

**Maternal, Newborn and
Infant Clinical Outcome
Review Programme**



Saving Lives, Improving Mothers' Care

Rapid report 2021: Learning from SARS-CoV-2-related
and associated maternal deaths in the UK

June 2020-March 2021



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July 2021

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Key to colour coding

Vignettes concerning the care of women who died are described in blue boxes

The majority of recommendations arise from existing national guidelines or previous reports and the source of these recommendations are cited within green boxes. Example:

Existing guidance requiring improved implementation is presented in green boxes

NICE 2345

Recommendations based on improvements in care noted by MBRRACE reviewers for which there is no current national guidance and which has not been noted in previous guidance or reports are shown in purple boxes. Example:

New recommendations are presented in purple boxes.

The recommendations identified by MBRRACE reviewers as the most frequently needed improvements are highlighted in the key messages section at the start of each chapter. The specific individuals or professional groups who need to take action are indicated alongside the key messages, where appropriate.

1. Key messages

New recommendations

1. Ensure protocols for assessment and monitoring of pregnant women with COVID-19 in the community take account of known risk factors for severe disease in pregnancy **[ACTION: General Practices, NHS 111, Community-based Antenatal Services]**.
2. Ensure early senior involvement of the maternal medicine team for any pregnant or postpartum woman admitted with COVID-19, whatever her gestation and wherever in the hospital she receives care **[ACTION: Hospitals/Trusts/Health Boards, All Health Professionals]**.
3. Ensure care for pregnant and postpartum women with COVID-19 follows RCOG/RCM guidance **[ACTION: Hospitals/Trusts/Health Boards, All Health Professionals]**.
4. Ensure protocols for assessment of pregnant women with respiratory symptoms include the consideration of SARS-CoV-2 and the different pattern of symptoms in pregnant compared to non-pregnant women. Be aware that the degree of respiratory symptoms may mask the severity of underlying lung pathology and that progression to respiratory failure in COVID-19 can occur rapidly. **[ACTION: Royal College of Obstetricians and Gynaecologists/Royal College of Midwives/Obstetric Anaesthetists Association/Royal Colleges of Physicians/Royal College of General Practitioners COVID-19 Guideline Development Groups, Hospitals/Trusts/Health Boards, All Health Professionals]**.
5. Referrals to the NHS ECMO service should be made for pregnant women or women post-pregnancy using the same criteria as for other adult patients i.e. if worsening severe respiratory failure despite appropriate conventional ventilatory support, or for women in whom lung protective ventilation cannot be achieved because of the severity of hypoxaemia or hypercapnia, or significant air-leak (e.g. barotrauma or bronchopleural fistula) **[ACTION: Hospitals/Trusts/Health Boards, All Health Professionals]**.

Existing guidance and recommendations requiring improved implementation

Original source in brackets

1. Treat pregnant and postpartum women the same as non-pregnant women unless there is a clear reason not to (*Multiple MBRRACE-UK Reports*) **[ACTION: Hospitals/Trusts/Health Boards, All Health Professionals]**.
2. The limitations of remote consultation methods should be recognised, including being aware that some women will not have sufficient internet access on their mobile devices or other computer hardware, there are challenges for women from socially vulnerable groups, women for whom English is not their first language or women who are hearing impaired, and that women may have unvoiced concerns regarding their care if they have less contact in person (*RCOG/RCM Coronavirus guidance version 13*) **[ACTION: Hospitals/Trusts/Health Boards, All Health Professionals]**.
3. Face to face treatment may be preferable when the patient has complex clinical needs, you need to examine the patient or [it is] hard to ensure, by remote means, that patients have all the information they want and need about treatment options (*GMC guidance on remote consultations*) **[ACTION: Hospitals/Trusts/Health Boards, All Health Professionals]**.
4. Women should be advised to continue their routine antenatal care, although it may be modified, unless they meet self-isolation criteria for individuals or households (including social bubbles) with suspected or confirmed COVID-19 (*RCOG/RCM Coronavirus guidance version 13*) **[ACTION: Hospitals/Trusts/Health Boards, All Health Professionals]**.
5. Maternity units should develop triage tools to assess the severity of illness for women who telephone with suspected or confirmed COVID-19. This should include an assessment of symptoms, clinical and social risk factors and escalation pathways. This should include 'safety netting advice' about the risks of deterioration and when to seek urgent medical attention (*RCOG/RCM Coronavirus guidance version 13*) **[ACTION: Hospitals/Trusts/Health Boards, All Health Professionals, Regional maternity strategy organisations]**.

6. While pyrexia may suggest COVID-19, clinicians should not assume that all pyrexia is due to COVID-19. The possibility of bacterial infection should be considered and a full sepsis screen performed in line with the UK Sepsis Trust Sepsis Screening and Action Tool and intravenous (IV) antibiotics administered when appropriate (*RCOG/RCM Coronavirus guidance version 13*) **[ACTION: Hospitals/Trusts/Health Boards, All Health Professionals]**.
7. Clinicians should be aware that young, fit women can compensate for deterioration in respiratory function and are able to maintain normal oxygen saturations until sudden decompensation (*RCOG/RCM Coronavirus guidance version 13*) **[ACTION: All Health Professionals]**.
8. An urgent multidisciplinary team meeting should be arranged for any unwell [pregnant or postpartum] woman with suspected or confirmed COVID-19 (*RCOG/RCM Coronavirus guidance version 13*) **[ACTION: Hospitals/Trusts/Health Boards, All Health Professionals]**.
9. Women should have a venous thromboembolism (VTE) risk assessment performed during their pregnancy in line with RCOG Green-top Guideline No. 37a. Infection with SARS-CoV-2 should be considered a transient risk factor and trigger reassessment (*RCOG/RCM Coronavirus guidance version 13*) **[ACTION: General Practices/Hospitals/Trusts/Health Boards, All Health Professionals]**.
10. Social workers should explain [to ensure face to face contact] why it is essential that they have access to the home, or that they see and speak to the children, to ensure they are safe and well. Visits should be face-to-face where possible and should be sufficient to meet the intended purpose of the visit whether that is safeguarding or promotion of the child's welfare (*Coronavirus (COVID-19): guidance for children's social care services*) **[ACTION: All Social Care Professionals]**.
11. Arrange urgent assessment [of pregnant women with UTI] in secondary care if there are any features of serious systemic illness such as sepsis or pyelonephritis (*NICE Clinical Knowledge Summary Urinary tract infection (lower) - women*) **[ACTION: All Health Professionals]**.
12. Employers should ensure pregnant women are able to adhere to any active national guidance on social distancing and/or advice for pregnant women considered to be clinically extremely vulnerable. Employers should consider both how to redeploy staff who are 28 weeks pregnant and beyond or with underlying health conditions that place them at a greater risk of severe illness from coronavirus and how to maximise the potential for homeworking, wherever possible. Where adjustments to the work environment and role are not possible and alternative work cannot be found, [pregnant women] should be suspended on paid leave. (*Department of Health and Social Care guidance Coronavirus: Advice for Pregnant Employees*) **[ACTION: All Employers]**.

2. Background

Rapid reports from MBRRACE-UK (Knight, Bunch et al. 2020a) and the UK Obstetric Surveillance System (UKOSS) (Knight, Bunch et al. 2020c, Vousden, Bunch et al. 2021) in the first wave of the pandemic identified key learning and recommendations for changes to care and services for pregnant and postpartum women in the context of any future waves of infection. These and other sources of evidence were used very rapidly by the Royal College of Obstetricians and Gynaecologists/Royal College of Midwives Covid-19 guidance cell, working with the Royal College of Paediatrics and Child Health, Royal College of Anaesthetists and the Obstetric Anaesthetists Association to generate evidence-based best practice guidelines (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021). Updates to guidance were rapidly implemented as evidence emerged, to ensure that an immediate single authoritative reference source of information on antenatal, intrapartum and postnatal care was available to all staff caring for pregnant and postpartum women in the context of the pandemic.

The second wave of SARS-CoV-2 infection in the UK brought further challenges to services and a higher burden of infection, together with new variants of concern. This rapid review was undertaken as part of the ongoing responsive remit of MBRRACE-UK to ensure any new messages for care and services were identified in a timely manner in order to implement rapid change. Note that this report draws these messages together in a format for publication, but where urgent issues have been identified, these have already been actioned through escalation to relevant organisations or through direct communication with the RCOG guidance cell.

2.1 The women whose care was reviewed

There are known to be substantial delays in coronial and/or inquest processes such that delays in receiving reports of deaths by MBRRACE-UK are likely to be greater for the deaths of women specifically from mental health-related causes or who are murdered. Lessons from reviews of the care of women who died from mental health-related causes or from domestic violence have not therefore been included in this report, as these notifications are currently highly likely to be incomplete, and may therefore give an inaccurate picture of the most important areas for improving care. As noted above, where urgent issues have been identified, these have already been actioned through escalation to relevant organisations, and this will continue. In order to ensure that messages for mental health care and safeguarding are fully identified and reported on in a timely manner, chapters reporting on lessons for mental health care and lessons learned from reviews of the care of women who are murdered will be included in both the main 2021 and 2022 MBRRACE-UK maternal reports.

This report therefore includes lessons identified from the care of all women who died following a positive test for SARS-CoV-2 infection, or in whom SARS-CoV-2 infection was diagnosed at autopsy, and from the deaths of women whose care or engagement with care was influenced by changes as a consequence of the pandemic.

3. Methods

This enquiry used the standard MBRRACE-UK methodology, as described in previous reports (Knight, Nair et al. 2016). Women's deaths were identified through direct reports from staff at hospitals where women died, by autopsy pathologists, through media reports, through the Northern Ireland Maternal and Child Health (NIMACH) team and through death registrations in Scotland between 01/06/2020 and 31/03/2021. Deaths were cross-checked with the UK Obstetric Surveillance System (UKOSS) study of women hospitalised with SARS-CoV-2 infection in pregnancy (Knight, Bunch et al. 2020c, Vousden, Bunch et al. 2021). Additional ascertainment of deaths through linkage of birth and death records, which is part of the standard MBRRACE methodology, was not possible on this time scale, due to the fact that these linked data will not be available until mid-late 2021 for 2020 deaths, and mid-2022 for 2021 deaths. This linkage will be carried out as usual in future MBRRACE reports.

Each woman's care was reviewed independently by one or two MBRRACE-UK assessors from each of pathology, midwifery, obstetric and anaesthetic. The care of selected women, according to their cause of death, was also reviewed by an obstetric physician assessor, infectious diseases physician assessor, psychiatry assessor and/or intensive care assessor.

All MBRRACE-UK assessments (5-7 per woman) were then reviewed at a virtual multi-disciplinary chapter-writing meeting held on 13/04/2021 to identify lessons learned to improve future care. This report was completed on 24/04/2021 prior to funder approval and sign-off processes, and recommendations should be viewed in the context of public health policies and clinical guidance current at that time.

4. The women who died

The care of a total of seventeen women was reviewed for the purposes of this rapid report. Three women did not have SARS-CoV-2 infection but their care or engagement with care was influenced by changes as a consequence of the pandemic. Fourteen women died with SARS-CoV-2 between 01/06/2020 and 31/03/2021 and their care was reviewed under the remit of MBRRACE-UK. Of these 14 women, 11 women with SARS-CoV-2 infection died during or up to six weeks after pregnancy and three died between six weeks and one year after the end of pregnancy, noting that one of these women acquired her infection within six weeks of the end of pregnancy although she died later. Ten of the women, including two women who died in the late postpartum period, died from causes directly relating to COVID-19, nine from cardio-respiratory complications of the disease, and one from thrombotic complications. Four women had confirmed SARS-CoV-2 infection at the time of their death but died from unrelated causes, however, the coincidental diagnosis of SARS-CoV-2 infection in two of these women impacted substantially on their care.

The characteristics of the women whose care was reviewed is shown in Table 4.1. Of note, 8 of the ten women who died from complications of COVID-19 were overweight or obese; six (60%) were obese (BMI $\geq 30\text{kg/m}^2$) and two (20%) were overweight (BMI 25-29 kg/m^2). Six (60%) women who died from COVID-19 were from black and minority ethnic groups; all five Asian women who died from COVID-19 were of Pakistani ethnicity. Five of the ten women (50%) who died from COVID-19 were in the third trimester of pregnancy at the time of disease onset. Of the 10 women who died from COVID-19, five had pre-existing mental health conditions; one of the seven women who died from other causes had known mental health problems. Pre-existing diabetes, hypertension or cardiac disease were not identified in any of these women.

Overall, three quarters of the women who died were multiparous; the 17 women who died had 30 existing children, thus a total of 38 motherless children remain.

During the ten months covered by this report (01/06/2020 to 31/03/2021) an estimated 587,700 women gave birth in the UK. The estimated SARS-CoV-2-associated maternal mortality rate, including all deaths of women with SARS-CoV-2 infection, is therefore 2.4 per 100,000 (95% CI 1.3-4.0). The usual MBRRACE-UK methodology would be to assess maternal mortality rates over a three-year period to give a more robust estimate. These figures should not therefore be compared to triennial rates, which will be lower if deaths decrease as a consequence of public health measures. Annually there are approximately 70 maternal deaths during or up to six weeks after pregnancy in the UK, thus the deaths of women from COVID-19 complications should be seen in this context. In total, including the deaths of women assessed in the 2020 rapid report (Knight, Bunch et al. 2020a), MBRRACE-UK have been notified of 20 women who have died with SARS-CoV-2 infection during pregnancy or up to six weeks after pregnancy over the 13 months 01/03/2020 to 31/03/2021, and a further 4 women who died between six weeks and a year after the end of pregnancy, 24 in total.

Table 4.1: Characteristics of women included in this report

Characteristics	Women who died from Covid-19 or its complications SARS-CoV-2 infection (n=10) Frequency (%)	Women who died from other causes (n=7*) Frequency (%)	Total (n=17) Frequency (%)
Age			
<25	0 (0)	2 (29)	2 (12)
25 – 29	2 (20)	1 (14)	3 (18)
30 – 34	4 (40)	3 (43)	7 (41)
≥ 35	4 (40)	1 (14)	5 (29)
Body mass index (kg/m²)			
<25	1 (10)	3 (43)	4 (24)
25-29	2 (20)	2 (29)	4 (24)
≥30	6 (60)	0 (0)	6 (35)
Missing	1 (10)	2 (29)	3 (18)
Parity			
0	1 (10)	3 (43)	4 (24)
≥1	9(10)	4 (47)	13 (76)
UK citizen			
Yes	9 (10)	4 (57)	13 (76)
No	0 (0)	2 (29)	2 (12)
Missing	1 (1)	1 (14)	2 (12)
Ethnicity			
White European	4 (40)	3 (43)	7 (41)
Asian	5 (50)	2 (29)	7 (41)
Black	1 (10)	1 (14)	2 (12)
Chinese/Other	0 (0)	0 (0)	0 (0)
Mixed	0 (0)	1 (14)	1 (6)
Woman's region of birth			
United Kingdom	5 (50)	3 (43)	8 (47)
Europe (not UK)	0 (0)	0 (0)	0 (0)
Asia	3 (30)	1 (14)	4 (24)
Africa	1 (10)	1 (14)	2 (12)
Not known	1 (10)	2 (29)	3 (18)
Employment status			
Employed (Either woman or partner)	9 (90)	5 (71)	14 (82)
Unemployed (Both)	0 (0)	0 (0)	0 (0)
Not known	1 (10)	2 (29)	3 (18)
Able to speak/understand English			
Yes	10 (100)	5 (71)	15 (88)
Living arrangements			
With partner	7 (70)	6 (86)	13 (76)
Other	3 (30)	1 (14)	4 (24)
Known domestic abuse			
Yes	0 (0)	1 (14)	1 (6)
No	7 (70)	1 (14)	8 (47)
Missing	3 (30)	5 (71)	8 (47)
Known to social services			
Yes	3 (30)	1 (14)	4 (24)
No	7 (70)	5 (71)	12 (71)
Missing	0 (0)	1 (14)	1 (6)
Smoking			
Smoker	0 (0)	0 (0)	0 (0)
Non-smoker	10 (100)	4 (57)	14 (82)
Missing	0 (0)	3 (43)	3 (18)
Substance user			
Yes	0 (0)	0 (0)	0 (0)
No	10 (100)	4 (57)	14 (82)
Missing	0 (0)	3 (43)	3 (18)

*Includes 4 women who had a positive test for SARS-CoV-2 but who died from other causes.

5. Overview of care and lessons to be learned

5.1 Overall messages for care

5.1.1 *Language and remote consultations*

A woman who spoke no English was identified to need an interpreter in either her native language or her second (European) language. She had a telephone antenatal booking visit, but an interpreter was not available. She had evidence of an asymptomatic urinary tract infection at booking. Her partner translated at some appointments, but it was evident from reports at the time of her death that he was not confident enough in his English skills to call emergency services and had to wait for a friend to assist him. She had pain, fever and continued signs of urinary infection in the second trimester and the findings and treatment plan were explained by an interpreter in her second language at a consultant appointment. The woman died at home a few days later and a renal abscess and renal stones were confirmed at postmortem. It is not clear if she had taken any of her prescribed antibiotics.

Lack of translation in a language she and her partner understood well may have impacted on this woman's ability to comply with the treatment plans offered and have inhibited her in accessing the appropriate services she required. A lack of understanding led to delays for another woman seeking care. It was evident that virtual consultations, either by video or telephone, meant that staff were not aware of the lack of understanding. An inability to speak English as a first language may be a contraindication to remote consultations and guidance reflects this. GMC guidance on remote consultations (General Medical Council 2021) states that face to face treatment may be preferable when it is hard to ensure, by remote means, that people have all the information they want and need about treatment options. This principle can be applied not solely to prescribed treatment but equally when other decisions are needed such as safety-netting advice about when to attend health services in person in the event of persisting or worsening symptoms.

- **Provide the woman with an interpreter (who may be a link worker or advocate and should not be a member of the woman's family, her legal guardian or her partner) who can communicate with her in her preferred language.**
- **When giving spoken information, ask the woman about her understanding of what she has been told to ensure she has understood it correctly.**

NICE Guideline CG110 Pregnancy and complex social factors (National Institute for Health and Care Excellence 2010)

- **If it is considered more appropriate for appointments to be conducted remotely, for example during periods of 'local lockdown', units should employ teleconferencing or videoconferencing consultations. The limitations of remote consultation methods should be recognised, including being aware that some women will not have sufficient internet access on their mobile devices or other computer hardware.**
- **It should be acknowledged that remote appointments, particularly by telephone, may cause new challenges in relationship-building between women and healthcare professionals, especially among socially vulnerable groups, women for whom English is not their first language or women who are hearing impaired.**
- **Healthcare professionals should be aware that the women may have unvoiced concerns regarding their care if they have less contact in person.**

RCOG/RCM Coronavirus guidance version 13 (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021)

This woman provided a urine sample at booking, which grew a *Proteus* species. This is an unusual organism and its presence raises concerns about a complicated urinary tract infection. She should have been investigated further with a renal ultrasound examination and monitored very closely to prevent the development of complications such as bacteraemia or pyelonephritis. Remote consultations and language difficulties meant that this monitoring did not take place and concerning deterioration could not be identified. NICE guidance states that pregnancy is one risk factor for development of a complicated urinary tract infection (National Institute for Health and Care Excellence 2020). NICE guidance also suggests reassessment if symptoms do not improve and that urgent specialist advice should be sought on further management of pregnant women who have recurrent lower UTI, or catheter associated UTI, or if culture reveals an atypical bacteria, or the woman has an underlying structural or functional abnormality or co-morbidity which increases the risk of complications or treatment failure or suspected underlying renal disease (National Institute for Health and Care Excellence 2020).

Development of pyelonephritis should be suspected if the woman develops a fever, rigors or chills, nausea or vomiting or costovertebral angle tenderness. This woman's pyelonephritis was managed as an outpatient; it is unclear whether this decision was influenced by service changes due to the pandemic. Pregnant women with pyelonephritis are at risk of significant morbidity and the seriousness of pyelonephritis in pregnancy must therefore be recognised. Pregnant women with pyelonephritis should be admitted for IV antibiotics and close monitoring. NICE guidance suggests specialist review for pregnant women with pyelonephritis and/or who have risk factors for a complicated UTI (risk factors include pregnancy), even in the context of the coronavirus pandemic. This woman died, untreated, at home, and inpatient management might have prevented her death.

Women should be offered routine screening for asymptomatic bacteriuria by midstream urine culture early in pregnancy. Identification and treatment of asymptomatic bacteriuria reduces the risk of pyelonephritis. NICE CG62 (National Institute for Health and Care Excellence 2017)

Reassess [pregnant women with lower urinary tract infection] if symptoms worsen rapidly or significantly at any time, or do not start to improve within 48 hours of taking the antibiotic, taking account of other possible diagnoses any symptoms or signs suggesting a more serious illness or condition, such as pyelonephritis. NICE NG109 (National Institute for Health and Care Excellence 2018)

Arrange urgent assessment in secondary care if there are any features of serious systemic illness such as sepsis or pyelonephritis.

NICE Clinical Knowledge Summary: Urinary tract infection (lower) - women (National Institute for Health and Care Excellence 2020)

5.1.2 *Delays in seeking care*

A woman had a cough for several days in late pregnancy but was anxious about attending hospital due to fear of COVID-19. She died at home without any contact with healthcare services. Two further women with severe COVID-19 symptoms declined admission to hospital initially and were critically unwell when they were admitted a few days later. Both died from COVID-19 pneumonitis. A fourth woman did not access any antenatal care due to concerns over COVID-19 and died after giving birth at home.

Concerns over the risks of acquired COVID-19 associated with hospital and GP visits clearly prevented these women accessing care. Detailed information for pregnant women is available at

www.rcog.org.uk/en/guidelines-research-services/guidelines/coronavirus-pregnancy/covid-19-virus-infection-and-pregnancy/.

Leaflets are available at

www.nhs.uk/conditions/coronavirus-covid-19/people-at-higher-risk/pregnancy-and-coronavirus/.

As noted in the previous section, it is more difficult to assess lack of understanding during virtual consultations, and women may have unvoiced concerns. It is particularly important to ensure that women receive, and have understood, 'safety netting advice' about the risks of deterioration and when to seek urgent medical attention. Given that the severity of symptoms does not always correlate with the severity of underlying disease, triage tools could include an assessment of the need for face-to-face review.

Women should be advised to continue their routine antenatal care, although it may be modified, unless they meet self-isolation criteria for individuals or households (including social bubbles) with suspected or confirmed COVID-19.

Maternity units should develop triage tools to assess the severity of illness for women who telephone with suspected or confirmed COVID-19. This should include an assessment of symptoms, clinical and social risk factors and escalation pathways. This should include 'safety netting advice' about the risks of deterioration and when to seek urgent medical attention.

RCOG/RCM Coronavirus guidance version 13 (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021)

The children of one woman who died were subject to child protection plans, but there was no evidence that they had been seen throughout the woman's pregnancy. Some of her concerns around accessing care, and the fact of her pregnancy, might have been identified if in-person child safeguarding visits had continued. Guidance is clear that in-person child safeguarding visits should continue even in the context of local or national lockdown (Department for Education 2021).

Social workers should explain [to ensure face to face contact] why it is essential that they have access to the home, or that they see and speak to the children, to ensure they are safe and well. Visits should be face-to-face where possible and should be sufficient to meet the intended purpose of the visit whether that is safeguarding or promotion of the child's welfare.

Coronavirus (COVID-19): guidance for children's social care services (Department for Education 2021)

5.1.3 Remote consultation

A woman consulted her GP remotely about severe back pain and was prescribed analgesia. She was not known to be pregnant. Her symptoms worsened over the next few days accompanied by shivery episodes and mottled skin, but she did not seek further advice. It was only at the time of her death from overwhelming sepsis, that her advanced pregnancy was recognised.

As with the women described previously, assessors felt that this woman had concerns about accessing care which may have been exacerbated by the pandemic. In this instance, the fact that she had a telephone consultation meant that her advanced pregnancy went unrecognised. An in-person consultation would have recognised both her pregnancy and the 'red flag' severity of her pain prompting admission could have prevented her death. She had clear symptoms and signs of sepsis, but sadly neither she nor her family recognised this until it was too late. As noted earlier, GMC guidance on remote consultations states that face to face treatment may be preferable when it is hard to ensure, by remote means, that people have all the information they want and need about treatment options (General Medical Council 2021). It also notes that face to face treatment may be preferable when a person has complex clinical needs or when examination is necessary.

Face to face treatment may be preferable when:

- **The patient has complex clinical needs**
- **You need to examine the patient**
- **It's hard to ensure, by remote means, that patients have all the information they want and need about treatment options.**

GMC guidance on remote consultations (General Medical Council 2021)

Clinical tools for professionals are produced by the UK Sepsis Trust to help with recognition of 'red flag' sepsis (Box 1) (Nutbeam T, Daniels R et al. 2019).

Box 1: Features of red flag sepsis in pregnancy or up to six weeks post-pregnancy:

- Objective evidence of new or altered mental state
- Systolic BP \leq 90 mmHg (or drop of >40 from normal)
- Heart rate \geq 130 per minute
- Respiratory rate \geq 25 per minute
- Needs O₂ to keep SpO₂ \geq 92%
- Non-blanching rash / mottled / ashen / cyanotic
- Not passed urine in 18 hours

UK Sepsis Trust General Practice Screening And Action Tool for Use in Pregnancy (Nutbeam T, Daniels R et al. 2019)

5.1.4 *Fixation errors*

A woman with a missed miscarriage presented to hospital with pain, nausea and feeling faint. She had a temperature of 39°C and a raised respiratory rate. Her oxygen saturation, heart rate and blood pressure were normal. She was known to be SARS-CoV-2 positive from a routine swab taken the previous day. She did not have further observations for six and a half hours. A speculum examination revealed foul smelling products of conception. She had observations taken shortly afterwards, which were highly abnormal (respiratory rate 40, oxygen saturation 94%). Approximately 30 minutes later she was noted to be unresponsive with laboured breathing and a medical team was called. She died despite extensive resuscitation. Postmortem examination revealed sepsis following an intrauterine infection.

This woman was unwell on arrival at hospital and her abnormal observations did not trigger a medical review nor were they escalated. Her symptoms were assumed to be due to COVID-19 despite clear signs of genital tract sepsis. Even if they had been due to COVID-19 she required repeated review and reassessment, which would have indicated that she was deteriorating rapidly. She had abnormal observations for several hours before her collapse. Sepsis was not considered, and she did not receive antibiotics. She had infrequent monitoring and no senior involvement. More than 50% of pregnant women who have a positive test for SARS-CoV-2 on admission to hospital are asymptomatic (Vousden, Bunch et al. 2021); most are therefore admitted for other reasons. The possibility of other reasons for symptoms must always be considered, even in the presence of a positive test, and particularly if, as in this woman, there are clear signs of a different pathology.

While pyrexia may suggest COVID-19, clinicians should not assume that all pyrexia [or other abnormal observations] are because of COVID-19. The possibility of bacterial infection should be considered and a full sepsis screen performed in line with the UK Sepsis Trust Sepsis Screening and Action Tool and intravenous (IV) antibiotics administered when appropriate.

RCOG RCM Coronavirus guidance version 13 (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021)

Abdominal pain, fever (greater than 38°C) and tachycardia (greater than 90 beats per minute in the [post-pregnancy] period) are indications for intravenous antibiotics and senior clinical review.

Monitoring of the woman with suspected sepsis or established sepsis should be multidisciplinary but preferably under the leadership of a single consultant. A senior obstetrician should be involved, in consultation with an intensivist, microbiologist or infectious disease clinician.

Regular observations of all vital signs (including temperature, pulse rate, blood pressure and respiratory rate) should be recorded on a modified early obstetric warning score (MEOWS) chart.

RCOG Greentop guideline 64b Bacterial sepsis following pregnancy (Royal College of Obstetricians and Gynaecologists 2012)

5.1.5 *Multidisciplinary team care*

A woman called the hospital with COVID-19 symptoms in the third trimester of pregnancy and was advised to call NHS 111. She attended in preterm labour four days later and was noted to have poor urine output. She gave birth quickly but was still unable to pass urine. A few hours after giving birth she still had not passed urine and bloods revealed coagulopathy, acute kidney injury, abnormal liver function tests and very raised urate. Despite a low normal body mass index, she received several litres of fluid, prescribed by different clinical teams but urine output remained very low. The critical care team became involved, and she was treated with dexamethasone and vitamin D on the assumption that her symptoms were due to COVID-19. A CT showed pleural effusions and ascites and she continued to deteriorate and die.

This woman's blood tests on admission were indicative of acute fatty liver of pregnancy (AFLP) (Knight, Nelson-Piercy et al. 2008). As with the previous woman, she was treated as if she had COVID-19. An obstetrician suggested the diagnosis of AFLP on the second day of this woman's admission, but she was labelled as having pre-eclampsia and after that time she was managed with little obstetric or obstetric medicine input. Nephrologists concentrated on the acute kidney injury, intensivists on the COVID-19 and there was no helicopter view or project management. In the face of deterioration, a liver unit should have been involved. Management with N-acetyl cysteine and broad-spectrum antibiotics would then have been advised (European Association for the Study of the Liver, Wendon et al. 2017). Multidisciplinary team care with expertise in pregnancy medicine may have enabled diagnosis and earlier treatment of this critically ill woman's AFLP including referral to a liver unit.

Senior decision-making doctors need to assess the woman, and after multi-disciplinary team discussion with senior colleagues in other units, decide on the best place for her on-going care; decisions must include the means and timing of inter- or intra-hospital transfer to ensure that the transfer is carried out safely and to a high standard.

Saving Lives, Improving Mothers' Care 2015 (Knight M 2015)

A need for better multidisciplinary care, specifically ensuring inclusion of obstetric, obstetric medicine, obstetric anaesthetic and midwifery expertise was even more evident when the care of women who died from COVID-19 was examined. This resulted in delays in diagnosis and treatment for pregnant women which are described further below. The need for effective multidisciplinary care in an appropriate location, particularly for women with complex physical and mental health needs, has been highlighted since the first MBRRACE-UK maternal report in 2014.

5.2 *Messages for care of women who died from SARS-CoV-2 infection or its complications*

5.2.1 *Inequitable treatment due to pregnancy*

From very early in the pandemic, the Royal College of Obstetricians and Gynaecologists, working with the Royal College of Midwives, Royal College of Paediatrics and Child Health, Royal College of Anaesthetists and the Obstetric Anaesthetists Association established a COVID-19 guidance cell. Guidance on management of SARS-CoV-2 infection in pregnancy was first published on 9th March 2020 and updated rapidly in response to emerging guidance. Each new version was accompanied by a summary of any changes, and widely publicised through professional networks. A weekly literature review, together with direct links to the UK-based research teams investigating SARS-CoV-2 in pregnancy (Allotey, Stallings et al. 2020, Knight, Bunch et al. 2020a, Knight, Bunch et al. 2020c, Mullins, Evans et al. 2020, Gale, Quigley et al. 2021) and the MBRRACE-UK collaboration ensured that this guidance was, and remains, the single definitive national source of guidance on evidence-based care for pregnant and breastfeeding women during the pandemic (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021).

A woman was admitted with COVID-19 in the first trimester of pregnancy. She was not seen by an obstetric, midwifery or obstetric medical team other than to confirm the fact of her pregnancy. There was evidence of a lack of understanding of the management of women with COVID-19 in pregnancy at all stages of her care. She was assessed on arrival using a National Early Warning Score (NEWS) rather than a Modified Early Obstetric Warning Score (MEWS/MEOWS). There were multiple examples of her treatment being constrained by concerns about the impact on her pregnancy. She was not recruited to the RECOVERY trial nor managed according to the evidence from the RECOVERY trial. Her clinicians conducted a literature review to determine whether and what steroids could be used, on the basis of concerns over a history of gestational diabetes in a previous pregnancy. She was deemed unsuitable for ECMO and she died after several weeks of critical care.

Nine out of ten (90%) of women who died from complications of COVID-19 were not managed according to RCOG guidelines, and, as with this woman, there were multiple examples of the care received being inappropriate due to a lack of understanding of what treatments can be used in pregnancy. Most women received evidence-based interventions such as maternal steroids (Recovery Collaborative Group, Horby et al. 2021, Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021) or tocilizumab too late (Recovery Collaborative Group 2021, Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021), involvement of the multidisciplinary maternity team (midwifery, obstetrics, gynaecology or obstetric medicine) too late or not at all and were inappropriately deemed ineligible for therapies such as ECMO.

Obstetricians, obstetric physicians, obstetric anaesthetists and midwives should all be aware of the RCOG guidance as the definitive source of information about evidence-based care in pregnancy and post-pregnancy, but in many instances they were not involved in women's care. It is imperative that clinicians in all areas of the hospital caring for pregnant women with COVID-19, whatever their gestation, are aware of and follow the RCOG guidance, and/or know which members of the maternity multidisciplinary team to call for advice in case of uncertainty. The new maternal medicine networks in England and equivalents in the devolved nations play an important role in providing this advice.

Ensure early senior involvement of the maternal medicine team for any pregnant or postpartum woman admitted with COVID-19, whatever her gestation and wherever in the hospital she receives care.

Ensure care for pregnant and postpartum women with COVID-19 follows RCOG/RCM guidance

Treat pregnant and postpartum women the same as non-pregnant women unless there is a clear reason not to.

Multiple MBRRACE reports 2014-2020

5.2.2 *Diagnosis*

A woman had a cough for several days in the third trimester of pregnancy. At a telephone consultation with a practice nurse the diagnosis of COVID-19 was not considered although this was during the peak of the second wave. A diagnosis of upper respiratory tract infection was made. She was found dead from COVID-19 pneumonia the following day.

The 2020 rapid report commented that it was reassuring that, in contrast to the situation observed in the 2009 influenza A/H1N1 pandemic (Knight, Kenyon et al. 2014), most women's symptoms were recognised and the diagnosis of COVID-19 was made early. In this woman, the diagnosis of COVID-19 was not considered, as she did not present with a fever. The WHO Living Systematic Review (Allotey, Stallings et al. 2020) reports that among more than 39,000 women whose symptoms are reported in the literature, only 40% have a fever. Fever was significantly less likely to be a symptom of COVID-19 infection amongst pregnant women compared to non-pregnant women. The importance of persistent new cough, which this woman had, and other symptoms such as change in sense of smell or taste must continue to be recognised. National guidance for SARS-CoV-2 testing in the presence of such symptoms applies equally in pregnancy. As SARS-CoV-2 becomes an endemic infection, it remains important that it continues to be considered among the differential diagnoses of respiratory symptoms. In this instance, it is unclear whether the practice nurse was following a protocol for telephone investigation of upper respiratory tract infection, and whether this had been updated to include consideration of COVID-19. In particular, it is not clear whether it included consideration of the different pattern of presentation of COVID-19 in pregnant women compared to non-pregnant women.

Ensure protocols for assessment of pregnant women with respiratory symptoms include the consideration of SARS-CoV-2 and the different pattern of symptoms in pregnant compared to non-pregnant women. Be aware that the degree of respiratory symptoms may mask the severity of underlying lung pathology and that progression to respiratory failure in COVID-19 can occur rapidly.

5.2.3 *Monitoring*

An ethnic minority woman in early pregnancy was admitted to the emergency department by ambulance with a three-day history of shortness of breath and a high temperature. She had a BMI of 40kg/m². On arrival her NEWS was 9 and MEOWS was not calculated. Her respiratory rate was over 40 with oxygen saturation of 92%. She was diagnosed with COVID-19 and admitted to a high dependency ward. Dexamethasone was considered, but not given. Admission documentation recorded that she did not 'look sick', although her NEWS was 8. The observation that she did not look sick but had a high NEWS was recorded on more than one occasion. She deteriorated overnight and was admitted to a critical care unit. Dexamethasone and enoxaparin were only started at this very late stage. She died a few weeks later.

This woman's care again illustrates the apparent confusion around treatment of pregnant women with steroids, and a lack of early involvement of the obstetric medical team. Once again NEWS, which is not validated for use in pregnant women and does not take account of the normal physiological changes in pregnancy, was used rather than MEOWS. As a result of the physiological changes of pregnancy and impact on clinical parameters, the trigger thresholds on NEWS2 charts may not be sufficiently sensitive to trigger a timely response in an obstetric patient, and NEWS2 charts are therefore not suitable for obstetric patients. National MEOWS already exist in the devolved nations, and development of a national MEOWS in England is at an advanced stage. Of additional concern was the fact that she was repeatedly documented to 'not look sick' despite very abnormal observations. It is unclear whether this reflected a lack of recognition of the fact that signs of pallor or flushing may be less obvious in women with darker skin tones. Pregnant women may appear well even when in extremis and it is important that they are cared for by a team that recognises this. It has also been recognised that patients with COVID-19 can have profound hypoxemia without any overt signs of respiratory distress such as increased respiratory rate or the sensation of breathlessness ('silent hypoxia') and in such patients rapid deterioration can occur.

Clinicians should be aware that young, fit women can compensate for deterioration in respiratory function and are able to maintain normal oxygen saturations until sudden decompensation.

An urgent multidisciplinary team review should be arranged for any unwell [pregnant or postpartum] woman with suspected or confirmed COVID-19. This includes women who are requiring oxygen to maintain saturations between 94% and 98%, women with a respiratory rate above 20 breaths/minute and women with a heart rate greater than 110 beats/minute. This should ideally involve senior decision makers and may include: a consultant obstetrician, consultant anaesthetist, midwife-in-charge, consultant neonatologist, neonatal nurse-in-charge, intensivist responsible for obstetric care, an obstetric physician, a respiratory physician and the infection control team. The discussion should be shared with the woman, and her family if she chooses. The following should be considered:

- Key priorities for medical care of the woman and her baby, and her birth preferences.
- The most appropriate location of care (e.g. intensive care unit, 'COVID bays', specific COVID-19 wards, isolation room in infectious disease ward or other suitable isolation room) and lead specialty.
- Concerns among the team regarding special considerations in pregnancy, including the health of the baby.

A consultant in obstetrics and gynaecology should review all pregnant and recently pregnant women with suspected or confirmed COVID-19 who are in hospital at least daily, even if they are not admitted to the maternity unit.

RCOG/RCM Coronavirus in pregnancy guidance version 13 (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021)

5.2.4 Women at risk

An Asian woman, with a BMI of 50 kg/m², gestational diabetes, previous gestational hypertension, self-reported learning difficulties had a positive PCR for SARS-CoV-2 in the second trimester. A few days after her positive test she contacted her GP surgery because of a persistent cough. Three days later she was admitted to intensive care via the emergency department with an oxygen saturation of <60%. She died despite full supportive care.

This woman was clearly at high risk of severe COVID-19 disease. She had a high BMI, was relatively immunosuppressed (because of pregnancy), had current gestational diabetes, was a member of an ethnic minority group shown to be at greater risk of poor outcomes and reported learning disability. If close community monitoring following a positive COVID-19 test could have been instituted by her GP surgery, especially after contact with the surgery for a troublesome cough, she may have been admitted sooner. Awareness of her specific risks should have led to a lower threshold for admission (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021).

Ensure protocols for assessment and monitoring of pregnant women with COVID-19 in the community take account of known risk factors for severe disease in pregnancy.

A decision was made on presentation to secondary care despite very high oxygen requirements, chest infiltrates on imaging and a rapid escalation to critical care not to give tocilizumab due to pregnancy. Tocilizumab has been shown to be beneficial in these circumstances (Recovery Collaborative Group 2021), is used in pregnancy (pregnant women were included in the RECOVERY trial of tocilizumab versus usual care), and is indicated according to RCOG guidance (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021).

The interleukin-6 receptor antagonist (anti-IL6) tocilizumab has been shown to improve outcomes, including survival, in hospitalised patients with hypoxia (oxygen saturation below 92% on air or requiring oxygen therapy)... Although data for the use of tocilizumab in pregnancy in this situation are limited, there is currently no compelling evidence that tocilizumab is teratogenic or fetotoxic. For women meeting the criteria above (hypoxic with systemic inflammation), the use of tocilizumab should be considered. It is recommended that any decision to treat with anti-IL6 agents should be taken by an MDT to include obstetric and infection specialists, and given if the benefits outweigh the risks.

RCOG/RCM Coronavirus in pregnancy guidance version 13 (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021)

5.2.5 Consideration of Extracorporeal Membrane Oxygenation (ECMO)

Only one woman who died received ECMO. There was evidence of widespread variation in the understanding of when ECMO might be considered, and assessors felt several women might have benefitted from referral.

A postnatal woman developed a pneumothorax after ventilation for COVID-19. She had a pneumomediastinum/pneumoperitoneum and was referred for ECMO, but the consensus was that there was 100% mortality for people with COVID-19 in these circumstances and the referral was declined.

A postpartum woman with COVID-19 required ventilation. Her care was discussed with an ECMO team but she was considered unsuitable due to the presence of pneumothoraces.

ECMO was considered for a postpartum woman but she was not referred due to her obesity.

NHS ECMO centres have developed clear consensus guidance about the referral and admission of patients with severe respiratory failure to the NHS ECMO service (Camporota, Meadows et al. 2021). Neither obesity nor a pneumothorax are contraindications to ECMO. The ECMO service reported survival rates of 74% in the first wave (Camporota, Meadows et al. 2021) and it is inappropriate to deny pregnant or postpartum women this potential benefit.

Referrals to the [NHS ECMO] service should be made by adult intensive care units for patients who continue to deteriorate despite appropriate conventional ventilatory support, or for patients in whom ventilation could be harmful because of the severity of hypoxaemia or hypercapnia.

(Camporota, Meadows et al. 2021)

Referrals to the NHS ECMO service should be made for pregnant women or women post-pregnancy using the same criteria as for other adult patients i.e. if worsening severe respiratory failure despite appropriate conventional ventilatory support, or for women in whom lung protective ventilation cannot be achieved because of the severity of hypoxaemia or hypercapnia, or significant air-leak (e.g. barotrauma or bronchopleural fistula).

5.2.6 Prevention and management of thromboembolism

A woman developed COVID-19 in the postpartum period. She had no other risk factors for venous thromboembolism. A few days following her COVID-19 diagnosis she developed leg pain and sent an online consultation request to her GP. The online consultation system did not identify either recent pregnancy or recent COVID-19 as 'red flags' and she was triaged for a next day consultation, which was after a weekend. She died from a pulmonary embolism two days later before the consultation could take place.

RCOG/RCM guidance on COVID-19 in pregnancy emphasises that even in the absence of pre-existing risk factors, women who are pregnant or immediately postpartum who have a diagnosis of COVID-19 will immediately have three different factors associated with venous thromboembolism – the hypercoagulable state of pregnancy and the puerperium, the hypercoagulable state associated with COVID-19, and potentially reduced mobility due to self-isolation. Reassessment of venous thromboembolism risk is therefore always indicated, and the online consultation system should raise an immediate alert. The GP practice concerned acted immediately to raise this with the system provider. This woman, with two transient risk factors for venous thromboembolism in the puerperium (COVID-19 infection and immobility) should have received thromboprophylaxis for at least ten days.

Women should have a venous thromboembolism (VTE) risk assessment performed during their pregnancy in line with RCOG Green-top Guideline No. 37a. Infection with SARS-CoV-2 should be considered a transient risk factor and trigger reassessment.

RCOG/RCM Coronavirus in pregnancy guidance version 13 (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021)

5.2.7 Workplace assessment

A woman with a BMI of over 50kg/m² who worked in a care setting returned to a front-facing role in the third trimester of pregnancy. It is unclear whether a workplace assessment took place. She developed COVID-19 infection but despite critical care, including management with dexamethasone and tocilizumab, she died from her infection.

More than three quarters of pregnant women admitted to hospital with symptomatic COVID-19 are in the third trimester of pregnancy, and women at later gestations are clearly at greater risk of symptomatic disease (Allotey, Stallings et al. 2020, Vousden, Bunch et al. 2021). Overweight and obese pregnant women are also more likely to be admitted to hospital with COVID-19 in pregnancy (Vousden, Bunch et al. 2021). Guidance is clear that all pregnant employees should undergo an individual workplace assessment and employers should consider how to redeploy them (Department of Health and Social Care 2021). If employers are unclear about appropriate work duties, additional guidance may be sought from occupational health services. Although pregnant women are not being advised to shield, the higher risk of admission and severe disease in the third trimester emphasises the importance of social distancing measures. This woman was at additional risk due to her high body mass index.

The following recommendations apply for pregnant women who are 28 weeks pregnant and beyond or with underlying health conditions that place them at a greater risk of severe illness from coronavirus:

If you are 28 weeks pregnant and beyond, or if you are pregnant and have an underlying health condition that puts you at a greater risk of severe illness from COVID-19 at any gestation, you should take a more precautionary approach.

This is because although you are at no more risk of contracting the virus than any other non-pregnant person who is in similar health, you have an increased risk of becoming severely ill and of pre-term birth if you contract COVID-19.

Your employer should ensure you are able to adhere to any active national guidance on social distancing and/or advice for pregnant women considered to be clinically extremely vulnerable (this group may previously have been advised to shield).

For many workers, this may require working flexibly from home in a different capacity.

All employers should consider both how to redeploy these staff and how to maximise the potential for home-working, wherever possible.

Where adjustments to the work environment and role are not possible (e.g. manufacturing/retail industries) and alternative work cannot be found, you should be suspended on paid leave. Advice on suspension and pay can be found in HSE guidance.

Coronavirus (COVID-19): advice for pregnant employees (Department of Health and Social Care 2021)

5.2.8 Good care

An immunosuppressed woman with a BMI of 40kg/m² in her third trimester consulted her GP with a history of breathlessness and COVID-19 symptoms for several days. The GP advised her to go to the emergency department for assessment. On arrival at hospital she was tachycardic, tachypnoeic and desaturating to 60% in air and 90% with 15L/min oxygen. She was transferred directly to intensive care, given rescue steroids and fluid, betamethasone and had a positive covid test. There was an immediate multidisciplinary team discussion. She deteriorated quite rapidly and an early decision was made for a caesarean birth. Her intensive care included all appropriate supportive therapies, proning and investigations including CTPA to exclude pulmonary embolism, but she died from her severe lung disease a few weeks later.

This woman had very good care by her GP and both hospitals involved. The severity of her disease was recognised quickly and escalated appropriately. She had multiple factors known to be associated with severe disease. Communication with her family was well-documented at all stages of her care and they were able to be with her at the time of her death.

5.3 Pathology messages

The proportion of women who did not have a postmortem examination appeared higher than has been previously documented in MBRRACE-UK reports (Knight, Bunch et al. 2020b). Of the women who died, five did not have an autopsy; all these women had died with documented COVID-19 lung disease, although in one woman there was also an unresolved possibility of venous thromboembolism. For another woman, the coronial autopsy report was still awaited at the time of the writing of this report, but the circumstances strongly indicate thromboembolism as her cause of death.

6. Conclusions

This report identifies three main themes affecting the care of pregnant and postpartum women in the context of the COVID-19 pandemic in the UK.

There are very clear ongoing indirect impacts such that women are fearful of seeking care and may delay presentation or not present at all. Other pregnancy complications remain many times more frequent than COVID-19 in pregnancy, and the need to ensure women are able to access the care they need is essential. This includes making sure that women are confident about their safety in attending face to face visits, but also recognising situations in which remote consultations are inadequate. This may be for several reasons including language difficulties, lack of access to appropriate technology, repeated presentation, clinical complexity or potentially severe/high risk conditions. Pregnant women are also more at risk of complications from urinary tract infections such as progression to pyelonephritis and must be reviewed frequently and treated appropriately.

Allied to this is the importance of recognising other causes for symptoms when a positive test for SARS-CoV-2 is essentially coincidental. Pregnant women should all now be offered COVID-19 vaccination (Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives 2021), and as vaccination programmes roll out and more pregnant women have a degree of immunity, this scenario may become more common. 'Think sepsis, not just COVID-19' and 'avoid COVID-centricity' are important messages. Alongside this, we must ensure that the UK maintains its position as a country with one of the lowest rates of death from hypertensive disorders of pregnancy and related complications through awareness of conditions such as AFLP and HELLP as well as enabling regular antenatal visits.

Perhaps the starkest finding from this report is the differential care women with COVID-19 and other conditions received simply because they were pregnant or in the immediate post-pregnancy period. Improvements in care which may have made a difference to their outcome were noted for 7 in 10 women who died from COVID-19 and its complications and for 5 of 7 women who died from other causes (Table 6.1). An almost total lack of involvement of the wider multidisciplinary team in many instances, coupled with an almost complete disregard of the needs of the woman herself because of misplaced concerns over her pregnancy and a lack of awareness of the availability of comprehensive national guidance led to unacceptable delays in women receiving the care they needed at all stages. These cultural and structural biases must be tackled to ensure pregnant and postpartum women do not continue to be subject to this unacceptable inequity.

Table 6.1: Classification of care received by women who died from SARS-CoV-2 or associated causes, UK, 01/06/2020-31/03/2021

Classification of care received	Women who died from Covid-19 or its complications SARS-CoV-2 infection (n=10) Frequency (%)	Women who died from other causes (n=7) Frequency (%)
Good care	1 (10)	1 (14)
Improvements to care which would have made no difference to outcome	2 (20)	1 (14)
Improvements to care which may have made a difference to outcome	7 (70)	5 (71)

7. References

- Allotey, J., E. Stallings, M. Bonet, et al. (2020). "Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis." *BMJ* 370: m3320.
- Camporota, L., C. Meadows, S. Ledot, et al. (2021). "Consensus on the referral and admission of patients with severe respiratory failure to the NHS ECMO service." *Lancet Respir Med* 9(2): e16-e17.
- Department for Education. (2021). "Coronavirus (COVID-19): guidance for children's social care services." Retrieved 12/05/2021, 2021, from www.gov.uk/government/publications/coronavirus-covid-19-guidance-for-childrens-social-care-services.
- Department of Health and Social Care. (2021). "Coronavirus (COVID-19): advice for pregnant employees." Retrieved 24/04/2021, 2021, from www.gov.uk/government/publications/coronavirus-covid-19-advice-for-pregnant-employees/coronavirus-covid-19-advice-for-pregnant-employees.
- European Association for the Study of the Liver, J. Wendon, J. Cordoba, et al. (2017). "EASL Clinical Practical Guidelines on the management of acute (fulminant) liver failure." *J Hepatol* 66(5): 1047-1081.
- Gale, C., M. A. Quigley, A. Placzek, et al. (2021). "Characteristics and outcomes of neonatal SARS-CoV-2 infection in the UK: a prospective national cohort study using active surveillance." *Lancet Child Adolesc Health* 5(2): 113-121.
- General Medical Council. (2021). "Remote consultations." Retrieved 24/04/2021, 2021, from www.gmc-uk.org/ethical-guidance/ethical-hub/remote-consultations.
- Knight, M., K. Bunch, A. Cairns, et al. (2020a). Saving Lives, Improving Mothers' Care Rapid Report: Learning from SARS-CoV-2-related and associated maternal deaths in the UK March – May 2020 Oxford, National Perinatal Epidemiology Unit, University of Oxford.
- Knight, M., K. Bunch, D. Tuffnell, et al., Eds. (2020b). Saving Lives, Improving Mothers' Care - Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2016-18. Oxford, National Perinatal Epidemiology Unit, University of Oxford.
- Knight, M., K. Bunch, N. Vousden, et al. (2020c). "Characteristics and outcomes of pregnant women admitted to hospital with confirmed SARS-CoV-2 infection in UK: national population based cohort study." *BMJ* 369: m2107.
- Knight, M., S. Kenyon, P. Brocklehurst, et al. (2014). Saving Lives, Improving Mothers' Care - Lessons learned to inform future maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009-12. Oxford, National Perinatal Epidemiology Unit, University of Oxford.
- Knight, M., M. Nair, D. Tuffnell, et al. (2016). Saving Lives, Improving Mothers' Care - Surveillance of maternal deaths in the UK 2012-14 and lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009-14. Oxford, National Perinatal Epidemiology Unit, University of Oxford.
- Knight, M., C. Nelson-Piercy, J. Kurinczuk, P. Spark and P. Brocklehurst (2008). "A prospective national study of acute fatty liver of pregnancy in the UK." *Gut* 57(7): 951-956.
- Knight M, N. M., Tuffnell D, Kenyon S, Shakespeare J, Gray R, Kurinczuk JJ (Eds.), on behalf of MBRRACE-UK. (2015). Saving Lives, Improving Mothers' Care - Surveillance of maternal deaths in the UK 2011-13 and lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009-13. . Oxford, National Perinatal Epidemiology Unit, University of Oxford.
- Mullins, E., D. Evans, R. M. Viner, P. O'Brien and E. Morris (2020). "Coronavirus in pregnancy and delivery: rapid review." *Ultrasound Obstet Gynecol* 55(5): 586-592.
- National Institute for Health and Care Excellence. (2010). "CG110: Pregnancy and complex social factors: A model for service provision for pregnant women with complex social factors." Retrieved 23/07/2015, 2015, from www.nice.org.uk/guidance/cg110.
- National Institute for Health and Care Excellence. (2017). "CG62: Antenatal care." Retrieved 15/04/2017, 2017, from www.nice.org.uk/guidance/cg62.
- National Institute for Health and Care Excellence. (2018). "NG109: Urinary tract infection (lower): antimicrobial prescribing." Retrieved 24/04/2021, 2021, from www.nice.org.uk/guidance/ng109.

National Institute for Health and Care Excellence. (2020). "Clinical Knowledge Summary: Urinary tract infection (lower) - women." Retrieved 24/04/2021, 2021, from cks.nice.org.uk/topics/urinary-tract-infection-lower-women/.

Nutbeam T, Daniels R and on behalf of the UK Sepsis Trust. (2019). "Clinical Tools." Retrieved 22/04/2021, 2021, from sepsistrust.org/professional-resources/clinical-tools/.

Recovery Collaborative Group (2021). "Tocilizumab in patients admitted to hospital with COVID-19 (RECOVERY): a randomised, controlled, open-label, platform trial." *Lancet* 397(10285): 1637-1645.

Recovery Collaborative Group, P. Horby, W. S. Lim, et al. (2021). "Dexamethasone in Hospitalized Patients with Covid-19." *N Engl J Med* 384(8): 693-704.

Royal College of Obstetricians and Gynaecologists (2012). Green-top Guideline No. 64b. Bacterial Sepsis following Pregnancy. London, RCOG.

Royal College of Obstetricians and Gynaecologists and The Royal College of Midwives (2021). Coronavirus (COVID-19) Infection in Pregnancy: Information for healthcare professionals. London, Royal College of Obstetricians and Gynaecologists.

Vousden, N., K. Bunch, E. Morris, et al. (2021). "The incidence, characteristics and outcomes of pregnant women hospitalized with symptomatic and asymptomatic SARS-CoV-2 infection in the UK from March to September 2020: A national cohort study using the UK Obstetric Surveillance System (UKOSS)." *PLoS One* 16(5): e0251123.

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