed. Among these, telemedicine and other 'Clinical Distancing' solutions have been widely adopted and seem promising. Yet, the strategy is not easy to implement and prior studies have already warned about 'a psychosocial disconnection' of the pregnant woman from the health facilities as a dangerous side effect resulting from this approach (Scott et al., 2020). Additionally, any form of forced isolation, from quarantine to lockdown, despite having intrinsic protective purposes, may interfere with women and families' right to care and increase the anxiety that often accompanies pregnancy (Cohen et al., 2020; Montagnoli et al., 2020).

By means of a narrative scoping review, this paper aims to appraise proposed new patterns of ANC, which may find application in present days and in the event of future sanitary emergencies.

## Methods

All human studies published between March and July 2020 reporting maternal care management of non-infected women during COVID-19 pandemic were identified using PubMed, CINAHL and WoS. Cross-referencing in bibliographies of the appraised papers ensured wider study capture.

All potentially eligible studies were reviewed in our initial search which encompassed the following key concepts and related keywords: 'antenatal care', 'pregnancy', 'medical comorbidities', 'therapeutic treatments', 'obstetric ultrasound', 'in-person obstetric visits', 'prenatal consultation', 'antenatal class', 'preconception evaluation', 'antenatal telemedicine', and 'COVID-19'. An exhaustive list of MeSH and non-MeSH terms combined with the Boolean operators 'AND', 'OR' and 'NOT' for the literature research is provided in the appendix (Appendix Table 2).

Inclusion criteria for selected papers were text concerning antenatal management of non-infected pregnant women during the COVID pandemic, availability of full text and English language. In contrast, guidelines and articles reporting maternity care for infected patients were excluded.

### Data extraction instruments and quality assessment

The full text of eligible papers was obtained, and quality assessment of selected studies was performed according to the projected population of interests based on a modified version of the Quality in Prognostic

Studies (QUIPS) checklist (Appendix Table 3) (Hayden et al., 2013). Quality of selected studies was assessed by the principal investigator and reported in Table 1. No primary study was excluded based on the result of the quality assessment, and if necessary, a second reviewer was consulted.

PRISMA Statements tools, i.e. 'Checklist for Systematic reviews and Meta-Analysis items' and 'flowchart template', were used to build the flowchart and to checklist essential items of the current review (Moher et al., 2009).

## Findings

A total of 73 studies were identified. Cross-referencing in bibliographies of the initial selected papers added no other study. After both title and abstract screening, 41 papers were assessed for eligibility. As many as 32 studies were excluded either because they did not meet the specific topic searched for or else due to full text unavailability. In the end, nine studies met the inclusion criteria and were read, analysed, and organized in tables. In the following search-flow diagram the process of identification, screening, eligibility, and inclusion is graphically summarized (Fig. 1).

### Clinical distancing patterns for women with low-risk pregnancies

Since the beginning of the COVID-19 pandemic, a limited number of studies has focused on maternal monitoring adapted to clinical distancing needs. Table 1 presents an overview of different approaches: solutions of ANC in non-infected pregnant women rely mainly on access reduction of in-person visits and implementation of emerging technological options.

In a tentative scheme for expectant mothers with a low-risk pregnancy, most studies suggest combining dating and anatomy scans with clinical observation and blood and urine tests in order to maximally exploit the fewer in-person visits (Murphy, 2020; Peahl et al., 2020; Richens et al., 2020).

A North-American initiative carried out in New York City modified the clinical pattern of ANC, transforming one third of face-to-face visits into distant contacts, a result judged as fairly successful in spite of not achieving the planned 50% reduction of in-person visits (Aziz et al., 2020; Madden et al., 2020).

Other experiences confirm both the sustainability and the advantages of available technologies allowing complementary distanced consultations at all times. Details have been provided on peculiar aspects that should not be overlooked: among them, the ideal setting for the pregnant woman who should sit alone or with a support person in a quiet room. A good connectivity from both parties is mandatory and the provider is encouraged to act in a professional environment, wearing a uniform and with access to the patient's medical records (Aziz et al., 2020). Alternative forms of ANC management with limited contacts include drive-through consultations: while staying in the car the woman is checked for temperature, blood pressure and foetal heart tones. If necessary, a handheld ultrasound probe connected to a smartphone may be used to evaluate foetal presentation and amniotic fluid. In case of abnormal findings, clinic or obstetric triage centres are available for further evaluation (Turrentine et al., 2020).

To some extent, relying on community resources with decentralization of primary levels of care should integrate most modern solutions: use of community facilities as well as epidemic-free hospitals should be electively selected for ANC follow-up including ultrasound consultations. This approach certainly applies more to limited-resource settings where telemedicine and drive-through are not affordable (Aziz et al., 2020; Madden et al., 2020; Turrentine et al., 2020).

Virtual follow-up sessions should also include antenatal classes, easily transferable on a range of social media channels (YouTube, ZOOM etc.) (Peahl et al., 2020).

**Table 1**  
Proposed models for maternal and foetal surveillance during COVID-19.

Citation Remote	Country	Clinical distancing ANC solutions			Management of the woman with a high-risk pregnancy	Quality assessment*
		Remote	Traditional	Others		
Aziz 2020 USA		Telehealth consultations	In-person		In-person and complementary telehealth follow-up with provision of remote monitoring equipment (GDM and Hypertension)	Medium
Barton 2020 USA		-			Hospitalization for women who show worsening of hypertensive disorders. Delivery starting from 30 + 0/7 weeks of gestation in the setting of severe preeclampsia	Low
Chen 2020 China		Home medical surveillance		Epidemic-free referral centres	More frequent in-person visits. Hospitalization for women who show worsening of pregnancy complications.	High
Madden 2020 USA		Telehealth consultations (in 47.8% of ANC follow-ups and 29.3% of bookings)	In-person		More frequent in-person visits depending on progress of the woman's pregnancy complication.	High
Murphy 2020 UK		Telehealth consultations	Essential in-person (6 USS, 2 in-person)		Remote real time glucose monitoring for women with T1D and T2D making use of insulin. Remote video consultations every 4-weeks.	Medium
Peahl 2020 USA		Telehealth consultations	Essential in-person (1 USS, 4 in-person)		Telemedicine with remote monitoring equipment.	Medium
Ranganathan 2020 India		Telehealth consultations with educational purposes		Primary health care referral facilities	More frequent in-person visits depending on progress of the woman's pregnancy complication.	Medium
Richens 2020 UK		Telephone/Virtual antenatal classes (YouTube)	Essential in-person	Community facilities	More frequent in-person visits depending on women experience of domestic violence or mental health issues.	Medium
Turrentine 2020 USA		Telehealth consultations	In-person	Drive-through	More frequent in-person visits depending on progress of the woman's pregnancy complication.	Medium

ANC, Antenatal care, USS, Ultrasound scan; T1D, Type 1 diabetes, T2D, Type 2 diabetes; GDM, Gestational Diabetes Mellitus.

\* According to a revised version of the QUIPS quality assessment tool (Appendix Table 3).

**Table 2**  
List of MeSH terms used for the literature search.

	Search Terms
MeSH (PubMed)	Coronavirus, Coronavirus Infection, Postnatal Care, Telemedicine, Midwifery, Prenatal Care, Pregnancy, Pregnancy High-Risk, Pregnancy Tests, Pregnancy Complications, Pre-Eclampsia, Diabetes Gestational, Prenatal Education, Ultrasonography Prenatal, Maternal Exposure.
Non-MeSH	Clinical Distancing, Virtual Care, Medical Comorbidities, Therapeutic Treatments, Obstetric Ultrasound, In-Person Obstetric Visits, Pre-Conceptional Evaluation, Social Distancing, Antenatal Care, Postpartum Care, Antenatal Class, Antenatal Telemedicine

**Table 3**  
Revised QUIPS Quality assessment tool.

	1. Study Participation	2. Study Attrition	3. Prognostic Factor Measurement	4. Outcome Measurement	5. Study Confounding	6. Statistical Analysis and Reporting
QUIPS	The study sample adequately represents the population of interest	The study data available (i.e., participants not lost to follow-up) adequately represent the study sample	The Prognostic Factor is measured in a similar way for all participants	The outcome of interest is measured in a similar way for all participants	Important potential confounding factors are appropriately accounted for	The statistical analysis is appropriate, and all primary outcomes are reported
Revised QUIPS	The study adequately considers specific populations	The study adequately considers practical implementation in specific populations	At least one prognostic factor is explicated	The measurement of the prognostic factor is explicated	Important potential confounding factors are appropriately considered	-

*Management of the woman with a high-risk pregnancy*

To provide paths of safe and appropriate prenatal care, special situations require higher levels of users' compliance: this is particularly true in the case of distanced caring for women with gestational diabetes or hypertensive disorders. Women with pregnancy complications are in fact compelled to go through a large amount of educational and training materials in order to learn how to measure blood pres-

sure, self-administer insulin and use glucose-pump (Barton et al., 2020; Murphy, 2020). Whenever necessary, telecare should allow to arrange multidisciplinary appointments with specialists connected via speakerphone and with the help of interpreters in cases of language barrier (Aziz et al., 2020).

In case of COVID-19 symptoms, different ANC models have been proposed based on the availability of self-protection tools and dedicated workforce. Delaying face-to-face follow-up visits for 14 days after the

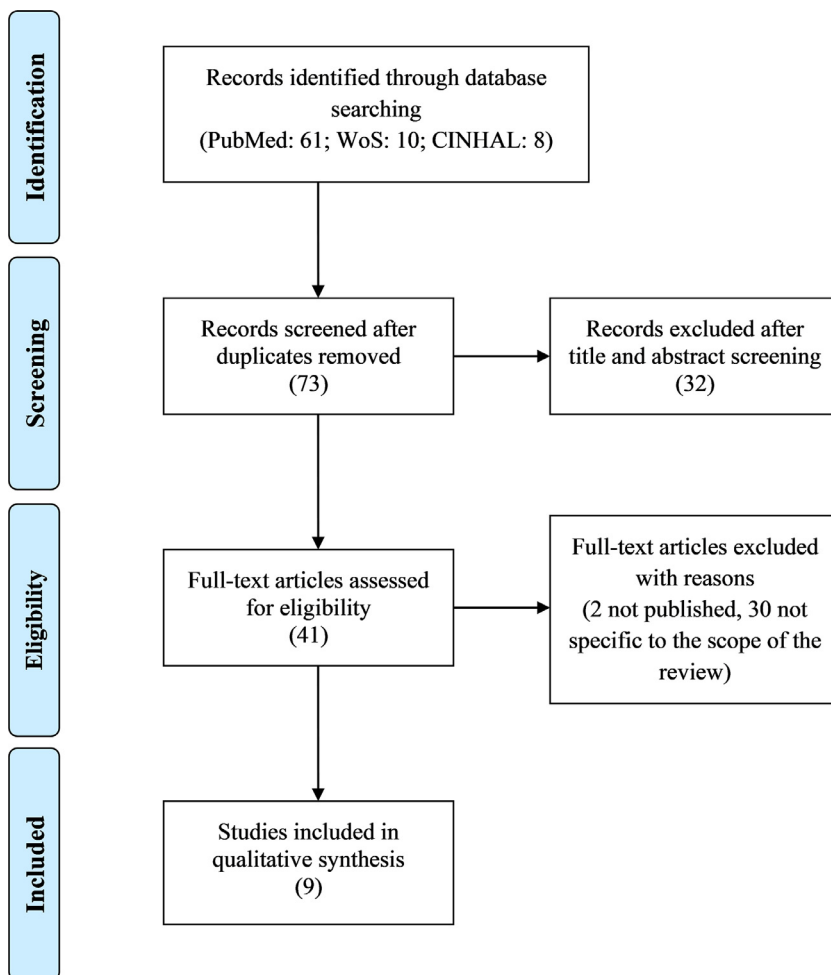


Fig. 1. Research flowchart.

end of symptoms is an option (Barton et al., 2020; Richens et al., 2020), but an alternative strategy contemplates a regular follow-up with multiple prenatal contacts as long as the necessary protective measures are guaranteed (Chen et al., 2020; Madden et al., 2020; Ranganathan et al., 2020).

#### Interdisciplinary perspectives

Commitment of both healthcare providers and of users are the premises for an effective transition to telemedicine. Yet virtual services also require the interdisciplinary coordination and optimization of Information Technology (IT) and administrative resources. Obstacles may be encountered in the implementation of telemedicine services: language and cultural barriers, limited accessibility to medical records during the visit and discontinuity of IT assistance (Madden et al., 2020). Included studies underline the strategic importance of time-consuming regular debriefing sessions dedicated to review telehealth implementation and possible improvements.

#### Discussion

During the COVID-19, pandemic new ways of prenatal care have been adopted, deemed useful to prevent infection by cutting contacts between women requiring care and providers. Preliminary simple solutions have been swiftly applied to the environmental and clinical settings based on longer visit-to-visit intervals and spacing seats in waiting areas to prevent overcrowding (Bourne et al., 2020; Royal College of Obstetricians and Gynaecologists, 2020a).

However, reducing the number of outpatients' appointments may have unpredictable implications likely at the expense of quality of care: a careful clinical observation often permits the timely recognition of pregnancy complications (WHO, 2020). In an effort to surpass the initial reaction and the drawbacks of the early countermeasures put in place against the novel coronavirus disease, the scientific community has searched for more structured solutions to cope with the continuously changing situation and to guarantee appropriate standards of ANC while protecting users and providers (WHO, 2020).

An ongoing stream of clinical guidelines invariably calls for a prenatal care model based on reduced in-person contacts, overcrowding avoidance and, whenever possible, aggregating ultrasound, clinical observation and blood testing in a single visit (Bourne et al., 2020; Royal College of Obstetricians and Gynaecologists, 2020a; WHO, 2020). Another message emphasizes the importance of keeping the pace with the magnitude of the pandemic by developing innovative, effective and, at the same time, accessible platforms for virtual counselling and screening (Royal College of Obstetricians and Gynaecologists, 2020a; WHO, 2020). remodeling forms of care is not always sustainable and may encounter different obstacles, peculiar for the specific setting as the situation evolves in the global scenario. Patterns of care for women with low-risk pregnancies vary according to each country's cultural roots. In Europe, this difference is marked between Nordic and Mediterranean countries: in the former ones, care of the pregnant woman is midwife-led and community based, while in the latter ones it is traditionally managed by obstetricians and supported in a centralized healthcare system, which makes feasible the implementation of telematics platforms.

In the current sanitary emergency where clinical distancing has a proven efficacy in protecting mothers and caregivers, it may be inferred

that the Nordic model allows a swift and highly performing ANC adjustment with limited effort (Berg et al., 2012). Consistently, pregnant women may be trained to self-monitor blood pressure and glycaemia between visits and to self-assess symphysis-fundal height thus providing reliable information concerning foetal growth (Bergman et al., 2007).

Antenatal and postpartum home visits are intrinsic features of Nordic healthcare systems with the advantage of distancing mothers and newborns from the clinical environment. Within this rearrangement, the implementation of home visits could exploit the role of the midwife: even though in some contexts this health professional suffers from marginalization, there are new indications that midwifery has the potential to regain its natural role of strengthening maternal care at the community level (The Economist, 2020). During the pandemic, throughout continents many women have turned away from maternities opting to give birth at home assisted by a midwife to avoid institutions at high risk of contagion (Dahlen, 2020; Davis-Floyd et al., 2020). Midwives have also been involved in larger health initiatives to control diffusion: where public places like stadiums have been converted into health structures for testing and visiting, midwives have been given responsibility for maternity and antenatal services ("In Pictures" 2020).

Within the holistic approach, comprehensive of maternal and neonatal health, a thorough insight into changes of postnatal care at the time of COVID-19 is equally important. Care of the new-born in the first month of life needs to be restructured and adapted to the epidemic with changes compatible with the new distancing of the mother-new-born dyad from health facilities. Essential early postnatal milestones include monitoring weight gain and cognitive development, as well as supporting breastfeeding and maternal bonding.

Considering the novelty of the pandemic, an implicit variability has to be accepted concerning what is advisable for monitoring early neonatal stages. A largely shared opinion considers essential the involvement of professionals with in-person visits either at home or within the health facilities and supports this mode in order to implement neonatal jaundice assessment by the mother and to plan for vaccinations (Harriel et al., 2020; Royal College of Obstetricians and Gynaecologists, 2020b; Sachdeva et al., 2020; Tscherning et al., 2020). On the other hand, a recent study supports the idea that maternal and child monitoring may be performed exploiting emerging virtual technologies in up to 87.3% of overall postpartum consultations whenever videoconferencing is available between institutions and homes. Among proven advantages, telemedicine allows screening for maternal mental health and guarantees psychological support to the new family (Madden et al., 2020).

To plan efficient and equitable remote interventions based on video consultations, future surveys involving women who experienced their pregnancy during the COVID-19 lockdown in different countries are mandatory. Key information to understand the new needs and the degree of satisfaction with distanced care would be provided. As forefront professionals, obstetricians and midwives should contribute with their views to introduce and implement the new changes.

The principle of interdisciplinary global health should be maximally implemented to successfully counteract the current epidemic situation: the joint contribution of human, technological and administrative resources is considered vital (Wernli et al., 2016).

### Strengths and limitations

By exploring the latest changes in ANC adjustments in reaction to the COVID-19 pandemic, this is to our knowledge the first review that addresses the needs of health professionals searching for solutions to guarantee appropriate standards of care (Sklaveniti, 2020). Nevertheless, given the novelty of the COVID-19 pandemic, the paucity of scientific literature is an anticipated limitation and the interventions outlined in this review are not yet supported by full evidence.

The sustainability of alternative ANC models and their implementation in low-resources countries is particularly challenging and deserves

specific consideration since scarcity of resources comprises also a limited access to devices and connectivity. Since the spread of telecommunications, mobile health (m-health) applications are used in several African countries so that women living in rural communities can make distant contacts with healthcare centres to be informed about timings and access to care during pregnancy (Arnaert et al., 2019). Forthcoming studies should thus explore how to adapt already available resources to the new needs of distanced care.

### Conclusions

Actual practices and policies put in place to fight the COVID pandemic are preliminary but essential for conceptualizing future studies' direction.

Isolation, from quarantine to lockdown, has intrinsic protective purposes and yet adverse implications for women and families. Despite the many benefits of remote caring for pregnant women and health workers, there are ongoing concerns on how to identify, support and assist expectant mothers who may experience domestic abuse and miss appointments (Murphy, 2020; Royal College of Obstetricians and Gynaecologists, 2020b). Evolving models of prenatal care should also thoroughly inquire on users' satisfaction and social needs.

In view of the transition toward virtual care, practical aspects to be taken into account include the reimbursement of telemedicine consultations by health insurances (Madden et al., 2020; Peahl et al., 2020).

Adapting to evolving models of care will require great flexibility, yet this effort is an undeniable key factor for advancing and protecting both women and institutions.

### Ethical approval

Not applicable.

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### Declaration of Competing Interest

The authors declare that they have no conflicts of interests.

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