



**INSTITUTE OF
OBSTETRICIANS &
GYNAECOLOGISTS**

ROYAL COLLEGE OF
PHYSICIANS OF IRELAND

Institute of Obstetricians and Gynaecologists

Royal College of Physicians of Ireland

Version 5.0

Date of Publication: 1st May 2021

Table of Contents

| | |
|---|----|
| 1. Executive Summary | 2 |
| 2 Version Control | 7 |
| 3 Aims of the guidance document | 8 |
| 4 Authors/ Contributors / Reviewers | 9 |
| 5 Endorsements | 9 |
| 6 Background | 10 |
| 7 Algorithms / Pathways | 22 |
| 8 Maternity care considerations | 24 |
| 9 Investigational Therapies for COVID-19: Use in Pregnancy and Lactation | 46 |
| 10 Vaccination: Pregnancy and Lactation | 51 |
| 11 Homebirth Services | 56 |
| 12 Neonatal Care Considerations | 58 |
| 13 Perinatal Pathology Considerations | 64 |
| 14 Personal Protective Equipment (PPE) | 67 |
| 15 Workforce considerations | 71 |
| 16 Facilities | 79 |
| 17 Audit | 84 |
| 18 References | 85 |
| 19 Useful Links | 92 |
| | |
| APPENDIX 1 | 93 |
| APPENDIX 2 | 94 |
| APPENDIX 3 | 95 |

1. Executive Summary

This guidance document outlines considerations for care for pregnant women and their infants during the COVID-19 pandemic. It provides advice for maternity units around the provision of safe care to women and infants with suspected / confirmed COVID-19. It is a resource for healthcare staff working in the maternity services, sets out a framework for managing the impact on maternity services and provides principles to help units develop their own response plans. Information in this document has been prepared using a multidisciplinary approach with reference to the best information and evidence available.

Background

The novel coronavirus disease (COVID-19), also termed severe acute respiratory syndrome coronavirus 2 or SARS-CoV-2, is a global public health emergency. The disease is referred to as coronavirus disease 2019 (COVID-19), and the causative virus is called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In March 2020, the World Health Organisation (WHO) declared the COVID-19 outbreak a pandemic. SARS-COV-2 is primarily spread through person-to-person contact via respiratory droplets; transmission may also occur via aerosolized droplets and through contact with contaminated surfaces. Asymptomatic, pre-symptomatic, and symptomatic people have all been shown to spread the virus. COVID-19 ranges from asymptomatic infection, through to mild disease, moderate disease (viral pneumonia), severe disease (severe pneumonia) and critical disease (Acute Respiratory Distress Syndrome, sepsis, septic shock, or complications such pulmonary embolism or acute coronary syndrome).

Pregnancy is a physiological state that predisposes women to complications of viral infection. Due to the physiological changes in their immune and cardiopulmonary systems, pregnant women are more likely to develop severe illness after infection with respiratory viruses. This tendency may be more obvious towards the end of pregnancy.

Pregnant women do not appear more likely to contract COVID-19 than the general population, but pregnancy is an independent risk factor for COVID-19 disease severity.

Pregnant women diagnosed with COVID-19 are more likely than their non-pregnant counterparts to be hospitalised and are at higher risk for preeclampsia/eclampsia. Pregnant and recently pregnant women are at increased risk of admission to an intensive care unit, receiving invasive ventilation and extra corporeal membrane oxygenation treatment, compared with non-pregnant women of reproductive age. Risk factors for severe COVID-19 in pregnancy include increasing maternal age, high body mass index, non-white ethnicity, pre-existing comorbidities, and pregnancy-specific conditions such as gestational diabetes and pre-eclampsia. Pregnant women with a COVID-19 diagnosis are at an increased risk of maternal death; risk factors associated with maternal death include: non-white ethnicity and high body mass index.

Pregnant women with COVID-19 are more likely to experience preterm birth and their neonates are more likely to be admitted to a neonatal unit. Reports of fetal death associated with SARS-CoV2 placentitis are of concern and need further investigation. Neonatal COVID-19 infection is uncommon, almost never symptomatic, and the rate of infection is no greater when the baby is born vaginally, breastfed or allowed contact with the mother.

Robust collection of maternal data by trimester of exposure, including the peri-conception period, is required to determine the effects of COVID-19 on early pregnancy outcomes, fetal growth and stillbirth. The pandemic has had other impacts on maternity services, and the adverse effects of COVID-19 on maternal and perinatal outcomes are likely not limited to the morbidity and mortality caused directly by the virus.

The following are the high level points which will be elaborated further in the main document of the guidance:

Women should be advised to attend routine antenatal care. If pregnant women test positive for COVID-19 they are advised to inform their own maternity unit, so that antenatal care can still be arranged, and the necessary surveillance agreed.

All women presenting at the maternity Emergency Department (ED) or early pregnancy clinic (EPC) should be triaged and asked about symptoms of COVID-19, recent test results as well as pertinent risk factors.

Women who become unwell or who are experiencing complications in pregnancy should always be encouraged to present for review at the maternity ED (or EPC, as appropriate).

Routine clinic appointments for normal-risk women with suspected or confirmed COVID-19 may sometimes be delayed until after the recommended period of self-isolation but this may not be appropriate in all cases and depends on pregnancy gestation as well as fetal wellbeing.

Any rationalising of ultrasound visits should ensure that those at risk of early pregnancy complications continue to be looked after. Changes in unit scanning policy may only be necessary at times of local outbreaks (and high community spread).

As much as possible, especially in scenarios of previous pregnancy loss or threatened miscarriage, women should be facilitated to have a partner attend early pregnancy scans with them in the maternity unit.

In general, pregnant women should be screened before entering the hospital for symptoms of COVID-19. Routine testing is recommended prior to elective admissions for procedures or surgery.

Each unit should have a policy regarding routine testing of unscheduled admissions, as well as for their long stay inpatients.

Possible COVID-19 and non COVID-19 patients should be separated into two parallel streams for subsequent assessment and clinical review. All units should have documented COVID-19 assessment and treatment pathways that are familiar to all staff.

It is important that COVID-19 status is documented clearly in the woman's healthcare record as if she attends for an unscheduled visit this needs to be communicated to healthcare providers.

Where women are self-isolating for whatever reason, they should inform the maternity unit of their situation, and get advice on their ongoing care, as well as details about increased fetal surveillance necessary at later gestations of pregnancy

Even if COVID-positive, many women will still need to attend hospital for assessment and for ongoing surveillance of fetal wellbeing, and this should be arranged using the hospital's COVID-19 pathway.

Support for women and families should be strengthened; women should be asked about mental health at every contact; and are urged to access support through remote means as far as possible.

Pregnant women should be informed that there is an uncommon but definite risk of stillbirth with COVID-19 in pregnancy. Pregnant women should be advised of monitoring fetal movements and asked to present immediately if they have any concerns. It is likely that fetal movement awareness with CTG surveillance, following baseline ultrasound examination, is the optimum form of monitoring with maternal COVID-19 infection after 24 weeks.

Given how little is still known about the natural history of infection in ongoing pregnancy, a detailed mid-trimester anomaly ultrasound examination should be provided following first-trimester / early second trimester maternal infection.

For pregnant women with confirmed infection in the third trimester who are recovering from COVID-19 in an ongoing pregnancy, after the acute illness, monitoring should be 2–4-weekly ultrasound assessment of fetal growth and amniotic fluid volume, with umbilical artery Doppler if necessary. Decisions around ongoing surveillance should be individualised.

In a pregnant woman with suspected COVID-19, a chest CT scan may still be considered as a primary tool for the detection of COVID-19 in epidemic areas, and used as available.

COVID-19 infection confers an increased risk of thrombosis, which extends from the early stages of pregnancy until at least 6 weeks post-partum. All women with suspected or confirmed COVID-19 infection should receive pharmaceutical thromboprophylaxis, unless contra-indications are present.

The Irish Maternity Early Warning System (IMEWS) should be used for the hospital care of a woman with a confirmed clinical pregnancy and for up to 42 days in the postnatal period irrespective of age or reason for presentation to hospital.

In circumstances where corticosteroids would normally be given, they should not be withheld in a woman with COVID-19 infection.

A multi-disciplinary planning meeting should be arranged as soon as possible following admission for the women admitted with symptomatic COVID-19 infection. The discussion and its conclusions should be discussed with the woman.

There are specific considerations for the multi-disciplinary team in managing the acutely ill pregnant woman in the intensive care unit.

During acute COVID-19 illness, fetal management should be similar to that provided to any critically ill pregnant woman.

Consideration of the safety of all medicinal products used during pregnancy, including for the management of COVID-19 infection, is essential.

When a woman with confirmed or suspected COVID-19 is admitted to the delivery suite, all members of the multi-disciplinary team should be informed.

It is expected that as a minimum, pregnant women should have one birthing partner with them throughout labour, unless this partner is symptomatic or unwell, irrespective of the woman's COVID-19 status.

In general, COVID-19 itself is not an indication for delivery, unless there is a need to improve maternal oxygenation.

Timing of delivery, in most cases, should not be dictated by maternal COVID-19 infection. Main considerations are maternal clinical status and disease progression, gestational age and fetal condition.

Early multidisciplinary collaboration with the obstetric anaesthesia team should be arranged to determine level of care and delivery plan. The most experienced anaesthetist available should perform all procedures.

Plans for emergency delivery (instrumental or operative) should be appropriately communicated in a timely manner with all relevant senior personnel on the delivery suite.

The neonatal team should be informed of plans for delivery of a woman affected by moderate to severe COVID-19 illness. COVID-19 in the mother is not per se an indication for the neonatal team to routinely attend delivery.

Babies of COVID-19 positive mothers who need admission to the NNU for any reason should be isolated, with dedicated staffing. Asymptomatic well babies should not be admitted to the neonatal unit.

Skin to skin contact is an essential component of initial care for both mother and infant and there is no data which suggests this may be harmful to the newborn of a woman with suspected or confirmed COVID-19 infection.

There is currently no clinical indication to test any well baby born to a COVID-19 positive mother.

The benefits of breastfeeding outweigh any potential risks of transmission of the virus through breastmilk, and women who choose to breastfeed should be supported to do so.

Neonatal transfers will still need to occur but should be limited to a minimum, and as per network escalation policies. Exposure to COVID-19 in itself is not a reason to transfer.

When baby and mother are ready for discharge, they should be provided with written advice regarding what to look out for, in terms of respiratory symptoms, lethargy, gastrointestinal symptoms or poor feeding, and from whom to seek further advice should they have concerns.

There is evidence that vaccines are highly effective in protecting individuals who are fully vaccinated against symptomatic infection and severe disease. A growing body of evidence suggests that fully vaccinated people are less likely to have asymptomatic infection and potentially less likely to transmit SARS-CoV-2 to others.

NIAC recommends that pregnant women should be offered mRNA COVID-19 vaccination between 14-36 weeks' gestation following an individual benefit/risk discussion with their obstetric caregiver. There is no known reason to avoid vaccination for those who are breastfeeding.

Specific circumstances

Planned homebirths continue as a choice for healthy normal risk women who meet the eligibility criteria for HSE Homebirth services or those criteria identified by the individual maternity hospitals with community midwifery services. Hospital birth is recommended for those women who are COVID-19 positive close to term or for whom delivery is recommended during the illness.

In keeping with the National Bereavement Standards and pathways parents must be supported to have the opportunity to care for their baby and to make all the memories possible but in a clinically safe way for parents and healthcare professionals. Parents should be given appropriate contact numbers for ongoing support following discharge from hospital which should include written information for hospital supports and national support networks.

A revised model of care for termination in early pregnancy was issued by the HSE, NWIHP and the Department of Health in April 2020. This provides for remote consultation with a medical practitioner for the purposes of accessing termination in early pregnancy.

Best practice guidelines for reintroduction and continuation of routine fertility treatments have been published to facilitate fertility clinics safely offering services.

Current COVID-19 related autopsy protocols refer to the infected or potentially infected patient and are applicable for COVID-19 related maternal deaths.

All perinatal post mortem examinations involve COVID-19 swabbing of the mother or infant or both. Each institution should have an agreed protocol for same to ensure that bereavement care is not unnecessarily compromised.

Hospitals should determine their own referral criteria for placentas from COVID-19 positive pregnancies e.g. some may agree that all placentas from pregnancies with a history of COVID-19 require pathological examination.

Workplace issues

Training for all staff in the use of PPE should be provided. Information leaflets should be placed in public areas in the hospital to raise awareness of PPE use.

Healthcare workers have a responsibility to keep informed and keep up to date with information from accurate sources. Maternity units should ensure that evidence-based information updates, from trustworthy sources are provided to all grades of staff regularly.

Each maternity hospital must agree their own entry pathways for patients and staff which will reflect the practices within their hospital, and may change at times of high community spread.

There is limited evidence for the effectiveness of thermal screening as a tool to reduce spread of COVID-19 infection among healthcare workers.

Healthcare workers should be advised of their responsibility to monitor themselves for high temperature and symptoms of COVID-19 infection and stay home if they are unwell, consequently enhancing colleague and patient protection. Pathways for self-referring to Occupational Health should be shared with all staff.

Occupational health will take responsibility for screening programmes and contact tracing for healthcare workers, and will liaise with the control team to give general advice on the management of staff with COVID-19.

All healthcare workers including pregnant women are at risk for COVID-19, given the increased risk of exposure in healthcare.

Healthcare workers who are at risk for complications of COVID-19, should be considered for alternate work assignment, away from direct patient care or areas of high exposure risk for the duration of the pandemic.

Guidance on fitness for work of healthcare workers in the higher risk categories, which includes pregnant HCWs, has been published and should be followed.

Visiting policies for Maternity Units should be decided by management in each hospital, following overall HSE guidance, taking the clinical situation in each individual hospital at the time into account, in particular the presence of local outbreaks and high community spread.

Visiting policies may vary across neonatal units, according to the level of the outbreak and NNU configuration.

Services should return to normal practice as soon as the local risk of transmission and prevalence allows.

Healthcare staff are at increased risk of stress and mental health problems when dealing with challenges of the COVID-19 pandemic. Self-care is a priority. Healthcare managers need to proactively take steps to protect the wellbeing of their staff.

2 Version Control

| Version | Date | Summary of Changes |
|----------------|-------------|---|
| 1.0 | 03.04.20 | Original |
| 2.0 | 10.04.20 | Executive summary added; p2-6 Updated background; p7-12 Early pregnancy care section added; p21 Fetal medicine section added; p23 Update from ESHRE added; p35 Revised model of care for TOP added; p35 Updated publication list, Appendix 1; p61 |
| 3.0 | 21.04.20 | Updated background; page 9-14 Updated publication list, Appendix 1; page 65 Updated contributor /reviewer list, page 8 Entonox statement, page 28 HFEA, page 35 Homebirth services, new section 9 added, page 38-39 Infant testing, pages 40, 42 Delayed cord clamping, page 41, 43 Updated PPE section, page 48 Example of neonatal delivery pathway, page 74 |
| 4.0 | 05.05.20 | Updated background; page 9-15 Updated publication list, Appendix 1, page 70 Updated VTE information, page 18,22,27 Updated Medications section, page 33-35 Updated ART section, page 36 Updated NNU Policies, page 45 Updated Perinatal Pathology section, page 47-49 Updated PPE section, page 50-51 Appendix 5; VTE prophylaxis protocol |
| 5.0 | 27.04.21 | New executive summary New background section New reference list All sections - updated New vaccination section New algorithms added Useful links updated Updated professional guidance Changed appendices |

3 Aims of the guidance document

- To outline considerations for care for pregnant women and their infants during the COVID-19 pandemic
- To advise maternity units around the provision of safe care to women and infants with suspected / confirmed COVID-19 infection
- To support healthcare staff working in the maternity services
- To set out a framework for managing the impact on maternity services
- To provide principles to help units develop their own response plans

This document is intended as a guide and provided for information purposes only. The information has been prepared using a multidisciplinary approach with reference to the best information and evidence available at the time of preparation.

We acknowledge using detail from guidance from the Royal College of Obstetricians and Gynaecologists, Royal College of Paediatrics and Child Health, the International Society of Ultrasound in Obstetrics and Gynaecology, the Society for Maternal and Fetal Medicine, and Queensland Health. The document can therefore be considered in conjunction with other relevant advice from these professional bodies and international organisations

The guidance document is not a substitute for clinical judgement, knowledge and expertise, or medical advice. Variation from the guidance document, taking into account individual circumstances, may be appropriate. As this is an evolving situation this guidance remains subject to ongoing review and will be updated as further information and evidence becomes available

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6 Background

The novel coronavirus disease (COVID-19), also termed severe acute respiratory syndrome coronavirus 2 or SARS-CoV-2, is a global public health emergency. Since the first case of COVID-19 pneumonia was reported in Wuhan, Hubei Province, China, in December 2019 (1), the infection spread rapidly to the rest of China and beyond (2,3).

The disease is referred to as coronavirus disease 2019 (COVID-19), and the causative virus is called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It is a new strain of coronavirus that has not been previously identified in humans. On March 11, 2020, the World Health Organisation (WHO) declared the COVID-19 outbreak a pandemic.

Virology

Coronaviruses are enveloped positive stranded RNA viruses in the order of Nidovirales and were identified as human pathogens in the mid-1960s. To date, seven coronaviruses have been shown to infect humans. Epithelial cells in the respiratory and gastrointestinal tract are the viruses' primary target cells. Due to these characteristics, viral shedding occurs via these systems and transmission can occur through different routes: fomites, airborne or faecal-oral (4, 5).

Coronavirus infections include the common cold (HCoV 229E, NL63, OC43 and HKU1), Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). The epidemics of the two β -coronaviruses, severe acute respiratory syndrome coronavirus (SARS-CoV), which emerged in 2003, and Middle East respiratory syndrome coronavirus (MERS-CoV), which emerged in 2012, have caused more than 10,000 cumulative cases in the past two decades, with mortality rates of 10% for SARS-CoV and 37% for MERS-CoV (4, 6,7). COVID-19 belongs to the same β -coronavirus subgroup and it has genome similarity of about 80% and 50% with SARS-CoV and MERS-CoV, respectively (8).

In early March 2020, a new variant was detected with a single D614G mutation in the spike (S) glycoprotein of SARS-CoV-2 that spread to global dominance over the next months due to increased transmissibility and virus replication (8). Since December 2020, novel SARS-CoV-2 variants that accumulate a high number of mutations, mainly in the S protein, have been detected in some geographical regions. These variants have been considered by the WHO as variants of concern (VOC) because of their potential risk to human health, and include the B.1.1.7 (first reported in the UK), B.1.351 (described in South Africa), P.1 (originated in Brazil) and, most recent, B.1.617 (first reported in India) variants.

Transmission

Human coronaviruses most commonly spread from an infected person to others through a variety of means, such as airborne droplets from coughing and sneezing; close personal contact, including touching and shaking hands; and touching one's nose, mouth, or eyes before washing one's hands.

Transmission of SARS-CoV-2 can occur through direct, indirect, or close contact with infected people through infected secretions such as saliva and respiratory secretions or their respiratory droplets, which are expelled when an infected person coughs, sneezes, talks or sings (9). Airborne transmission of SARS-CoV-2 can occur during medical procedures that generate aerosols ("aerosol generating procedures"). Short-range aerosol transmission, particularly in specific indoor locations, such as crowded and inadequately ventilated spaces over a prolonged period of time with infected persons can occur (9).

Respiratory secretions or droplets expelled by infected individuals can contaminate surfaces and objects, creating fomites (contaminated surfaces). Therefore, transmission may also occur indirectly through touching surfaces in the immediate environment or objects contaminated with virus from an infected person (e.g. stethoscope or thermometer), followed

by touching the mouth, nose, or eyes (9). Transmission can occur from an infected person with no symptoms, although this may also be because some people with COVID-19 experience only mild symptoms with the disease and /or are in the early stage of infection (9).

The incubation period of coronaviruses (i.e. the time between exposure to the virus and onset of symptoms) ranges from 2–12 days. SARS-CoV had an incubation period between 3–10 days and MERS-CoV up to 14 days (8, 9, 10). The incubation period for SARS-CoV2 is estimated at between two and 14 days (median, 5 days) (10). The WHO reported a reproduction number (R0) of 2–2.5 but an early literature review estimated the average R0 to be 3.28 (11). A November 2020 systematic review estimated the reproductive number at 2.87 (95% CI, 2.39–3.44). (12)

Evidence (9) suggests that SARS-CoV-2 RNA can be detected in people 1-3 days before their symptom onset, with the highest viral loads, as measured by RT-PCR, observed around the day of symptom onset, followed by a gradual decline over time. The duration of RT-PCR positivity generally appears to be 1-2 weeks for asymptomatic persons, and up to 3 weeks or more for patients with mild to moderate disease. In patients with severe COVID-19 disease, it can be prolonged, which has obvious implications for hospital care and health services (13)

Clinical features and case definition

Clinical presentations of COVID-19 range from no symptoms to severe pneumonia, and severe disease can lead to death. Huang et al. first reported a cohort of 41 patients with COVID-19 pneumonia, and described the epidemiological, clinical, laboratory and radiological characteristics, as well as treatment and clinical outcome of the patients (1). Subsequent studies with larger sample sizes have shown similar findings. The most common symptoms reported are fever and cough, but include general weakness/fatigue, headache, myalgia, sore throat, coryza, dyspnoea, anorexia/nausea/vomiting, diarrhoea, and altered mental status (14).

COVID-19 ranges from asymptomatic infection, through to mild disease (no evidence of pneumonia or hypoxia), moderate disease (viral pneumonia), severe disease (severe pneumonia, e.g. with SpO2 below 90% on room air) and critical disease (Acute Respiratory Distress Syndrome [ARDS], sepsis, septic shock, or complications such pulmonary embolism or acute coronary syndrome).

Typical chest imaging findings suggestive of COVID-19 include the following:

- Chest radiography: hazy opacities, often rounded in morphology, with peripheral and lower lung distribution
- Chest CT: multiple bilateral ground glass opacities, often rounded in morphology, with peripheral and lower lung distribution
- Lung ultrasound: thickened pleural lines, B lines (multifocal, discrete, or confluent), consolidative patterns with or without air bronchograms

More severe symptoms such as pneumonia with marked hypoxia are widely described with COVID-19 in older people, the immunosuppressed and those with long-term conditions such as diabetes, cancer and chronic lung disease (15, 16). The median duration between onset of symptoms and intensive care admission has been 9 to 10 days, suggesting a gradual deterioration in the majority of cases (15, 16).

Those with hypertension and cardiovascular disease (CVD) have been more likely to develop severe symptoms if infected with SARS-CoV-2, and patients with CVD account for a high proportion of the deaths from COVID-19 (17).

Case definitions have been set out by the WHO, ECDC and the Irish Health Protection Surveillance Centre (HSPC).

The HPSC's most recent definition (27th January 2021) includes the following clinical criteria (18)

A patient with acute respiratory infection (sudden onset of at least one of the following; cough, fever (>38), shortness of breath)

OR

Sudden onset of anosmia, ageusia or dysgeusia

OR

A patient with severe acute respiratory infection or SARI (fever and at least one sign/symptom of respiratory disease (e.g. cough, fever, shortness of breath)) AND requiring hospitalisation AND with no other aetiology that fully explains the clinical presentation.

Case fatality ratio estimates for COVID-19 (including asymptomatic and symptomatic infections) were initially the range of 1-2% (0.5-10%), although these estimates differed around the world through 2020 according to the testing regimes used and the population demographics, and they continue to change in the literature (10, 19). More recent reviews of seroprevalence data suggest a median infection fatality rate worldwide of 0.23% (20). The mortality rate in people infected with SARS-CoV-2 increases steeply with age; the proportion of deaths in people younger than 65 years out of all deaths ranges from 0.6-2.8% (10, 20).

Pregnancy

Pregnancy is a physiological state that predisposes women to complications of viral infection. Due to the physiological changes in their immune and cardiopulmonary systems, pregnant women are more likely to develop severe illness after infection with respiratory viruses (3). This tendency may be more obvious towards the end of pregnancy.

In 2009, pregnant women accounted for 1% of patients infected with influenza A (the subtype H1N1) virus, but they accounted for 5% of all H1N1-related deaths (21). In addition, SARS-CoV and MERS-CoV are both known to be responsible for severe complications during pregnancy, including the need for admission to an intensive care unit (ICU), mechanical ventilation, renal failure and death (4, 22).

The case fatality rate of the original SARS-CoV infection among pregnant women was up to 25% in some series (22) but was 15% for all reported cases in the literature (23). Pregnancy outcomes also varied by trimester, with a high rate of pregnancy loss and preterm delivery reported (22, 23). Ongoing pregnancies were more likely to be complicated by fetal growth restriction (2/3 cases) and other placental-mediated complications (22). No vertical transmission was reported for cases of SARS-CoV or MERS-CoV in pregnancies delivered by Caesarean section or vaginal delivery (23). It is important to note, however, that a number of pregnancies had good outcomes despite maternal infection with SARS or MERS, with adverse outcomes largely related to the severity of maternal respiratory compromise.

Although data are limited, there is no evidence from other severe coronavirus infections (SARS-CoV or MERS-CoV) that pregnant women are more susceptible per se to infection with coronaviruses (3, 22, 23). There are no data that inform whether pregnancy increases susceptibility to SARS-CoV2 infection.

Maternal outcomes

Early reports in pregnant women suggested that the clinical course of COVID-19 was mild in the majority of cases (86%), severe in 9% and critical in 5% (24, 25, 26, 27). A regional series of women treated between December 2019 and March 2020, was extracted by the National Health Commission of China, which stores the medical records of all 50 designated hospitals in Wuhan city. Nineteen of the 50 hospitals had reported cases. No mothers died, and apart from 3 spontaneous abortions, 2 ectopic pregnancies, and 4 induced abortions, no babies died (27). The 2020 report of the WHO-China Joint Mission on Coronavirus Disease 2019 stated that "as opposed to Influenza A (H1N1), pregnant women do not appear to be

at higher risk of severe disease. In an investigation of 147 pregnant women (64 confirmed, 82 suspected and 1 asymptomatic), 8% had severe disease and 1% were critical (28). This was similar to the clinical course distribution seen among the non-pregnant population in China in 2020 – mild (81%), severe (14%) or critical (5%) illness (29).

The most prevalent first symptoms in infected women are reported as cough (20%), sore throat (16%), myalgia (12%) and fever (12%).

A May 2020 report (30) from the International Severe Acute Respiratory and emerging Infections Consortium (ISARIC) included 16,749 hospitalised UK patients with COVID-19. This represented 14.7% of people who tested positive for COVID-19 in the UK and 28% of admissions with COVID-19. 55/963 (6%) of the women of reproductive age were pregnant. This is similar to the authors' estimated proportion of pregnant women in the community. Pregnancy (at that point in time) was not said to be associated with increased mortality (30).

More recent data suggest pregnant women are at increased risk of severe COVID-19-associated illness compared with their non-pregnant counterparts, although the absolute and overall risk for severe COVID-19 remains low. This includes an increased risk of intensive care unit (ICU) admission, mechanical ventilation, receiving extracorporeal membrane oxygenation (ECMO) and even death, and after adjusting for age, race/ethnicity and underlying medical conditions (31,32, 33, 34, 35).

These findings in successive publications and reviews suggest that pregnancy itself may manifest increased complications and morbidities among women with severe and critical COVID-19 symptoms.

In the BMJ's living systematic review of COVID-19 in pregnancy, the odds of admission to an intensive care unit (odds ratio 2.13), invasive ventilation (2.5) and need for extra corporeal membrane oxygenation (2.02) were all higher in pregnant and recently pregnant than non-pregnant reproductive aged women (28). Increased maternal age (odds ratio 1.83), high body mass index (2.37), any pre-existing maternal comorbidity (1.81), chronic hypertension (2), pre-existing diabetes (2.1), and pre-eclampsia (4.21) were associated with severe COVID-19 in pregnancy (31).

Pregnant Black, Asian and Hispanic women have been noted in large studies to have disproportionately higher rates of COVID-19 infection, ICU admission and death (32). Pre-existing comorbidities, such as co-existing respiratory and cardiovascular disease, diabetes, advanced maternal age and obesity, seem to be significant risk factors for severe COVID-19 (32, 35). These medical co-morbidities are strongly linked to social determinants of health.

The updated 2020 UK Obstetric Surveillance System (UKOSS) report found that women hospitalised with symptomatic SARS-CoV-2 were more likely to be from a Black, Asian or other minority ethnic (BAME) background to be overweight or obese and to have a relevant medical comorbidity (36).

The association between being of BAME background and severe COVID-19 in pregnancy echoes findings from before the pandemic that showed women of BAME background had higher morbidity and mortality in pregnancy than white women (37). The association between BAME background and severe COVID-19 or death from COVID-19 is not confined to pregnant women. In the UK, 13% of the total population identify as being from a BAME background, but 30% of all individuals admitted to UK critical care for COVID-19 were from BAME backgrounds, and individuals from BAME backgrounds were more likely to die from COVID-19 (38). In the case of COVID-19, it has been suggested that this association may be related to health inequalities or socioeconomic factors; however, further research is needed (39). Another possible contributing factor to the observed association between severe illness and BAME background is vitamin D deficiency (40). Most countries recommend vitamin D supplementation to all pregnant women and individuals of BAME background, regardless of the COVID-19 pandemic.

From many reports, the SARS-CoV-2 infection rate in pregnant women seems to be higher than similarly aged adults. In one US study the COVID-19 infection rate in pregnant people was 70% higher than similarly aged adults in the State, which could not be completely explained by universal screening at delivery (41).

Severe maternal illness seems to be more common in the second half of pregnancy, with women beyond 20 weeks of gestation being five times more likely to be admitted to ICU compared with those in the first half of pregnancy (42). In the UKOSS Study, symptomatic COVID-19 was principally diagnosed in the third trimester: 83% of symptomatic women were diagnosed at or beyond 28 weeks, with 52% diagnosed at or beyond 37 weeks (36). The WA State study also highlighted the increased risk of severe COVID-19 in the third trimester: of the 24 women who were admitted unwell with COVID-19, the median gestation was 32+4 weeks (interquartile range [IQR] 26–36+1 weeks). (41)

In the US reports, the most common time of diagnosis was during the third trimester (50% of cases) (33). In the Canadian registry, pregnant women were most likely to be diagnosed with COVID-19 from 27 to 34 weeks, and the most common underlying conditions were diabetes and obesity (43).

The German COVID-19 Related Obstetric and Neonatal Outcome Study (CRONOS) registry has published reports from 2020 data. Of their 247 reported pregnancies, 14 women (5.6%) were admitted to ICU, of whom 10 were in the third trimester of pregnancy; there were no reported maternal deaths (44). The Netherlands (NethOSS) COVID registry reports (26th March 2021) 7374 pregnancies with COVID-19, with a 6% hospital admission rate, and of those 7% were admitted to ICU (45).

The updated report from UKOSS in 2020 on 1148 pregnant women admitted to hospital with confirmed SARS-CoV-2 infection in the UK between 1 March and 31 August 2020, reported that 63% were symptomatic, and that the estimated incidence of hospitalization with symptomatic SARS-CoV-2 was 2.0 per 1000 maternities (95% CI 1.9-2.2) (36). Compared to pregnant women without SARS-CoV-2, hospitalized pregnant women with symptomatic SARS-CoV-2 were more likely to be admitted to intensive care (aOR 57.67) but the absolute risk of poor outcomes was low. Overall, 63 (5%) women required critical care and 4 (<1%) required ECMO (36).

The UK's Intensive Care National Audit & Research Centre (ICNARC) report of 26th March 2021 (38) includes details of all admissions to critical care with COVID-19 over the course of the pandemic. This includes 70 currently or recently pregnant women admitted up to 31 August 2020 and 293 pregnant or post-partum women admitted since 1st September 2021. Of the larger and more recent critically ill group, their median age was 32 years and 30% were invasively ventilated within 24 hours of admission to ICU; there were 8 deaths in this cohort (38)

The Canadian surveillance of COVID-19 in pregnancy report, published in December 2020, added to the growing body of evidence that suggests that pregnant women are at increased risk of severe illness related to COVID-19. This data from a 3 province analysis of population outcomes in pregnancy revealed that hospitalization and ICU admission were both increased in pregnant women over non-pregnant women by a wider margin. The rate of hospitalization was 11% and the rate of ICU admission was 2.3% (43).

Data on COVID-19 during pregnancy and the severity of maternal illness has been reported by the CDC since the start of the pandemic. Their data tracker now shows (April 12th 2021) that the cases reported in pregnancy total 84,629 with 95 maternal deaths reported. Of their complete ascertained data, 21% of COVID-19 positive women were admitted to hospital and 3% were admitted to ICU (46).

From US Data, after adjusting for age, race/ethnicity, and underlying medical conditions, pregnant women were significantly more likely than non-pregnant women to be admitted to

an intensive care unit (10.5 versus 3.9 per 1,000 cases; [aRR] = 3.0), and die (1.5 versus 1.2 per 1,000 cases; aRR = 1.7). The risk increased with maternal age groups – this was higher in the 35-44 years cohort compared to 15-24 years – and was notable in the BAME groups (35).

A large cohort study (INTERCOVID) across 18 countries, recently published, compared pregnant women with and without COVID-19 and followed pregnancy outcomes in 2020 (47). Women with a COVID-19 diagnosis were at higher risk for preeclampsia/eclampsia (relative risk [RR], 1.76), ICU admission (RR, 5.04), maternal mortality (RR, 22.3), and preterm birth (RR, 1.59). The authors concluded “COVID-19 in pregnancy was associated with consistent and substantial increases in severe maternal morbidity and mortality and neonatal complications when pregnant women with and without COVID-19 diagnosis were compared” (47).

The most recent UK report prepared by the ISARIC4C Consortium, UK Obstetric Surveillance System (UKOSS) and COVID-19 Clinical Information Network (CO-CIN) for the UK Scientific Advisory Group for Emergencies (SAGE) includes detail on pregnant women with COVID from the whole of the UK (48). ISARIC data had already suggested that women aged 20-39 with SARS-CoV-2 infection were over-represented in the hospital cohort (30, 38). The report concluded that of symptomatic pregnant women hospitalised with COVID-19, 10% received critical care and 1% died. 18% of those admitted required some form of respiratory support (48).

Pregnant women hospitalised in areas/periods since the more transmissible B.1.1.7 variant became predominant in the UK were significantly more likely to require respiratory support (48). This is in keeping with other reports in non-pregnant adults across the UK (49), where patients with B.1.1.7 have been found to be at increased risk of critical care admission and mortality compared with patients without. The authors concluded there was a lower threshold for admission for pregnant women, with overall a shorter length of stay in hospital. The majority of women admitted to hospital were in the third trimester of pregnancy, and around half were symptomatic (48).

Maternal outcomes - Preterm birth, mode of delivery.

Rates of preterm birth are likely to be associated with the severity of maternal COVID-19 infection, and early on in the pandemic were also probably associated with a lack of understanding of the disease, its outcomes, and the optimal treatment.

Rates of preterm birth (before 37 weeks’ gestation) as high as 30% were reported from the early cohorts (1, 15, 27, 32, 50) however more recent review studies estimate around a 15% incidence of preterm birth (31).

Iatrogenic preterm births were more common in women with symptomatic SARS-CoV-2 (aOR 11.43) in the UKOSS report (36). Preterm birth was more likely for women with COVID-19: 19% of women with symptomatic COVID-19 and 9% of women with asymptomatic COVID-19 gave birth before 37 weeks of gestation. For women with symptomatic COVID-19, 78% of preterm births were iatrogenic (36).

According to the US CDC, among 3912 live births with reported gestational age, 12.9% were born preterm (<37 weeks’ gestation) compared to 10.2% in the general US population. Of those COVID-19 related preterm births, 3.8% were delivered at <34 weeks’ gestation (33).

A multicentre prospective study in Spain showed that infection increased the odds of preterm birth in COVID-19 positive pregnant women, but this was significant for iatrogenic preterm delivery (13.8% vs 6.7%), while the occurrence of spontaneous preterm birth was statistically similar across positive and negative groups (6.1% vs 4.7%) (51).

In the recent UKOSS/ISARIC/CO-CIN report, 18% of women with COVID-19 in the UK had a preterm birth, about 2.5 times the background rate (48).

Many early reports of COVID-19 in pregnancy described management by caesarean and isolation of the neonate from the mother at birth. The reasons included previous experience of the severity of other coronavirus infections in pregnancy as well as an intention to protect the neonate from infection (1, 3, 5, 22). Another factor may have been that the pandemic began in China, where caesarean rates are often over 40% and obstetricians are used to responding to problems by recommending birth by this route (52). There is currently no evidence from the published literature to favour one mode of birth over another. Systematic reviews now suggest that COVID-19 disease should not be an indication for caesarean birth or isolation of the infant from the mother (52). Caesarean sections should continue to be performed for the normal obstetric indications (52).

Maternal death

The first maternal death from COVID-19 in the published literature originated from Iran in April 2020 (53). In that first case report, the baby was also stillborn following a 30 week preterm delivery (53). Early scientific papers from Brazil, Mexico and Iran reported that 4% of women died with COVID-19 infection in pregnancy (54).

Mortality for non-pregnant people, age 16-49 years, with COVID-19 in the UK, who needed intensive care is 18.8% (38). From the HPSC statistics in Ireland, there have been 24 COVID-19 related deaths of females aged 15 – 44 years from a total number of cases of 68,000 in this cohort, giving a case fatality rate of 0.035%.

In the initial UKOSS reports there were 8 maternal deaths – 2 of which were unrelated to SARS-CoV-2 (32, 36). This gave a maternal mortality rate of 2.2 hospitalized women per 100,000 maternities (95% CI 0.9-4.3).

A more detailed report on behalf of MBRRACE-UK gave the estimated SARS-CoV-2-associated maternal mortality rate, including all deaths of women with SARS-CoV-2 infection, as 6.2 per 100,000 (3.0-11.3) maternities. In this report, 8 women died from causes directly related to COVID – all were in the third trimester of pregnancy and 7 were from BAME groups (55). The authors cautioned at the time that 'these figures give an artificially high impression of excess maternal mortality due to SARS-CoV-2 infection'.

US reports from 2020 estimated mortality rate in pregnancy at is 1.5 versus 1.2 per 1000 cases – 0.15% (pregnant) versus 0.12% (non-pregnant) (35). CDC data on COVID-19 during pregnancy shows (April 12th 2021) 95 maternal deaths, or a 0.11% case fatality rate (46).

The updated BMJ living systematic review is clear that compared to pregnant women without COVID-19, those with the disease had increased odds of maternal death (odds ratio 2.85, 1.08 to 7.52; I²=0%) (31). Risk factors associated with maternal death included: non-white ethnicity and high body mass index.

In the recent UKOSS/ISARIC/CO-CIN report, 16 women in the cohort died, one of whom was asymptomatic, giving a case fatality among symptomatic women of 0.6% (95% confidence interval 0.3%-0.6%) (48).

In the same report, data from MBRRACE-UK suggested that maternal mortality rates have increased during the pandemic, but not solely due to COVID-19. Deaths of 24 women with SARS-CoV-2 infection have been notified to the MBRRACE-UK Confidential Enquiry into Maternal Deaths over the past year; 19 occurred during pregnancy or up to six weeks postpartum, 5 between six weeks and a year postpartum (late maternal deaths). Nineteen women's deaths (16 early, 3 late) were due to COVID-related respiratory or thrombotic disease (48). The authors conclude that on the basis of deaths already notified, the UK maternal mortality rate for March 2020-February 2021 is likely to be at least 20% higher than

in previous recent years (12 per 100,000 maternities compared to 10 per 100,000) (48). As of April 2021, no maternal deaths due to COVID-19 have been notified to the Maternal Death Enquiry (MDE) Ireland.

Pregnancy loss: miscarriage and stillbirth

There are currently limited data on outcomes after first-trimester COVID-19 infection. An increase in the risk of miscarriage in women affected by COVID-19 cannot be ruled out, given the SARS-CoV data (3, 22) and the fact that severe maternal illness with fever is associated with miscarriage. There are mixed data regarding the risk of congenital malformations in the setting of maternal fever in general (3, 23).

The literature for COVID-19 in pregnancy suggests that, similar to findings related to SARS-CoV 1 and MERS – vertical transmission is rare (if ever confirmed) and teratogenicity has not been observed to date. However, data concerning COVID-19 infection during the first trimester, when embryogenesis occurs, are limited, so the risk of congenital anomaly associated with COVID-19 infection cannot yet be entirely excluded.

There are case reports of small numbers of miscarriages in the first and second trimester in the literature; in some cases the woman was critically ill which explains the pregnancy loss, but it is not clear in all that the cause of miscarriage can be directly linked to COVID-19.

Overall, data are insufficient to suggest an increased risk of early fetal loss or congenital anomalies associated with SARS-CoV-2 infection early in pregnancy.

A case of second trimester miscarriage (19 weeks) in a woman with COVID-19 was reported early on in 2020; the placental swabs were positive for SARS-CoV2. Placental histology demonstrated mixed inflammatory infiltrates, with funisitis (inflammation of the umbilical cord connective tissue suggesting a fetal inflammatory response) was also present (56). The Iranian series which reported 9 pregnant women with severe COVID-19 disease, included 5 stillbirths at gestations from 24- 38 weeks and a neonatal death of 28 week twins (54); these infants appears to have tested negative for SARS-CoV2 or not been tested.

One UK single-site study initially reported early in 2020 that the incidence of stillbirth was significantly higher during the pandemic period ($n = 16$ [9.31 per 1000 births] than during the pre-pandemic period ($n = 4$ [2.38 per 1000 births]; $p=0.01$). Authors speculated on undiagnosed direct effects of COVID-19 as well as indirect effect of the pandemic that may be responsible. None of these stillbirths occurred in women positive for COVID-19 (57).

The French research network (33 maternity units) also reported a high rate of stillbirths initially; 7 stillbirths among 181 pregnancy between March and April 2020 (50); but with limited detail.

However, in subsequent larger series and population-level reports, the risks of stillbirth or neonatal death were not significantly increased (32, 33, 34, 36).

The NethOSS COVID registry has reported (by 26th March 2021) 7374 pregnancies with COVID-19, of which 2907 are ongoing. They report 4 fetal deaths and cause has not been established for these, nor any direct relationship to COVID-19 (45).

Pregnancy losses (at all gestations) occurred for 2% of pregnancies completed during COVID-19-associated hospitalizations, and were experienced by both symptomatic and asymptomatic women in one large US report (34, 35). The SET-NET (CDC) report (33) included 20 stillbirths after 20 weeks from 4,527 infants born to COVID-19 positive mothers, without detailed discussion on cause (0.4%).

The updated BMJ living systematic review reported 18 stillbirths (27 studies; 2837 offspring) and six neonatal deaths (26 studies; 1728 neonates) that occurred among pregnant and

recently pregnant women with COVID-19, resulting in negligible changes in overall risks for perinatal death with COVID-19 (31).

The recent UKOSS/ISARIC/Co-CIN report, comments that due to delays in units notifying stillbirths and neonatal deaths and time lags in receipt of data to allow for cross-checking, MBRRACE-UK 'cannot yet make any confident interpretation of stillbirth and neonatal mortality rates for 2020' (48).

SARS-CoV-2 Placentitis and fetal death

As the COVID-19 pandemic evolved during 2020 a small number of international reports began to emerge describing a particular pattern of inflammation in placentas of COVID-19 positive women. A group in Cork University Hospital/Cork University Maternity Hospital described one case and brought it and 10 others from the international literature together in a review article and used the term "SARS-CoV-2 placentitis" to describe this particular pattern of placental involvement by COVID-19 in January 2021 (58).

At the time of assembling this report only 11 cases of SARS-CoV-2 placentitis had been seen in 235 placentas from COVID-19 positive women whose placental pathology had been described in the literature, a rate of 4.7% (58, 59). Its occurrence therefore seemed to be uncommon but had "...the potential to cause significant placental injury, potentially resulting in fetal compromise" (58). This experience is not confined to Ireland and internationally a small number of stillbirths have been similarly attributed to SARS-CoV-2 placentitis after thorough clinical and pathological examination (59).

6 cases of stillbirth have now been identified nationally in Ireland's 3rd wave of COVID-19 (December 2020 onwards), along with one fetal death at 20 weeks' gestation. In all cases there was recent maternal COVID-19 and the placentas in all cases had features of SARS-CoV-2 placentitis. For these 7 cases it is the view of the pathologists conducting these investigations that COVID-19 was the significant factor that resulted in the stillbirth of these infants (60). 3 other cases of SARS-CoV-2 placentitis in the third trimester of pregnancy have been identified from births in 2021 where an emergency delivery resulted in a good outcome for mothers and babies involved.

Data from the HSPC in Ireland indicates the number of pregnant women who tested positive for COVID-19 in January and February this year was 840, although the January figure is an estimate. From these data, this implies a risk of COVID-19 related Stillbirth in pregnant women with COVID-19 of 1/120 cases (8.3 per 1000).

Results to date, from the baby's deaths, indicate a link with the B.1.1.7 variant of concern which may explain why this finding was not a significant feature of the 1st and 2nd waves in 2020 (60). It may also partially explain why it is not a clear feature of COVID-19 in the international literature to date, which largely dates from COVID-19 cases seen in 2020. This condition appears to occur a relatively short time after contracting COVID-19 infection, ranging up to 21 days from experiencing symptoms. Maternal COVID-19 symptoms varied from none to moderate. Gestations involved ranged from 20- 36 weeks (60).

Pregnancy complications; pregnancy after COVID

Among the early reported cases, 47% women affected by COVID-19 delivered preterm (1, 16, 23, 24, 27) and these data informed some of the initial guidance about management of the third trimester of pregnancy. There are also case reports of preterm birth in women who had had COVID-19 infection, but it is unclear whether the preterm birth was always iatrogenic, or whether some were spontaneous (23, 61), and it is not clear that these outcomes were related to maternal infection in every case. In about a third of reported cases the preterm delivery was indicated by fetal distress (23). In many early reported cases, women were either in late pregnancy when affected, or delivered anyway within 2 weeks of the onset of illness (23, 61).

There are no clear data on fetal growth in the large numbers of ongoing pregnancies or pregnancy outcomes now reported (34, 43, 44, 45, 46) and the majority of reports have focused on maternal outcomes (35, 37, 36, 42, 48) rather than on the natural history of the disease throughout the remainder of pregnancy.

An Italian prospective study concluded that pregnancies complicated by SARS-CoV-2 infection are not at higher risk of developing fetal growth restriction due to impaired placental function (62). In studies that include abnormal fetal growth as a secondary outcome, there appear no difference in rates of growth restriction (63).

At present, it is unclear whether pregnancy will impact on the proportion of women who develop prolonged signs and symptoms after an acute SARS-CoV-2 infection, (so-called 'long COVID' or post COVID-19 condition).

Neonatal outcomes and vertical transmission

Respiratory viruses uncommonly result in intrauterine transmission of infection to fetuses; therefore, intrauterine transmission of SARS-CoV-2 is anticipated to be low (64).

With regard to vertical transmission (transmission from mother to baby antenatally or intrapartum), evidence suggests that vertical transmission is possible, but it is clear that the evidence for vertical transmission is not robust and these studies should be interpreted with caution (65). To confirm definite vertical transmission, it has been proposed that detection of the virus by PCR in umbilical cord blood, neonatal blood collected within the first 12 hours of birth or amniotic fluid collected prior to rupture of membranes is needed. These complete criteria have not been met in the majority of published studies (52, 65).

Original case reports from China suggested that there was no evidence for vertical transmission and amniotic fluid, cord blood, neonatal throat swabs, placenta swabs and breastmilk samples from COVID-19 infected mothers all tested negative for the virus (23, 27). Another report described a single pregnancy in which the infant born to a COVID-19 positive mother was found to have SARS-CoV-2 IgM in serum at birth, but otherwise tested negative for COVID-19. As IgM does not cross the placenta, the authors suggested this may represent a neonatal immune response to in-utero infection (66).

Two individual case reports suggestive of probable congenital infection have been published. Zamaniyan and colleagues (67) described a preterm neonate born to a mother with severe COVID-19; the neonate tested positive by nasopharyngeal swab at 48 hours and amniotic fluid was also positive for SARS-CoV-2 by rtPCR. Kirtsman and colleagues reported a term neonate born to a mother with 1 day of fever and cough at time of delivery. The mother's placental tissue was rtPCR-positive for SARS-CoV-2 on both the parenchymal and chorionic sides. The infant tested positive for SARS-CoV-2 at birth by nasopharyngeal swab (68).

The original UKOSS study reports 12/24 cases of possible vertical transmission. Limited information is given for the 12 neonates but 6/12 infants tested positive for COVID-19 within 12 hours of birth. It is unclear what method of testing was used, and thus whether criteria for definite vertical transmission were met (32).

Overall, few infections have been reported in the newborns of COVID-19-positive mothers, and outcomes in the infants who were antibody positive appear to have been good (64). In one series, of 120 infants both to COVID-19 positive mothers, no infant had SARS-CoV-2 virus detected by a nasopharyngeal swab in the immediate postnatal period (24 h), nor at 5–7 or 14 days of life. Additionally, all infants remained asymptomatic during the study period. This finding supports the previous reports of a low risk of perinatal transmission with strict infection control practices (64).

Systematic reviews have concluded that neonatal COVID-19 infection is uncommon, almost never symptomatic, and the rate of infection is no greater when the baby is born vaginally, breastfed or allowed contact with the mother (52, 65).

A UK prospective population-based cohort study of babies with confirmed SARS-CoV-2 infection in the first 28 days of life confirmed that inpatient care for neonates with confirmed SARS-CoV-2 is rare, with 5.6 cases per 10000 livebirths (one in 1785) at the UK peak in March and April, 2020. Infection in the first 7 days after birth to a mother with perinatal SARS-CoV-2 infection was uncommon and generally mild or asymptomatic, despite a national policy that promoted keeping mother and neonate together (69). This study identified only two babies with possible vertically acquired infection.

From the US SET-NET reports, among 610 infants (21.3%) with reported SARS-CoV-2 test results born to COVID-19 positive mothers, perinatal infection was infrequent (2.6%) and occurred primarily among infants whose mother had SARS-CoV-2 infection identified within 1 week of delivery (33).

It is not yet clear whether SARS-CoV2 can be transferred via breast milk. Other coronaviruses are destroyed by pasteurisation but there is little evidence to inform whether COVID-19 (if present) would be similarly destroyed. Several reports have now documented the presence of virus in breast milk by detecting viral RNA by polymerase chain reaction. Whether this translates to viable virus or degraded residual nucleic acid cannot not be ascertained, since no efforts have been made to grow the virus in cell culture. At present, therefore, data are not sufficient to conclude vertical transmission of COVID-19 through breastfeeding (65, 70, 71).

For those reasons, the proven short- and long-term benefits of breastfeeding should outweigh the potential risks of transmission, especially given that COVID-19 in infants seems to represent a much lower threat to survival and health than other infections that breastfeeding is protective against (68). Perinatal transmission is unlikely to occur if correct hygiene precautions are undertaken and rooming in and breastfeeding are safe procedures when paired with effective parental education of infant protective strategies (52, 64, 72).

Impact of the pandemic on maternal and perinatal outcomes

There have been reports in the literature suggesting that rates of stillbirth and preterm birth might have changed during the pandemic, as indirect effects of the pandemic. A reduction in health-care-seeking behaviour, as well as reduced provision of maternity services, has been suggested as a possible cause (73).

A recent systematic review has reported that global maternal and fetal outcomes have worsened during the COVID-19 pandemic, with an increase in maternal deaths, stillbirth, ruptured ectopic pregnancies, and maternal depression. Some outcomes showed considerable disparity between high-resource and low-resource settings. (74)

These authors identified significant increases in stillbirth (pooled OR 1.28; 12 studies, 168295 pregnancies during and 198993 before the pandemic) and maternal death (1.37, two studies [both from low-income and middle income countries], 237018 and 2224859 pregnancies) during versus before the pandemic. The observed increase in maternal death is based only on data from LMICs. Preterm births before 37 weeks' gestation were not significantly changed overall (0.94; 15 studies, 170640 and 656423 pregnancies) but were decreased in high-income countries (0.91; 12 studies, 159987 and 635118 pregnancies), where spontaneous preterm birth was also decreased (0.81; two studies, 4204 and 6818 pregnancies) (74). The authors conclude; "there is an urgent need to prioritise safe, accessible, and equitable maternity care within the strategic response to this pandemic" (74).

Summary

Pregnant women are considered to be a high risk group for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, and the potential adverse effects of the virus on maternal and perinatal outcomes are of increasing concern.

Pregnant women are not at more risk of contracting COVID-19 than their peers, but pregnancy is an independent risk factor for COVID-19 disease severity.

Pregnant women diagnosed with COVID-19 are more likely than their non-pregnant counterparts to be hospitalised.

Pregnant and recently pregnant women with COVID-19 are at increased risk of admission to an intensive care unit, receiving invasive ventilation and extra corporeal membrane oxygenation treatment, compared with non-pregnant women of reproductive age.

Risk factors for severe COVID-19 in pregnancy include increasing maternal age, high body mass index, non-white ethnicity, pre-existing comorbidities, and pregnancy-specific conditions such as gestational diabetes and pre-eclampsia.

Pregnant women with a COVID-19 diagnosis are at an increased risk of maternal death; risk factors associated with maternal death include: non-white ethnicity and high body mass index

Pregnant women with COVID-19 are more likely to experience preterm birth and their neonates are more likely to be admitted to a neonatal unit.

Reports of fetal death caused by SARS-CoV2 placentitis are of concern and deserve further investigation; predisposing or underlying factors are not yet understood.

Neonatal COVID-19 infection is uncommon, almost never symptomatic, and the rate of infection is no greater when the baby is born vaginally, breastfed or allowed contact with the mother.

Robust collection of maternal data by trimester of exposure, including the periconception period, is still required to determine the effects of COVID-19 infection on early pregnancy outcomes, fetal growth and stillbirth.

The pandemic has had other impacts on healthcare systems, including maternity services, and the adverse effects of COVID-19 on maternal and perinatal outcomes are likely not limited to the morbidity and mortality caused directly by the virus – this needs to be a focus of ongoing work in response to the pandemic.

7 Algorithms / Pathways



COVID-19 Assessment and testing pathway for use in a HOSPITAL SETTING



At entry to hospital: Segregate possible COVID-19 and non COVID-19 patients into two Parallel Streams

Criteria for COVID-19 parallel stream:

- New onset of acute respiratory infection (including any one of fever, cough or shortness of breath); Influenza-like illness; or hypoxic respiratory failure in a previously healthy person
- OR
- Acute deterioration of existing respiratory disease requiring hospital assessment
- OR
- Temperature above 38°C or chills in the absence of reasonable evidence of infection at a non-respiratory site
- OR
- Sudden onset of anosmia¹, ageusia² or dysgeusia³

Clinical judgement should be applied in application of these criteria to determine who requires testing.

Clinicians should be alert to the possibility of atypical (including non-respiratory) presentations in older patients (may present with lethargy, confusion, loss of appetite, unexplained change in baseline condition), younger patients and in those who are immunocompromised.

¹ Loss of sense of smell; ² Loss of sense of taste; ³ Distortion of sense of taste

Patients should wear a surgical mask, if tolerated.

Assess and rapidly differentiate into discharge to Home/Community management versus need for Acute Hospital Management

Discharge to community

If patient is well and does not need hospital admission:

- If symptomatic as detailed in [Telephone assessment and testing pathway for patients who phone general practice and healthcare settings other than receiving hospitals](#), ask patient to return home and contact GP to arrange testing. If the patient does not have a GP, they will be facilitated, as detailed [here](#). Do not use 999 OR 112.
- The patient may be driven home by a person who has already had significant exposure, who is aware of the risks and who is willing to drive them. If patient had driven themselves, they may drive home if feeling well enough to drive.
- Patients should be advised to remain in [self-isolation](#) pending test and test result.
- Everyone is asked to adhere to Public Health advice on reducing their contacts and preventing infection. Additional restrictions for household contacts are outlined [here](#).

Admission to hospital

- ISOLATE in a single room if possible
- STANDARD, CONTACT & DROPLET PRECAUTIONS
- See [Laboratory guidance for COVID-19](#) for details on SARS-CoV-2 testing: Combined swab for NASOPHARYNGEAL and OROPHARYNGEAL SAMPLE (one swab to test both is sufficient) or Bronchoalveolar lavage (BAL) or ENDOTRACHEAL ASPIRATE or SPUTUM (if produced).
- ADVICE available from the National Isolation Unit (NIU) (adults): 01-830 1122 and CHI (paediatrics): 01-409 6100 as required (ask for ID Consultant on call).
- Continue isolation in a single room while awaiting test results.

LABORATORY TEST POSITIVE

- Laboratory to inform clinician and input data on CIDR
- All patient management to be supported by input from ID Clinician/Microbiologist in line with [IPC guidance](#)

STANDARD PRECAUTIONS (SP)

- See [here](#). Surgical face masks should be worn:
1. When providing care to all patients (within 2 metres)
 2. For all encounters, ≥15 minutes, with other HCWs in the workplace where a distance of 2 metres cannot be maintained

CONTACT & DROPLET PRECAUTIONS (NS):

- Hand Hygiene
 - Patient placement: In a single room if available, or cohort if appropriate
- PPE (see [here](#) for further information):
- Respiratory protection (surgical mask or an FFP2 respirator mask)
 - Gloves
 - Long-sleeved gown (for high contact activities) / apron (for low contact activities)
 - Eye protection as per risk assessment* (face shield or goggles)

*where there is a risk of blood, body fluids, excretions or secretions (including respiratory secretions) splashing into the eyes.

"Airborne precautions" for aerosol generating procedures—see [here](#)
An FFP2/3 respirator mask must be worn

Laboratory test: Not Detected
Maintain IPC precautions until discussed with IPC team.

Note: If virus is not detected in an upper respiratory tract sample, clinical suspicion for COVID-19 should be maintained in patients with severe respiratory disease that is not readily explained. Testing of lower respiratory tract samples can be considered, if available.

Version 15.2 Publication date: 19/02/2021

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/algorithms/>



Clinical Decision Support Tool for Maternity

(Based on general principles of what we already know)

Use this tool if the patient has fever/chills and/or signs/symptoms of respiratory tract infection. If you have a clinical suspicion of COVID-19; use in conjunction with HPSC COVID-19 Assessment & testing pathway in a hospital setting. Once IPC measures are in place, the obstetric emergency should be dealt with as the priority. Do not delay obstetric management in order to test for COVID-19.



Background:

Covid-19 is a new disease. Our knowledge of it is increasing daily. For this reason, early multidisciplinary involvement is strongly recommended.

For more information on the management of COVID-19 and pregnancy, please visit the information section on HSE website at <https://hse.drsteevenslibrary.ie/CovidV2>

Actions:

For Woman: alcohol gel hands, put on a surgical mask and be appropriately isolated (minimum requirement is social distancing > 2m).

Infection Prevention & Control (IPC):
Apply standard, contact and droplet precautions for COVID-19 (Airborne precautions are required for aerosol generating procedures).
For details visit www.hpsc.ie

Addressograph here

Signs and Symptoms:

Most common:

Cough Shortness of breath Myalgia
Fatigue Fever (Do not assume all pyrexia is due to COVID-19)

Less common:

Anorexia Sputum production Sore throat
Dizziness Headache Rhinorrhoea
Haemoptysis Nausea/vomiting Diarrhoea
Abdominal pain Conjunctival congestion Chest pain

Red flags

(Multidisciplinary involvement as soon as clinically indicated)

Consider critical care early for assessment:

- RR > 30 breaths/min
- Severe respiratory distress
- New onset SpO₂ < 90% on room air
- New onset confusion
- Hypotension
- Oliguria > 12 hours

Risk factors for severe disease (extrapolated from general practice):

Pregnant/postnatal women do not appear to be more susceptible to the consequences of infection with COVID-19 than the general population. Special consideration should be given to women with associated medical illnesses.

The following may be associated with increased risk of severe infection:

Existing chronic disease 1^o or 2^o immunosuppression VTE
Gestational Diabetes Asthma HIV
Smoking Obesity Cancer
Essential/Gestational Hypertension/Preeclampsia

All women who require inpatient care within 42 days of birth should be monitored using IMEWS with appropriate escalation of care. Observations at least hourly including respiratory rate.

| IMEWS Trigger | Normal Values | Yellow Zone | Pink Zone |
|----------------------|---------------|------------------------|-----------------------------|
| Resp. rate | 11-19 | 20-24 | ≤10 or ≥25 |
| SpO ₂ (%) | 96-100 | - | ≤95 |
| Temperature °C | 36.0 – 37.4 | 35.1-35.9 or 37.5-37.9 | ≤35 or ≥38 |
| Maternal HR | 60-99 | 50-59 or 100-119 | <50 or ≥120 |
| Systolic BP | 100-139 | 90-99 or 140-159 | <90 or ≥160 |
| Diastolic BP | 50-89 | 40-49 or 90-99 | <40 or ≥100 |
| AVPU | Alert | | Voice, Pain or Unresponsive |

Consider admission for:

- IMEWS ≥1 yellow **OR**
- Using clinical judgement

Initial management:

- Oxygen for sats ≥ 94% (88-92% in chronic hypoxic lung disease)
 - Antimicrobial as per local guideline
 - Paracetamol (for fever and/or myalgia)
 - VTE risk assessment and VTE prophylaxis if unwell
 - **Increase fetal vigilance.**
- Steroids should be given for fetal lung maturation where indicated
- COVID-19 specific therapies (as per hospital's guidelines & senior decision) *Caution in breastfeeding mothers.*

Preliminary Tests & Investigations:

| | | |
|------|----------------|------------------------------|
| FBC | Blood Cultures | Covid-19 Nasal & Throat Swab |
| CRP | Coag Screen | Others as indicated |
| U&E | ABG/VBG | e.g. HVS, MSU |
| LFTs | | Chest X-ray or CT scan |

Fluid management:

COVID-19 may cause severe lung injury, which can be aggravated by excess intravenous fluid administration. Intravenous fluids should only be given if there is a clinical indication such as hypotension, raised lactate or the patient is unable to tolerate oral fluids. Given the association of COVID-19 with acute respiratory distress syndrome, women with moderate-severe symptoms of COVID-19 should be monitored using hourly fluid balance charts; targeted towards achieving neutral fluid balance.

Caution with Syntocinon: prolonged infusions can result in water retention and hyponatremia, giving rise to water intoxication. Symptoms include – altered mental status, headache, muscle cramps and nausea.

Caution with pre-eclampsia.

Escalation to Critical Care:

Multidisciplinary involvement

Consider critical care review in a woman with an IMEWS 2 yellows or 1 pink or clinically deteriorating with an IMEWS >2 yellows or >1 pink. The decision to admit rests with the duty anaesthesiology / critical care team.

*Aerosol generating procedures (AGPs):

- Intubation should occur in a single room and with the **minimum** staff present and using airborne precautions, www.hpsc.ie
- Non-invasive ventilation and high-flow nasal oxygen therapy are AGPs and are **NOT** recommended outside of isolation rooms. Early intubation is associated with improved outcomes.

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https://hse.drsteevenslibrary.ie/ld.php?content_id=32855969

8 Maternity care considerations

All pregnant women and their newborns, including those with confirmed or suspected COVID-19 infections, have the right to high quality care before, during and after childbirth.

It is important to recognise the increased stress and anxiety caused by COVID-19 which may be particularly felt by pregnant women, recently-pregnant women, and their partners, children, and families; healthcare providers have a role in responding to pregnant women in an appropriate and compassionate way.¹

8.1 Routine antenatal care

Many elements of antenatal care may require in-person assessment, in particular blood pressure and urine checks, measurement of fetal growth and blood tests. Routine antenatal care is essential to detecting common complications of pregnancy such as pre-eclampsia, gestational diabetes, fetal growth concerns and asymptomatic urine infection. Services should return to normal practice as soon as the local risk of transmission and prevalence allows.

Strategies to minimize the risk of infection with COVID-19 should be incorporated into guidance discussions during prenatal care for all pregnant patients, with education about the risk of community transmission of the virus.

General Considerations

Women should be advised to attend routine antenatal care unless they meet current self-isolation guidance for individuals and households of individuals with symptoms of new continuous cough or fever. If pregnant women test positive for COVID-19 they are advised to inform the maternity unit, so that antenatal care can still be arranged

At times of outbreaks and high community spread, women may be advised to attend clinic on their own (with exceptions as per local hospital policy) and to only come at their designated time to avoid too many people in hospital waiting areas.

Units should consider adopting tele-conferencing and video-conferencing capability and consider what appointments can be conducted remotely. This may not be feasible where women carry their own (paper) charts and where more limited information is available in the maternity unit; this is also more relevant at times of a major outbreak

Remote consulting reduces the need for women to travel, enter a hospital, and be within two metres of others, and thus reduces their risk of infection. It also reduces footfall in the clinic and therefore makes social distancing within the clinical area more achievable, reducing the risk of infection to staff and other vulnerable patients there.

Record keeping remains paramount. Electronic record systems should be used and, where remote access for staff or patients is an available function, this should be expedited. When seeing women face to face, simultaneous electronic documentation will facilitate future remote consultation.

Individualised plans for women requiring more frequent review (and/or those with high-risk conditions) by healthcare staff in the maternity unit may still be necessary.

Units should appoint a group of clinicians to co-ordinate care for women who miss appointments due to self-isolation. Women should be able to notify the unit of their self-isolation through phone numbers that are already available to them. Appointments should

¹ <https://www.who.int/news/item/01-09-2020-increasing-understanding-of-the-impact-of-covid-19-for-pregnant-women-and-their-babies>

then be reviewed for urgency and either converted to remote appointments, or attendance appropriately advised or rescheduled, only if appropriate.

For women who have symptoms, appointments may be deferred until 14 days after the start of symptoms – but this should only be after discussion with healthcare providers in the hospitals as it may not be appropriate to defer every appointment. For women who are self-isolating because someone in their household has possible symptoms of COVID-19, appointments may be deferred for 14 days, with the same cautions. In both cases women should inform the maternity unit of their situation, and get advice on their ongoing care, as well as details about increased fetal surveillance necessary at later gestations of pregnancy.

Units should have a system to flag women who have missed serial appointments, and any woman who has a routine appointment delayed for more than 2 weeks should be contacted.

For women who are self-isolating at home, they should stay well hydrated and mobile throughout this period. Women who have thromboprophylaxis already prescribed should continue taking this. If women are concerned about the development of venous thromboembolism (VTE) during a period of self-isolation, a clinical review (in person) should occur to assess VTE risk, and thromboprophylaxis considered on a case-by-case basis.

Pregnant women will continue to need at least as much support, advice, care and guidance in relation to pregnancy, childbirth and early parenthood as before the pandemic. Units also need to consider alternatives (virtual; online, recorded) to the delivery of parentcraft education during this time.

It is important that care is available to ensure continuation of support for women with multiple complex needs. Women living with adversity including poverty, homelessness, substance misuse, being an asylum seeker, experiencing domestic abuse and mental health problems will continue to require timely expert support.

Isolation, bereavement, financial difficulties, insecurity and inability to access support systems are all widely recognised risk factors for mental ill-health. The coronavirus epidemic increases the risk of perinatal anxiety and depression, as well as domestic violence. It is critically important that support for women and families is strengthened as far as possible; that women are asked about mental health at every contact; and that women are urged to access support through remote means as far as possible.

Maternal Medicine / Obstetric complications

A senior obstetrician with a specialist interest in maternal medicine should assess all new referrals of pregnant women with medical disorders. Particular consideration should be made to combine additional blood tests with those taken at the booking appointment. This will facilitate planning for one-stop booking clinics, preventing the need for the woman to re-attend the hospital for additional tests when requested by her maternal medicine team.

Routine clinical assessment checks (e.g. measurement of fundal height, urinalysis, and blood pressure) conducted at midwifery/general practice appointments need not be repeated in maternal medicine clinics. Maternal medicine clinics can use telephone or video consultations instead of face-to-face encounters for some visits, only if this is appropriate in each individual case.

Some maternal medicine clinic appointments will need to be face-to-face, primarily when the woman is having a physical interaction such as an obstetric scan or requires blood testing. Face-to-face interactions should be limited by reviewing the purpose of the appointment in advance and ensuring that the relevant tests/treatments can all be done in a single visit. At the end of each appointment, question whether the next appointment is medically necessary, whether it can be / should be conducted remotely, and whether it can be tied up with other necessary appointments and use local arrangements to streamline care.

The HSPC/HSE have identified individuals with which are considered vulnerable to severe COVID-19 disease. Adults with some co-morbidities have been identified as 'extremely vulnerable' to the severe effects of COVID-19 infection. Therefore pregnant women with the following conditions should adhere to these recommendations.

The underlying conditions listed below are recognised as significant:-

- Solid organ transplant recipients
- Those with cancer, undergoing active chemotherapy or immunosuppressive treatments
- Those with severe respiratory conditions including cystic fibrosis and severe asthma
- Those who have homozygous sickle cell disease
- Those receiving immunosuppression therapies sufficient to significantly increase risk of infection
- Those receiving dialysis or with advanced stage chronic kidney disease
- Those with significant congenital or acquired heart disease

Finally, it is important to remember that routine laboratory services may not be functioning in the same way as normal during some times of the COVID-19 pandemic. Units should liaise with laboratory services to make alternative arrangements and ensure a plan is place for urgent or clinically important tests.

Hypertension

The obstetric team should first review the woman at 10-14 weeks (in person if aligned with an 11-13 weeks' dating ultrasound scan). This review should assess the risk status, plan care and ensure that the pregnant woman has prescriptions for antihypertensive medication and low-dose aspirin.

- Send blood for urea & electrolytes (U&E) and urine for protein: creatinine ratio (PCR) with the booking bloods.
- Consider arranging for the woman to self-monitor her blood pressure where possible, and where the supervision, expertise and technology exists
- Arrange obstetric reviews at the same visit as ultrasound scans.
- For other antenatal reviews, plan for remote review as much as possible.

Pre-eclampsia

A face-to-face encounter is necessary to assess a woman with suspected pre-eclampsia for assessment of disease severity and fetal wellbeing.

If a woman with pre-eclampsia is managed as an outpatient:

- Arrange for her to self-monitor her blood pressure every 2 days (again, where the expertise and technology is available for supervision of home-monitoring) and have blood tests for preeclampsia according to the recommended schedule.
- Increase the intensity of monitoring depending on the risk status and clinical findings.
- Arrange for a healthcare professional review twice a week, at the time of the blood tests or fetal growth scans, for women managed as outpatients.

For all women with hypertensive disorders in pregnancy, postnatal anti-hypertensive medication should be reviewed with senior input to optimise blood pressure control and minimise the length of postnatal stay in the hospital. Advise women to self-monitor their blood pressure at least 2-3 times in the first week after discharge home, under supervision.

Pre-existing Diabetes

Adults with pre-existing diabetes have been identified as being more vulnerable to the severe effects of COVID-19 infection. They have been advised to stringently follow social distancing

measures. Additional tests at the booking appointment for pregnant women with pre-existing diabetes should include early face-to-face review being organised. This should coincide with the 11-14 week scan and booking bloods.

This review should cover:

- HbA1c, renal and thyroid function, and urinary PCR.
- Blood glucose monitoring (continuous monitoring or sensor or finger prick) and the process for remote review of blood glucose control.
- Appropriate prescriptions for blood glucose and/or ketone monitoring,
- Information on hypoglycaemia avoidance and awareness for women using insulin.
- Prescription for folic acid and low dose aspirin.
- Care planning which involves the diabetic specialist nurse or midwife.
- To reduce the number of hospital visits, consider recommending retinal screening only to women with known retinal changes prior to pregnancy.
- Consultations by the diabetes team for the purpose of reviewing home capillary blood sugar levels should be done remotely, wherever possible.
- All women should continue to have antenatal care with their team (e.g. to include blood pressure and urinalysis), remotely where possible.

Throughout the pregnancy, visits should coincide with planned ultrasound appointments and at 34-36 weeks' gestation, to comprehensively assess maternal and fetal condition, and plan timing and mode of birth.

Women affected by COVID-19 and who are symptomatic should be aware of the potential effects of infection on blood sugar control and should be advised that they will need more frequent review of home capillary blood sugars and ketones (where appropriate), which can be arranged remotely by the diabetes team.

Gestational Diabetes (GDM)

All women diagnosed with GDM should have an appointment with the diabetes midwife/nurse, who will provide training in the use of a glucose meter. Where feasible, this could be done remotely via video call. This visit should also be used as an opportunity to provide women with dietetic information and contact details of the dietician, where one is available.

Women should be followed-up remotely in the week after the meter training by the diabetes midwife/nurse and for all appointments where home capillary blood sugar levels are to be checked by the diabetes team.

Women should be provided with clear guidance on who to contact if they have >3 abnormal blood glucose levels in a week or >10-15% of all readings – this will usually be the diabetes antenatal team. It is possible that services may not be able to contact all women with GDM who are self-monitoring. It is therefore essential that women understand the responsibility of contacting the diabetes team if their readings are outside of the specified targets.

In women who have GDM and are taking metformin and/or insulin, offer obstetric review at 28 and 32 weeks' gestation to reassess the risk status. When face-to-face obstetric reviews are needed, for example in women with additional risk factors or poorly controlled blood sugars, ensure that these reviews coincide with any planned ultrasound appointments. Always offer obstetric review at 36 weeks, to comprehensively assess maternal and fetal condition, plan timing and mode of birth, and plan follow-up care until birth.

If women who are taking metformin become symptomatic with COVID-19 it would seem prudent to consider stopping the metformin because of the risk of hypoxia.

Cardiac disease

Maternal cardiac disease represents a significant challenge during the pandemic because:

- It is a risk factor for maternal death and requires careful multidisciplinary care.
- COVID-19 appears to carry a significantly greater risk of death in patients with cardiovascular disease.

Public health measures such as shielding, distancing and isolation aim to lower the risk of COVID-19 exposure but increase the risk of women not receiving adequate pregnancy care.

Plan face-to-face care around essential investigations, e.g. echocardiogram, and 'piggy-back' obstetric care (e.g. scans) to minimise repeated hospital visits.

- Arrange telephone/telemedicine consultations when essential face-to-face investigations are not required.
- Provide women with a reliable contact number to call with any care queries.
- Involve anaesthetists as early as possible in birth planning. These plans are often difficult to make but easy to execute, and anaesthetists will be under huge pressure to look after ventilated COVID-19 patients elsewhere.

Haematology/Venous thromboembolism (VTE)

Isolation at home is likely to cause a significant reduction in daily mobility, which may increase the risk of VTE in all pregnant women. The risk of thrombosis among this group of women is high and consideration for VTE prophylaxis should occur following discussion with a haematologist. Decisions on thromboprophylaxis and imaging for confirmation of VTE should be made on a case-by-case basis, involving senior obstetricians, physicians and radiologists.

Triage and risk factor screening

Before entering the maternity unit, pregnant women should be triaged at entry to the hospital or department (or clinical area). All those entering the maternity unit/services should be asked if there has been recent onset of fever or chills and signs or symptoms of respiratory tract infection, which includes cough or shortness of breath. Clinical judgement should be employed when assessing these criteria, as pregnant women may present with atypical symptoms alongside fever or chills. These symptoms include myalgia, diarrhoea, abdominal pain and anosmia.

Possible COVID-19 and non COVID-19 patients should be separated into two parallel streams for subsequent assessment and clinical review. All units should have documented COVID-19 assessment and treatment pathways that are familiar to all staff.

Maternity units should consider testing pregnant women routinely within 72 hours of scheduled or elective procedures (such as Induction of Labour or Elective Caesarean Section).

Each unit should have a policy regarding routine testing of unscheduled admissions, as well as for their long stay inpatients (e.g. every 3 days or at a minimum every week).

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/algorithms/>

8.2 Unscheduled care

All women presenting at the maternity Emergency Department (ED) or early pregnancy clinic (EPC) should be triaged and asked about symptoms of COVID-19 as well as pertinent risk factors. It is important to remember that women may have attended other units or hospitals, or been tested (or be awaiting a test result) in the community, and should be specifically

asked about this. Appropriate communication needs to be ensured with pregnant women for whom English is not their first language.

Women who become unwell or who are experiencing complications in pregnancy should still be encouraged to present for review at the maternity ED (or EPC, as appropriate). A woman who is presenting at the unit with COVID-19 symptoms or who is COVID-19 positive should be met and looked after in a specific and appropriately equipped isolation room. All units should have COVID-19 pathways of care for this purpose.

To minimise the possibility of infection, approved social distancing protocols should be enacted in all ED/EPC clinical and waiting areas.

Early pregnancy care

Reduction in resources and capacity related to the COVID-19 pandemic, as well as the aim to minimise hospital attendance for social distancing of pregnant women, have led to a general recommendation (international) of one of the following three options:-

- Scans and/or visits that need to be undertaken without delay;
- Scans and/or visits that can be delayed without affecting clinical care;
- Scans and/or visits that can be avoided for times of major outbreaks during the pandemic.

Any rationalising of visits should ensure that those at risk of early pregnancy complications continue to be looked after. Changes in unit scanning policy may only be necessary at times of local outbreaks (and high community spread).

Where scans are deferred or delayed for unavoidable reasons, women must be contacted to ensure that they present if unwell, and where possible are given alternative appointments or clinical options. As much as possible, in scenarios of previous pregnancy loss or threatened miscarriages, women should be facilitated to have a partner attend early pregnancy scans with them in the maternity unit.

Women diagnosed with miscarriage should be managed in accordance with local protocols. There should be an effort to reduce inpatient admission: offer expectant management for incomplete miscarriage and consider medical management. Telephone follow up for scenarios of pregnancy of unknown location (PUL) can be considered as well as use of conservative management after PUL or following medical management.

Aerosol generation at intubation and extubation during general anaesthesia (GA) poses the highest risk of disseminating SARS-CoV2. If surgical management is indicated for management of early pregnancy complications, appropriate precautions related to personal protective equipment (PPE) should be taken. Regional anaesthesia may be considered in COVID-19 positive women to reduce the risk to both patient and staff from general anaesthesia. Pre-operative routine COVID-19 testing (according to hospital policy) for what is most commonly an electively scheduled surgical procedure like an ERPC provides the option of general anaesthesia for the woman.²

Women with ectopic pregnancy should be managed in accordance to local protocols with an emphasis on conservative management if possible and appropriate. Surgical management of ectopic pregnancy should still be considered, but only following senior review of the ultrasound scan, beta-hCG results and clinical findings.

² Uppal V, Sondekoppam RV, Landau R, El-Boghdadly K, Narouze S, Kalagara HKP. Neuraxial anaesthesia and peripheral nerve blocks during the COVID-19 pandemic: a literature review and practice recommendations. *Anaesthesia*. 2020 Oct;75(10):1350-1363. doi: 10.1111/anae.15105

Laparoscopic surgery should be undertaken with strict precautions taken to filter any CO₂ escaping into the operating theatre and the theatre staff wearing appropriate PPE. The magnitude of SARS-CoV-2 viral transmission risk from airborne particles created by laparoscopic surgery is uncertain. There is no evidence of an increased risk of COVID-19 transmission during laparoscopic surgery when PPE is used, though data specifically evaluating this hazard are lacking.

<https://mk0britishsocioep8d9m.kinstacdn.com/wp-content/uploads/2020/12/Joint-RCOG-BSGE-Gynaecological-Endoscopy-211220.pdf>

Women with early pregnancy complications should still be referred to appropriate counselling services and to reliable, accurate online sources of information. ISUOG have provided useful suggestions for triage of early pregnancy scans:

<https://www.isuog.org/resource/isuog-consensus-statement-on-rationalization-of-early-pregnancy-care-and-provision-of-ultrasonography-in-context-of-sars-cov-2-pdf.html>

8.3 Ultrasound scans and fetal surveillance in pregnancy

Ultrasound is an essential part of obstetric care, but exposes the patient and the caregiver to high risks, given the impossibility of keeping the recommended distance between them during the ultrasound scan. It is therefore essential to take all possible precautions when undertaking routine clinical activity.

<https://www.isuog.org/resource/isuog-consensus-statement-on-rationalization-of-early-pregnancy-care-and-provision-of-ultrasonography-in-context-of-sars-cov-2-pdf.html>

Recommendations for ultrasound practice

Ultrasound rooms should be cleaned thoroughly each morning before patients arrive and again in the afternoon after all patients have been scanned. Items to be cleaned include computer keyboard and mouse, doorknobs, patient beds, guest chairs, ultrasound machines, sonographer chairs, countertops, cabinet door handles, and light switches.

Following ultrasound examination, ensure surfaces of transducers are cleaned and disinfected according to manufacturer specifications. Consider using protective covers for probes and cables, especially when a transvaginal scan is necessary.

In the case of confirmed COVID-19, a 'deep clean' of the equipment is necessary. A bedside scan is preferred in these situations; if the patient needs to be scanned in the clinic, this should be done at the end of the clinic, as the room and equipment will subsequently require a deep clean.

In order to reduce the risk of transmission, it is important to respect the time of scheduled visits, to widen the appointment intervals in order to prevent crowding in the waiting room and to space the seats to at least a 2 meters apart. Minimise clutter in the ultrasound rooms and remove unnecessary items.

It is recommended that providers use a three-ply surgical mask when performing ultrasound scans as there is direct and frequent patient contact in close proximity. The surgical masks may be reused during the care of multiple patients, if used to protect the healthcare provider from an activity with low transmission risk, such as ultrasonography. Replace the mask as soon as it is damp and do not reuse single-use masks.

Hand hygiene is imperative before and after direct patient contact. If it is not possible to wash hands, hand sanitizer can be used. Latex-free disposable gloves should be used during the ultrasound examination and changed after each patient.

During local outbreaks (and high community spread), consideration can be given to reducing the contact time for anomaly scans to 15 minutes, and to not providing repeat anomaly cans unless an anomaly is suspected or the gestational age is incorrect. These limitations should be recorded on the scan report. Labelling of images should be kept to a minimum to facilitate this, and all details regarding the pregnant woman's history and previous scans reviewed before she enters the scan room.

With some levels of COVID-19 hospital restrictions and at times of outbreaks, the pregnant woman may be attending the scan on her own. She should also be advised that detailed explanations may not be given during the examination. Hospital policy about the recording of images or provision of scan pictures should also be explained.

The RCOG have provided useful suggestions for triage of ultrasound services.

<https://www.rcog.org.uk/globalassets/documents/guidelines/2020-12-09-guidance-for-antenatal-screening-and-ultrasound-in-pregnancy-in-the-coronavirus-covid-19-pandemic.pdf>

The Society of Maternal Fetal Medicine has published the guideline: "The Society for Maternal-Fetal Medicine COVID-19 Ultrasound Practice Suggestions".

[https://s3.amazonaws.com/cdn.smfm.org/media/2550/Ultrasound_Covid19_Suggestions_10-20-20_\(final\).pdf](https://s3.amazonaws.com/cdn.smfm.org/media/2550/Ultrasound_Covid19_Suggestions_10-20-20_(final).pdf)

Fetal Medicine

Fetal Medicine Services are essential to the provision of routine Obstetric Care. All referrals to Fetal Medicine Services should be discussed with a Fetal Medicine consultant prior to referral. For some women, delaying the appointment until after the period of self-isolation or until recovered from the illness, may be clinically acceptable, but this depends on gestation of pregnancy and fetal wellbeing. Consideration should be given to reducing the number of staff that attend these clinics, at times of local outbreaks.

In general, pregnant women should be screened before entering the hospital for symptoms of COVID-19. Consideration should always be given to a partner (screened before entering the hospital) attending the consultations when a fetal anomaly has been diagnosed.

If symptoms are present then a discussion with the fetal medicine consultant covering the unit should occur. She/he will review the reason for referral and decide if the woman needs to be seen on that day; if the decision is to postpone the evaluation it should be communicated clearly to the woman and a new appointment given.

Fetal Medicine screening such as fetal echocardiography can be deferred if appropriate (i.e. reserved for the most high risk pregnancies) and if the anomaly scan with normal cardiac views has been performed.

The need for invasive prenatal diagnosis should be decided on an individual basis by a Fetal Medicine Consultant. Pregnant women who require urgent review, such as fetal hydrops or fetal growth restriction should be seen, following risk assessment, with appropriate PPE provided as indicated by the clinical situation.

Therapeutic Procedures should continue with appropriate PPE provided after risk assessment for COVID-19; including Laser ablation for Twin to Twin Transfusion Syndrome, Intrauterine Transfusion for fetal anaemia and Amniocentesis.

Cases that have been delayed but require diagnostic testing and/or discussion regarding termination of pregnancy should still be discussed at a weekly MDT meeting (consider teleconferencing for this MDT meeting to facilitate a wide attendance).

8.4 Management of COVID-19 suspected and /or confirmed infection in pregnancy

Diagnosis of COVID-19 infection

Any suspected case should be tested for COVID-19 using available molecular tests, such as quantitative reverse transcription polymerase chain reaction (qRT-PCR). This is usually through the collection of upper-respiratory-tract specimens of combined nasopharyngeal and oropharyngeal swabs. Bearing in mind the possibility of false negative results, if a strong clinical suspicion persists in an unwell patient, a retest should be considered.

Chest imaging, especially CT scan, has proven essential for evaluation of the clinical condition of adults with COVID-19. Fetal growth restriction (FGR), microcephaly and intellectual disability are the most common reported adverse effects from high-dose (>610mGy) radiation exposure. According to data from the American College of Radiology and American College of Obstetricians and Gynecologists, when a pregnant woman undergoes a single chest X-ray examination, the radiation dose to the fetus is 0.0005–0.01 mGy, which is negligible, while the radiation dose to the fetus is 0.01–0.66 mGy from a single chest CT or CT pulmonary angiogram.

<https://www.acr.org/-/media/ACR/Files/Practice-Parameters/Pregnant-Pts.pdf>

Chest CT scanning has high sensitivity for diagnosis of COVID-19. In a pregnant woman with suspected COVID-19, a chest CT scan may still be considered as a primary tool for the detection of COVID-19 in epidemic areas, and used as available. Informed consent should be acquired (with shared decision-making) and a radiation shield be applied over the gravid uterus.

<https://www.isuog.org/clinical-resources/coronavirus-covid-19-resources/research-and-journal/interim-guidance-coronavirus-pregnancy-puerperium.html>

If pregnant women test positive for COVID-19 (in the community or at another unit) they are advised to inform their own maternity unit, so that antenatal care can still be arranged, and the necessary surveillance agreed.

Management at home, isolating

Pregnant women with a mild clinical presentation may not initially require hospital admission and isolation at home can be considered, provided that this is possible logistically and that monitoring of the woman's condition and fetal wellbeing can be ensured.

Women should be provided with appropriate information, referred to helpful sources, and given contact details for the hospital.

These women should be offered thromboprophylaxis according to the guideline.

Maternity units should allow for telephone clinics for to check on women who have been told to self-isolate at home. Some women will still need to attend hospital for assessment, and this should be arranged using the hospital's COVID-19 pathway.

It should be emphasized that COVID-19 patients can decompensate after several days of apparently mild illness, and women should be instructed to call or be seen for care if symptoms, particularly shortness of breath, worsen.

Antenatal Care

Pregnant women should be informed that there is emerging evidence of a risk of stillbirth with maternal COVID-19 infection in pregnancy. They should be informed that while the relative risk is around 3-4 fold, the absolute risk is estimated at 1%, from current data, and

information gathering is still ongoing. Pregnant women should be advised of the particular importance of monitoring fetal movements. They should be asked to present immediately if they have any concerns regarding fetal movements.

A cluster of stillbirths recently reported in Ireland appear to be acute in nature, that is to say, occurring within 7-21 days of COVID-19 infection. Fetal growth restriction is not a feature, possibly due to the acute course of the condition. It is not known whether Doppler abnormalities preceded the stillbirths, and the liquor volume was reportedly normal in these cases. Based on these observations it is unlikely that ultrasound will be useful in detection or prediction of adverse outcome, as these changes are usually found in more chronic forms of uteroplacental insufficiency.

In most cases fetal a reduction in fetal movement was noted. It is likely that fetal movement awareness with CTG surveillance is the optimum form of monitoring, understanding that many women reported reduced fetal movements in advance of the fetal death.

Recommendations for antenatal surveillance of the fetus following a diagnosis of COVID-19 in a pregnant woman is as follows:-

COVID-19 at a gestation greater than 24 weeks:

Initial evaluation should be with CTG and baseline ultrasound.

- A CTG should be performed at the time of diagnosis of COVID-19, for evaluation of fetal wellbeing.
- If there is an abnormality on CTG, or if the CTG is difficult to interpret (as with lower gestations) then fetal ultrasound for biophysical score should be performed and the management directed as per standard guidance with this investigation.
- Any concern following this evaluation should be discussed with a senior Obstetrician/Fetal Medicine Specialist.
- An ultrasound scan for biometry, AFV and UADs should be scheduled. This ultrasound should be performed as soon as is reasonably practicable (and as soon after the COVID-19 diagnosis as feasible).
- If there is an abnormality found on this scan appropriate follow up should be discussed with a senior Obstetrician/Fetal Medicine Specialist.

Follow on management.

- Further surveillance should be with CTGs on a weekly basis (at a minimum).
- Ultrasound should be requested in the event of a concern on CTG, rather than as an adjunct to monitoring.
- Repeat ultrasound examination should be performed for fetal growth, AFV and UADs at 2 and 4 weeks following the initial COVID-19 diagnosis. This may improve detection of Doppler abnormality in the acute phase.
- Other ultrasound scans should be as for usual indications.
- If being monitored as inpatients due to symptomatic COVID-19 then daily CTGs are advised.
- For some women admission to the unit may be more practical and/or safer in the short term and/or during acute illness, and daily monitoring arranged.

COVID-19 at a gestation less than 24 weeks:

When the infection is acquired in the first or early second trimester of pregnancy, a detailed morphology / anomaly scan at 18–23 weeks of gestation is indicated, and these pregnancies should be monitored carefully after recovery. It is reasonable to consider regular sonographic assessment of fetal growth in the third trimester thereafter. Decisions around ongoing surveillance should be individualised.

Ongoing outpatient care – ultrasound

For pregnant women with confirmed infection in the third trimester (>28 weeks) who are recovering from COVID-19 in an ongoing pregnancy, after the acute illness, monitoring should be 2–4-weekly ultrasound assessment of fetal growth and amniotic fluid volume, with umbilical artery Doppler if necessary. Decisions around ongoing surveillance should be individualised.

Although there is no evidence yet that fetal growth restriction (FGR) is a consequence of COVID-19, two-thirds of pregnancies with SARS were affected by FGR, so some ultrasound follow-up seems prudent and has been generally adopted internationally. This could be individualised as a 32 week fetal growth scan, for example.

International guidance on fetal growth surveillance following COVID-19 currently recommends as a minimum a single fetal growth ultrasound scan a minimum of 14 days following resolution from acute illness of COVID-19.

Ongoing outpatient care – clinics

Routine appointments for normal-risk women with suspected or confirmed COVID-19 (antenatal community or secondary care appointments) may be delayed until after the recommended period of self-isolation but this is not appropriate in all cases and depends on pregnancy gestation. Routine vaccinations (e.g. pertussis) should continue after the illness.

Advice to attend pre-arranged appointments (fetal medicine surveillance, high-risk antenatal care) require a senior clinician's decision on urgency and potential risks/benefits. If obstetric or midwifery care cannot be delayed until after the recommended period of isolation, IPC measures should be arranged locally to facilitate care e.g. separate COVID-19 clinics in areas of hospital away from other clinical areas.

Pregnant women in self-isolation who need to attend should be contacted by a local care coordinator to re-book urgent appointments / scans, preferably at the end of the working day. It is important that COVID-19 status is documented clearly in the woman's healthcare record as if she attends for an unscheduled visit this needs to be communicated to healthcare providers so that she can be appropriately isolated, alongside the correct care being organised.

Antenatal corticosteroids for fetal lung maturation

With regard to the administration of maternal corticosteroids for fetal lung maturation, NICE guidance is as follows³:

- 23 – 33+6 weeks: offer maternal corticosteroids
- 34 – 35+6 weeks: consider maternal corticosteroids.

In circumstances where steroids would normally be given, they should not be withheld in a woman with COVID-19; there is no evidence from the Coronavirus outbreaks that a course of corticosteroids for fetal lung maturation causes any clinically significant adverse effect on the mother's illness.

Venous Thromboembolism⁴

COVID-19 is recognised to confer an increased risk of thrombosis. COVID-19 can be assumed to further increase the pre-existing procoagulant state in pregnancy. The risk of thrombosis extends from the early stages of pregnancy until at least 6 weeks post-partum.

³ <https://www.nice.org.uk/guidance/ng25>

⁴ Thromboprophylaxis guidelines. With guidance from Dr Kevin Ryan Consultant Haematologist at the National Coagulation Centre, St James Hospital

This increased risk attributed to COVID-19 is thought to last for 4 weeks from the onset of infection, but may be longer if there are serious complications, including ICU admission. Although evidence is lacking, this increased risk of thrombosis can be assumed to be present regardless of clinical well-being. Consequently, thromboprophylaxis is recommended following a diagnosis of COVID-19 in pregnancy.

- All women with suspected or confirmed COVID-19 should receive pharmaceutical thromboprophylaxis, unless contra-indications are present. If the woman is found to be COVID-19 negative, thromboprophylaxis may be discontinued.
- As self-isolation may result in reduced mobility, and recognising the increased risk of VTE, all women with confirmed COVID-19 in the out-patient setting should be advised to commence LMWH thromboprophylaxis for a period of four weeks following diagnosis of COVID-19.
- In women with suspected COVID-19 in the out-patient setting, thromboprophylaxis should also be considered, pending the result of COVID-19 testing, particularly if additional risk factors for the development of VTE are present. Such cases can be discussed with the local coagulation haematology service. If the woman is found to be COVID-19 negative, thromboprophylaxis may be discontinued.
- LMWH thromboprophylaxis should continue for 4 weeks from the diagnosis of COVID-19 in antenatal women. If LMWH thromboprophylaxis is required during the post-partum period, either because of a diagnosis of COVID-19 within 4 weeks of delivery, or a new diagnosis in the post-partum period, LMWH thromboprophylaxis should continue until at least 6 weeks post-partum, or for 4 weeks, whichever is longer. This is because the risk of thrombosis in pregnancy is known to remain elevated until 6 weeks post-partum.

Example: If a woman develops COVID-19, at 3 weeks postpartum she will require LMWH prophylaxis until 7 weeks post-partum.

Example: If a woman develops COVID-19, 3 weeks prior to delivery she will require LMWH prophylaxis until 6 weeks postpartum (i.e. for a total of 9 weeks).

In patients with COVID-19 who are anticoagulated, timing of administration should be carefully considered to allow regional anaesthesia, in the event of labour or need for delivery.

Additional measures to reduce the risk of thrombosis should be considered in all women with COVID-19, including mobilisation and maintaining adequate hydration. All women should be educated on the signs and symptoms of VTE, and advised to attend for medical review should any develop. This is particularly relevant for women being treated as out-patients.

VTE prophylaxis with low molecular weight heparin (LMWH) at standard obstetric dosing is recommended initially for all pregnant women with confirmed or suspected COVID-19 (unless they are within 12 hours of birth). Where women with complications of COVID-19 infection are under the care of other teams, such as intensivists or acute physicians, the appropriate dosing regimen of LMWH should be discussed in an MDT that includes a senior obstetrician and a local VTE expert.

https://hse.drsteevenslibrary.ie/ld.php?content_id=32860341

Women who develop new symptoms of COVID-19 infection during inpatient admission

There is an estimated incubation period of 0-14 days (mean 5-6 days); an infected woman may therefore present asymptotically, developing symptoms later during an admission.

Health professionals should be aware of this possibility, particularly those who regularly measure patient vital signs. In the event of new onset of respiratory symptoms or unexplained fever of or above 37.8 degrees following admission, the woman should be isolated and appropriate infection control precautions initiated in line with HSPC Guidance. The local IPC team should also be notified so that appropriate investigations can be carried out. It is recognised that this may lead to substantial numbers of women treated as suspected COVID-19. Suspected COVID-19 should not delay administration of therapy that would be usually given (for example, IV antibiotics in a woman with fever and prolonged rupture of membranes).

The Irish Maternity Early Warning System (IMEWS) should be used for the hospital care of a woman with a confirmed clinical pregnancy and for up to 42 days in the postnatal period irrespective of age or reason for presentation to hospital. The standard IMEWS vital signs must be recorded as a baseline on admission to hospital. These are: respiratory rate, temperature, maternal heart rate, systolic blood pressure, diastolic blood pressure and neurological response. The subsequent frequency of observations should be determined by the baseline recordings and the woman's individual clinical circumstances.

For outpatient or inpatient care, it is also important to have a plan for the handling of documentation, such as where the pregnant woman is carrying her own medical chart. This will need to be in her vicinity, but the IPC advice is that the chart is at the maximum possible distance from the patient (greater than 2 metres), and that hand hygiene is observed by caregivers before and after using the chart.

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/infectionpreventionandcontrolguidance/>

Considerations for care for the pregnant woman with confirmed COVID-19 infection (moderate/severe infection)

A multi-disciplinary discussion planning meeting ideally involving a consultant physician (infectious disease specialist where available), consultant obstetrician, consultant neonatologist / paediatrician, midwife-in-charge and consultant anaesthetist responsible for obstetric care should be arranged as soon as possible following admission. The discussion and its conclusions should be discussed with the woman.

The following should be discussed:

- Key priorities for medical care of the woman;
- Most appropriate location of care (e.g. intensive care unit, isolation room in infectious disease ward or other suitable isolation room) and lead specialty;
- Concerns amongst the team regarding special considerations in pregnancy, particularly the condition of the fetus.
- The priority for medical care should be to stabilise the woman's condition with standard supportive care therapies.

Particular considerations for pregnant women are:

- Hourly observations, monitoring both the absolute values and the trends.
- Titrate oxygen to keep saturations >94%.
- Hourly respiratory rate looking for the rate and trends:
- Young fit women can compensate for a deterioration in respiratory function and are able to maintain normal oxygen saturations before they then suddenly decompensate. So a rise in the respiratory rate, even if the saturations are normal, may indicate a deterioration in respiratory function and should be managed by starting or increasing oxygen.
- Radiographic investigations should be performed as for the non-pregnant adult; this includes chest X-ray and CT of the chest. Chest imaging, especially CT chest, is essential

for the evaluation of the unwell patient with COVID-19 and should be performed when indicated, and not delayed due to fetal concerns. Abdominal shielding can be used to protect the fetus as per normal protocols.

- Consider additional investigations to rule out differential diagnoses, e.g. ECG, CTPA as appropriate, echocardiography. The latter may be additionally indicated in pregnancy, noting reports of cardiomyopathy in COVID-19.
- Do not assume all pyrexia is due to COVID-19 and also perform full sepsis-six screening.
- In view of the small risk associated with Metformin to cause lactic acidosis which is exacerbated in any clinical situation pre-disposing to hypoxia (Pneumonia etc.), Metformin should be discontinued, and treatment with Insulin commenced for blood glucose control of Gestational Diabetes.
- Consider bacterial infection if the white blood cell count is raised (lymphocytes usually normal or low with COVID-19 infection) and commence antibiotics.
- Apply caution with IV fluid management. Try boluses in volumes of 250-500mls and then assess for fluid overload before proceeding with further fluid resuscitation.
- The frequency and suitability of fetal heart rate monitoring should be considered on an individual basis, taking into consideration the gestational age of the fetus and the maternal condition. If urgent delivery is indicated for fetal reasons, birth should be expedited as normal, as long as the maternal condition is stable
- Adults with COVID-19 infection who become unwell with severe acute respiratory distress syndrome (SARS) develop high troponin and high D-dimer levels. In this clinical setting, elevation of these biomarkers is not associated with myocardial infarction or thromboembolic disease. It is unknown how these biomarkers change in pregnant women with COVID-19.
- However, it is well known that D-dimer levels are commonly elevated in healthy pregnancy, whereas cardiac troponin levels should remain within normal ranges throughout normotensive pregnancy.
- Caution with patients on magnesium sulphate infusions as elevated magnesium levels may result in respiratory paralysis.

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.

Considerations for care for the pregnant woman in ICU

The overarching principle in managing the acutely ill pregnant woman is that optimal management of the condition, including essential imaging (see above) and medication (see below), is paramount. The fetus is always secondary to this.

The following issues need to be taken into account in a pregnancy:

- Use left lateral tilt after 20 weeks' gestation if possible as aorto-caval compression significantly reduces cardiac output from 20 weeks of gestation thus reducing venous return and cardiac output by up to 30–40%,
- Prone positioning may not always be feasible, but should be considered in early (pre-viable) gestations of pregnancy. The left lateral position is an alternative but may not be as effective.
- Changes in lung function, diaphragmatic splinting by the enlarged uterus and increased oxygen consumption make the pregnant woman become hypoxic more readily and can make ventilation more difficult.
- Difficult intubation is more likely in pregnancy because of large breasts inhibiting the working space and laryngeal oedema can contribute to make intubation more difficult.
- Pregnant women are at an increased risk of aspiration requiring early intubation with effective cricoid pressure and the use of H₂ antagonists and antacids prophylactically.
- High ventilation pressures may require ongoing foetal monitoring due to the potential reduction in cardiac output.

- BP of 90/60 is a normal blood pressure in pregnancy and with hypertension the aim is to keep BP <150/100 mmHg. If there is organ damage, aim for BP <140 mmHg.
- Increased cardiac output means that large volumes of blood can be lost rapidly, especially from the uterus which receives 10% of blood volume at term.
- Significant blood loss can also exacerbate right-left shunts making critical care management of the cardiorespiratory function more difficult
- Due to increased risk of VTE – prophylaxis is required and should be continued following discharge from ICU for 6 weeks.
- In patients receiving magnesium sulphate for seizure prophylaxis or neonatal neuroprotection, careful monitoring of magnesium levels is advised as elevated magnesium levels may worsen respiratory compromise in patients who are not ventilated. Dose reduction of magnesium sulphate may be necessary in patients with acute renal injury.
- Pregnant women who are critically ill require a multidisciplinary care team to plan timing and location of delivery to ensure the safety of mother and newborn.

During acute illness, fetal management should be similar to that provided to any critically ill pregnant woman. Continuous fetal monitoring in the setting of severe illness should be considered only when delivery would not compromise maternal health or when it is used as another non-invasive measure of maternal status.

Steroids form part of the treatment for critically ill COVID-19 patients requiring respiratory support. Administration of steroids for treatment of COVID-19 in the obstetric patient should be reviewed with a consultant obstetrician.⁵

Due to the configuration of maternity services in Ireland, there are some tertiary referral hospitals providing critical care that do not have access to 24 hour obstetric, neonatal and midwifery coverage. This can pose unique challenges for management and delivery planning. Each hospital should explore local pathways for provision of care and contact local obstetric services as soon as admission takes place.

Management of labour and delivery

All women should be encouraged to call the maternity unit for advice in early labour. When a woman attends the maternity unit, general recommendations about hospital attendance (triage; screening etc.) apply.

Once in an isolation room, a full maternal and fetal assessment should include:

- Maternal observations including temperature, respiratory rate and oxygen saturations (repeated hourly). The IMEWS should be used and appropriately recorded.
- Aim to keep oxygen saturation >94%, titrating oxygen therapy accordingly.
- Confirmation of the onset of labour, as per standard care.
- Electronic fetal monitoring using cardiotocograph (CTG).
- If the woman has signs of sepsis, investigation and treatment as per guidance on sepsis in pregnancy, but also consideration of active COVID-19 infection as a cause of sepsis and investigate according to guidance.
- There is no evidence that the use of Entonox is an aerosol-generating procedure (AGP).

When a woman with confirmed or suspected COVID-19 is admitted to the delivery suite, the following members of the multi-disciplinary team should be informed: consultant obstetrician, consultant anaesthetist, midwife-in-charge, and consultant neonatologist, neonatal nurse in charge and infection control team.

⁵ Clinical Trials. Randomised Evaluation of COVID-19 Therapy (RECOVERY) 2020 [Internet]. 2020 [cited 2021 Mar 7]. Available from: <https://clinicaltrials.gov/ct2/show/NCT04381936>

Electronic fetal monitoring using cardiotocograph (CTG) should be offered to women with symptomatic suspected or confirmed COVID-19 during labour and vaginal birth, given evidence showing fetal distress during labour.

Efforts should be made to minimise the number of staff members entering the room and units should develop a local policy specifying essential personnel for emergency scenarios and practice simulation and drills to ensure correct use of PPE.

The use of birthing pools in hospital should be avoided in suspected or confirmed cases, given the inability to use adequate protection equipment for healthcare staff during water birth and the risk of infection via faeces.

The WHO have set out the care that should be available to all pregnant women, including those with confirmed or suspected COVID-19, and reiterated they should have the right to high quality care before, during and after childbirth. This includes antenatal, newborn, postnatal, intrapartum and mental health care.

According to the WHO, a safe and positive childbirth experience includes:

- Being treated with respect and dignity;
- Having a companion of choice present during delivery;
- Clear communication by maternity staff;
- Appropriate pain relief strategies;
- Mobility in labour where possible, and birth position of choice.

<https://www.who.int/news-room/q-a-detail/q-a-on-covid-19-pregnancy-childbirth-and-breastfeeding>

The RCOG/RCM guideline documents also state that “Women should be permitted and encouraged to have a birth partner present with them in their labour and during birth”. Having a trusted birth partner present throughout labour is known to make a significant difference to the safety and well-being of women in childbirth. A single, asymptomatic birth partner should be permitted to stay with the woman, at a minimum, through pregnancy and birth.⁶

It is therefore expected that as a minimum, pregnant women should have one birthing partner with them throughout labour and birth, unless this partner is symptomatic or unwell, irrespective of the woman’s COVID-19 status.

In situations where the woman has or is suspected to have COVID-19 there may be (rare) situations where the above is not possible relating to PPE availability, workforce gaps or unit configuration. Local policies may also apply (especially during local outbreaks) for the partner to wear PPE, and to stay in the room for the duration of the labour. In emergency scenarios for COVID-19 positive women, such as in category 1 Caesarean section, it may not be feasible for the partner to attend the delivery in theatre.

It is important to acknowledge, that while the birth partner should be facilitated to be present, this may not be appropriate in all scenarios and situations may still arise in the hospital/ unit, where the presence of an additional person present may not be safe or practical.

Partners of COVID-19 positive patients should be swabbed and advised that in the event they test positive, they may not be permitted in the delivery suite or theatre (as per above and hospital policy). It is important to have this conversation as early as possible to minimise stress and confusion.

⁶ <https://www.rcm.org.uk/media/4339/birth-partners-v2-220920.pdf>

Decision to deliver

Current consensus is that COVID-19 is not an absolute indication for ending pregnancy, but timing of delivery should be evaluated on a case-by-case basis. Main considerations are maternal clinical status and disease progression, gestational age and fetal condition.

With regard to induction of labour if COVID-19 is remote from term, it is not clear what the optimum management should be. In view of the estimated risk of COVID-19- related stillbirth of 1% (ROI current estimate) it would be advisable to consider delivery at 37-39 weeks, consistent with management of other at risk pregnancies, for those with COVID-19 infection after 24 weeks.

Women with suspected or confirmed COVID-19 who are in labour and/or in the delivery suite should be placed in an isolation room with en-suite facilities. The door should remain closed with appropriate isolation signage (standard, droplet and contact) placed on the exterior door.

In the event that an infected woman has spontaneous onset of labour with optimal progress, she could be allowed to labour as normal and deliver vaginally. Continuous electronic fetal monitoring is recommended as fetal distress has been reported in women with COVID-19 infection. Recourse to early epidural anaesthesia should be considered.

There should be a lower threshold to expedite the delivery when there is fetal distress, poor progress in labour and/or deterioration in maternal condition. Caesarean delivery involves significantly more staff input and potential for exposure to SARS-CoV2.

In the case of a COVID-19 infected woman presenting with spontaneous preterm labour, tocolysis should not be used in an attempt to delay delivery in order to administer antenatal steroids. The neonatal team should be informed of plans for birth as soon as possible

Until further information is available, it is best to avoid fetal scalp electrode monitoring and fetal blood sampling (consistent with recommendations for other maternal infections). Although data are limited they do not suggest that maternal to fetal transmission is likely to occur.

The data on perinatal transmission available to date do not preclude the use of forceps or vacuum for assisted delivery, if indicated.

Given the association of COVID-19 with acute respiratory distress syndrome, women with moderate-severe symptoms of COVID-19 should be monitored using hourly fluid input-output charts, and efforts targeted towards achieving neutral fluid balance in labour, in order to avoid the risk of fluid overload.

Management of delivery

Timing of delivery, in most cases, should not be dictated by maternal COVID-19. For women infected early in pregnancy who recover, no alteration to the usual timing of delivery is necessary.

For women infected in the third trimester who recover, it is reasonable to attempt to postpone delivery (if no other medical indications arise and if fetal condition is reassuring) either until a negative test result is obtained or quarantine status is lifted in an attempt to avoid transmission to the neonate or others.

In general, COVID-19 itself is not an indication for delivery, unless there is a need to improve maternal oxygenation.

For suspected, probable and confirmed cases of COVID-19, delivery should be conducted in an isolation room (negative pressure room, where available). A senior obstetrician should be present.

Septic shock, acute organ failure or fetal distress should prompt emergency Caesarean delivery or consideration given to termination of pregnancy under Health (Termination of Pregnancy) Act 2018 before fetal viability (sections 9 or 10).

Plans for emergency delivery (instrumental or operative) should be appropriately communicated in a timely manner with all relevant senior personnel on the delivery suite. Local plans need to be in place about the number of staff involved in these scenarios, the use of PPE, as well as safe transfer from delivery suite to operating theatres if this becomes necessary.

If delivery in theatre is indicated, the minimum number of staff should be present and wearing appropriate PPE for their role and exposure risk. If intubation is required for CS under general anaesthesia the minimum of staff necessary should be present.

If LMWH thromboprophylaxis is required during the post-partum period, either because of a diagnosis of COVID-19 within 4 weeks of delivery, or a new diagnosis in the post-partum period, LMWH thromboprophylaxis should continue until at least 6 weeks post-partum, or for 4 weeks, whichever is longer. This is because the risk of thrombosis in pregnancy is known to remain elevated until 6 weeks post-partum.

Anaesthesia considerations

Early multidisciplinary collaboration with the obstetric anaesthesia team should be arranged to determine level of care and delivery plan. The most experienced anaesthetist available should perform all procedures. Regional anaesthesia is preferred to minimise pulmonary complications and reduce the risk associated with aerosol generation during intubation and extubation.

For the labouring parturient, early epidural anaesthesia is advocated to provide optimal analgesia, minimise viral dissemination and to minimise the need for general anaesthesia if urgent delivery is required. As many adults with COVID-19 develop thrombocytopenia (platelet count <150), it is prudent to check the platelet count before insertion of epidural or spinal anaesthesia, and possibly again before removal of the epidural catheter. Platelet counts as low as 70 may be considered for regional anaesthesia in pregnant women, especially if there is a high risk of respiratory compromise with general anaesthesia⁷.

In patients with COVID 19 who are anticoagulated, timing of administration should be carefully considered to allow regional anaesthesia. The obstetric anaesthesia team should be informed and additional haemorrhage precautions may be necessary.

Consider transfer arrangements in different scenarios for a woman who needs an emergency caesarean delivery e.g. delivery suite room to theatre. Regular drills on the delivery suite, and with PPE, will help. An isolation theatre should be utilised with appropriate ventilation.

Donning PPE is mandatory and time consuming and this will impact on decision to delivery time for category 1 caesarean delivery, no matter what the anaesthetic technique used. Women and their families should be told about this delay.

General anaesthesia for caesarean section is associated with a high risk of aerosolisation. For patients who are COVID-19 positive or whose COVID-19 status is unknown, only essential

⁷ Forest, D.J., Segal, S. Update on Thrombocytopenia in Pregnancy and Neuraxial Anesthesia. *Curr Anesthesiol Rep* 7, 111–118 (2017). <https://doi.org/10.1007/s40140-017-0204>

staff should be present and all should wear aerosol generating procedure (AGP) PPE for intubation and extubation.

When there is potential need to convert from neuraxial to general anaesthesia in a category 1 section, all theatre staff should wear AGP PPE. Local policies for the type of anaesthesia used for Category 1 delivery may need to be reviewed for these cases. Consider plans for the management of a failed regional technique.

8.5 Specific pregnancy circumstances

Assisted Reproductive Technology (ART)

In view of the published information and evidence about SARS-CoV2, and the maternal and neonatal outcomes reported in cases of other coronavirus infections (such as SARS-CoV), the European Society for Human Reproduction and Embryology (ESHRE) initially recommended a precautionary approach.

"In line with the position of other scientific societies in reproductive medicine such as the American Society for Reproductive Medicine (ASRM), ESHRE advise that all fertility patients considering or planning treatment, even if they do not meet the diagnostic criteria for COVID-19 infection, should avoid becoming pregnant at this time. For those patients already having treatment, they suggest considering deferred pregnancy with oocyte or embryo freezing for later embryo transfer. ESHRE further advises that patients who are pregnant or those (men and women) planning or undergoing fertility treatment should avoid travel to known areas of infection and contact with potentially infected individuals."

ESHRE reaffirmed that all medical professionals have a duty to avoid additional stress to a healthcare system that in many locations is already overloaded.

In an updated statement on April 2nd, ESHRE reiterated that *"since many uncertainties remain about the effects of SARS-CoV-2 infection on ART and pregnancy, and despite different approaches among treatment centres and countries, ESHRE currently considers any risk too high when similar treatments can be performed at a later date."* The society stated that: healthcare professionals and clinics should remain available to provide supportive care, psychological support and clinical advice to their patients, preferably via online consultation.

Subsequently, the ESHRE COVID-19 working group prepared and published (23rd April 2020) the "ESHRE Guidance on recommencing ART treatments", a set of recommendations for centres planning to restart ART treatments.

Its recommendations were made in response to a decreasing risk of COVID-19 infection – though were still subject to local regulations. The guidance was based on six pillars of good medical practice: Discussion, agreement and consent to the start of treatment; Staff and patient triage; Access to advice and treatment; Adaptation of ART services; Treatment cycle planning; and Code of Conduct for staff and patients.

In October 2020 the ESHRE COVID-19 working group issued guidance on 'Safe ART services during the third phase of the COVID-19 pandemic'. This document noted that "there are large variations in regional and national case numbers and in testing protocols in Europe. As a result the mitigation measures for safe ART services should be guided by local circumstances. All possible factors which might affect ART services should be assessed to ensure that plans of action are in place to maintain service".

<https://www.eshre.eu/Home/COVID19WG>

The Association of Reproductive and Clinical Scientists (ARCS) and British Fertility Society (BFS) U.K. best practice guidelines for reintroduction of routine fertility treatments during the COVID-19 pandemic were published in May 2020.

<https://www.britishfertilitysociety.org.uk/wp-content/uploads/2020/05/ARCS-BFS-COVID-19-guideline-v1.1-1.pdf>

Five Key Principles underpinning the ARCS-BFS guidance are as follows:

- Resumption of fertility services must take place in a manner that minimises the chances of spread of COVID-19 infection to patients and fertility clinic staff.
- Centres should ensure a fair and transparent approach to any prioritisation policy.
- Resumption of treatment should not result in an undue burden on the NHS.
- Patients considering treatment should be fully informed about the effect of the ongoing pandemic on their treatment and give informed consent to having fertility treatment at this time.
- The fertility sector should adopt sustainable changes in working practices that help to build resilience against any future increases in the spread of COVID-19 in the community.

The UK's Human Fertilisation and Embryology Authority (HFEA) issued a mandatory 'General Direction' which required all clinics to have a COVID-19 treatment strategy in place and to have stopped all treatments by 15 April 2020. On 1 May 2020, the HFEA announced that in the week commencing 11 May, fertility clinics could apply to reopen, once revised General Directions were issued.

<https://www.hfea.gov.uk/treatments/covid-19-and-fertility-treatment/coronavirus-covid-19-guidance-for-professionals/>

The HFEA continue to direct (5th January 2021) that fertility clinics can continue to safely offer treatment. They state that "There may be local circumstances which mean that a clinic may have to suspend services for a period of time. Clinics should keep in regular contact with patients who may be very concerned about this continuing situation and how it might affect their treatment. We expect clinics to continue to follow professional and local guidance and let us know immediately if there is a local decision to suspend or change the services they provide."

ESHRE have recently published a statement with the International Federations of Fertility Societies (IFFS) on considerations around COVID-19 vaccination for pregnant women and those considering pregnancy.⁸

Abortion care

Abortion is an essential component of comprehensive health care. It is also a time-sensitive service for which a delay of several weeks, or in some cases days, may increase the risks or potentially make it completely inaccessible. The consequences of being unable to obtain an abortion profoundly impact a person's life, health, and well-being.

"The American College of Obstetricians and Gynecologists and the American Board of Obstetrics & Gynecology, together with the American Association of Gynecologic Laparoscopists, the American Gynecological & Obstetrical Society, the American Society for Reproductive Medicine, the Society for Academic Specialists in General Obstetrics and Gynecology, the Society of Family Planning, and the Society for Maternal-Fetal Medicine, do not support COVID-19 responses that cancel or delay abortion procedures. Community-based and hospital-based clinicians should consider collaboration to ensure abortion access is not compromised during this time."

⁸ Hum Reprod Open. 2021 Apr 16;2021(2):hoab016. doi: 10.1093/hropen/hoab016. eCollection 2021. DOI: 10.1093/hropen/hoab016

https://s3.amazonaws.com/cdn.smfm.org/media/2269/Joint_Statement_on_Abortion_During_COVID_19.pdf

The Royal College of Obstetricians and Gynaecologists have issued information for healthcare professionals on abortion care. They state that as Abortion care is an essential part of health care for women: services must be maintained even where non-urgent or elective services are suspended. Further that attention should be paid to providing care as early as possible given gestational limits, and that delays should be minimised.

<https://www.rcog.org.uk/en/guidelines-research-services/guidelines/coronavirus-abortion/>

In Ireland, a revised Model of Care for termination in early pregnancy was issued by the HSE, NWIHP and the Department of Health on the 6th April (the document has been circulated but does not seem available on HSE or DoH websites). This document provides for remote consultation with a medical practitioner for the purposes of accessing termination in early pregnancy. Where a medical practitioner judges it to be clinically necessary, a face-to-face consultation may be held with the patient; however, the document states that such consultations should be kept to a minimum during the COVID-19 public health emergency.

Pregnancy loss

In this unprecedented time of the SARS-CoV2 pandemic, the diagnosis, investigation and management of pregnancy loss should continue as much as possible in accordance with the National Standards for Bereavement Care following Pregnancy Loss and Perinatal Death.

<https://www.hse.ie/eng/about/who/acute-hospitals-division/woman-infants/bereavement-care/>

Isolation and infection control policies associated with COVID-19 should be applied in pregnancy loss situations with a risk/benefit analysis and evidence base so that staff can continue to provide the highest standard of compassionate supportive care.

The services of Clinical Midwife/Nurse Specialists in Bereavement and Loss are critical to the provision of Bereavement Care. These services should be protected from redeployment to other areas in COVID-19. All bereavement services should continue to be available to parents in so far as possible.

The following areas of care should be borne in mind:

Isolation:

Pregnancy loss is an isolating experience in itself and this can be further compounded with heightened visitor restrictions during COVID-19. The importance of the presence of a partner/support person during what is finite time should always be protected (unless a partner is confirmed or suspected COVID-19 positive, and even then accommodation should be made for bereavement). Where a mother is COVID-19 positive, the use of PPE should be in accordance with current guidelines.

Existing pregnancy loss clinical areas should be protected as much as possible and in particular the accommodation of bereaved mothers should be sensitively maintained in the maternity services.

Making memories:

In keeping with the National Bereavement Standards and pathways parents must be supported to have the opportunity to care for their baby and to make all the memories possible but in a clinically safe way for parents and healthcare professionals.

Staff need to afford parents every opportunity to make memories with their baby; these include: creating mementos, taking photographs, seeing and holding their baby, dressing their baby, providing the Feileacain memory box, participating in spiritual /religious /cultural rituals and customs.

Additional opportunities to create virtual visiting (using video calls/ video recordings) and memory making in accordance with the expressed wishes of parents may be necessary to include siblings and wider family members who will not be able to visit the hospital. Obviously, in this scenario, and assuming the mother is not critically ill, the baby should be allowed to stay in the room with the mother as is usual practice.

Postnatal/ Post discharge support:

Informed by public health guidelines, changes to funeral/ cremation arrangements may be necessary. While this is distressing it is important to capture as many moments and memories of this time to share with family later.

Postnatal care and support should continue to be provided. Parents should be given the appropriate contact numbers for ongoing support following discharge from hospital which should include written information for hospital supports and national support networks.

Consideration needs to be given to rearranging Pregnancy Loss Clinic appointments to take place on the telephone (or virtually) - particularly where there are time-sensitive issues about results of investigations or future pregnancy considerations to be discussed.

Useful links for pregnancy loss

<https://www.hse.ie/eng/services/list/3/maternity/bereavement-care/>

<https://www.hse.ie/eng/about/who/acute-hospitals-division/woman-infants/bereavement-care/covid-19-pregnancy-loss.pdf>

<https://www.inha.ie/wp-content/uploads/COVID-end-of-life-care-MDY-4-upd-15.11.20-1.pdf>

www.pregnancyandinfantloss.ie

9 Investigational Therapies for COVID-19: Use in Pregnancy and Lactation

Based on the limited available evidence, the clinical characteristics of COVID-19 pneumonia are similar for pregnant and non-pregnant adult patients of similar age. At present, the approach to prevention, evaluation, diagnosis, and treatment of pregnant women with suspected COVID-19 should be similar to that in non-pregnant individuals.

Consideration of the safety of all medicinal products used during pregnancy, including for the management of COVID-19 infection, is essential. Treatment should only be initiated with multidisciplinary input from relevant Specialities, including Infectious Diseases / Microbiology / Obstetrics, and Pharmacy advice should be sought on this as well as on available products, choice of agent, and potential drug-drug interactions.

There are several medicinal agents under investigation for use in COVID-19. The following is a summary of the information available for their use in pregnancy and lactation and is designed to signpost and complement the HSE national guidance on their use. The use of pharmacological agents outside of a clinical trial should balance the available evidence of the safety of these agents in pregnancy with the unproven efficacy.

More detailed information on their use in pregnancy and lactation is available on Brigg's Pregnancy and Lactation via the [medicinescomplete](#) package on HSE networks and via OpenAthens on the National Health Library and Knowledge service.

<https://www.hse.ie/eng/about/who/acute-hospitals-division/drugs-management-programme/hse-interim-guidance-for-the-pharmacological-management-of-patients-hospitalised-with-covid-19.pdf>

1. Specific Antiviral Therapies

The use of hydroxychloroquine, azithromycin or lopinavir/ritonavir is no longer recommended outside of the setting of a clinical trial due to evidence indicating a lack of benefit in patients hospitalised with COVID-19.(1) Remdesivir, ideally within the context of clinical trial enrolment is the sole antiviral agent recommended by the HSE national guideline. It is indicated for patients hospitalised with COVID-19 requiring supplemental oxygen at the start of treatment (low- or high-flow oxygen or other non-invasive ventilation). Remdesivir is not indicated for patients requiring invasive forms of ventilatory support at the start of treatment.

Full information available on HSE guideline

<https://www.hse.ie/eng/about/who/acute-hospitals-division/drugs-management-programme/specific-antiviral-therapy-in-the-clinical-management-of-acute-respiratory-infection-with-sars-cov2-covid19.pdf>

| Medication | Use in Pregnancy (1-10) | Use in Breastfeeding(11,12) |
|--|---|--|
| <p>Remdesivir (intravenous)</p> <p>200mg once daily on Day 1, then 100mg ONCE daily from day 2 onwards.</p> <p>Duration: 5 days</p> | <p>Limited human data.</p> <p>No particular concerns have been reported in relation to the safety of remdesivir in pregnancy; however, the absence of data on the use of remdesivir in the first trimester limits these conclusions.(1)</p> | <p>No data on use in breastfeeding available.</p> <p>Small molecule so likely to transfer into breastmilk. Poor oral absorption means infants unlikely to absorb a clinically significant amount of drug from breastmilk. In newborn infants who received remdesivir for Ebola virus, no adverse effects were noted.</p> |

| | | |
|--|--|---|
| | Remdesivir should not be withheld from pregnant patients if it is otherwise indicated. | Based on limited available information, the use of Remdesivir is not an indication to avoid breastfeeding.(11) Infant monitoring: Due to lack of information on the use of remdesivir in breastfeeding, infants should be closely monitored for the potential adverse effects of remdesivir reported in treated patients. These include elevated aminotransferase and bilirubin levels and other liver function tests, diarrhoea, rash, renal impairment, and hypotension. |
|--|--|---|

*information provided for well, term infants. In preterm or unwell infants consult with Consultant Neonatologist.

2. Tocilizumab

Tocilizumab is a monoclonal antibody against interleukin-6 (IL-6), more recently used in the management of patients who have severe Covid-19 with suspected hyperinflammation.

Full guidance available on [HSE guidelines Interim Recommendations for the use of Tocilizumab in the Management of Patients who have Severe COVID-19 with Suspected Hyperinflammation.](#) (13)

| Medication | Use in Pregnancy(3,14,15) | Use in Breastfeeding(11,16,17) |
|---|---|--|
| <p>Tocilizumab (intravenous infusion)</p> <p>8mg/kg (max 800mg) as single dose</p> <p>One additional dose may be considered 8-12 hours later if clinical symptoms worsen or there is no improvement (max 2 doses per course)</p> | <p>Limited human experience. The currently available evidence consists of a small number of case reports/series which together describe approximately 360 unique exposed pregnancies.</p> <p>There is currently no compelling evidence that tocilizumab is teratogenic or fetotoxic. There is no evidence that additional fetal monitoring is required however it is recommended due to the limited evidence available, all first trimester exposed patients should have their 20-week ultrasound scan conducted by a clinician experienced in the prenatal detection of malformations.(14)</p> | <p>Limited data available. Only small amounts of tocilizumab were detected in breastmilk after intravenous doses in several mothers.</p> <p>In the few reported cases, breastfeeding has resulted in undetectable infant serum levels and no reported adverse effects. If tocilizumab is required by the mother, it is not a reason to discontinue breastfeeding.</p> <p>Infant monitoring: Fever, diarrhoea, weight gain, infection.</p> |

*information provided for well, term infants. In preterm or unwell infants consult with Consultant Neonatologist.

3. Corticosteroids

Corticosteroids as dexamethasone orally or intravenously (IV) or hydrocortisone IV for 7 to 10 days, are now recommended for severely ill non-pregnant patients who are on supplemental oxygen or ventilatory support and do not have any contraindications to use.(18) The HSE national guideline states that the evidence for use of corticosteroids in the management of pregnant patients with severe COVID-19 disease is lacking and specialist advice should be sought for the appropriate clinical management of these patients.

Full guidance available on [HSE Interim Guidance for the use of Systemic Corticosteroids in the Management of Hospitalised Patients with Severe COVID-19 Disease](#).

The RECOVERY trial recommended a substitution of dexamethasone with prednisolone orally or hydrocortisone IV for pregnant women, to reduce unnecessary fetal exposure to corticosteroids as they cross the placenta less readily than dexamethasone.(21) International guidelines provide guidance on the use of corticosteroids in pregnant women, based on the same criteria as non-pregnant patients, with some variation in the choice of corticosteroid recommended. (7,19, 20)

| Medication (7,19,22-24) | Use in Pregnancy (17,20,25) | Use in Breastfeeding (11,16,17) |
|--|--|---|
| <p>Total steroid course duration: 7-10 days</p> <p>Proposed steroid regimens:</p> <p>If steroids are not indicated for fetal lung maturation:</p> <p>Oral prednisolone 40 mg once a day, or IV hydrocortisone 80 mg twice daily.(19)</p> <p style="text-align: center;">Or</p> <p>Oral dexamethasone 6mg or IV Dexamethasone Phosphate 8mg once daily.(7,20)</p> <p>If steroids are indicated for fetal lung maturation:</p> <p>Prescribe dexamethasone/ corticosteroid as per local guidelines for fetal lung maturation and complete course as above.</p> | <p>Commonly used in pregnancy for multiple medical conditions and in third trimester for fetal lung maturation.</p> <p>While an increased risk of adverse fetal effects following use of high dose/potency corticosteroids, or use for extended periods, cannot be ruled out, where use of systemic corticosteroids is clinically indicated for mother or fetus, treatment should not be withheld on account of pregnancy.</p> | <p>Short term use: Compatible with breastfeeding</p> <p>Small amounts of corticosteroids are secreted into breastmilk. No adverse effect has been reported in breastfed infants with maternal use of any corticosteroid during breastfeeding.</p> <p>Infant monitoring: Monitor infants for feeding, growth, weight gain.</p> |

4. Other Medications

Human Normal Intravenous Immunoglobulin (IVIg)

IVIg is not recommended at this time for the management of COVID-19 infection due to a lack of evidence. Full guidance is available on HSE guideline HSE Interim Position Statement on the Use of Human Normal Intravenous Immunoglobulin (IVIg) in the Management of COVID-19.(26)

Analgesics

Paracetamol should be used first line for the management fever or pain symptoms in COVID-19 infection.(27) In patients with abnormal liver chemistries secondary to COVID-19 or Remdesivir treatment, a potential concern of paracetamol use is hepatic toxicity; however, doses less than 2 grams per day are likely safe in the absence of severe or decompensated hepatic disease.(23) Outside of the critical care setting, women taking NSAIDs for other conditions, who develop COVID-19 infection, do not need to interrupt their treatment. NSAIDs use should be avoided in the third trimester. For postnatal patients, NSAIDs, can be included as a component of multimodal postnatal analgesia. Further information is available from the HSE and EMA.(27, 28)

Antibiotics

National (29) or local obstetric antimicrobial guidelines for community acquired pneumonia or hospital acquired pneumonia can be followed when antibiotics are required in women with COVID-19. Important information on antimicrobial stewardship during COVID-19 is available from the Health Protection Surveillance Centre (HPSC).(30)

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10 Vaccination: Pregnancy and Lactation

Pregnant women were excluded from initial vaccine trials but there are studies in progress at present. A small number of female trial participants in the original studies were subsequently found to be pregnant. Outcomes from this small group have not to date indicated any higher risk of adverse effects or pregnancy loss. Trials are underway currently of the Pfizer-BioNTech vaccine in pregnant participants (1). Animal studies do not indicate direct or indirect harmful effects with respect to fertility, pregnancy, embryo/foetal development, delivery or post-natal development. There is no biologically plausible reason why any of the available vaccines would affect fertility.

The Moderna and Pfizer-BioNTech COVID-19 vaccines are mRNA vaccines that do not contain the live virus that causes COVID-19 and, therefore, cannot infect a recipient with SARS-CoV2. There is limited data regarding efficacy of vaccines but there does not seem to be evidence that they are less efficacious than in the general population. There is some emerging data from vaccinated pregnant healthcare workers which indicates production of antibodies which cross the placenta raising the likelihood of neonatal protection. (2)

International recommendations

FIGO position statement

“There are no risks actual or theoretical that would outweigh the potential benefits of vaccination in pregnant women. We support offering COVID-19 vaccination to pregnant and breastfeeding women.”

<https://www.figo.org/covid-19-vaccination-pregnant-and-breastfeeding-women>

European Network of Teratology Information Services

“Vaccination is the currently most effective measure to reduce the risks associated with COVID-19 disease in pregnant women and that current safety data are reassuring, leading to a favourable benefit-risk ratio for COVID-19 vaccination in pregnancy.” The European Network of Teratology Information Services published a position statement on COVID-19 vaccination in pregnancy on April 14th 2021. Specific groups are highlighted and there is a recommendation that there should be no contraindication for women – regardless of individual risk status - who received their first vaccine dose before pregnancy to complete the vaccination with the second dose according to the original recommended schedule, even after conception.(3)

https://www.entis-org.eu/wp-content/uploads/2021/04/ENTIS-Position-Paper-on-COVID_Vaccine_in_pregnancy.pdf

France

An mRNA COVID-19 vaccine was recommended for pregnant women with a high-risk medical condition up to 1st April 2021. Since then, an mRNA COVID-19 vaccine is now recommended for all pregnant women.

<https://solidarites-sante.gouv.fr/grands-dossiers/vaccin-covid-19/publics-prioritaires-vaccin-covid-19>

<https://www.academie-medecine.fr/should-pregnant-women-be-vaccinated-against-covid-19/?lang=en>

Italy

Vaccination should be considered for pregnant women at high risk of exposure or with underlying conditions predisposing them to poor outcomes.

https://www.epicentro.iss.it/vaccini/pdf/ItOSS%20Vaccination%20against%20COVID-19%20in%20pregnancy_feb.09.2021.pdf

Netherlands

The Health Council of the Netherlands advises against vaccinating pregnant women at present because the vaccine's efficacy and safety have not been tested sufficiently for this specific group. Exceptions can be made in individual cases, for instance, when the risks of COVID-19 outweigh the possible drawbacks of vaccination.

<https://www.government.nl/topics/coronavirus-covid-19/dutch-vaccination-programme/getting-vaccinated-against-covid-19>

Israel

In Israel the vaccine was available to women who wished to receive it, especially if they were exposed to COVID-19 patients at work. On February 1st the Israeli Teratology Information Service; the National Council for Obstetrics, Gynaecology, Neonatology and Genetics; The Israeli Society of Obstetrics & Gynaecology and the Israeli Society for Maternal Fetal Medicine released updated recommendations. These include the lack of a contraindication to vaccination at any stage in pregnancy, although first trimester vaccination is only recommended for women in risk groups. An estimated 70,000 pregnant women have received an mRNA vaccine during pregnancy in Israel to date (4).

<https://www.gov.il/en/departments/news/28012021-03>

UK

Joint Committee on Vaccination and Immunisation (JCVI) advises that all pregnant women should have access to COVID-19 vaccination, preferably mRNA vaccines where available. Pfizer and Moderna vaccines are the preferred vaccines for pregnant women of any age, because of more extensive experience of their use in pregnancy.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/978508/Green_book_chapter_16April2021.pdf

The RCOG (UK) notes in guidance that the latest advice from the JCVI is that COVID-19 vaccines should be offered to pregnant women at the same time as the rest of the population, based on their age and clinical risk group.

<https://www.rcog.org.uk/en/guidelines-research-services/coronavirus-covid-19-pregnancy-and-womens-health/covid-19-vaccines-and-pregnancy/covid-19-vaccines-pregnancy-and-breastfeeding/>

Canada

The SOGC supports the use of all available COVID-19 vaccines approved in Canada in any trimester of pregnancy and during breastfeeding in accordance with regional eligibility.

https://sogc.org/en/content/featured-news/SOGC_Statement_on_the_COVID-19_vaccines_and_rare_adverse_outcomes_of_%20thrombosis.aspx

US

All pregnant women are advised to avail of vaccination with no gestational limits. The CDC advises that pregnant women can choose to become vaccinated with any of the authorised vaccines (Pfizer or Moderna).

<https://www.cdc.gov/vaccines/covid-19/info-by-product/clinical-considerations.html#pregnant>

Over 100,000 vaccinations in pregnancy have been reported to the CDC in the US as of April 26th 2021. (5) There are approximately 4,700 enrolments in the VAERS monitoring system for more detailed follow up. So far all information seems to show pregnancy complications

rates similar to what would normally be expected. Most (73%) reports to VAERS among pregnant women involved non-pregnancy-specific adverse events (e.g., local and systemic reactions). Miscarriage was the most frequently reported pregnancy-specific adverse event to VAERS; numbers are within the known background rates based on presumed COVID-19 vaccine doses administered to pregnant women. No unexpected pregnancy or infant outcomes have been observed related to COVID-19 vaccination during pregnancy. Long term follow up of vaccine recipients or COVID-19 affected persons is not available

Initial findings reported do not indicate any excess risk of pregnancy complications, neonatal problems or fetal loss. Data from both v-safe and VAERS (6, 7) have not shown any patterns to indicate safety problems with the Pfizer-BioNTech and Moderna COVID-19 vaccines in pregnant people, and no unexpected pregnancy or infant outcomes have been reported. (6) Allergic reactions, including anaphylaxis, have been reported to be rare (4.7 per million for Pfizer-BioNTech and 2.5 per million for Moderna) following COVID-19 vaccination in non-pregnant individuals. Management of anaphylaxis in pregnant individuals is the same as in the non-pregnant (7).

In a recent cohort study, maternal antibodies to SARS-CoV2 were found to have crossed the placenta after infection during pregnancy, and cord blood antibody concentrations correlated with maternal antibody concentrations. In other studies, antibodies have been detected in breast milk (8, 9). These findings demonstrate the potential for maternal antibodies to transfer to the fetus and provide neonatal protection. They also suggest the need for further data to determine if SARS-CoV2 antibodies are protective against newborn infection, the concentration needed to achieve protection, and whether vaccine-elicited antibodies are similar to naturally acquired antibodies.

National recommendations

The Institute of Obstetricians and Gynaecologists supports pregnant women who wish to avail of COVID-19 vaccination.

- Pregnant women and their obstetric caregivers should engage in shared decision-making in advance of vaccination.
- Counselling should balance available data on vaccine safety, risks to pregnant women from SARS-CoV-2, and a woman's individual risk for infection and severe disease.
- Specific permission letters should not be required from women presenting for vaccination.
- Clinics and hospital sites should facilitate provision of information to women about the option of vaccination.

The Institute of Obstetrics and Gynaecology has a Q and A document that addresses frequently asked questions.

<https://www.rcpi.ie/policy-and-advocacy/national-immunisation-advisory-committee/niac-and-covid-19-vaccine/>

An interval of 2 weeks should be allowed between another vaccine (e.g. Pertussis) and a COVID-19 vaccine.

In those who have had laboratory confirmed COVID-19 infection within 6 months, a single dose of vaccine is sufficient for vaccination.

For further information see the NIAC Immunisation guidelines, noting frequent updates.

<https://www.hse.ie/eng/health/immunisation/hcpinfo/guidelines/covid19.pdf>

Vaccine specific information

In Ireland, four vaccines targeting the S protein have been authorised for supply; two use an mRNA platform (Pfizer BioNTech COVID-19 mRNA vaccine BNT162b2 and Moderna mRNA-1273 COVID-19 vaccine) and two use an adenovirus vector (AstraZeneca COVID-19 vaccine and COVID-19 Vaccine Janssen).

- Comirnaty Pfizer/BioNTech®
Where the risk/benefit is favourable, the two doses should be given 28 days apart. The two dose schedule should be given between 14 and 36 completed weeks of pregnancy.
- COVID-19 vaccine Moderna®
Where the risk/benefit is favourable, the two doses should be given 28 days apart. The two dose schedule should be given between 14 and 36 completed weeks of pregnancy.
- Vaxzevria® (formerly COVID-19 Vaccine AstraZeneca®)
In March 2021, a combination of thrombosis and thrombocytopenia, in some cases accompanied by bleeding, was observed in a very small number of people following vaccination with COVID-19 Vaccine AstraZeneca®. From current NIAC recommendations this vaccine is not being offered to people under the age of 50 years in Ireland. Those who receive a first dose in pregnancy will have the second dose deferred for 16 weeks. However, there may be others aged under 50 years who, fully informed of the very rare risk and symptoms of unusual blood clots and low platelets, wish to receive their second dose after 12 weeks and they should be facilitated where feasible.
- COVID-19 Vaccine Janssen®
The COVID-19 Vaccine Janssen® is currently preferred for people over 50 years of age because of small associated risk of clotting events.

Breastfeeding

There is no known reason for vaccines to be avoided in those who are breastfeeding. Weaning is not required prior to vaccination. Breastfeeding mothers should be vaccinated according to their risk grouping. Women on maternity leave should be facilitated to receive vaccination with their co-workers. Unnecessary barriers must not be put in place for these women.

Fertility treatment

Those planning a pregnancy should not put off vaccination if offered. Those who are due to commence IVF can consider deferral a short time in order to ensure both doses received. Those who find they have unexpectedly had a positive test can defer the second dose to 14 weeks. This is in order to avoid a high temperature in early pregnancy.

For further information see the full NIAC Immunisation guidelines and be aware of updates to these documents.

<https://www.hse.ie/eng/health/immunisation/hcpinfo/guidelines/covid19.pdf>

<https://www.rcpi.ie/policy-and-advocacy/national-immunisation-advisory-committee/niac-and-covid-19-vaccine/>

https://www.hse.ie/eng/health/immunisation/hcpinfo/covid19vaccineinfo4hps/?utm_source=Broadcast&utm_medium=Email&utm_campaign=coronavirus&utm_term=covid%20vaccine&utm_content=Update%20on%20vaccine%20rollout%20-%20Staff%20Update

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11 Homebirth Services

Currently HSE services for women opting for homebirth in Ireland are provided by Self Employed Community Midwives (SECM) via a Memorandum of Understanding (MOU) and Agreement dated 2014 (HSE,2018). Governance for HSE homebirth services lies with Primary Care (HSE, 2018). Community midwives employed by the acute maternity hospitals also provide Homebirth services and the services provided by these community midwives are under the governance of the relevant hospital i.e the National Maternity Hospital, University Hospital Waterford and Wexford General Hospital.

The HSE MOU has as its guiding principle the; (1) identification of safe, acceptable and feasible options of maternity care, which are women-centred, facilitate choice and continuity of care and which promotes partnerships and supports professionals involved in the service delivery; (2) Homebirth is a safe option for pregnant women; and (3) a safe outcome for mother and baby is paramount.

The COVID-19 pandemic has brought with it unprecedented challenges and SECMs, Designated Midwifery Officers (DMOs), Community Midwives and Directors of Midwifery have been required to adapt provision of care in line with national HSE and HSPC COVID-19 recommendations. There has been a significant increase in demand for home births nationally since the pandemic started last year. In 2019, 272 women were approved for the homebirth service and 206 had homebirths. A further 354 were approved for the service in 2020 with 206 homebirths, an increase of 30.15% in approvals (NPEC, 2019) and this upward trend is continuing into 2021.

Guidance produced by the Royal College of Midwives (RCM) and informed by a rapid review (Renfrew et al, 2020) was developed to support maternity care leaders in decision making about midwife-led birth settings in the evolving pandemic (RCM/RCOG, 2020).

The following adjustments to HSE Homebirth services during the COVID-19 pandemic apply:

For all women

- Planned homebirths continue as a choice for healthy normal risk women who meet the eligibility criteria for HSE Homebirth services or those criteria identified by the individual maternity hospitals with community midwifery services.
- Provision of routine antenatal care should continue and remote/virtual consultations can be considered
- Provision of the homebirth service will depend on the availability of the SECMs (including second midwife) or in the case of community midwifery services –sufficient midwives deployed in the community.
- Provision of the homebirth service will also depend on the availability of the ambulance service to provide emergency transfer if required. Regular communication between the SECMs/community midwives and the National Ambulance Service (NAS) should be maintained to assess ambulance availability. It is important to note that the rate of transfer of primagravid women is much higher than for multiparous women.
- The SECM/community midwife should make all women booked for home birth aware about the impact of reduced midwifery staffing and/or ambulance availability on provision of a safe homebirth service, to prepare them in advance for any interruption to the homebirth service during the pandemic and need to transfer care to the hospital setting.
- SECM /second midwife/community midwife should follow the HSE COVID-19 guidance on social distancing while in the home and if possible community midwifery staff should aim to keep separate from midwifery staff in the hospital to reduce risk of transmission between staff.
- Entonox use in labour can be safely offered with standard single-patient microbiological filter.
- Standard PPE precautions apply

Prior to any home visits: the SECM/community midwife should contact the woman by phone to ascertain if the planned home visit is safe to proceed.

The SECM/community midwife should ask the woman if they or any member of their household have:

- Recent onset of fever or chills and signs and symptoms of respiratory tract infection which includes cough or shortness of breath
- Been in contact with a person confirmed with COVID-19;
- Been advised by a public health doctor or GP to self-isolate.

The SECM/community midwife may ask the above questions again before entering the home, to check if the situation has changed. If the answers are all no, then the planned visit should go ahead and all standard precautions taken.

If the visit has to be postponed or delayed the SECM/community midwife should reassure the woman of her plans to reorganise care and re-emphasise to the woman, the importance of continuing with routine antenatal care and monitoring of baby's movements. All discussions are documented in the woman's domiciliary midwifery notes (and the national maternity healthcare record if available).

For women with suspected or confirmed COVID-19 infection

- The SECM/community midwife should advise the pregnant woman to follow the HSE/HSPC guidance [as outlined](#) and refer the woman to the associated maternity unit.
- An Obstetric consultation with the pregnant woman should take place that outlines all potential risks including the increased risk of fetal compromise in the active phase of labour if infected with COVID-19 (RCOG, 2021); the SECM/community midwife should attend this consultation either in person or by telephone.
- Hospital birth is recommended for those women who are COVID-19 positive close to term or for whom delivery is recommended during the illness.
- A key recommendation that should be discussed and explained to the woman is regarding attending a maternity unit for birth, and where the baby can be monitored using continuous electronic fetal monitoring (EFM) (RCOG, 2021).
- The unit staff with the woman will put a management plan in place for the rest of pregnancy and the birth. This plan will be determined by the gestation of the pregnancy and the severity of the woman's illness, as well as recommendations around timing of birth or the need for ongoing antenatal surveillance such as ultrasound scans.
- The SECM/community midwife is to be notified of the plan as it may include referral back to the homebirth services if the woman does not test positive for COVID-19 or after she has recovered from her illness if positive for COVID-19.

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12 Neonatal Care Considerations

Baby of Suspected/Positive COVID-19 mother

| Aspect | Consideration |
|--|---|
| Risk assessment | <ul style="list-style-type: none"> • Maintain high index of suspicion for signs of sepsis/unwell baby • As babies are known to be significant shedders of respiratory viruses, a confirmed COVID-19 positive baby requires full infection control precautions (including stools) |
| Neonatal care in birthing suite | <ul style="list-style-type: none"> • Assign a dedicated neonatal team member to attend the birth but only according to usual clinical indications • If neonatal stabilisation /resuscitation required in the birthing room/theatre, use full PPE. Neonatal team can remain outside in PPE until the baby is delivered. • Where feasible, transport baby between locations in the facility in a closed system • If required, plan to transfer to a designated isolation area in the neonatal unit (NNU) • Transfer baby to NNU on resuscitaire with staff in PPE if baby unwell • In the NNU, the baby should be nursed in an isolette |
| Respiratory support | <ul style="list-style-type: none"> • High risk activities <ul style="list-style-type: none"> ○ Those associated with aerosolisation require full PPE use ○ This includes intubation/IPPV with Neopuff/BIPAP/CPAP/HFNC ○ Intubation and less invasive surfactant administration <ul style="list-style-type: none"> ▪ Use in-line suction with endotracheal tubes if possible ▪ Consider where feasible Videolaryngoscopy • Where feasible, nurse babies requiring respiratory support in an incubator |
| Neonatal testing | <ul style="list-style-type: none"> • No indication to test well asymptomatic baby • Case definition: newborns may not show all the features of an influenza-like illness, e.g. a fever, so clinicians should have a high index of suspicion in all babies admitted to the NNU and monitor for signs of respiratory illness during the admission. • Symptomatic babies that meet the definition only by virtue of requiring respiratory support for an anticipated non-COVID-19 respiratory pathology (e.g. RDS), should be tested after 72 hours of age – to avoid potential early false negative results. <ul style="list-style-type: none"> ○ It is suggested to test again on day 5 before declaring non-infected. • Collect nasopharyngeal and oropharyngeal swab (single swab both sites) • If ventilated, send endotracheal secretions • Undertake subsequent testing as indicated <ul style="list-style-type: none"> ○ e.g. if baby becomes unwell, after maternal negative result, or as recommended by infectious disease team • SARS-CoV2 swabs on any baby to be agreed at Consultant level. |
| Admission to nursery | <ul style="list-style-type: none"> • COVID-19 positive mother with a well newborn (and no other neonatal concerns), is not itself an indication for admission to a neonatal unit • Perform clinical assessment after birth as per usual protocols (in PPE) • Assess if required care can safely be provided during co-location with mother (preferred option) • Follow usual clinical criteria, processes and protocols relevant to admission |

| | |
|--|---|
| <p>Neonatal surveillance</p> | <ul style="list-style-type: none"> • Maintain high index of suspicion for signs of sepsis/unwell baby • Provide infection control advice for mothers who remain infectious on discharge; i.e; wear mask for feeding infant and other close face to face contact until mother is no longer infectious and/or 5 days symptom free. Adhere to strict hand hygiene • Provide post discharge advice about indications for readmission and possible course of disease <ul style="list-style-type: none"> ○ Most commonly reported are respiratory symptoms requiring readmission 1–3 weeks after discharge ○ Delay routine follow-up as required (e.g. hearing screen) • Readmission to Paediatrics units to keep infected infants away from the immunocompromised NNU population. |
| <p>Adapted from Queensland Clinical Guidelines: Perinatal care of suspected or confirmed COVID-19 pregnant women. March 26 2020. https://www.health.qld.gov.au/qcg</p> | |

Delivery

The neonatal team should be informed of plans for delivery of a woman affected by moderate to severe COVID-19, as far in advance as possible and should also be given sufficient notice of the birth, to allow them to attend and don PPE before entering the room/theatre. However, COVID-19 in the mother is not per se an indication for the neonatal team to routinely attend delivery.

A designated member of the neonatal team should be assigned to attend suspected/confirmed COVID-19 deliveries, if this is clinically necessary. It is important that the most senior person likely to be required attends in the first instance, to minimise staff exposure. Units might chose to establish a dedicated COVID-19 Neonatal Team with dedicated Registrar and Consultant during working hours. Local units should make their own arrangements for designating staff, but senior involvement is expected.

PPE should be donned in an adjacent room and the team member should wait outside the delivery room, ready to be called in should the baby require any intervention(s). If it is anticipated that the baby will require respiratory support, appropriately skilled neonatal team members should be present at delivery and wearing PPE.

Neonatal resuscitation/stabilisation should proceed as per guidance. If additional equipment is required, this can be passed to the team by a 'clean' staff member outside the room. Neonates should be transferred in a closed incubator, although where the baby is unwell they may need to be transferred by resuscitaire (with staff in full PPE). Where possible, all procedures and investigations should be carried out in the single room or in an isolation room/bay with a minimal number of staff present.

There is no evidence to suggest that antenatal corticosteroids for fetal lung maturation cause any harm in the context of COVID-19, except perhaps where the pregnant woman has a critical illness in which case a multidisciplinary discussion needs to determine their relative benefit. Steroids should therefore be given to mothers anticipating preterm delivery where indicated and urgent delivery should not be delayed for their administration.

Magnesium Sulphate (MgSO₄) should be given for neuroprotection of babies <32 weeks' gestation as per current guidance.

Regarding neonatal management of suspected, probable and confirmed cases of maternal COVID-19, the umbilical cord should be clamped and the neonate should be transferred to the resuscitation area for routine assessment and if appropriate assessment by the attending neonatal team.

There is insufficient evidence regarding whether delayed cord clamping (DCC) increases the risk of infection to the newborn via direct contact. In units in which delayed cord clamping is usually recommended, clinicians should consider whether this practice should be continued. The most recent RCH/BAPM/RCOG guidance clearly states that deferred cord clamping is still recommended provided there are no other contraindications. The baby can be dried as normal while the cord is still intact. In the case of a preterm baby, standard thermoregulatory measures including the use of a plastic bag should also be used.

Whether DCC is practiced or not, the neonate should be transferred after delivery to the resuscitaire for initial assessment by the attending midwife, or by the neonatal team as appropriate for the circumstances at delivery. An immediate skin to skin approach with the COVID-19 infected mother should not take place; this can be considered later with the mother alongside appropriate hand hygiene and sterile PPE precautions.

Asymptomatic well babies should not be admitted to the neonatal unit (NNU). Babies of COVID-19 positive mothers who need admission to the NNU for any reason should be isolated, and managed in their own isolette in a designated isolation area, with dedicated staffing.

Skin to skin guidance for infants born to women with suspected or confirmed COVID-19

Skin to skin contact is not recommended immediately post-delivery for women with confirmed or suspected COVID-19. However, skin to skin contact is an essential component of initial care for both mother and infant and there is currently no data which suggests this may be harmful to the newborn of a woman with suspected or confirmed COVID-19.

As skin to skin contact has proven benefits for both mother and infant, this practice should not be excluded for this group, but rather employed as soon as feasibly possible, once appropriate precautions for preventing/minimising perinatal transmission of COVID-19 have been employed.

- The infant's mucosal sites should be cleaned with saline as soon as feasibly possible; i.e., clean the eyes with saline and also wipe/clean the nostrils, oral and peri-oral surfaces in order to remove maternal blood/body fluids and thus minimise potential risk of viral entry
- The mother should sanitise her hands and apply a clean surgical mask to replace the mask worn during delivery
- The mother should be able to sit upright before she receives the infant

Thus, skin to skin contact may take place in the delivery suite after vaginal birth, in the Recovery area if Caesarean birth, or on the postnatal wards depending on the maternal status.

Rooming-in and Infant feeding

It is reasonable to assume that a newborn from a mother with COVID-19 at delivery could possibly be infected, either in utero or perinatally, and thus should be placed in isolation to avoid exposure to other newborns.

However, well term/near-term babies, not otherwise requiring neonatal unit care, should stay with their mother, if at all possible. If the mother is severely or critically ill, separation may then be necessary and will be reviewed on an individual case basis. Maternal illness is not in itself an indication for newborn admission to the NNU, so the baby may be cared for in an isolette in the nursery (where available) or in isolation with the mother e.g. on a COVID-19 assigned ward. It is recommended that the baby is cared for at home if the mother is admitted to an Acute Adult Hospital so as to reduce the risk of infection to the baby.

In light of the evidence, the benefits of breastfeeding outweigh any potential risks of transmission of the virus through breastmilk, and women who choose to breastfeed should be supported to do so.

If the woman is asymptomatic or mildly affected, breastfeeding and rooming-in can be considered by the mother in coordination with healthcare providers. Breastfeeding can still be encouraged through supporting mothers who have been separated from their baby to express milk (EBM). Either way, mothers should have a designated breast pump for exclusive use and local infection control policies should be consulted in the cleansing of this.

Whether COVID-19 can be transmitted through breastmilk is unknown. Since the main concern is that the virus may be transmitted by respiratory droplets rather than breastmilk, breastfeeding mothers should ensure to wash their hands and wear a three-ply surgical face mask before touching the baby. Similarly, mothers should wear a face mask and wash hands, before touching breast pump or bottles, as well as avoid coughing or sneezing on the baby while feeding.

In case of rooming-in, the baby's cot should be kept at least 2 meters from the mother's bed, and a physical barrier such as a curtain may be used. An incubator can also be used in the room as a physical barrier.

Babies requiring subsequent additional care (e.g. intravenous antibiotics) should be assessed in the delivery suite or postnatal wards and a decision made as to whether additional care can safely be provided at the mother's bedside. NNU admission should be avoided if at all possible and safe.

Any need to separate mothers with COVID-19 from their newborns, with the consequence that they are unable to breastfeed directly, may impede early bonding as well as establishment of lactation. These factors will inevitably cause additional stress for mothers in the postpartum period. As well as caring for their physical wellbeing, medical teams should consider the mental wellbeing of these mothers, showing appropriate concern and providing support when needed (RCOG/RCM, 2020).

The Neonatal Paediatric COVID-19 guidance group have issued recommendations for breastfeeding during the Covid-19 pandemic. These state that the HSE and Faculty of Paediatrics encourage breastfeeding to protect children and reiterate that "the benefits of breastfeeding outweigh the potential for exposure to the virus".

<https://hse.drsteevenslibrary.ie/c.php?g=679077&p=4866588>

<https://hse.drsteevenslibrary.ie/c.php?g=679077&p=4866641>

Testing

There is currently no clinical indication to test any well baby born to a COVID-19 positive mother who does not require admission to the NNU. Performing nasal swabs on asymptomatic infants may also result in false negatives, and the optimal timing of testing in any case is unclear.

Asymptomatic patients, including infants, even if positive, are unlikely to transmit the virus, providing everyone adheres to basic hygiene measures. Viral RNA may be detectable in stools for several weeks, but this does not mean that the faecal material is necessarily infective; providing carers adhere to basic hygiene measures, the risk is not thought to be significant.

Asymptomatic babies should not be routinely admitted to the NNU. If subsequently admitted for other issues such as jaundice /hypoglycaemia they do not require testing unless their symptoms fit the case definition (HSPC).

Newborns may not show all the features of an influenza-like illness, particularly a fever, so clinicians should have a high index of suspicion in all babies admitted to the NNU and monitor for signs of respiratory illness during the admission (RPCH / BAPM).

Babies of COVID-19 positive mothers who need admission to the NNU for any reason should be isolated, and managed in their own isolette in a designated isolation area, with dedicated staffing. They must be monitored for signs of COVID-19 during their admission. If they develop signs, they should then be tested.

Symptomatic babies that meet the definition only by virtue of requiring respiratory support for an anticipated non-COVID-19 respiratory pathology (e.g. RDS), should be tested after 72 hours of age – to avoid potential early false negative results. It is suggested to test again on day 5 before declaring them non-infected.

It is important to note that newborn COVID-19 may present with non-respiratory signs (e.g. gastrointestinal) and if there is any clinical indication to test - adhere to the recommendation of > 72 hours old and repeat on day 5, as above.

Babies can come out of isolation despite continuing need for respiratory support, providing the tests on day 3 and 5 are negative, and the baby is following the projected clinical course (e.g. expected for RDS, etc.).

If there is clinical concern that a baby who meets the case definition or who has been in isolation is not following a typical clinical course for an anticipated non-COVID-19 respiratory pathology, they should be tested that day and remain in isolation until results are available.

Known COVID-19 positive babies should be isolated until their symptoms resolve and they no longer need respiratory support; they can then be allowed out of isolation but must remain in an incubator and monitored for respiratory signs and symptoms for a further 14 days.

Babies awaiting test results and <7 days of age can be cohorted in the same isolation room, provided they remain in incubators, as airborne transmission (with the exception of aerosol generating procedures) is not currently thought to be a major mechanism of transmission in this clinical context.

Clinical investigations should be minimised whilst maintaining standards of care. Senior input is recommended when deferring routine investigations and in prioritisation of work.

Procedures in the NNU

In the absence of evidence, it is reasonable to treat the baby's respiratory illness in the same way as if they were not potentially exposed to COVID-19. The evidence in favour of early intubation is limited to adults and older children. All babies requiring respiratory support should be nursed in an incubator.

Intubation is an aerosol generating procedures (AGP), although the risk of transmission soon after birth is thought to be low; however it is recommended that staff follow their local guidance regarding use of appropriate PPE, even in an emergency. In-line suction with endotracheal tubes should be used, where possible.

Where possible, use of a video-laryngoscope should be considered for intubation, which might facilitate keeping the baby within the incubator. By reducing proximity to the baby's airway this may help to reduce exposure to the virus. Intubation should only be undertaken by staff with appropriate competencies.

CPAP and high flow therapies are also associated with aerosolisation, and staff caring for infants receiving these therapies must also adhere to their local guidance regarding use of appropriate PPE.

Policies in the NNU

Transfers should be limited to a minimum, and as per network escalation policies. Exposure to COVID-19 in itself is not a reason to transfer.

All staff must adhere to the locally recommended PPE guidelines before entering an isolation room. A register must be kept of all staff entering isolation rooms. All equipment coming out of the isolation room should be cleaned.

It is anticipated that NNU capacity may become problematic either due to cot capacity or staff availability. Individual units should have agreed staffing plans when optimal staffing plans cannot be achieved. Cohorting of confirmed positive cases may be necessary and should follow local guidance.

COVID-19 positive mothers should not visit their baby on the NNU, until they are asymptomatic or have tested negative. Partners of COVID-19 positive mothers must adhere to the current advice regarding self-isolation, and the hospital policy regarding visiting the maternity wards and NNU, except under exceptional circumstances.

These policies may vary across units, according to the level of the outbreak and NNU configuration; units are therefore encouraged to provide updated and accessible information regarding visiting for mothers and accompanying partners.

Newborn screening

Newborn Infant Physical Examination (NIPE) – this should be completed as usual in hospital, prior to discharge. Newborn Blood Spot (NBS) screening should take place as usual.

Audiology screening should continue in maternity units and on the NNU. The ability to perform investigations and tests once the infant has left hospital will be restricted – e.g. newborn hearing screening in the community, bringing infants back for echocardiograms, etc. Thus, where possible, investigations and tests should be performed before discharge from the maternity or neonatal unit.

Maternity units should aim to maintain sufficient staffing in order to perform the necessary screening before discharge.

Discharge home

When baby and mother are ready for discharge, they should be provided with written advice regarding what to look out for, in terms of respiratory symptoms, lethargy, gastrointestinal symptoms or poor feeding, and from whom to seek further advice should they have concerns. They should be advised to self-isolate for 14 days.

All measures aimed at early discharge from the NNU should be scaled up, where possible.

Consider telephone / video consultations for neonatal follow up, where possible, to avoid vulnerable infants with chronic lung disease, etc., attending clinics.

Advice should be provided to parents of those infants at increased risk (e.g. immunocompromised, chronic lung disease, cardiac disease) about reducing risk of infection (reduce social contact, handwashing) and interventions aimed at preventing other diseases (e.g. immunisations) should be optimised.

Parents who telephone NNUs for help should receive experienced advice, with the aim of minimising direct contact with either neonatal or paediatric services.

13 Perinatal Pathology Considerations

SARS-CoV-2 is regarded as a hazard group 3 (HG3) organism by the UK Health and Safety Executive Advisory Committee on Dangerous Pathogens, with consequent implications for if, where and how autopsy examinations may be undertaken. Similarly, the 2013 Code of Practice for the Safety, Health and Welfare at Work (Biological Agents) Regulations lists SARS Coronavirus as a 'group 3 biological agent'.

<https://www.hse.gov.uk/pubns/misc208.pdf>

Current COVID-19 related autopsy protocols refer to the infected or potentially infected patient and would be applicable for COVID-19 related maternal deaths. They do not deal with the specific scenario where an autopsy is being considered on the miscarried or stillborn infant of an infected mother. In this scenario the risk to hospital staff of infection is poorly understood but at a minimum, apart from considerations around reported instances of possible vertical transmission, there is a risk of infection from fomite contamination of the surface of the infant or of its wrappings following delivery.

We now know that in rare cases maternal COVID-19 infection can directly affect the pregnancy by means of a "SARS-CoV-2 placentitis" and can have deleterious effects up to and including stillbirth (58, 59). This needs to be kept in mind when determining the need for placental examinations in pregnancies complicated by COVID-19 and when considering a post mortem examination where a miscarriage or stillbirth occurs in a mother who has had COVID-19 in her pregnancy.

Impact on current services

Staffing levels in histopathology laboratories may be affected through illness or staff redeployment. Mortuary staff may be particularly affected through having to handle and process bodies, from either the hospital or community, where COVID-19 infection is known, suspected or unknown. As this necessary processing of bodies may become onerous there is potential for impact on the nature of autopsy services that a particular mortuary may be able to safely offer.

Only certain mortuaries in the country have the infection control facilities that would enable them to support autopsies in COVID-19 positive cases. Nationally, some transportation to these facilities may be required in certain Coroner-directed autopsies or State Pathologist autopsies.

Limited autopsy protocols

During the current COVID-19 pandemic, autopsy practice involves making a risk assessment on a case by case basis.

A number of guidelines now exist to guide practice on handling deceased persons and autopsy practice: RCPATH Briefing on Autopsy practice relating to possible cases of COVID-19; Draft Faculty of Pathology (Ireland) recommendations for post mortem practice in COVID-19; HSE/HPSC National Interim Guidelines for Funeral Directors on managing infection risks when handling deceased individuals with confirmed COVID-19 and Notice to Fellows: Update on Swabbing for COVID virus and related issues 24 April 2020.

<https://www.rcpath.org/profession/coronavirus-resource-hub.html>

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/funeraldirectorsguidance/>

<http://www.coroners.ie/en/COR/>

In brief, if a patient is known to be COVID-19 positive and dies and a medical certificate of death may be issued, an autopsy will not be performed. An autopsy will only proceed in a COVID-19 positive case only in very limited scenarios, often for legal purposes.

According to Faculty of Pathology guidance "no open cavity post-mortem should be undertaken without performing a COVID-19 swab first, during this pandemic time period". With the agreement of Coroners nationally other practices are being modified to reduce the burden on pathologists/mortuaries during this time.

PM for the infected infant / POC examination in infected cases

Three main forms of pathological examination are carried out for the maternity services in a setting of COVID-19 positive mothers.

1) Examination of products of conception (from 1st trimester miscarriage):

Appropriate safety precautions need to be taken during the collection of these specimens. The tissue should then be placed in formalin for fixation and sent to the pathology laboratory labelled with clinical details including COVID-19 status. The specimen should then be fixed for a minimum of 24 hours before examination to minimise the risk of infection for laboratory staff. The taking and sending of fresh samples for purposes such as cytogenetic analysis may pose an unwarranted risk of infection at this time and should be discussed with the relevant laboratory before being sent.

2) Examination of placentas:

Appropriate safety precautions need to be taken during the collection of these specimens. Hospitals should determine their own referral criteria for these cases e.g. some may agree that all placentas from pregnancies with a history of COVID-19 infection require pathological examination. Laboratories that store placentas fresh for later potential examination should re-evaluate their safety protocols in view of the recommendations on handling of fresh tissue (e.g. for frozen section) in the context of SARS-CoV2. Placentas to be examined pathologically should be placed in formalin for fixation and sent to the pathology laboratory labelled with clinical details including COVID-19 status. The specimen should then be fixed for a minimum of 24 hours before examination to minimise the risk of infection for laboratory staff. The taking and sending of fresh samples for purposes such as cytogenetic analysis should be discussed with the relevant laboratory before being sent.

3) Post mortem examinations:

All perinatal post mortem examinations will now necessarily involve COVID-19 swabbing of the mother or infant or both.

Each institution should have an agreed protocol to ensure that bereavement care is not unnecessarily compromised.

An example of the processes involved is suggested below for assistance:

For Intrauterine demise / Termination of pregnancy:

1. At the time of administration of Mifepristone for medical management of intrauterine demise or termination of pregnancy, a maternal COVID-19 swab should be taken.
2. The doctor who takes the swab should discuss the case with the microbiology laboratory indicating that it is for post mortem purposes.
3. The Perinatal Pathologist should be informed that a COVID-19 swab has been taken and when the result will likely be available.
4. The midwifery / duty manager should be informed of the case and that a COVID-19 swab has been taken.

5. Since this swab is taken as a screening test, there is no indication to isolate the mother and staff do not need to wear additional PPE.

Intrapartum demise / Neonatal death:

1. For cases of intrapartum death after 24 weeks or early neonatal death at any gestation, a COVID-19 swab must be taken from the baby.
2. Consideration should be given to taking a maternal COVID-19 swab also in these cases.
3. Steps 2-5 above should then be followed

Where a mother is COVID-19 positive or where there is a suspicion of infection:

These cases must be the subject of urgent senior level MDT discussion with the Perinatal Pathologist, and Coroner if necessary. A staged approach to pregnancy loss investigations is necessary and should be discussed with the local pathologist as each case arises. For earlier pregnancy losses, where an autopsy is being considered (second trimester), it may be possible to place the fetus in formalin fixative to reduce the risk of infection. While this would delay the examination, the fetus may be returned to its parents after the autopsy.

For later gestations consideration should be given to the necessity for a full autopsy examination in order to minimise exposure of staff to the risk of infection (including within radiology and the mortuary/pathology departments). Results of any prior anomaly scan, basic bed-side measurements, Kleihauer tests, placental examination etc. may provide the information required to formulate a cause of death without need for a full autopsy. Consideration of microbiological sampling of the infant/neonate for COVID-19 (nasopharyngeal/anal swabs; cord blood for serology) may be discussed with the local microbiology department. Needle biopsies of key organs (lung, liver, heart) may provide information in certain circumstances and may be performed on the ward, again reducing the necessity for a full autopsy.

However, there may be an argument for a full fetal autopsy to assist in the gathering of information on how COVID-19 may affect pregnancies and how in rare instances this may result in stillbirth – some of the factors to consider here may include the availability of suitable mortuary facilities and staff vaccination status.

Any COVID-19 swabs taken for the purposes above should be labelled “urgent: for post-mortem decision making” or similar to ensure urgent hospital processing.

Due to the complexity of the issues involved, particularly with the potential for involvement of the Coroner’s office, case by case evaluation of these cases is mandated along with early discussion with the Pathologist.

14 Personal Protective Equipment (PPE)

Please visit the link below for all up to date guidelines regarding PPE:

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/infectionpreventionandcontrolguidance/ppe/>

This section is to be used in conjunction with:

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/infectionpreventionandcontrolguidance/ppe/>

As well as the complete Infection Prevention and Control Guidance for COVID-19:

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/infectionpreventionandcontrolguidance/>

This document provides maternity services specific suggestions.

- Designate a member of the management team to take responsibility for PPE
- Senior management agree a team to manage PPE stock within the hospital/unit.
- Create a log of supplies
- Senior hospital managers to be aware of how to access/procure PPE at all time
- Ensure stock levels are maintained by enforcing appropriate use of PPE
- Ensure appropriate level of PPE is being used for all procedures
- Provide training for all staff in the use of PPE
<https://healthservice.hse.ie/staff/news/news-items/prevent-the-spread-of-coronavirus-in-the-workplace.html>
- Educate staff on PPE use
- Place information in public areas in the hospital to raise awareness of PPE use

PPE Jargon Buster

| | |
|------|-----------------------------------|
| FRSM | fluid resistant surgical mask |
| FRDG | fluid resistant disposable gown |
| PPE | personal protective equipment |
| AGP | aerosol generating procedure |
| FFP2 | filtering face piece level 2 mask |

Use of Surgical Masks

COVID-19

HAND HYGIENE BEFORE
AND AFTER USING A MASK



Coronavirus
COVID-19
Public Health
Advice

Safe use of Masks

THE MASK YOU NEED

DO: REMEMBER TO WEAR THE CORRECT MASK FOR THE TASK:

Wear Surgical or FFP2 mask: for droplet precautions, or when providing care within 2 metres of any patient, or when working within 2 metres of another healthcare worker for more than 15 minutes.



Always wear a fit tested FFP2/ FFP3 respirator mask for AGPs. Fit check your respirator mask every single time.



WEARING THE MASK

DO: Wear your mask so it comes all the way up, close to the bridge of your nose, and all the way down under your chin.



DO: Press the metal band so that it conforms to the bridge of your nose.



DO: Tighten the loops or ties so it's snug around your face, without gaps. If there are strings, tie them high on top of the head to get a good fit.



DO NOT:
Wear the mask below your nose.



DO NOT:
Leave your chin exposed.



DO NOT:
Wear your mask loosely with gaps on the sides.



DO NOT:
Wear your mask so it covers just the tip of your nose.



DO NOT:
Push your mask under your chin to rest on your neck.



ONCE YOU HAVE ADJUSTED YOUR MASK TO THE CORRECT POSITION, FOLLOW THESE TIPS TO STAY SAFE:

- ALWAYS change your mask when you answer the telephone or you take a drink/break.
- ALWAYS wash your hands before and after handling a mask.
- ALWAYS change mask when leaving a cohort area or exiting a single patient isolation room.
- ALWAYS change mask if it is dirty, wet or damaged.
- NEVER fidget with your mask when it's on.
- NEVER store your mask in your pocket.

REMOVING THE MASK



Use the ties or ear loops to take the mask off.

Do not touch the front of the mask when you take it off.

DISPOSING OF THE MASK



Dispose of mask properly in a bin as ordinary household waste unless you were caring for a person with COVID-19. If you are disposing a mask after contact with a person who has a COVID-19 infection or suspected COVID-19, please follow these disposal instructions. Place the mask in a healthcare risk waste bin.

IF HEALTHCARE RISK WASTE SERVICE IS NOT AVAILABLE:
The mask, along with any other PPE used when treating a person with COVID-19 or suspected COVID-19, needs to be double-bagged and stored for 72hrs in a secure location, then put in the domestic waste.




Care of patients with respiratory symptoms/ suspected/confirmed COVID-19

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/infectionpreventionandcontrolguidance/ppe/PPE%20double%20graphic%20hpsc.pdf>

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/infectionpreventionandcontrolguidance/ppe/>

COVID-19 Safe PPE

HAND HYGIENE FIRST IN ALL CASES

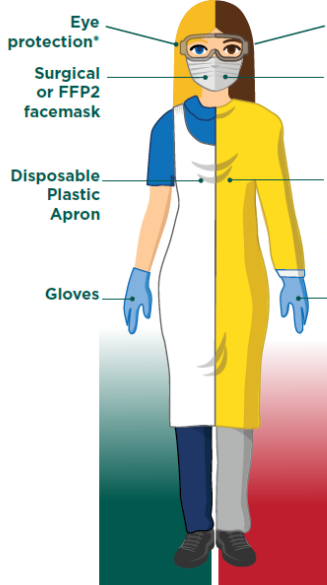


Coronavirus
COVID-19
Public Health
Advice

Care of patients with respiratory symptoms/ suspected/confirmed COVID-19


Always wear a fit tested FFP2/FFP3 respirator mask for AGPs.

Fit check your respirator mask every single time.



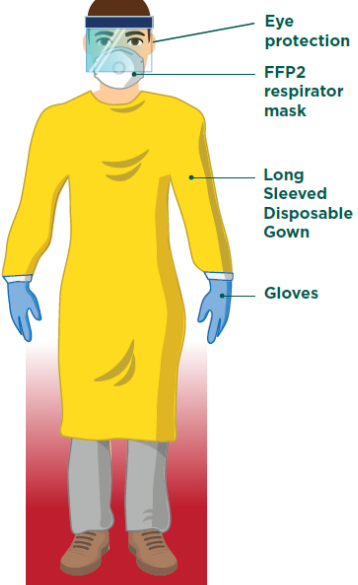
Low Contact

Unlikely to provide opportunities for the transfer of virus/other pathogens to the hands and clothing.



High Contact


Increased risk for transfer of virus and other pathogens to the hands and clothing.



Aerosol Generating Procedures

Also if there is a risk of an unplanned aerosol generating procedure.

*Eye protection to be worn on risk assessment



Donning PPE for obstetric anaesthesia

Adapted from N Lucas, J Bamber and F Donald on behalf of the OAA, 20 March 2020

| An individual risk assessment should be carried out before/at the time of providing care to determine which scenario applies and when the risk has changed. Here are examples of possible scenarios. | | | | | |
|---|--|---|--|--|---|
| | | Outside room: | In the room | Theatre | At the end of the case |
| A | Labour epidural Fluid resistant surgical mask Gloves Plastic apron | <ul style="list-style-type: none"> Put on theatre hat, FRSM & eye protection Scrub up Put on disposable fluid resistant sterile gown, sterile gloves | <ul style="list-style-type: none"> Perform epidural and ensure it is working Remove gloves, clean hands with gel Remove gown & turn inside out Remove eye protection. Dispose of all items in clinical waste bin Gel hands | | Remove FRSM (avoid touching outside) & hat Dispose of in clinical waste bin Wash hands with soap and water |
| B | Caesarean delivery Spinal anaesthesia (low risk of conversion to GA) Fluid resistant surgical mask Gloves Plastic apron | | | <ul style="list-style-type: none"> Put on sterile PPE as described, in an area at least 2m away from patient Perform spinal procedure Wear this PPE throughout case | Ask patient to put on FRSM after cleaning hands with gel Hand over patient to clean team who will transfer her back to her room (midwife looking after patient and someone to push bed) Remove PPE as described Wash hands with soap and water |
| C | Emergency Caesarean delivery (General anaesthesia or neuraxial with high risk of conversion to GA) AGP PPE <ul style="list-style-type: none"> Hand Hygiene Disposable Single Use Nitrile Gloves Long sleeved disposable gown FFP respirator mask Eye Protection | | | Put on AGP PPE in an area at least 2m away from patient prior to induction Undertake induction and intubation Keep AGP PPE on until after extubation | <ul style="list-style-type: none"> Ask patient to clean hands with gel and to put on FRSM Add a well fitted oxygen mask if needed Hand over to clean team who will be wearing standard PPE (midwife looking after patient + someone to push bed) Patient transferred to room by clean team Remove AGP PPE as per doffing procedure Wash hands with soap & water |

15 Workforce considerations

Rights, roles and responsibilities of health workers, including occupational safety and health, World Health Organisation, 2020.

Health workers are at the front line of any outbreak response and as such are exposed to hazards that put them at risk of infection with an outbreak pathogen (in this case COVID-19 infection from SARS-CoV2). Hazards include pathogen exposure, long working hours, psychological distress, fatigue, occupational burnout, stigma, and physical and psychological violence. This document highlights the rights and responsibilities of health workers, including specific measures needed to protect occupational safety and health.

https://www.who.int/docs/default-source/coronaviruse/who-rights-roles-respon-hw-covid-19.pdf?sfvrsn=bcabd401_0

Healthcare worker rights include that employers and managers in health facilities:

- assume overall responsibility to ensure that all necessary preventive and protective measures are taken to minimize occupational safety and health risks¹;
- provide information, instruction and training on occupational safety and health, including;
 - Refresher training on infection prevention and control (IPC);
 - Use, putting on, taking off and disposal of personal protective equipment(PPE);
- provide adequate IPC and PPE supplies (masks, gloves, goggles, gowns, hand sanitizer, soap and water, cleaning supplies) in sufficient quantity to healthcare or other staff caring for suspected or confirmed cases of COVID-19, such that workers do not incur expenses for occupational safety and health requirements;
- familiarize personnel with technical updates on COVID-19 and provide appropriate tools to assess, triage, test and treat patients and to share infection prevention and control information with patients and the public;
- as needed, provide with appropriate security measures for personal safety;
- provide a blame-free environment for workers to report on incidents, such as exposures to blood or bodily fluids from the respiratory system or to cases of violence, and to adopt measures for immediate follow-up, including support to victims;
- advise workers on self-assessment, symptom reporting and staying home when ill;
- maintain appropriate working hours with breaks;
- consult with healthcare workers on occupational safety and health aspects of their work and notify appropriately of cases of occupational disease;
- ensure healthcare workers are not required to return to a work situation where there is continuing or serious danger to life or health, until the employer has taken any necessary remedial action;
- provide access to mental health and counselling resources; and
- enable co-operation between management and workers and/or their representatives.

Healthcare workers should:

- follow established occupational safety and health procedures, avoid exposing others to health and safety risks and participate in employer-provided occupational safety and health training;
- model good hygiene practices
- use provided protocols to assess, triage and treat patients;
- treat patients with respect, compassion and dignity;
- maintain patient confidentiality;
- swiftly follow established public health reporting procedures of suspected and confirmed cases of COVID-19;
- provide or reinforce accurate infection prevention and control and public health information, including to concerned people who have neither symptoms nor risk;
- put on, use, take off and dispose of personal protective equipment properly;

- self-monitor for signs of illness and self-isolate or report illness to managers and to occupational health, if it occurs;
- advise management if they are experiencing signs of undue stress or mental health challenges that require support interventions.

Staff education and training

In a pandemic situation education and training of staff is vital to ensure staff safety and delivery and continuation of a safe, effective service.

This includes:-

- training and fit-testing for staff likely to use PPE.
- training in infection control measures for all members of the multidisciplinary team.
- regular practice drills of all possible emergency scenarios in the hospital.

These must include doffing and donning of PPE in an emergency situation. Drills must be attended by all members of the multidisciplinary team.

Healthcare workers have a responsibility to keep informed and keep up to date with information from accurate sources. Maternity units should ensure that evidence-based information updates, from trustworthy sources (e.g. Department of Health, HSE, Professional bodies and Professional colleges) are provided to all grades of staff regularly.

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/guidanceforhealthcareworkers/>
<https://healthservice.hse.ie/staff/news/coronavirus-news/>

Another useful resource may be the Royal College of Physicians of Ireland website; they provide updates, access to clinical guidance and helpful resources.

<https://www.rcpi.ie/covid19/>

Staff resourcing and deployment

Employers have an important role in communication with staff, providing clear policies on pay, sick leave and self-isolation. Support for the latter is vital to guarantee compliance and to prevent the unnecessary spread of infection (RCPI, 2020).

There is now a complex landscape of factors to consider regarding the safety of people (including pregnant women) in the workplace. Therefore, while the clinical information stands, the risk assessments and the resulting conclusions in relation to safety at work are expected to differ between employment sectors and by region and country, and therefore, single recommendations are no longer appropriate (RCOG, 2021).

<https://www.hse.ie/eng/staff/workplace-health-and-wellbeing-unit/covid-19-guidance/occupational-health-interim-guidance.pdf>

Deployment

Healthcare workers assigned to care for patients with COVID-19 or who work in areas of a hospital segregated for patients with COVID-19 should as much as possible not be assigned to care for non COVID-19 infected patients or work in non COVID-19 areas. Hospitals should also give consideration to reducing cross-site working arrangements (in several hospitals) for their staff, unless this is considered of critical importance.

Newly recruited staff

At this time it is expected that there will be an increase in recruitment of healthcare staff. These will include newly-qualified staff, staff returning to work after retirement or who had left the health services, as well as agency staff who may be new to working in the facility.

While it may not be possible to provide a formal induction programme for all new staff at this time, hospitals should consider developing a manual/quick reference guide for these staff with relevant information to their employing hospital. These staff must be supported in their work by senior colleagues.

The Office of Nursing & Midwifery Services Director (ONMSD) has developed online education and training resources to help up skill nursing and midwifery staff returning to work during COVID-19 crisis. Access to these COVID-19 Resource Packs are available in the course catalogues section on [HSELandD](#).

Staff who are returning to practice and need support with education and training can contact the local Centre of Nurse and Midwifery Education (CNMEs) or the local Nursing and Midwifery Planning and Development Units (NMPDUs).

Staff uniforms

The appropriate use of PPE will protect uniforms from contamination in most circumstances. During a pandemic, healthcare workers should not travel to and from work or between hospital residences and place of duty in uniform or in scrubs. Hospitals and other healthcare facilities should provide changing rooms/areas where staff can change into uniforms upon arrival at work. Hospitals should provide shower facilities for staff to use as necessary.

Healthcare workers at risk for complications from COVID-19

Healthcare workers who are at risk for complications of COVID-19, should be considered for alternate work assignment, away from direct patient care or areas of high exposure risk for the duration of the pandemic. At the very least they should not provide care to patients known to have COVID-19 nor enter parts of the hospital segregated for the specific treatment of patients with COVID-19.

The HSE has published a list of those who are considered vulnerable healthcare workers.

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/occupationalhealthguidance/Pregnant%20HCWs,%20Vulnerable%20HCWs&%20Other%20HCWs%20with%20Pre-existing%20Disease.pdf>

Pregnant healthcare workers

All healthcare workers including pregnant women are at risk for COVID-19, given the increased risk of exposure in healthcare.

Employers should be sensitive to the fact that pregnant women are, appropriately, often anxious about their own health and protective of their unborn baby. Pregnant healthcare workers are specifically impacted by the nature of their professional activities and exposure. This risk applies particularly, but is not limited to, those in nursing and midwifery, or those providing medical, or ancillary care, to known infected patients. Risk seems to be proportional to exposure duration and is higher for occupations that involve aerosolisation.

There is evidence that certain underlying health conditions increase the risk of morbidity and mortality from COVID-19. These people are clinically vulnerable whether pregnant or not. No available quality data on pregnant HCWs that stratifies risk by exposure, gestation, underlying co-morbidities or socio-demographic risks exist.

Pregnant women now appear to be at greater risk of being hospitalised and of becoming critically ill, with ICU admission, as a result of COVID-19 infection. There are also concerns about the increased risk of stillbirth from maternal COVID-19 infection, observed in 2021.

Guidelines were issued by the Workplace Health and Wellbeing Unit of the HSE in January 2021 and were last updated on 16th April.

<https://www.hse.ie/eng/staff/workplace-health-and-wellbeing-unit/covid-19-guidance/guidance-on-fitness-for-work-of-healthcare-workers-in-the-higher-risk-categories.pdf>

Pregnant HCWs, with underlying conditions, should be deemed 'High Risk' and should work from home if possible –

The underlying conditions listed below are recognised as significant:-

- Solid organ transplant recipients
- Those with cancer, undergoing active chemotherapy or immunosuppressive treatments
- Those with severe respiratory conditions including cystic fibrosis and severe asthma
- Those who have homozygous sickle cell disease
- Those receiving immunosuppression therapies sufficient to significantly increase risk of infection
- Those receiving dialysis or with chronic kidney disease
- Those with significant congenital or acquired heart disease

As per the government guidance, 'Very High Risk' or 'Vulnerable' Healthcare Workers should not be at work. The Government guidelines 'Return to Work Safely Protocol - COVID-19 Specific National Protocol for Employers and Workers', state 'if an 'at risk' or 'vulnerable worker' cannot work from home and must be in the workplace, employers must make sure that they are preferentially supported to maintain a physical distance of 2 metres. However, employers should enable vulnerable workers to work from home where possible'.

Pregnant HCWs with the following risk factors may be defined as 'Very High Risk':

- Black, Asian and minority ethnic (BAME) background
- Being obese (BMI >30)
- Pre-pregnancy co-morbidity, such as pre-existing diabetes and chronic hypertension.
- Maternal Age 35 or older
- Adverse social circumstances

The current HSE guidance states that 'Very High Risk' HCWs 'must work from home and cannot return to the workplace'.

Pregnant HCWs, with no other risk factors, should be deemed 'High Risk' and should work from home if possible

- Clinical work, care work and working closely with others may be possible where, and provision of controls (e.g. screens, PPE, testing of patients and staff) is effective in managing the risk.
- Pregnant HCWs in this category should not work with known or suspected COVID positive patients. If a HCW cannot carry out their substantive duties from home, a referral to OH should be made for assessment.

Women should therefore discuss with their Obstetrician the options, which include:-

- Working from home or in a suitable non-clinical area, noting the above.
- Receiving vaccination and returning to work 14 days after the second vaccination dose.

According to the HSE guidance, 'At Risk' HCWs should be referred to Occupational Health for a medical opinion regarding fitness for work, using the management referral process. Management should conduct an individual risk assessment in collaboration with the employee taking into account the occupational health advice and where necessary, modify the workplace to minimise the risk of infection as far as reasonably practicable.

<https://www.hse.ie/eng/staff/workplace-health-and-wellbeing-unit/covid-19-guidance/guidance-on-fitness-for-work-of-healthcare-workers-in-the-higher-risk-categories.pdf>

According to the HSE guidance, pregnant HCWs with other underlying health conditions or 'high risk' pregnancies that could be negatively impacted by COVID-19 may also be considered 'High Risk', subject to individual clinical risk assessment by the Occupational Health Physician, in consultation with the HCW's Obstetrician or other Specialists involved in their care.

Vaccination

There is evidence that vaccines are highly effective in protecting individuals who are fully vaccinated against symptomatic infection and severe disease. A growing body of evidence suggests that fully vaccinated people are less likely to have asymptomatic infection and potentially less likely to transmit SARS-CoV-2 to others.

Vaccination against SARS-CoV-2 is not contraindicated in pregnancy and advice from the IOG and NIAC is that shared decision making should occur between caregiver and woman to come to individual decision. Occupational exposure, population prevalence, living conditions and other medical comorbidities should be considered. The IOG and NIAC have produced an information leaflet and decision aid which should be of help. Vaccination can be offered between 14 and 36 completed weeks of pregnancy.

<https://www.rcpi.ie/policy-and-advocacy/national-immunisation-advisory-committee/niac-and-covid-19-vaccine/>

From 27th April 2021 NIAC has recommended that pregnant women should be offered mRNA COVID-19 vaccination between 14-36 weeks' gestation following an individual benefit/risk discussion with their obstetric caregiver.

<https://www.rcpi.ie/news/releases/statement-from-the-institute-of-obstetricians-and-gynaecologists-on-niac-recommendations-for-covid-19-vaccination-of-pregnant-women/>

The latest HSE guidance (16th April 2021) sets out some considerations for vaccinated 'at risk' HCWs. This is likely to be updated as more information on efficacy is published.

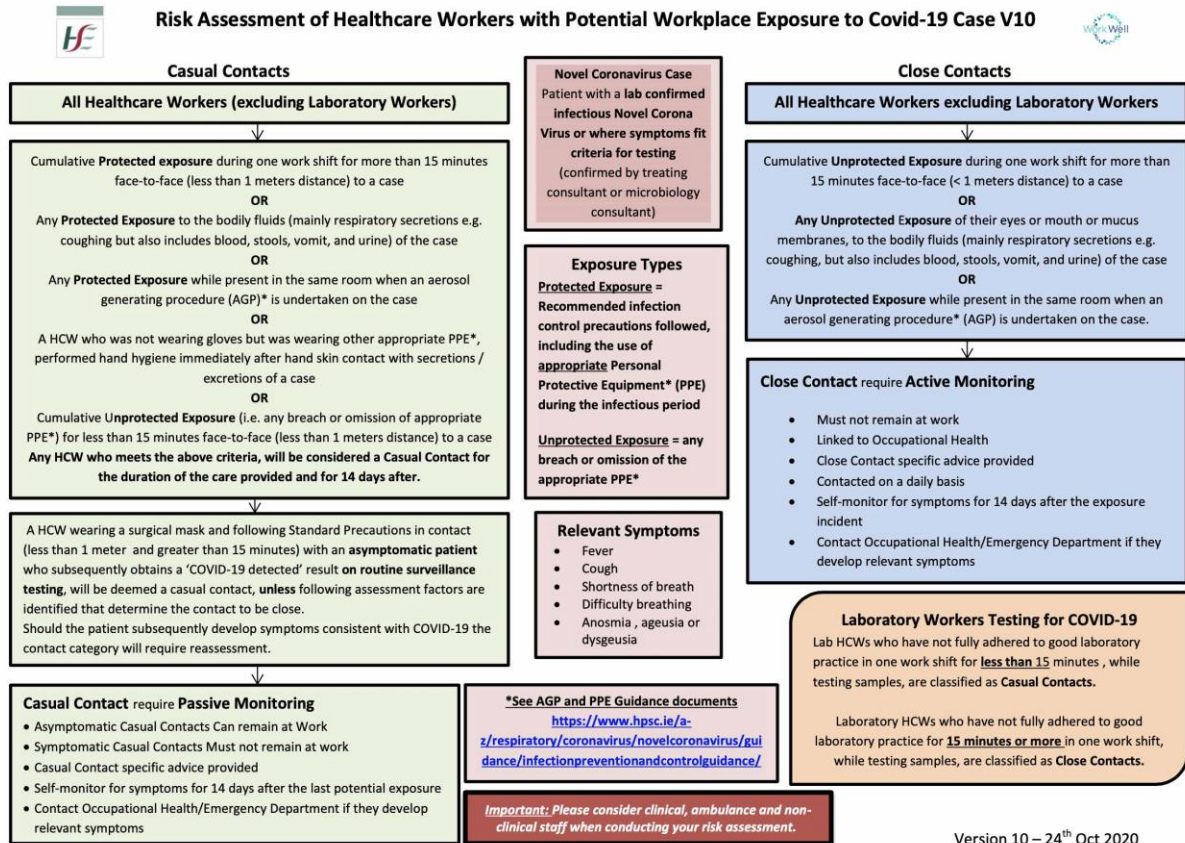
- The following HCWs will move from the 'very high risk' to the 'high risk' category: HCWs with underlying conditions, who are not likely to be immunosuppressed and who have completed vaccination, plus the specified period following vaccination to achieve immunity.
- As with those in the 'high risk' category, these HCWs should continue to work from home if possible. If they cannot work from home, they can return to work following medical assessment by Occupational Health and a risk assessment by management.
- The return to work of vaccinated HCWs who are pregnant or who are immunosuppressed, will be decided as further evidence on vaccine efficacy becomes available.

<https://www.hse.ie/eng/staff/workplace-health-and-wellbeing-unit/covid-19-guidance/guidance-on-fitness-for-work-of-healthcare-workers-in-the-higher-risk-categories.pdf>

Occupational Health

Occupational health will take lead responsibility for screening programmes and contact tracing for healthcare workers, and will liaise with the Infection control team to give general advice on the management of staff with COVID-19.

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/occupationalhealthguidance/>



<https://www.hse.ie/eng/staff/workplace-health-and-wellbeing-unit/covid-19-guidance/risk-assessment-of-healthcare-worker-exposure-to-covid-191.pdf>

Staff Care and Wellbeing

Healthcare staff are at increased risk of stress and mental health problems when dealing with challenges of the COVID-19 pandemic. Self-care is a priority. Healthcare managers need to proactively take steps to protect the wellbeing of their staff.

Staff must be supported:-

- by reinforcing good team structures.
- by ensuring sufficient rest and respite during work or between shifts.
- By ensuring that sufficient and healthy food is provided to them when in work.
- By providing regular opportunities to discuss decisions and check on staff wellbeing.

Employee Assistance Programmes (EAP) may be helpful to support staff.

<https://www.hse.ie/eng/staff/workplace-health-and-wellbeing-unit/employee-assistance-and-counselling-service/>

<https://www2.hse.ie/wellbeing/mental-health/minding-your-mental-health-during-the-coronavirus-outbreak.html>

<https://www.rcpi.ie/news/releases/health-and-wellbeing-for-trainers-and-trainees-during-challenging-times/>

The constant stream of new reports can cause worry to many people. Reliable sources are best to get news, including:.

- The Health Service Executive (HSE) <https://www2.hse.ie/coronavirus/>
- Health Protection Surveillance Centre <https://www.hpsc.ie/>
- Minding your mental health during coronavirus outbreak <https://www2.hse.ie/wellbeing/mental-health/minding-your-mental-health-during-the-coronavirus-outbreak.html>
- HSE Work Well <http://workwell.ie/>

The anticipated needs of staff will vary across each of the phases; consider the following support mechanisms:

| Phases | Issues and likely impact | Needs and recommended approach |
|---|---|--|
| <p>Pre-phase:</p> <p>No cases on unit</p> | <p>Anticipatory anxiety about what's on its way.</p> <p>Inability to think clearly, feeling overwhelmed, planning.</p> <p>Communication errors.</p> <p>Tension in working relationships.</p> <p>"Readiness" burnout.</p> | <p>Increase a sense of control - the team are in a safe pair of hands.</p> <p>Reassurance and planning. Communication updates are key (you may be thinking ahead, they are thinking now).</p> <p>Escalation plan.</p> <p>Support to managers who are making plans and holding the stresses.</p> |
| <p>Initial phase:</p> <p>Case 1</p> | <p>Starting to get going, lots of trying out, lost time, repetition and frustration.</p> <p>Further anticipatory anxiety.</p> | <p>War room - planning central to allow centralised communication.</p> <p>Management are visible and available.</p> <p>Regular communication bulletins and open forums.</p> <p>Have runners in PPE areas. Promote peer support.</p> <p>It's okay to say you are not okay - Senior staff to model this.</p> |
| <p>Core Phase: Full scale</p> <p>Multiple cases</p> | <p>Biggest risk period.</p> <p>Fear infection and implications for families.</p> <p>Overwhelming workload.</p> <p>Full go mode- adrenaline and automatic pilot. Exhaustion.</p> <p>Moral distress as healthcare rationed.</p> <p>Distress linked to personal or family experience of COVID-19.</p> <p>Experience fear or stigma when out in public.</p> | <p>Rotate workers from high-stress to lower-stress functions.</p> <p>Small pre-brief and debrief the day.</p> <p>Partner inexperienced workers with their more experienced colleagues.</p> <p>Psychological first aid - drop-in sessions for staff with employee wellbeing if you have it.</p> <p>Ensure the basics: Breaks, Facilities (food trolley in staff room), Sleep, Days off.</p> <p>Manage visitors.</p> |
| <p>End Phase:</p> <p>Immediate aftermath</p> | <p>Exhaustion and post trauma recovery/ stress</p> | <p>Debriefing.</p> <p>Staff 1-1 and group sessions. Learning and preparation for the future. Organise thanks and reward.</p> |
| <p>Long term</p> | <p>Some ongoing PTSD Reflection and learning</p> | <p>Look out for signs of PTSD in staff:</p> <ul style="list-style-type: none"> •on edge and hyper arousal, poor sleep •flashbacks or re-experiencing •avoidance of reminders. |

Adapted from Highfield, 2020, Intensive Care Society; www.ics.ac.uk

16 Facilities

Triage and risk factor screening for COVID-19 infection

Screening and containment measures have been successful in slowing the spread of the virus, and provided a small window of time for preparation of the response. In the general population identifying infected patients and isolating them within 48 hours of the onset of even mild symptoms is recommended.

- Advise a woman if she or her birth partner have suspected or confirmed COVID-19 to inform the maternity hospital prior to arrival to allow consideration of infection control and service planning, for example: identifying the most appropriate room for labour and birth, ensuring infection prevention and control supplies and PPE are available, informing workforce involved in care.
- Triage and risk screen pregnant women presenting for pregnancy-related concerns in a dedicated area. Establish triage and risk screening capability for maternity patients before entry to inpatient and outpatient areas including Birthing Suites, Antenatal Clinics and Fetal Assessment Units.
- Use open-ended screening questions for antenatal clinic phone enquiries, birthing suite enquiries, admission room enquiries and postnatal home visiting initial phone contacts.
- Consider the need for screening and isolation with respect to urgency of required care.

Each maternity hospital must agree their own entry pathways for patients and staff which will reflect the practices within their hospital. The information below should be considered when preparing individual hospital pathways.

For staff presenting for work

Temperature monitoring during infectious disease outbreaks has become common practice over 2020 in public areas such as entry points to hospitals. However, there is limited evidence for its effectiveness as a tool to reduce spread among healthcare workers.

The HSE advised against mass temperature screening in June 2020.⁹ This is because:-

- Fever is absent in 52% of confirmed cases.
- IR thermometers may not give an accurate reading.
- Normal temperature readings may give a false sense of security and may diminish the effects of other important interventions.
- Data from previous similar outbreaks show little evidence of benefit from mass temperature screening.

Healthcare workers should be advised of their responsibility to monitor themselves for high temperature and symptoms of COVID-19 and stay home if they are unwell, which enhances colleague and patient protection. Pathways for self-referring to Occupational Health should be shared with all staff.

For women presenting for maternity care

If suspected or confirmed COVID-19:

- Utilise isolation and transmission precautions
- Use isolation rooms on the antenatal and postnatal wards

⁹ National Health Library and Knowledge Service Evidence Team, 29 June 2020
<https://hselibrary.ie/is-there-evidence-that-temperature-checks-for-healthcare-workers-hcws-reduce-the-transmission-of-covid-19-in-healthcare-settings/>

- Where available, utilise negative pressure birthing room for confirmed COVID-19
- Inform neonatal team of birth plans as early as possible
- Units should have an escalation plan for the care of pregnant and postnatal women with COVID-19.

If COVID-19 not suspected:

- Utilise usual care pathways
- Avoid exposure to other known or potentially infected patients

Inter-Hospital Transfer – Obstetric and Neonatal

- All Inter-hospital transfers need consultant to consultant assessment and decision-making based on consideration of all factors and importantly urgency relative to capacity
- Coordinate retrievals via the usual pathway with the National Ambulance Service or National Neonatal Transport Service where applicable.
- Coronavirus infection is not an indication for transfer/retrieval in the absence of other indications

Mother and baby contact if mother suspected or confirmed COVID-19 infection

- Consider the individual situation in assessing whether there is *any* need for temporary separation - this will depend on the clinical condition and disease severity in the mother.
- Involve multidisciplinary team including consultant obstetrician, midwife in charge, and consultant neonatologist/paediatrician, and neonatal/paediatric nurse in charge
- If mother and baby rooming in:
 - Provide facemask and hand hygiene information to the mother including washing hands before touching baby and body where baby may make skin to skin contact
 - Support breastfeeding according to mothers intention – use transmission precautions while breastfeeding (facemask and hand hygiene)
 - Consider maintaining general isolation distance of 2m where possible
- If *temporarily* separating mother and baby due to illness:
 - Consider and support the mother’s intention to breastfeed
 - If temporarily separated, encourage to express their breast milk to establish and maintain milk supply. If possible, a dedicated breast pump should be provided. Prior to expressing breast milk, mothers should practice hand hygiene. After each pumping session, all parts that come into contact with breast milk should be thoroughly washed and the entire pump should be appropriately disinfected per the manufacturer’s instructions. This expressed breast milk should be fed to the newborn by a caregiver.
- If the mother is unable to care for the baby due to illness, consider sending baby home for home isolation – this decision must be discussed within the multidisciplinary team.

Visitors

- A visiting policy for Maternity Hospitals / Units will be decided by management in each hospital, following overall guidance from the HSE, taking the clinical situation in each individual hospital at the time into account, in particular the presence of local outbreaks and times of high community spread.
- Advise staff and patients to check for daily updates.
- Advise security and reception staff of the daily updates as soon as they have been decided.
- Individual visiting requests on compassionate grounds should always be facilitated and can be arranged through hospital management

The HSE provides updates on appointments and visiting restrictions at all hospital sites.

<https://www2.hse.ie/services/hospital-service-disruptions/hospital-service-disruptions-covid19.html#:~:text=Only%20one%20visitor%20per%20patient,have%20symptoms%20of%20COVID%2D19.>

Maternity Services Management Recommendations to manage services during the COVID-19 Pandemic During outbreaks of infection

Maternity services should provide clear signposting for pregnant and postnatal women about changes to antenatal and postnatal services on their websites, through their social media accounts or through public information sites.

Services should return to normal practice as soon as the local risk of transmission and prevalence allows.

Outpatient services

- Ensure availability of isolation room for provision of antenatal and postnatal care
- Reduce on site hospital-based outpatient services as much as feasible
- Establish pathways to redirect normal-risk women to community-based antenatal care clinics, and utilise community facilities to run antenatal clinics. Ensure they are staffed with senior clinicians with decision-making capacity
- Continue services and facilitate provision of high-risk obstetric services.
- Consider a reduction in the amount of routine ultrasound scans being offered. Suggestions to decrease the number of ultrasound appointments in the context of COVID-19, must be individualised to ultrasound units
- Facilitate early transfer home where appropriate for mother and baby
- Continue to arrange Newborn Screening in the community, as appropriate

Gynaecology

- Routine gynaecology clinics should be postponed during outbreaks. This decision must be made by senior clinicians with hospital management. Patient lists for upcoming clinics need to be assessed by a senior clinician.
- Routine gynaecological day case procedures should be postponed and all elective surgery should be cancelled.
- Arrangements should be put in place to safely continue cancer surgery and urgent / emergency gynaecology procedures

The HSE issued guidance in 2020 on the resumption of scheduled surgical services for adults in acute hospital in the COVID-era. This does not mention gynaecology services, but the general principles for pre-admission protocols, risk designation, day services procedures and operating theatre practice apply.

<https://www.hse.ie/eng/about/who/acute-hospitals-division/covid-19-guidance/guidance-on-the-resumption-of-scheduled-surgical-services-during-the-covid19-era.pdf>

Neonatal Unit/Special Care Baby Unit

- Establish isolation rooms within the NNU/SCBU
- Establish a well-baby nursery
- Consider the parent visiting policy in the NNU/SCBU
- Provide room for mother to express breastmilk (allowing for physical distancing)

Obstetric Theatres

- Where feasible, assign a specific operating theatre for operating on confirmed or suspected COVID-19 infected patients. This may require liaison with the theatre governance committees for co-located general hospitals.
- Consider need for extra PPE supplies and ensure availability of same
- Secure separate recovery area for COVID-19 positive theatre cases

Allied Health Professional Services

- Consideration needs to be given to the postponement of outpatient physiotherapy, occupational therapy, and speech and language clinics
- Consideration needs to be given to rearranging social work appointments, and to undertaking urgent consultations on the telephone

Isolation Facilities

- Establish isolation capacity for women and their baby requiring admission
- Home isolation is recommended where inpatient admission is not clinically necessary
- Inpatient and outpatient hospital-based care will need isolation capacity for all areas in maternity including antenatal, pregnancy assessment, birthing, peri-operative, postnatal, and neonatal units
- Consideration should be given to dividing the hospital into zones to signpost staff regarding use of PPE and level of risk in different clinical areas
- Isolation rooms should ideally have an ante-chamber for putting on and removing staff PPE equipment and en-suite bathroom facilities
- Where possible use designated single rooms for isolation. Designate multi-occupancy rooms as isolation bays as needed.
- Only essential staff should enter isolation rooms.
- Consider isolation capacity and pathways for advanced levels of care e.g. High Dependency Unit Care
- Consideration needs to be given to proximity of isolation rooms to equipment, hand-washing facilities, safe PPE donning and doffing area

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/infectionpreventionandcontrolguidance/>

Cleaning of Maternity Facilities

- The Infection, Prevention and Control Committee in each Maternity unit must prepare/update a manual for staff on cleaning of the environment and equipment following exposure to COVID-19.
- All clinical areas will need to be deep-cleaned after any involvement with a COVID-infected case
- Training/up-skilling for housekeeping staff in cleaning procedures in these situations should be provided
- Particular attention should be given to regular cleaning of frequently used surfaces in clinical areas; to include computer keyboards, phones, ward desks and COWs (computers on wheels)

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/infectionpreventionandcontrolguidance/>

Staff Facilities

- Provide appropriate facilities for staff to have their meal breaks where physical distancing can be facilitated
- Provide appropriate changing facilities with showers for staff use
- Provide free on-site car parking for staff

Communication and Information Sharing

- Consider developing a communication plan on how to inform staff on updates to practice

- Various methods of communication must be considered as not all staff will have access to email
- Staff must be made aware of how often updates will be circulated
- Facilitate staff to give feedback on how the changes to work practices are being implemented
- Include all grades and disciplines of staff in updates
- Inform staff of who is responsible for managing the COVID-19 outbreak in their area
- Brief all staff on updates weekly (adhering to physical distancing practices)
- Consider the use of an electronic document sharing programme to make information readily available to staff

17 Audit

Clinical guidelines are developed, based on a thorough evaluation of the evidence, to assist decisions about appropriate health care for specific clinical circumstances.¹⁰

The rapid emergence of COVID-19 means that the evidence on transmission patterns, associated risk factors and complications in pregnancy and/or birth is still emerging.

In order to proactively measure the effectiveness of the response to COVID-19 the National Women and Infants Health Programme (NWIHP) directed the National Perinatal Epidemiology Centre (NPEC) to engage with all maternities units to establish a national audit on COVID-19. To ensure this clinical audit is robust and of high quality, it aligned with guidance from international bodies including the WHO and the RCOG. The surveillance period ran from March 2020 until December 2020. All units reported and provided information on all pregnant women and newborns who tested for COVID-19 to the NPEC Audit. The NPEC is currently validating data and will report on findings in the coming months.

<https://www.ucc.ie/en/npec/roicovid-19study/>

All units should continue to collate information of all pregnant women and newborns who have been tested for COVID-19. A record of COVID-19 positive cases should be maintained in each maternity unit, so that pregnancy outcomes can be followed and care practices reviewed. All units should maintain data entry practices that continue to provide up to date, quality data.

¹⁰ Guidelines for Clinical Practice: From Development to Use. Institute of Medicine (US) Committee on Clinical Practice Guidelines; Field MJ, Lohr KN, editors. Washington (DC): National Academies Press (US); 1992.

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Covid-19 Pandemic Frequently Asked Questions within Neonatal Services: A BAPM supplement to RCPCH guidance. Updated 25th March 2021 https://hubble-live-assets.s3.amazonaws.com/bapm/redactor2_assets/files/897/COVID_FAQs_Update_25-3-21.pdf

19 Useful Links

Ireland

<https://www2.hse.ie/coronavirus/>

<https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/>

<https://www.rcpi.ie/covid19/>

<https://www.medicalcouncil.ie/covid-19/>

<https://hse.drsteevenslibrary.ie/Covid19V2>

<https://www.rcpi.ie/policy-and-advocacy/national-immunisation-advisory-committee/niac-and-covid-19-vaccine/>

https://www.hse.ie/eng/health/immunisation/hcpinfo/covid19vaccineinfo4hps/?utm_source=Broadcast&utm_medium=Email&utm_campaign=coronavirus&utm_term=covid%20vaccine&utm_content=Update%20on%20vaccine%20rollout%20-%20Staff%20Update

Professional colleges and bodies

<https://www.isuog.org/clinical-resources/coronavirus-covid-19-resources.html>

<https://www.rcog.org.uk/en/guidelines-research-services/guidelines/coronavirus-pregnancy/>

<https://www.smfm.org/covid19>

<https://ranzcog.edu.au/statements-guidelines/covid-19-statement>

<https://sogc.org/en/-COVID-19/en/content/COVID-19/COVID-19.aspx?hkey=4e808c0d-555f-4714-8a4a-348b547dc268>

<https://www.rcpch.ac.uk/resources/covid-19-guidance-paediatric-services#working-in-neonatal-settings>

<https://www.bapm.org/pages/182-perinatal-covid-19-resources>

<https://www.rcpath.org/profession/coronavirus-resource-hub.html>

<https://www.aappublications.org/cc/covid-19>

https://www.oaa-anaes.ac.uk/OAA_COVID19_Resources

<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance>

Academic resources

<https://cgf.cochrane.org/news/covid-19-coronavirus-disease-fertility-and-pregnancy>

<https://www.bmj.com/coronavirus>

<https://www.thelancet.com/coronavirus>

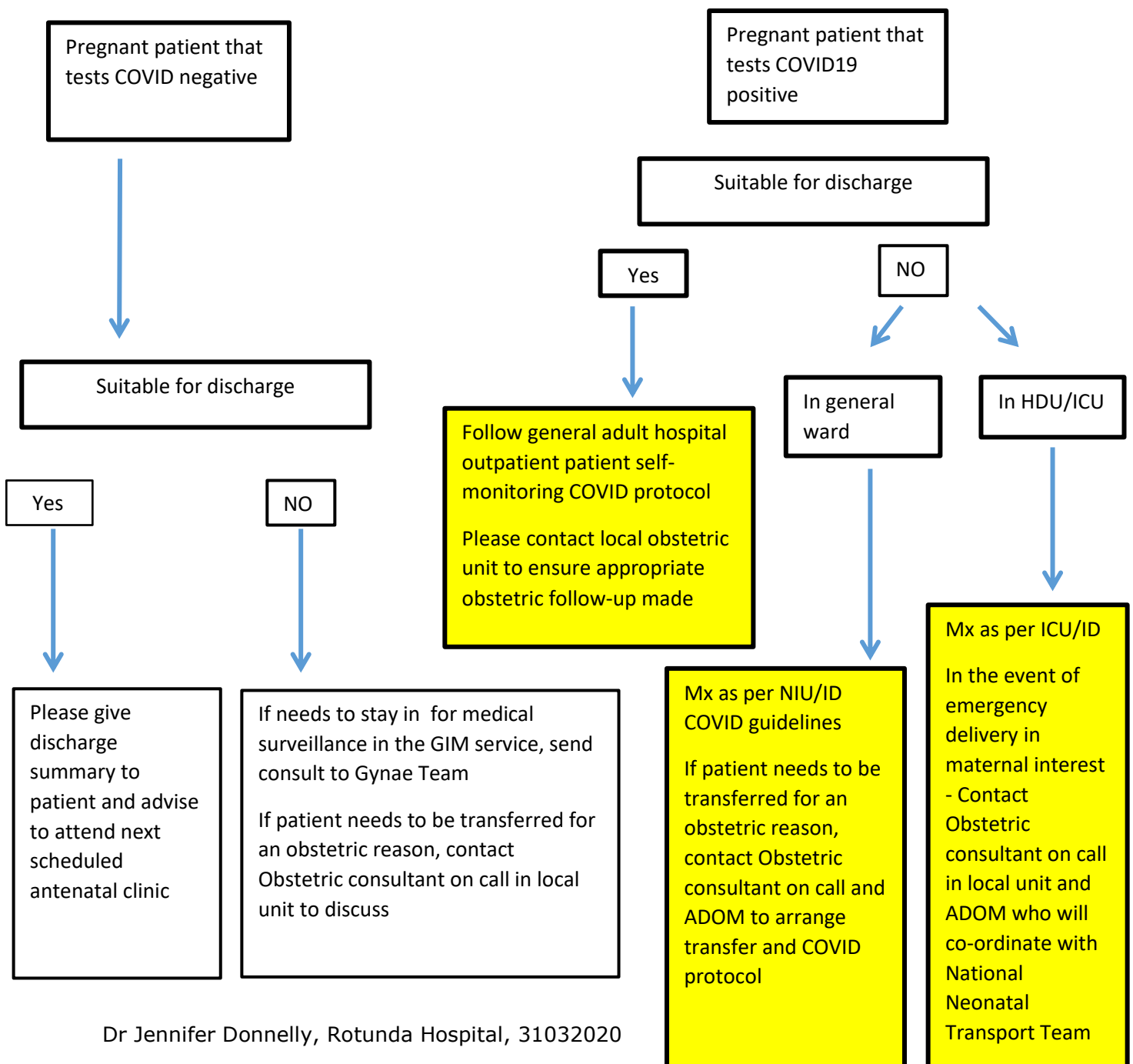
<https://www.nejm.org/coronavirus?query=RP>

<https://jamanetwork.com/journals/jama/pages/coronavirus-alert>

APPENDIX 1

Suggested Pathway for pregnant women admitted to general hospital with no on-site obstetric unit with suspected COVID-19

1. **Usual care pathway** for COVID-19 assessment for all
2. Additional steps for pregnancy- use iMEWS for recording vital signs and contact ADON
3. Contact gynaecology team for consult (if provided) required who should link with local obstetric service Not all cases will need direct patient contact to assess obstetric issues.
4. In case of emergency: Contact local hospital Obstetric Consultant on call via switch and they will contact their ADOM to arrange midwifery support should this be required and to contact neonatal Transport Team if delivery planned



Dr Jennifer Donnelly, Rotunda Hospital, 31032020

APPENDIX 2

Further up to date management information can be found at

<https://www.rcog.org.uk/coronavirus-pregnancy>

<https://www.rcog.org.uk/globalassets/documents/guidelines/2020-03-30-guidance-for-maternal-medicine-in-the-evolving-coronavirus-covid-19-pandemic.pdf>

<https://www.rcplondon.ac.uk/guidelines-policy/acute-care-toolkit-15-managing-acute-medical-problems-pregnancy>

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Assessment of a pregnant woman on the medical take

Obstetric History

Current pregnancy Gestational age? single or multiple? current obstetric issues? scans normal? baby moving well?
Previous pregnancies Details including mode of delivery

Any urgent obstetric problems?

Bleeding? Reduced fetal movements? Signs of labour?
 Vaginal discharge/fluid? Hypertension +/- proteinuria? Abdominal pain?

Examination

Observations: consider use of maternal early warning score chart
 BP \geq 140/90 mmHg hypertension - repeat BP in 30 minutes
 BP \geq 160/100 mmHg severe hypertension - Inform Obstetric Registrar urgently
 Urgent antihypertensive treatment

Temp, saturations, respiratory rate, peak flow UNCHANGED in pregnancy

Cardiovascular system Systolic (flow) murmur, bounding pulse, S3 can be normal
 Respiratory system No changes due to pregnancy alone
 Abdominal examination Uterine tenderness – CONCERNING

Other investigations

Urinalysis *Perform in every pregnant woman*
 Leucocytes: common, not specific for UTI
 Nitrites: more specific for UTI, send MSU
 Protein: send lab PCR* if 1+ or more

CXR Perform if needed, don't worry about radiation!
 Radiation equivalent to 140g brazil nuts

CT Radiation dose low; reassure re breast cancer risk (not a reason to avoid—see ESC PE 2019)

Blood tests: what is normal in pregnancy?

Hb Anaemia is defined as <105 g/l in 2nd or 3rd trimester
WCC Mild neutrophilia
Platelets Mild reduction
Electrolytes Mild reduction in Na, others essentially unchanged
Renal decrease in urea and creat (view creat $>$ ~ 75 as ABNORMAL)
Liver Mild decrease in ALT/AST (view ALT $>$ ~ 40 as ABNORMAL)
CRP Unchanged
Troponin Unchanged in pregnancy/labour/C section; can \uparrow in pre-eclampsia
D-dimer Not currently recommended for assessment of possible VTE

Do not forget!

Other causes of pyrexia in pregnancy e.g. Group A strep, chorio-
 amnionitis
Other causes of SOB/cough including PE, pulmonary oedema

Contact numbers

Complete maternity VTE assessment for every pregnant woman
 N.B. LMWH doses are different in pregnancy (any trimester)

*PCR – protein:creatinine ratio

APPENDIX 3

Medical conditions associated with very high risk or high risk of severe COVID-19 disease

Conditions in the shaded areas may be associated with a suboptimal response to vaccines and should be given an mRNA vaccine if practicable and timely. However, if preferential selection of an mRNA vaccine will result in delayed vaccination for more than 3 weeks, any benefit of using a higher efficacy vaccine may be lost.

| Medical condition ¹ | Very high risk | High risk |
|--|---|---|
| Cancer | All cancer patients actively receiving (and/or within 6 weeks of receiving) systemic therapy with cytotoxic chemotherapy, targeted therapy, monoclonal antibodies or immunotherapies and surgery or radical radiotherapy for lung or head and neck cancer All patients with advanced/ metastatic cancers | Haematological - within 1 year Haematological - within 1 - 5 years Non-haematological - within 1 year All other cancers on non- hormonal treatment |
| Chronic heart (and vascular) disease | | e.g. heart failure, hypertensive cardiac disease |
| Chronic kidney disease | On dialysis, or eGFR <15 ml/min | With eGFR <30ml/min |
| Chronic liver disease | | e.g. cirrhosis or fibrosis |
| Chronic neurological disease or condition | With evolving ventilatory failure requiring non-invasive ventilation e.g. motor neurone disease, spinal muscular atrophy | Significantly compromising respiratory function and/or the ability to clear secretions e.g. Parkinson's disease, cerebral palsy |
| Chronic respiratory disease | Severe e.g. severe cystic fibrosis, severe COPD, severe pulmonary fibrosis | Other e.g. stable cystic fibrosis, severe asthma (continuous or repeated use of systemic corticosteroids), moderate COPD |
| Diabetes | HbA1c ≥58mmol/mol | All other diabetes (Type 1 and 2) |
| Immunocompromise due to disease or treatment | Severe e.g. Transplantation: - Listed for solid organ or haematopoietic stem cell transplant (HSCT) - Post solid organ transplant at any time - Post HSCT within 12 months Genetic diseases: - APECED2 | Other e.g. High dose systemic steroids (as defined in Immunisation) Persons living with HIV |

| | | |
|---|---|---|
| | - Inborn errors in the interferon pathway Treatment: - included but not limited to Cyclophosphamide, Rituximab, Alemtuzumab, Cladribine or Ocrelizumab in the last 6 months | |
| Inherited metabolic diseases ³ | Disorders of intermediary metabolism/at risk of acute decompensation e.g. Maple Syrup Urine Disease | Disorders of intermediary metabolism not fulfilling criteria for very high risk |
| Intellectual disability ³ | Down Syndrome | Intellectual disability excluding Down Syndrome |
| Obesity | BMI >40 Kg/m ² | BMI >35 Kg/m ² |
| Severe mental illness ³ | | e.g. Schizophrenia, bipolar disorder, severe depression |
| Sickle cell disease | Sickle cell disease | |

¹ may also include other people who have been classed as at very high

risk, based on clinical judgement and an assessment of their needs

² APÉCED - autoimmune polyendocrinopathy candidiasis ectodermal dystrophy

³ additional or updated medical conditions

Pregnant women should be offered mRNA COVID-19 vaccination between 14-36 completed weeks gestation following an individual benefit/risk discussion with their obstetric caregiver.

<https://www.hse.ie/eng/health/immunisation/hcpinfo/guidelines/covid19.pdf>