CD19-069

COVID-19 INFECTION - GUIDANCE FOR MATERNITY SERVICES

National Women & Infants Health Programme

INSTITUTE OF OBSTETRICIANS & GYNAECOLOGISTS
ROYAL COLLEGE OF PHYSICIANS OF IRELAND

COVID-19 infection Guidance for Maternity Services

TABLE OF CONTENTS

Appendices

Version 2.0 **10 April 2020**

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.

The novel coronavirus infection (COVID-19), also termed SARS-CoV-2, which emerged in December 2019 has become a global public health emergency and was declared a pandemic by the World Health Organisation on the 11th March 2020. Symptoms of COVID-19 are non-specific, although most typically involve cough, shortness of breath and fever, and the disease presentation can range from no symptoms (asymptomatic) to severe pneumonia and death. Most people infected with COVID-19 virus have mild disease and recover. Approximately 80% of those infected have mild to moderate disease, 13-14% have severe disease and around 6% develop critical disease. Individuals at highest risk for severe disease and death include people aged over 60 years and those with underlying conditions such as hypertension, diabetes and cardiovascular disease; mortality rates increase with age and disease in children seems to be both rare and mild.

Pregnancy is a physiological state that predisposes women to complications of viral infection, and therefore pregnant women have been predicted to be at greater risk for serious illness, morbidity or mortality due to COVID-19 compared to the general population. From the literature to date, pregnant women do not appear more likely to contract COVID-19 infection than the general population. It is still unclear whether pregnant women with COVID-19 will be shown to experience more severe disease, when more evidence and information becomes available. There is no data on first trimester infection nor on implications for ongoing pregnancy. However, the growing numbers of published case reports and case series reassuringly suggest that pregnant women are no more likely to experience severe or critical illness than non-pregnant women. No maternal deaths have been reported. To date, viral RNA has not been detected in amniotic fluid, vaginal secretions or breast milk. It is currently considered possible, but not proven, that SARS-CoV-2 can be transmitted vertically, from mother to baby. The proportion of pregnancies affected and the significance for the child are yet to be determined.

Women should be advised to attend routine antenatal care unless they meet current self-isolation guidance with symptoms of new continuous cough or fever. The women should attend clinic on their own and are asked to only come at their designated time to avoid too many people in waiting areas. Remote consulting may be useful. Units should appoint a group of clinicians to co-ordinate care for women forced to miss appointments due to self-isolation, and should have a system to flag women who have missed serial appointments. It is important that support for women and families is strengthened as far as possible. 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.

A senior obstetrician with a specialist interest in maternal medicine should assess all new referrals of pregnant women with medical disorders. Some will need individualised care plans and to attend in person for clinics. Consideration to the specific topics: hypertension, pre-eclampsia, pre-existing diabetes, gestational diabetes (GDM) cardiac disease, haematology/venous thromboembolism (VTE) are provided in a short outline in the document. Pregnant women with some medical co-morbidities may be considered more vulnerable to COVID-19 infection.

All women presenting at the maternity emergency department (ED) or early pregnancy clinic (EPC) should be triaged and asked about symptoms of COVID-19 infection as well as pertinent risk factors. Women who become unwell or who are experiencing complications in pregnancy should still be encouraged to present for review at the maternity ED.

Early pregnancy care may need reorganisation to reduce the numbers of scan appointments, and management of early pregnancy loss should consider greater recourse to conservation and medical options. Women with early pregnancy complications should still be referred to appropriate counselling services and to reliable, accurate online sources of information.

Ultrasound is an essential part of obstetric care, but exposes both patient and 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 ultrasound activity, use of personal protective equipment (PPE) is recommended, and providers should reduce the contact time for scans. 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. In cases where urgent review or intervention cannot be delayed, women should be seen with the appropriate PPE used by clinicians.

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. Possible COVID-19 and non COVID-19 patients should be separated into two parallel streams for subsequent assessment and clinical review throughout the hospital/unit. Maternity units should consider contacting women the day before elective admission for Caesarean section or induction of labour, in order to triage and ask about symptoms. If these meet the case definition, elective admission and management can be better planned.

If the pregnant woman is well and does not need hospital admission: then it is recommended the woman returns home and contacts her GP to arrange testing or can undertake local maternity testing if available. She should be provided with appropriate information and referred to helpful sources, and given contact details for the hospital. However, if the woman has an additional co-morbidity or develops an obstetric condition that is likely to require further assessment in the maternity service e.g. obstetric cholestasis, gestational hypertension, fetal growth restriction, or is >34 weeks' gestation then testing should be prioritised and arranged through local maternity pathways.

Chest imaging, especially CT scan, has proven essential for evaluation of the clinical condition of adults with COVID-19 infection. In a pregnant woman with suspected COVID-19 infection, 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.

In the setting of a mild infection, management similar to that for a patient recovering from influenza is reasonable. Given how little is known about this infection, a detailed mid-trimester anomaly ultrasound examination should be provided following first-trimester maternal infection. For those experiencing illness later in pregnancy, and with an ongoing pregnancy, it is reasonable to consider regular sonographic assessment of fetal growth in the third trimester

VTE risk assessment should be carried out on all women who are admitted with COVID19 infection and VTE prophylaxis is recommended if they are unwell. 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 subsequent frequency of observations should be determined by the baseline recordings and the woman's individual clinical circumstances.

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.

Where a pregnant or postpartum woman is critically ill, a multi-disciplinary discussion planning meeting should be arranged as soon as possible following admission, to consider key priorities for medical care, the most appropriate location of care, and concerns amongst the team regarding special considerations in pregnancy, particularly the condition of the fetus. These considerations, including where the pregnant woman requires intensive care (ICU) unit admission, are set out in the document.

Timing of delivery, in most cases, should not be dictated by maternal COVID-19 infection. 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) either until a negative testing result is obtained or quarantine status is lifted in an attempt to avoid transmission to the neonate or others.

It is expected that as a minimum, pregnant women should have one birthing partner with them in labour, 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 infection there may be situations where regrettably this is not possible relating to PPE availability, workforce gaps or unit configuration. Local policies may also apply for the partner to wear PPE, and to stay in the room for the duration of the labour or delivery. Hospitals/ units need to provide accessible information regarding visiting and partners.

In general, COVID-19 infection itself is not an indication for delivery, unless there is a need to improve maternal oxygenation in critical illness. For suspected, probable and confirmed cases of COVID-19 infection, delivery should be conducted in an isolation room. A senior obstetrician should be present. Both regional anaesthesia and general anaesthesia can be considered, depending on the clinical condition of the pregnant woman and after consultation with the senior obstetric anaesthetist.

Continuous electronic fetal monitoring is recommended as fetal distress has been reported in pregnant women with COVID-19 infection. It is best to avoid fetal scalp electrode monitoring and fetal blood sampling (consistent with recommendations for other maternal infections).

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 needs 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. General anaesthesia should be avoided unless absolutely necessary for standard indications. 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.

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 and Pharmacy advice should be sought on this as well as on available products, choice of agent, and potential drug-drug

interactions. A summary of the information available for medications use in pregnancy and lactation is provided, and is designed to complement the HSE national guidance on their use.

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.

The neonatal team should be informed of plans to deliver the baby of a woman affected by moderate to severe COVID-19 infection, as far in advance as possible and should also be given sufficient notice at the time of birth. Asymptomatic well babies should not be admitted to the neonatal unit (NNU). Given the current lack of information, it seems reasonable to assume that a newborn from a mother with COVID-19 infection at delivery could possibly be infected, either in utero or perinatally, and thus should be placed in isolation to avoid exposure to other newborns.

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. 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.

In light of current evidence, the benefits of breastfeeding outweigh any potential risks of transmission of the virus through breastmilk. If the woman is asymptomatic or mildly affected, breastfeeding and co-location can be considered by the mother in coordination with healthcare providers. 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.

There is currently no clinical indication to test any well baby born to a COVID-19 positive mother. 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, especially those admitted to the NNU and monitor for signs of respiratory illness during the admission. In the absence of evidence to the contrary, it is reasonable to treat the baby's respiratory illness in the same way as if they were not potentially exposed to COVID-19.

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.

Current COVID-19 related autopsy protocols refer to the infected or potentially infected patient and are 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. Further, during the current COVID-19 pandemic, autopsy practice involves making a risk assessment on a case by case basis. 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.

A designated member of the management team should take responsibility for PPE and senior management agree a team to manage PPE stock within the hospital/unit. 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.

Pregnant healthcare workers, are anticipated to be an at-risk group for COVID-19 infection, and they 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. Pregnant healthcare workers should therefore be allocated to patients, and duties, that have reduced exposure to patients with, or suspected to have, COVID-19 infection.

Those pregnant healthcare staff who also have underlying medical conditions should discuss with their treating obstetrician as redeployment or working from home may be further advised.

Education and training of staff is vital to ensure staff safety and delivery and continuation of a safe, effective service. Employers have an important role in communication with staff, providing clear policies on pay, sick leave and self-isolation.

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.

All units should report and provide information of all pregnant women and newborns who have been tested for COVID-19 to the National Perinatal Epidemiology Centre (NPEC) register. A record of COVID-19 positive cases should be maintained as the NPEC intend to complete an in-depth national audit later in the year. All units should maintain data entry practices that continue to provide up to date, quality data.

2 Background

The novel coronavirus infection (COVID-19), also termed 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 has spread rapidly to the rest of China and beyond (2,3). The disease is now 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 (3, 6,7, 8, 9). 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 (10).

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. There is some evidence suggesting that transmission can occur from an infected person with no symptoms (4), although this may be because some people with COVID-19 experience only mild symptoms with the disease and are in the early stage of infection. Studies to date however suggest that the virus that causes COVID-19 is mainly transmitted through contact with respiratory droplets rather than through the air (European Centre for Disease Prevention and Control (ECDC) and the World Health Organisation (WHO)).

The incubation period of coronaviruses (i.e. the time between exposure to the virus and onset of symptoms) ranges from 2–14 days (4). SARS-CoV had an incubation period between 3–10 days and MERS-CoV up to 14 days (8, 9). The incubation period for COVID-19 is currently estimated at between two and 14 days (median, 5 days). The WHO have estimated a high R0 (reproduction number) of 2–2.5 but a recent literature review estimated the average R0 to be 3.28 (11).

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 (43.8% of cases on admission and 88.7% during hospitalization) and cough (67.8%) (12). All hospitalised cases are reported to have abnormalities on radiological imaging of the chest.

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 (12, 13). 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 (13).

Those with hypertension and cardiovascular disease (CVD) also seem 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 (14), with around 7% of those infected suffering a myocardial injury.

Case definitions have been set out by the WHO, ECDC and the Irish Health Protection Surveillance Centre (HSPC). The latter's most recent definition (26th March 2020) includes the following clinical criteria (15):

> A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease e.g., cough, shortness of breath)
> OR
> A patient with any acute respiratory illness AND having been in contact with a confirmed or probable COVID-19 case in the last 14 days prior to symptom onset
> OR
> A patient with severe acute respiratory illness (fever and at least one sign/symptom of respiratory disease e.g., cough, shortness of breath AND requiring hospitalization) AND in the absence of an alternative diagnosis that fully explains the clinical presentation.

Overall case fatality ratio estimates for COVID-19 (including asymptomatic and symptomatic infections) appear to be in the range of 1-2% (0.5-10%), although these estimates differ around the world according to the testing regimes used and the population demographics, and they continue to change in the literature (16, 17).

Since 31 December 2019 and as of 9 April 2020, 1,476,819 cases of COVID-19 (in accordance with the applied case definitions and testing strategies in affected countries) have been reported, including 87,816 deaths across over 200 countries (18).

In EU/EEA countries with available data, 30% of diagnosed COVID-19 cases were hospitalised and 4% had severe illness. Hospitalisation rates were higher for those aged 60 years and above (18) and men were more frequent among hospitalised cases and deaths (1, 12, 18).

In Ireland as of 9 April 2020 6,574 cases have been reported and 267 deaths have been confirmed by the HSPC (19).

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, 20). 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 (7, 22). The case fatality rate of SARS-CoV infection among pregnant women is up to 25% in some series (7) but was 15% for all reported cases in the literature (22). Pregnancy outcomes also varied by trimester, with a high rate of pregnancy loss and preterm delivery reported (3, 7, 17, 22). Ongoing pregnancies were more likely to be complicated by fetal growth restriction (2/3 cases) and other placental-medicated complications (22). No vertical transmission was reported for cases of SARS-CoV or MERS-CoV in pregnancies delivered by Caesarean section or vaginal delivery (22).

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, 17, 20). There are no data to inform whether pregnancy increases susceptibility to COVID-19 infection (22).

From the experience with SARS-CoV and MERS-CoV it is reasonable to predict that pregnant women might be at greater risk for severe illness, morbidity, or mortality following COVID-19 infection compared with the general population (3, 20, 22, 23). It also seems reasonable to speculate that pregnant women with co-morbidities such as diabetes or hypertension, or other cardiovascular disease, might be more at risk.

A brief summary of the published literature – primary case reports and case series – is included in Appendix 1 at the end of the document.

Maternal outcomes

Pregnant women do not appear more likely to contract COVID-19 infection than the general population (3, 20, 22). It is still unclear whether pregnant women with COVID-19 will be shown to experience more severe disease, when more evidence and information becomes available. However, the growing numbers of published case reports and case series reassuringly suggest that pregnant women are no more likely to experience severe or critical illness than non-pregnant women.

To date, around 200 women affected by COVID-19 infection in pregnancy have been reported or discussed in the scientific literature. There are some duplicate reports, so this number may not be accurate.

In cases in which maternal morbidity were reported from China (22,24), two women required intensive care unit (ICU) admission and mechanical ventilation (25, 26)and one developed multi-organ dysfunction and was still on extracorporeal membrane oxygenation (ECMO) when her case was reported (26).

In a recent case series from New York and the first from outside China, 2 women became acutely unwell peri/post-partum and required ICU admission with one needing mechanical ventilation; both recovered (27). In a larger combined series from 2 New York hospitals (which included original cases), the authors report 37 (87%) women with mild disease, four (9.3%) exhibited severe disease, and two (4.7%) developed critical disease (28). These percentages are similar to those described for non-pregnant adults with COVID-19 infections: about 80% mild, 15% severe, and 5% critical disease. An unrelated New York series reported that 2 of 7 women developed critical disease and both were diagnosed with a cardiomyopathy. It is unclear if this is a COVID-19 complication, which is possible given rates of cardiomyopathy reported in non-pregnant COVID-19 positive ICU patients, or a manifestation of multi-organ failure and critical illness (29).

An initial report from Lombardy, one of the regions worst affected to date by the COVID-19 pandemic, comments on 20/42 women with pneumonia, and 7 with severe disease, all of whom apparently recovered (30).

The UK's INARC report of 4TH April includes details of 2,384 admissions to critical care with COVID-19 infection; of these two female patient were currently pregnant and 10 are reported to have been recently pregnant (31). Specific outcomes for these women are not reported (31).
The report of the WHO-China Joint Mission on Coronavirus Disease 2019 states 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 (32)."

Very little is known about the natural history of pregnancy after a pregnant woman recovers from COVID-19 infection (20, 22, 23), however reports to date include around 35 ongoing pregnancies (28, 29, 33, 34), so this information should in time be available.

There is no evidence to suggest that corticosteroids for fetal lung maturation cause any harm in the context of COVID-19 infection in pregnancy, except perhaps where the pregnant woman has a critical illness as there is some evidence in critically-ill adults that steroids worsen the course of the disease. In these situations, a multidisciplinary discussion needs to determine the relative value of antenatal corticosteroids, versus the more likely benefit of immediate delivery.

There is currently no evidence from the published literature to favour one mode of birth over another. Almost all reported cases in the literature from China feature pregnancies delivered by Caesarean section. With the newer US and Italian case series, there are increasing reports of uncomplicated vaginal deliveries (28, 29, 30). At present, there are no recorded cases of vaginal secretions being tested positive for COVID-19 and some studies have specifically focussed on this question (35).

Given the rate of fetal compromise reported in the two original Chinese case series (36, 37), the current recommendation is for continuous electronic fetal monitoring in labour.

No maternal deaths from COVID-19 infection have been reported to date. While there are isolated reports of maternal deaths in European news media, these are not verified in the medical literature, and COVID-19 is not proven as cause of death in these cases (38).

Pregnancy loss

There are currently no data on first-trimester COVID-19 infection (17, 22, 23, 28, 30). An increase in the risk of miscarriage in women affected by COVID-19 cannot be ruled out at this stage, given the SARS-CoV data (22) and the fact that severe maternal illness with fever is associated with miscarriage.

There is no evidence currently that the virus is teratogenic (20, 22, 23), but it is early in the course of understanding COVID-19 infection in pregnancy. SARS-CoV2 only emerged in December 2019, and there are as yet no longitudinal pregnancy studies reporting data. There are mixed data regarding the risk of congenital malformations in the setting of maternal fever in general (3).

The literature includes one third-trimester stillbirth (26) and one neonatal death at 34 weeks (32) but whether both are directly related to COVID-19 infection is unclear from the details given (22, 24, 26, 37); the neonate reported tested negative for COVID-19 infection and there is no information about the stillbirth.

Pregnancy complications

Among the early reported cases, 15/32 (47%) women affected by COVID-19 delivered preterm (22, 24, 26, 36, 37), 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 with COVID-19, but it is unclear whether the preterm birth was always

iatrogenic, or whether some were spontaneous (20, 22), and it is not clear that these outcomes were related to maternal infection in every case (23, 30). In about a third of reported cases the preterm delivery was indicated by fetal distress (22).

There were no data on fetal growth in the ongoing pregnancies reported (28, 29, 33, 34) at the time of publication and in many reported cases, women were either in late pregnancy when affected, or delivered within 2 weeks of the onset of illness (22, 24, 30, 36, 37).

Vertical transmission

With regard to vertical transmission (transmission from mother to baby antenatally or intrapartum), emerging evidence now suggests that vertical transmission is probable (39, 40), although the proportion of pregnancies affected and the significance to the neonate has yet to be determined (20, 23, 40). Previous case reports from China suggested that there was no evidence for this and amniotic fluid, cord blood, neonatal throat swabs, placenta swabs and breastmilk samples from COVID-19 infected mothers have so far all tested negative for the virus (20, 22, 36, 37).

A recent report describes 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 infection. As IgM does not cross the placenta, the authors suggest this may represent a neonatal immune response to in-utero infection (39).

There are currently no data on perinatal outcome when the infection is acquired in the first and early second trimester of pregnancy (3).

There is no evidence that delayed cord clamping increases risk of infection to the newborn via direct contact but the majority of pregnancies reported have been delivered by caesarean section and not all studies report detail on cord clamping. Those that do, report immediate cord clamping with neonatal separation. (20, 22, 24).

Neonatal / infant complications

The presentation of COVID-19 in paediatric patients appears to be much milder than in adults. By contrast with findings in adults, children with COVID-19 had milder clinical manifestations; nearly half of paediatric patients reported have been asymptomatic (41).

The youngest individual to have documented infection with COVID-19 was a 36-hour-old neonate born by caesarean delivery, suggesting neonatal rather than vertical transmission (42, 43). A news report of a baby of a COVID-19 infected mother testing positive at 30 hours after delivery has not been reported in a scientific journal (38).

Consistent with previous studies, the clinical symptoms from 33 neonates with or at risk of COVID-19 were mild and outcomes were favourable. Of the 3 neonates with symptomatic COVID-19, the most seriously ill neonate may have been symptomatic from prematurity, asphyxia, and sepsis, rather than COVID-19 infection, and all recovered. These authors state that as strict infection control and prevention procedures were implemented during the delivery, it is likely that the sources of SARS-CoV-2 in the neonates were maternal in origin, but that they cannot rule out vertical-maternal-fetal transmission in their cohort (44).

Overall, the literature to date reports 4 neonates who tested positive for COVID-19 infection (42, 43, 44) after birth and 3 other infants who were found to have IgM antibodies to COVID—19/ SARS-CoV-2 (39, 40). This is not in itself proof of vertical transmission. All outcomes in these infants appear to have been good.

It is not yet clear whether COVID-19 can be transferred via breast milk. Other coronaviruses are destroyed by pasteurisation but there is no evidence to inform whether

COVID-19 (if present) would be similarly destroyed. Small studies to date have not identified SARS-CoV2 in breast milk.

Perinatal Pathology

In the UK, pathogens are categorised according to their risk to humans by the Advisory Committee on Dangerous Pathogens (ACDP) within the Health and Safety Executive. ACDP guidance is largely aimed towards staff in clinical and research-related microbiology laboratories, however given the potential risk to the health of mortuary staff, autopsy practice has been adapted to reflect the risk of transmission of infectious pathogens during and after the post-mortem examination. These hazard groups (HG1–4) are assigned according to the risk of human infection, the likelihood spread and access to treatment or prophylaxis. SARS-COV 2 has recently been categorised as a HG3 organism (45). Similarly, the 2013 Code of Practice for the Safety, Health and Welfare at Work (Biological Agents) Regulations 2013 lists SARS Coronavirus as a 'group 3 biological agent' (46).

There are a limited number of descriptions of the pathology of COVID-19 infection. A report on 2 lung cancer resection patients, retrospectively identified as having COVID-19 describes the early changes of COVID-19 and were essentially non-specific (47).

In advanced disease a report on post-mortem biopsies from one case have shown features compatible with diffuse alveolar damage with hyaline membrane formation. The inflammation was predominantly lymphocytic, and multinucleated giant cells were seen alongside large atypical pneumocytes. No definitive viral inclusions were seen (48).

Limited placental pathology is available to date from COVID-19 positive pregnancies (20, 22, 23). One report examined placental pathology in 3 cases and described no unusual findings (49).

Summary

COVID-19 infection is a new disease and the impact on pregnancy remains uncertain. Larger case series appearing in the literature offer reassurance that COVID-19 infection in pregnancy does not appear to be different to that in the non-pregnant population. It is currently considered possible, but not proven, that SARS-CoV-2 can be transmitted vertically. There is as yet limited evidence to support changing routine care practices in labour and at delivery.

3 Aims of the guidance document

- To outline considerations for care for pregnant women and their infants during the COVD-19 pandemic
- To advise maternity units around the provision of safe care to women and infants with suspected / confirmed COVID-19
- 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 recent 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 (Section 15; Useful links).

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 is subject to ongoing review and will be updated as further information and evidence becomes available.

4 Authors/ Contributors / Reviewers

Authors

Dr Keelin O'Donoghue
Joye McKernan

Contributors

Riona Cotter
Prof Gene Dempsey
Dr Jennifer Donnelly
Sarah Fenton
Dr Wendy Ferguson
Dr Brendan Fitzgerald
Dr Niamh McAuliffe
Dr Brendan Murphy
Dr Daniel Nuzum

Reviewed by

Angela Dunne (NWIHP)
Prof Richard Greene (NPEC)
Dr Peter McKenna (NWIHP)
Dr Cliona Murphy (IOG)
Dr John Murphy (NWIHP)
Aideen Quigley (NWIHP)

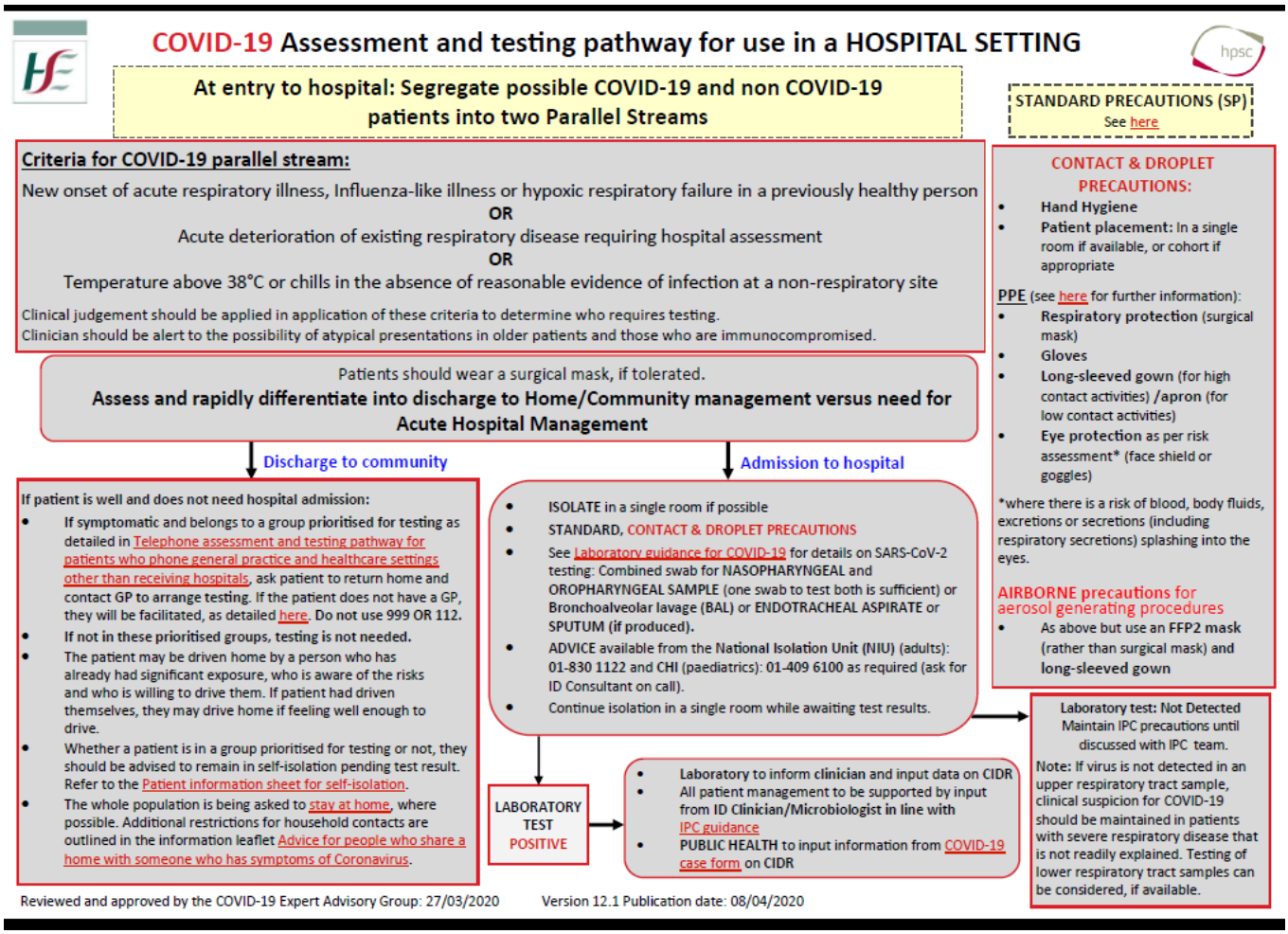
5 Endorsements

National Women and Infants Health Programme (NWIHP)
Executive Council of the Institute of Obstetricians and Gynaecologists of Ireland (IOG)

6 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

7 Algorithms / Pathways

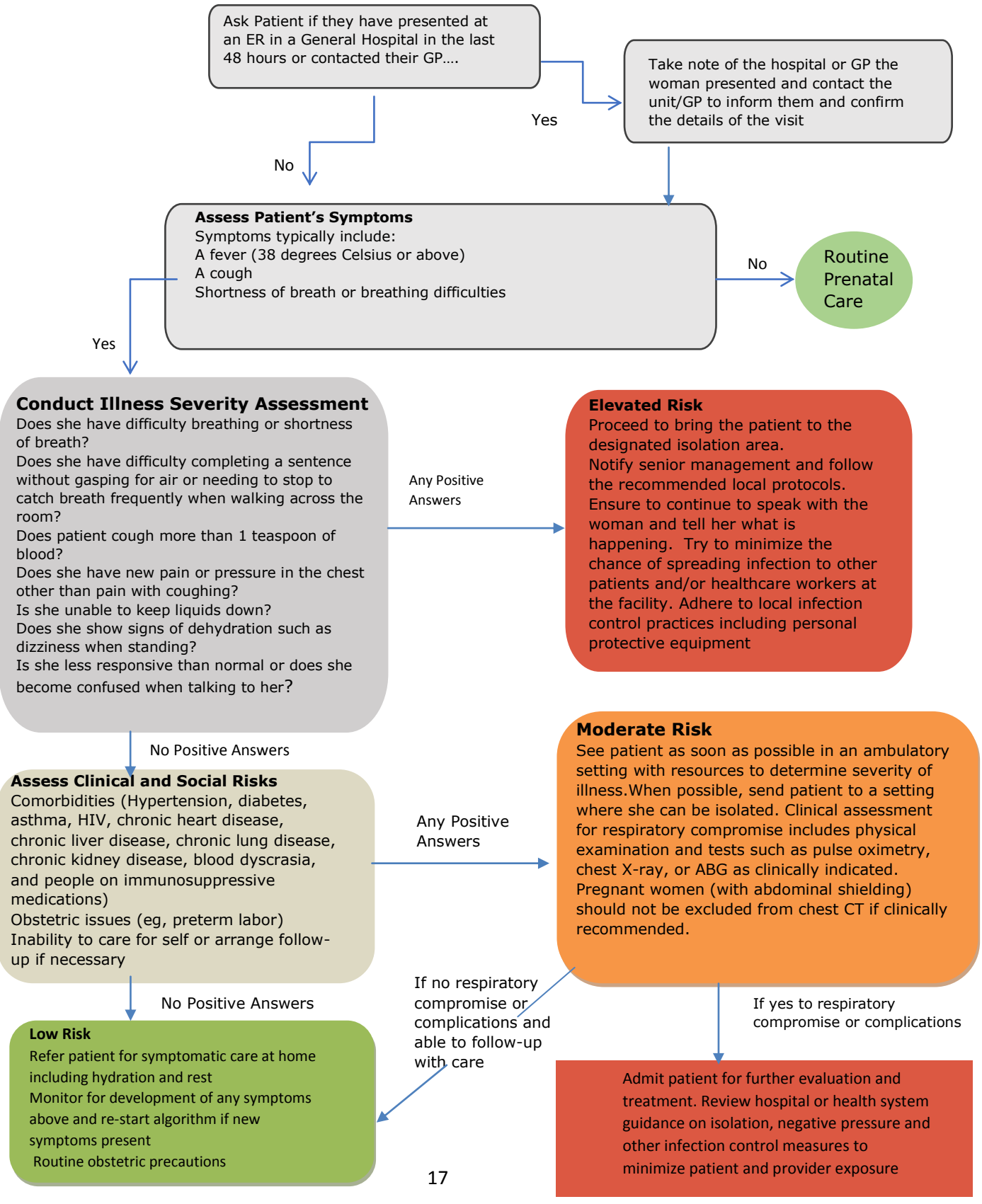


https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/algorithms/

Outpatient Assessment and Management for Pregnant Women with Suspected or Confirmed Novel Coronavirus (COVID-19)

This algorithm is designed to aid practitioners in promptly evaluating and treating pregnant persons with known exposure and/or those with symptoms consistent with COVID-19.

Please use this in conjunction with **COVID-19 Assessment and testing pathway for use in a HOSPITAL SETTING**



Adapted from the American College of Obstetrics and Gynaecologists, 2020

8 Maternity care considerations

Routine antenatal care

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.

Women should attend clinic on their own and are asked to only come at their designated time to avoid too many people in waiting areas.

Units may need to 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.

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 be necessary.

Units should appoint a group of clinicians to co-ordinate care for women forced to 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 then be reviewed for urgency and either converted to remote appointments, attendance appropriately advised or deferred.

For women who have had symptoms, appointments can be deferred until 14 days after the start of symptoms. For women who are self-isolating because someone in their household has possible symptoms of COVID-19, appointments should be deferred for 14 days

Units should have a system to flag women who have missed serial appointments, which is a particular risk for women with small children who may become repeatedly unwell, and any woman who has a routine appointment delayed for more than 3 weeks should be contacted.

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 will 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 obstetric 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 therefore use telephone or video consultations instead of face-to-face encounters for some visits. 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.

A minority of 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, an echocardiogram, or requires blood testing. Face-to face interactions should be limited by reviewing the purpose of the appointment in advance (ideally one week earlier) 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 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 and should be 'cocooned'. Therefore pregnant women with the following conditions should adhere to these recommendations.

Maternity services should familiarise themselves with this guidance and make modifications to care as appropriate:

- Women who are pregnant with solid organ transplant recipients
- Women who are pregnant with cancer
- Women who are pregnant with severe respiratory conditions including cystic fibrosis, severe asthma and severe COPD.
- Women who are pregnant with rare diseases and inborn errors of metabolism that significantly increase the risk of infections (such as SCID, homozygous sickle cell).
- Women who are pregnant on immunosuppression therapies sufficient to significantly increase risk of infection.

Finally, it is important to remember that routine laboratory services may not be functioning in the same way as normal during 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.

https://www2.hse.ie/conditions/coronavirus/cocooning.html

Hypertension

The obstetric team should first review the woman at 10-14 weeks by remote consultation (or 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 (urinary 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 all 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 predicted 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, review postnatal anti-hypertensive medication 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. If this review is needed, 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.

The obstetric team should otherwise aim to review the woman as a minimum and if face-to-face reviews are required, these 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. If feasible and appropriate, this can be done remotely.

Women affected by COVID-19 infection 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 should 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.

In women who have GDM that is diet-controlled, with blood glucose levels consistently in the target range no further hospital visits or ultrasound scans for fetal growth are needed.

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 remotely at 28 and 32 weeks' gestation to reassess the risk status. If 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.

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.

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 infection 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)

Social distancing at home is likely to cause a significant reduction in daily mobility, which may increase the risk of VTE in all pregnant women.

Decisions on thromboprophylaxis and imaging for confirmation of VTE should be made on a case-by-case basis, involving senior obstetricians, physicians and radiologists.

Preconception counselling

Preconception counselling in a hospital setting, for women with medical problems, should be deferred during the pandemic and replaced with advice to delay pregnancy and use reliable contraception. Review should be arranged when system capacity returns.

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 infection as well as pertinent risk factors. It is important to remember that women may have attended other units or hospitals, or been tested (or 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.

A women who is presenting at the unit with COVID-19 symptoms should be dealt with in an isolation room.

If possible the ED/EPC should be kept for emergencies occurring during pregnancy and staff rostered to work in ED/EPC should if at all possible be kept to work in this area only.

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

Early pregnancy care

The inevitable reduction in resources and capacity, 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 the duration of the pandemic.

Rationalising visits should ensure that those at risk of early pregnancy complications continue to be looked after. Where scans are deferred or delayed, women must be contacted to ensure that they present if unwell, and where possible are given alternative appointments or clinical options.

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 PUL can be considered as well as use of conservative management after PUL or following medical management.

The availability of surgery will need to be reviewed locally on a daily basis and if surgical management is indicated, 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 staff from general anaesthesia, which is an aerosol-generating procedure.

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

with strict precautions taken to filter any CO2 escaping into the operating theatre and the theatre staff wearing appropriate PPE.

https://www.bsge.org.uk/news/joint-rcog-bsge-statement-on-gynaecological-laparoscopic-procedures-and-covid-19/
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

Ultrasound scans and 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.

Recommendations for ultrasound practice

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 there are infected skin lesions or when a transvaginal scan is necessary. In the case of high infectivity, a 'deep clean' of the equipment is necessary. A bedside scan is preferred; 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.

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.

Providers should attempt to shorten the duration of the examination by arranging for the most experienced sonographer to perform for example, anomaly ultrasound scan examinations.

Consideration can be also given to reducing the contact time for anomaly scans to 15 minutes, and to not providing repeat scans 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. In some units it may be more practical to consider limiting the time for all scans to 12 minutes and thus reducing the direct patient contact time.

With COVID-19 visiting restrictions, the pregnant woman will be attending the scan on her own. She should also be advised that detailed explanations will not be given during the

examination. Hospital policy about the recording of images or provision of scan pictures should also be explained.

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

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. Consideration should be given to reducing the number of staff that attend these clinics.

In general, pregnant women should attend alone and be screened before entering the hospital for symptoms of COVID-19 infection. 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 patient needs to be seen on that day; if the decision is to postpone the evaluation it should be communicated clearly to the patient and a new appointment given.

Fetal Medicine screening such as fetal echocardiography should be deferred 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. Patients 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; these procedures include:

a. Laser ablation for Twin to Twin Transfusion Syndrome
b. Intrauterine Transfusion for fetal anaemia
c. Shunting procedures
d. Amniodrainage

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).

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

https://www.rcog.org.uk/globalassets/documents/guidelines/2020-03-25-covid19-fetal-medicine.pdf

https://www.rcog.org.uk/globalassets/documents/guidelines/2020-03-25-covid19-antenatal-screening.pdf

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.

If the patient is well and does not need hospital admission: then recommend the woman returns home and contact her GP to arrange testing or undertake local maternity testing if available. However, if the woman has an additional co-morbidity or develops an obstetric condition that is likely to require further assessment in the maternity service e.g. obstetric cholestasis, gestational hypertension, fetal growth restriction, or is >34 weeks' gestation then testing should be prioritised and arranged through local maternity pathways.

Maternity units should consider contacting women the day before elective admission for Caesarean section or induction of labour, in order to triage and ask about symptoms. If these meet the case definition, elective admission and management can be better planned.

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

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 infection 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 infection.

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 infection. In a pregnant woman with suspected COVID-19 infection, 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

Management at home, isolating

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

If a woman is recommended to self-isolate after clinical assessment, it is advised that she returns home and does not go out for 14 days. She can stop self-isolating once she has had no temperature for 5 days and it has been 14 days since she developed any symptoms.

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

- Suggest separating themselves from other household members (use own bed, bathroom, towels, crockery and utensils) if possible.
- Suggest recommending continued appropriate food choices, and suggest to try and exercise within limits in the household.

Maternity units should allow for telephone clinics for to check on women who have been told to self-isolate at home.

https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/guidance/selfisolationathome/

Antenatal Care

Pregnant women with confirmed infection who are asymptomatic or recovering from illness in an ongoing pregnancy, should be monitored with 2–4-weekly ultrasound assessment of fetal growth and amniotic fluid volume, with umbilical artery Doppler if necessary (from 24 weeks gestation).

Outpatient care

In the setting of a mild infection, management similar to that for a patient recovering from influenza is reasonable. Given how little is known about this infection, a detailed mid-trimester anomaly ultrasound examination should be provided following first-trimester maternal infection. For those experiencing illness later in pregnancy, it is reasonable to consider regular sonographic assessment of fetal growth in the third trimester

Routine appointments for women with suspected or confirmed COVID-19 (growth scans, OGTT, antenatal community or secondary care appointments) should be delayed until after the recommended period of self-isolation. Routine vaccinations (e.g. pertussis) should continue after the illness.

Advice to attend more urgent pre-arranged appointments (fetal medicine surveillance, high-risk antenatal care) will require a senior clinician's decision on urgency and potential risks/benefits.

Local maternity services are advised to arrange local, robust communication pathways for senior maternity staff members to screen and co-ordinate appointments missed due to suspected or confirmed COVID-19 infection.

If it is deemed that 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 COVID19 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 this 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.

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

There is an estimated incubation period of 0-14 days (mean 5-6 days); an infected woman may therefore present asymptomatically, developing symptoms later during an admission. Women from at risk groups (e.g. Roma, Direct provision) and women with poor communication skills should be considered for testing on admission if there is any uncertainty.

Health professionals should be aware of this possibility, particularly those who regularly measure patient vital signs (e.g. Health Care Assistants). 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 infection. Suspected COVID-19 infection should not delay administration of therapy that would be usually given (for example, IV antibiotics in woman with fever and prolonged rupture of membranes).

VTE risk assessment should be carried out on all women who are admitted with COVID19 infection and VTE prophylaxis is recommended if they are unwell.

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/

Antenatal corticosteroids for fetal lung maturation

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

- 24 – 33+6 weeks: offer steroids
- 34 – 35+6 weeks: consider steroids.

This advice still stands. In circumstances where steroids would normally be given, do not routinely withhold them in a woman with COVID-19 infection; as yet, 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.

However, in a critically ill pregnant woman, use caution regarding the use of antenatal steroids (dexamethasone or betamethasone). Consider whether administration of antenatal steroids could potentially worsen the clinical condition and whether it would delay delivery that if was necessary for management of the patient. The use of antenatal steroids should be considered in discussion with infectious-disease specialists, maternal–fetal-medicine specialists and neonatologists.

Important 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 infection 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 infection.
- 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 infection.
- 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.

<u>Considerations for care for the pregnant woman in ICU</u>

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.
- 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.
- 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.

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 as another non-invasive measure of maternal status.

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 (Appendix 2 – suggested pathway).

Management of labour (Appendix 3)

All women should be encouraged to call the maternity unit for advice in early labour. Women with mild COVID-19 symptoms can be encouraged to remain at home (self-isolating) in early (latent phase) labour as per standard practice. When a woman decides to attend the maternity unit, general recommendations about hospital attendance 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.

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.

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 infections, 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 guideline documents (20) 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".

It is therefore expected that as a minimum, pregnant women should have one birthing partner with them in labour, 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 infection there may be situations where regrettably this is not possible relating to PPE availability, workforce gaps or unit configuration. Local policies may also apply for the partner to wear PPE, and to stay in the room for the duration of the labour or delivery. In emergency scenarios for COVID-19 positive women, such as category 1 or 2 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 arise in the hospital/ unit, where the presence of an additional person present may not be safe or practical. Units are encouraged to provide accessible information regarding visiting / accompanying partners.

Decision to deliver

Current consensus is that COVID-19 infection 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.

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. The patient should remain in isolation throughout their hospital admission.

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.

Induction of labour should be considered in pregnant women, where this would be the usual care plan.

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).

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 (Appendix 3)

Timing of delivery, in most cases, should not be dictated by maternal COVID-19 infection. 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) either until a negative testing result is obtained or quarantine status is lifted in an attempt to avoid transmission to the neonate or others.

In general, COVID-19 infection 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 infection, 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 needs 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.

VTE prophylaxis should be considered for at least 10 days postpartum as per guidelines on sepsis in the peri-partum period.

Anaesthesia considerations

Liaise early with the obstetric anaesthesia team to plan delivery. The most experienced anaesthetist available should perform all procedures.

Both regional anaesthesia and general anaesthesia can be considered, depending on the clinical condition of the patient and after consultation with the obstetric anaesthetist.

Approximately one third of patients in a case series from Wuhan developed thrombocytopaenia (platelet count <150) so it would be prudent to check the platelet count before insertion of epidural or spinal anaesthesia, and possibly before removal of the epidural catheter.

Discuss neuraxial blockade before/early in labour to minimise need for general anaesthesia if urgent delivery is required.

Use nitrous oxide only if single patient microbiological filter (of less than 0.05µm pore size) is available for the breathing system.

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.

Regional anaesthesia is recommended where possible to minimise pulmonary complications and reduce droplet aerosolisation. Avoid general anaesthesia unless absolutely necessary for standard indications. Consider plans for the management of a failed regional technique. Local policies for the type of anaesthesia used for Category 1 delivery may need to be reviewed for these cases.

General anaesthesia for caesarean section is associated with a high risk of aerosolisation. Only essential 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.

Investigation 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 infection 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 infection. The following is a summary of the information available for their use in pregnancy and lactation and is designed to complement the HSE national guidance on their use.

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 Athens.

1. Specific Antiviral Therapies

Full information available on HSE guideline Specific Antiviral Therapy in the Clinical Management of Acute Respiratory Infection with SARS-CoV-2 (COVID-19).

Medication	Use in Pregnancy	Use in Breastfeeding*
Hydroxychloroquine (oral) Day 1: 400mg TWICE a day. Then Days 2-5: 200mg TWICE daily (total duration 5 days)	Used in the management of rheumatic conditions in pregnant women. The limited published data relating to the use of hydroxychloroquine during human pregnancy do not indicate that the drug poses a significant risk to the fetus at this dose.	Compatible with breastfeeding. **Infant monitoring:** Irritability, insomnia, vomiting, diarrhoea, weight gain.
Azithromycin (oral) 500mg ONCE a day for three days (used in combination with hydroxychloroquine)	Used in the management of bacterial infections in pregnancy. Compatible with pregnancy.	Compatible with breastfeeding Infant monitoring: Vomiting, diarrhoea, rash.
Lopinavir/ritonavir (**Kaletra®**) (oral) 400mg/100mg TWICE daily up to a maximum of 14 days.	Used for the treatment of HIV during pregnancy, where the benefits of treatment considered to outweigh the risk. The human pregnancy experience with lopinavir/ritonavir combination, suggests that the embryo-fetal risk is low. Liquid preparation should be avoided in pregnancy due to propylene glycol and alcohol content, use tablets.	Limited human data as breastfeeding is contraindicated in women with HIV, the usual indication for Kaletra®, in developed countries. Kaletra® is used for the treatment of HIV in infants ≥14 days. The dose received via breastmilk is a fraction of the infant treatment dose, so it is reasonable to not suspend breastfeeding during this short maternal treatment course. **Infant monitoring:** Vomiting and diarrhoea.

Remdesivir (intravenous) 200mg once daily on Day 1, then 100mg ONCE daily from day 2 - 10.	Limited human experience. Used for treatment of Ebola in pregnant women. While case fatality rate of 50% in Ebola makes for a higher tolerance for adverse effects compared to COVID-19, it seems reasonable not to exclude seriously ill pregnant women from access to this therapy. Pregnant women are one of the groups eligible for access under individual compassionate use grounds.	No data available. As mechanical ventilation is a key inclusion criterion to access Remdesivir, it is reasonable to assume breastfeeding would not be considered during the treatment period.

* information provided for well, term infants. In preterm or unwell infants consult with Consultant Neonatologist.
The EMA have recently published guidance on the compassionate use of Remdesivir. https://www.ema.europa.eu/en/documents/other/summary-compassionate-use-remdesivir-gilead_en.pdf

2. Tocilizumab

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.

Medication	Use in Pregnancy	Use in Breastfeeding*
Tocilizumab (intravenous infusion) 8mg/kg (max 800mg) as single dose One additional dose may be considered 8-12 hours later if clinical symptoms worsen or there is no improvement (max 2 doses per course)	Limited human experience. In the small number of exposures reported no teratogenic effects have been noted.	Limited data available. Only small amounts of tocilizumab were detected in breastmilk after intravenous doses in several mothers. 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. **Infant monitoring:** Fever, diarrhoea, weight gain, frequent infections.

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

3. Other Medications

Analgesics
Paracetamol should be used first line for the management fever or pain symptoms in COVID-19 infection. Women taking NSAIDs for other conditions, who develop COVID-19 infection, do not need to interrupt their treatment and for postnatal patients, NSAIDs, can be included as a component of multimodal postnatal analgesia.

Further information is available from the HSE and EMA.

Steroids
Systemic steroids can be given where indicated for fetal lung maturation and clinical indications such as exacerbations of asthma, in women with COVID-19.

Antibiotics
National or local obstetric antimicrobial guidelines for community acquired pneumonia (CAP) can be followed when antibiotics are required in women with COVID-19. The use of Azithromycin in combination with hydroxychloroquine as a COVID-19 treatment regimen has prompted some centres to include this as the macrolide of choice in this patient group.

Mucolytics
Mucolytics such as Carbocisteine used to aid mucus clearance in patients with COVID-19 are not recommended for use in women in the first trimester. Carbocisteine is compatible with breastfeeding.

4. Bibliography

Interim Recommendation for the use of Tocilizumab in the Management of Patients who have Severe COVID-19 with Suspected Hyperinflammation accessed on https://www.hse.ie/eng/about/who/acute-hospitals-division/drugs-management-programme/interim-recommendations-for-the-use-of-tocilizumab-in-the-management-of-patients-with-severe-covid-19.pdf/ 30/03/20

HSE Guideline on Specific Antiviral Therapy in the Clinical Management of Acute Respiratory Infection with SARS-CoV-2 (COVID-19) accessed on 01/04/2020 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-cov-2-covid-19-.pdf

Mullins E et al. (2020) Coronavirus in pregnancy and delivery: rapid review. Ultrasound Obstet Gynecol (ahead of print) accessed on https://obgyn.onlinelibrary.wiley.com/doi/epdf/10.1002/uog.22014 27/03/20

HSE Medication Guidelines for Obstetrics and Gynaecology Antimicrobial Prescribing Guidelines accessed on https://www.hse.ie/eng/services/publications/clinical-strategy-and-programmes/antimicrobial-prescribing-guidelines.pdf 27/03/20

Briggs Pregnancy and Lactation accessed https://about.medicinescomplete.com/ 27/03/20.

National Library of Medicine Drugs and Lactation Database (Lactmed) accessed on https://www.ncbi.nlm.nih.gov/books/NBK547435/ on 28/03/20.

Kaletra Summary of Product Characteristics accessed https://www.ema.europa.eu/en/documents/product-information/kaletra-epar-product-information_en.pdf on 28/03/20

Reprotox Database http://reprotox.org/ accessed 27/03/20.
EMA gives advice on the use of non-steroidal anti-inflammatories for COVID-19: https://www.ema.europa.eu/en/news/ema-gives-advice-use-non-steroidal-anti-inflammatories-covid-19 accessed 26/03/20.

HSE Advice about Anti-Inflammatory medication and COVID-19 https://www.hse.ie/eng/services/news/media/pressrel/advice-about-anti-inflammatory-medication-and-covid-19.html accessed 26/03/20.

Hale Medication in Mother's Milk accessed on https://www.halesmeds.com/ 27/03/20.
WHO Guidelines for the management of pregnant and breastfeeding women in the context of Ebola virus disease accessed on 30/03/20 https://apps.who.int/iris/bitstream/handle/10665/330851/9789240001381-eng.pdf

Specific circumstances

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) has 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.

https://www.eshre.eu/Press-Room/ESHRE-News#COVID19_April2

The British Fertility Society have issued similar guidance and state they expect all centres to stop initiating new fertility treatments, including In-Vitro Fertilization, frozen embryo transfer, surgical sperm retrieval, insemination and ovulation induction. This statement also comments that: "maintaining contact with patients whose treatment has been disrupted or deferred is important, and consideration should be given to prioritisation when services are able to recommence".

https://www.britishfertilitysociety.org.uk/2020/03/18/guidance-for-the-care-of-fertility-patients-during-the-coronavirus-covid-19-pandemic/

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*."

https://www.smfm.org/covid19

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 has been issued by the HSE, NWIHP and the Department of Health. This revised 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 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.

Isolation and infection control policies associated with COVID-19 infection 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. All bereavement services should continue to be available to parents in so far as possible.

The following areas 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 be protected (unless a partner is confirmed or suspected COVID-19 positive). Where a mother is COVID-19 positive, the use of PPE should be in accordance with current guidelines.

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 - particularly where there are time-sensitive issues about results of investigations or future pregnancy considerations to be discussed.

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

www.pregnancyandinfantloss.ie

9 Neonatal care considerations

Baby of suspected/positive COVID-19 mother

Aspect	Consideration
Risk assessment	• 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	• 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	• High risk activities ○ Those associated with aerosolisation require full PPE use ○ This includes intubation/IPPV with Neopuff/BIPAP/CPAP/HFNC ○ Intubation and less invasive surfactant administration ▪ 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	• No indication to test well asymptomatic baby • First test at 12–24hours of age only if indicated ○ Consider second test 24 hours after first test to confirm result ○ Collect nasopharyngeal and oropharyngeal swab (single swab both sites) • Undertake subsequent testing as indicated ○ e.g. if baby becomes unwell, after maternal negative result, or as recommended by infectious disease team • Clearance requires two consecutive negative tests 24 hours apart • SARS-CoV2 swabs on any baby to be agreed at Consultant Neonatologist level – not by nursing/midwifery or DIT staff.
Admission to nursery	• COVID-19 positive mother (i.e. no other neonatal criteria), is not itself an indication for admission to a neonatal unit • Perform clinical assessment after birth as per usual protocols • 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
Neonatal surveillance	• Maintain high index of suspicion for signs of sepsis/unwell baby • Provide post discharge advice about indications for readmission and possible course of disease ○ 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.

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

Delivery

The neonatal team should be informed of plans to deliver the baby of a woman affected by moderate to severe COVID-19 infection, as far in advance as possible and should also be given sufficient notice at the time of birth, to allow them to attend and don PPE before entering the room/theatre. However, COVID-19 infection 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. 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 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 infection, 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. It might be considered appropriate for preterm babies <32 weeks but best not routinely undertaken at later preterm gestations or term. This should be a discussion between obstetrics and neonatal specialists prior to delivery, in each case.

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.

Rooming-in and Infant feeding

Given the current lack of information, it seems reasonable to assume that a newborn from a mother with COVID-19 infection 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 on isolation with the mother e.g. on a COVID-19 assigned ward.

In light of the current evidence, the benefits of breastfeeding outweigh any potential risks of transmission of the virus through breastmilk.

If the woman is asymptomatic or mildly affected, breastfeeding and co-location (also called 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 infection 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.

Testing

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

> Case definition: 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.

Babies admitted for reasons other than respiratory distress do not need isolating, but 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.

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.

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.

<u>Procedures in the NNU</u>

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

Limit transfers 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 and have tested negative.

Partners of COVID-19 positive mothers must still adhere to the current advice regarding self-isolation, and the hospital policy regarding visiting the maternity wards and NNU, except under exceptional circumstances. There is no visiting to infants of COVID-19 positive mothers who are being isolated in the NNU.

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 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 upscaled, 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.

10 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.

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.

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.

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 a medical certificate of death may be issued and an autopsy will not be performed, with the exception of very limited legal scenarios. If a case is suspected but not confirmed appropriate swabs will be taken and results awaited before an autopsy would be considered. 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-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. 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 may pose an unwarranted risk of infection at this time and should be discussed with the relevant laboratory before being sent.

3) Post mortem examinations:

   Where there is no maternal evidence of suspicion of infection, autopsy procedures may proceed as normal with the caveat that mortuary capacity may be limited and be subject to service restrictions.

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

   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.

11 Personal Protective Equipment (PPE)

- 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 mangers 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

The section is to be used in conjunction with:

The Current recommendations for the use of Personal Protective Equipment (PPE) in the management of suspected or confirmed COVID-19

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.

PPE Jargon Buster

FRSM	fluid resistant surgical mask
FRDG	fluid resistant disposable gown
PPE	personal protective equipment
AGP	aerosol generating procedure
FFP3	filtering face piece level 3 mask

Suggestions that all staff should wear a surgical mask for all patient encounters and meetings between staff where social distancing (2 metres) cannot be maintained is not consistent with current national guidance.

The basis for the recommendation is problematic in that it may suggest that the risk from mildly symptomatic healthcare workers attending work can be managed by mask use.

This is also problematic because it can be expected to promote poor practice in relation to use of masks and thereby increase risk for patients and colleagues. Safe mask use means that masks are tied appropriately and removed and discarded any time the healthcare worker needs to take a toilet break, answer the telephone or uncover their mouth to eat or drink or for any other reason.

Martin Cormican, HSE, 28 March 2020

PPE for care of women with known or suspected COVID-19 infection in labour

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.			
Scenario		**Examples**	**PPE required**
A	Low risk of splashing of secretions (including respiratory secretions), blood, body fluids or excretions	Routine care including in 1st stage of labour	• Fluid resistant surgical mask • Gloves • Plastic apron
B	Risk of splashing of secretions (including respiratory secretions), blood, body fluids or excretions	2nd / 3rd stage of labour Vaginal delivery Operative Delivery (incl Category 2-4)	• Fluid resistant surgical mask • Gloves • Long-sleeved fluid repellent disposable gown • Eye protection
C	Aerosol generating procedure (AGP)	All Caesarean sections under General Anaesthesia (inc Category 1) Includes maternal intubation Note the following are **not** aerosol generating events: • heavy exhalation in labour • use of Entonox	• Hand Hygiene • Disposable Single Use Nitrile Gloves • Long sleeved disposable gown • FFP2 respirator mask • Eye Protection **AGP for mother:** All individuals in the room. Only essential staff in room. **AGP for neonate:** The risk that any aerosol generated during neonatal resuscitation would contain clinically significant virus is considered so low that PPE as described in Scenario B is recommended.

Adapted from NHS England

Donning PPE for obstetric anaesthesia

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	•Put on theatre hat, FRSM & eye protection •Scrub up •Put on disposable fluid resistant sterile gown, sterile gloves	• 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			• 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** •Hand Hygiene • Disposable Single Use Nitrile Gloves • Long sleeved disposable gown • FFP2 respirator			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	• Ask patient to clean hands with gel and to put on FRSM • Add a well fitted oxygen mask if needed • Wait for 20 minutes in theatre • 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

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

12 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-19patients, such that workers do not incur expenses for occupational safety and health requirements;
- familiarize personnel with technical updates on COVID-19and 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 infection;
- 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.

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).

<u>Deployment</u>

Healthcare workers assigned to care for patients with COVID-19 infection or who work in areas of a hospital segregated for patients with COVID-19 infection 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.

<u>Newly recruited staff</u>

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 these 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.

<u>Healthcare workers at risk for complications from COVID-19</u>

Healthcare workers who are at risk for complications of COVID-19 infection (e.g. immunocompromised workers), 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 treatment of patients with COVID-19 infection. The HSE has published a list of those who are considered vulnerable healthcare workers.

Pregnant healthcare workers

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 some occupations that involve aerosolisation.

Pregnant health care workers should therefore be allocated to patients, and duties, that have reduced exposure to patients with, or suspected to have, COVID-19 infection. It is specifically recommended to avoid rostering pregnant staff to COVID-specific units or wards, and redeployment to lower risk duties should be considered. Those pregnant staff who also have underlying medical conditions should discuss with their treating obstetrician as redeployment or working from home may be further advised.

The HSE's list of those who are considered vulnerable healthcare workers includes women who are pregnant with significant heart disease, congenital or acquired. This advice appears to relate to the statement from the UK Maternal Cardiology Society.

https://www.britishcardiovascularsociety.org/resources/covid-19-clinicians-hub

https://www.britishcardiovascularsociety.org/__data/assets/pdf_file/0028/9559/UKMCS-Statement-COVID19.pdf

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.

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 infection. In institutions where there is no occupational health physician, the General Manager will consult with the Chair of the Medical Executive to assign this role to a suitable doctor (HSE, 2008).

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

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. Use reliable sources to get your 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 Workplace Health and Wellbeing Unit announced the launch of a dedicated Healthcare worker COVID-19 helpline (Call Save 1850 420 420). The helpline will assist staff and managers with information and advice during this COVID-19 period.

It important to stress that this number is for **health care workers only.**

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
Pre-phase: **No cases on unit**	Anticipatory anxiety about what's on its way. Inability to think clearly, feeling overwhelmed, planning. Communication errors. Tension in working relationships. "Readiness" burnout.	Increase a sense of control - the team are in a safe pair of hands. Reassurance and planning. Communication updates are key (you may be thinking ahead, they are thinking now). Escalation plan. Support to managers who are making plans and holding the stresses.
Initial phase: **Case 1**	Starting to get going, lots of trying out, lost time, repetition and frustration. Further anticipatory anxiety.	War room - planning central to allow centralised communication. Management are visible and available. Regular communication bulletins and open forums. Have runners in PPE areas. Promote peer support. It's okay to say you are not okay - Senior staff to model this. Rotate workers from high-stress to lower-stress functions. Small pre-brief and debrief the day. Partner inexperienced workers with their more experienced colleagues. Psychological first aid - drop-in sessions for staff with employee wellbeing if you have it. Ensure the basics: Breaks, Facilities (food trolley in staff room), Sleep, Days off. Manage visitors.
Core Phase: Full scale **Multiple cases**	Biggest risk period. Fear infection and implications for families. Overwhelming workload. Full go mode- adrenaline and automatic pilot. Exhaustion. Moral distress as healthcare rationed. Distress linked to personal or family experience of COVID-19. Experience fear or stigma when out in public.	
End Phase: **Immediate aftermath**	Exhaustion and post trauma recovery/ stress	Debriefing. Staff 1-1 and group sessions. Learning and preparation for the future. Organise thanks and reward.
Long term	Some ongoing PTSD Reflection and learning	Look out for signs of PTSD in staff: •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

13 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 infection 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 patient pathways which will reflect the practices within their hospital. The information below should be considered when preparing individual hospital pathways.

For women presenting for maternity care

<u>If suspected or confirmed COVID-19:</u>
- Utilise isolation and transmission precautions
- Use isolation rooms on the antenatal and postnatal wards
- Where available, utilise negative pressure birthing room for confirmed COVID-19
- Inform neonatal team of birth plans as early as possible

<u>If COVID-19 not suspected:</u>
- 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

- To reduce the risk of transmission of the virus that causes COVID-19 infection from the mother to the baby, the hospital must consider whether there is need to separate the mother and baby, and should consider the risks and benefits of this approach.

- 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:
    - 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 healthy 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 guidance from the HSE, taking the clinical situation in each individual hospital at the time into account.
- 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.

Maternity Services Management
Recommendations to manage the service during the COVID-19 Pandemic

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 at this time. Suggestions to decrease the number of ultrasound appointments in the context of COVID-19 infection, 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. 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

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 (take note of guidance from HSE)
- 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

14 Audit and reporting

Clinical guidelines are developed, based on a thorough evaluation of the evidence, to assist decisions about appropriate health care for specific clinical circumstances (50, 51). The rapid emergence of COVID-19 means that there is limited evidence on transmission patterns, associated risk factors and complications in pregnancy and/or birth.

In order to proactively measure the effectiveness of the response to COVID-19 the National Women and Infants Health Programme (NWIHP) have directed the National Perinatal Epidemiology Centre (NPEC) to engage with all maternities units to establish a national audit on COVID-19 infection. To ensure this clinical audit is robust and of high quality, it will align with guidance from international bodies including the WHO and the RCOG.

All units should report and provide information of all pregnant women and newborns who have been tested for COVID-19 to the NPEC register. A record of COVID-19 positive cases should be maintained as the NPEC intend to complete an in-depth national audit later in the year. All units should maintain data entry practices that continue to provide up to date, quality data.

The following items are a sample of the type of data which will be requested to the maternity units nationally, by the NPEC:

- Epidemiological factors to define the type of contact with COIVID-19 (SARs-CoV-2)
- Signs and symptoms at admission
- Co-morbidities
- Treatment and medication
- Complications during episode
- Laboratory and radiological characteristics
- Antenatal care
- Vertical transmission testing
- Delivery details
- Outcome

The purpose of this national audit is to facilitate identification of key epidemiological and clinical characteristics of COVID-19 in order to determine associated risk factors, possible complications in pregnancy and/or birth and further potential impacts of the virus. The data collected from this audit will be critical to inform future clinical guidance.

UK cases are being reported to the UK Obstetric Surveillance System (UKOSS) via each NHS Trust's local UKOSS reporter. https://www.npeu.ox.ac.uk/ukoss/current-surveillance/covid-19-in-pregnancy
There also is an international registry (Lausanne University Hospital) and a US UCSF-based national study. https://www.chuv.ch/fr/dfme/dfme-home/recherche/femme-mere/materno-fetal-and-obstetrics-research-unit-prof-baud/covi-preg/ and https://priority.ucsf.edu/

15 References

1. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, Zhang L, Fan G, Xu J, Gu X, Cheng Z, Yu T, Xia J, Wei Y, Wu W, Xie X, Yin W, Li H Liu M, Xiao Y, Gao H, Guo L, Xie J, Wang G, Jiang R, Gao Z, Jin Q, Wang J, Cao B. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020; 395: 497-506.
2. World Health Organization. Novel coronavirus - China. 12 January 2020. https://www.who.int/csr/don/12-january-2020-novel-coronavirus-china/en/
3. Poon et al. ISUOG Interim Guidance on 2019 novel coronavirus infection during pregnancy and puerperium: information for healthcare professionals. 2020.
4. European Centre for Disease Prevention and Control – Sweden. 20 January 2020. https://www.ecdc.europa.eu/en/factsheet-health-professionals-coronaviruses
5. Yin Y, Wunderink RG. MERS, SARS and other coronaviruses as causes of pneumonia. Respirology. 2018;23(2):130-7.
6. Ksiazek TG, Erdman D, Goldsmith CS, Zaki SR, Peret T, Emery S, Tong S, Urbani C, Comer JA, Lim W, Rollin PE, Dowell SF, Ling AE, Humphrey CD, Shieh WJ, Guarner J, Paddock CD, Rota P, Fields B, DeRisi J, Yang JY, Cox N, Hughes JM, LeDuc JW, Bellini WJ, Anderson LJ; SARS Working Group. A novel coronavirus associated with severe acute respiratory syndrome. N Engl J Med, 2003,348(20):1953-1966.
7. Wong SF, Chow KM, Leung TN, Ng WF, Ng TK, Shek CC, Ng PC, Lam PW, Ho LC, To WW, Lai ST, Yan WW, Tan PY. Pregnancy and perinatal outcomes of women with severe acute respiratory syndrome. Am J Obstet Gynecol, 2004,191(1):292-297.
8. World Health Organisation MERS-CoV https://www.who.int/emergencies/mers-cov/en/
9. World Health Organisation SARS-CoV https://www.who.int/csr/sars/guidelines/en/
10. Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, Wang W, Song H, Huang B, Zhu N, Bi Y, Ma X, Zhan F, Wang L, Hu T, Zhou H, Hu Z, Zhou W, Zhao L, Chen J, Meng Y, Wang J, Lin Y, Yuan J, Xie Z, Ma J, Liu WJ, Wang D, Xu W, Holmes EC, Gao GF, Wu G, Chen W, Shi W, Tan W. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. Lancet. 2020 Feb 22;395(10224):565-574.
11. Ying Liu1, Albert A. Gayle2, Annelies Wilder-Smith3,4 and Joacim Rocklöv2. The reproductive number of COVID-19 is higher compared to SARS coronavirus. Journal of Travel Medicine 2020, 1-4
12. Guan W, Ni Z, Hu Y, Liang W, Ou C, He J, Liu L, Shan H, Lei C, Hui DSC, Du B, Li L, Zeng G, Yuen K, Chen R, Tang C, Wang T, Chen P, Xian J, Li S, Wang J, Liang Z, Peng Y, Wei L, Liu Y, Hu Y, Peng P, Wang J, Liu J, Chen Z, Li G, Zheng Z, Qiu S, Luo J, Ye C, Zhu S, Zhong N. Clinical Characteristics of Coronavirus Disease 2019 in China. NEJM 2020; ePub online Mar 6
13. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA. Published online February 7, 2020.
14. Clerkin KJ, Fried JA, Raikhelkar J, Sayer G, Griffin JM, Masoumi A, Jain SS, Burkhoff D, Kumaraiah D, Rabbani L, Schwartz A, Uriel N. Coronavirus Disease 2019 (COVID-19) and Cardiovascular Disease. Circulation. 2020 Mar 21. doi: 10.1161/CIRCULATION AHA.120.046941. [Epub ahead of print
15. https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/casedefinitions/
16. Dorigatti I, Okell L, Cori A, et al. Report 4: Severity of 2019-novel coronavirus (nCoV). WHO Collaborating Centre for Infectious Disease Modelling, MRC Centre for Global Infectious Disease Analysis, Imperial College London.

https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-severity-10-02-2020.pdf
17. Rasmussen SA, Smulian JC, Lednicky JA, Wen TS, Jamieson DJ. Coronavirus Disease 2019 (COVID-19) and pregnancy: what obstetricians need to know. Am J Obstet Gynecol 2020 Feb 24. pii: S0002-9378(20)30197-6. [Epub ahead of print]
18. https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases
19. https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/casesinireland/
20. Royal College of Obstetricians and Gynaecologists, London. Coronavirus (COVID-19) Infection in Pregnancy. Version 7. 9 April 2020
21. Siston AM, Rasmussen SA, Honein MA, Fry AM, Seib K, Callaghan WM, Louie J, Doyle TJ, Crockett M, Lynfield R, Moore Z, Wiedeman C, Anand M, Tabony L, Nielsen CF, Waller K, Page S, Thompson JM, Avery C, Springs CB, Jones T, Williams JL, Newsome K, Finelli L, Jamieson DJ; Pandemic H1N1 Influenza in Pregnancy Working Group. Pandemic 2009 influenza A(H1N1) virus illness among pregnant women in the United States. JAMA 2010; 303: 1517-25.
22. Mullins E, Evans D, Viner RM, O'Brien P, Morris E. Coronavirus in pregnancy and delivery: rapid review. Ultrasound Obstet Gynecol. 2020 Mar 17. doi: 10.1002/uog.22014. [Epub ahead of print]
23. The Society for Maternal-Fetal Medicine (SMFM). Dotters-Katz S and Hughes BL. Coronavirus (COVID-19) and Pregnancy: What Maternal-Fetal Medicine Subspecialists Need to Know https://s3.amazonaws.com/cdn.smfm.org/media/2267/COVID19- updated 3-17-20 PDF.pdf
24. Schwartz DA. An Analysis of 38 Pregnant Women with COVID-19, Their Newborn Infants, and Maternal-Fetal Transmission of SARS-CoV-2: Maternal Coronavirus Infections and Pregnancy Outcomes. Arch Pathol Lab Med. 2020 Mar 17. doi: 10.5858/arpa.2020-0901-SA. [Epub ahead of print]
25. Wang X, Zhou Z, Jianping Z, Zhu F, Tang Y, Shen X. A case of 2019 Novel Coronavirus in a pregnant woman with preterm delivery. Clin Infect Dis. 2020;
26. Liu Y, Chen H, Tang K, Guo Y. Clinical manifestations and outcome of SARS-CoV-2 infection during pregnancy. J Infect 2020 Feb 27
27. Breslin N Baptiste C, Miller R, Fuchs K, Goffman D, Gyamfi-Bannerman C and D'Alton M. COVID-19 in pregnancy: early lessons. Am J Obstet Gynecol 2020; Mar 26 [Epub ahead of print]
28. N Breslin, C Baptiste, C Gyamfi-Bannerman, R Miller, R Martinez, K Bernstein, L Ring, R Landau, S Purisch , AM Friedman, K Fuchs, D Sutton, M Andrikopoulou, D Rupley , JJ Sheen, J Aubey, N Zork, L Moroz, M Mourad, R Wapner, LL Simpson, ME D'Alton, D Goffman. AJOG MFM in press Apr 3 2020
29. A Juusela, M Nazir M Gimovsky. Two Cases of COVID-19 Related Cardiomyopathy in Pregnancy. AJOG MFM Available online 3 April 2020, doi.org/10.1016/ j.ajogmf.2020.100113
30. Ferrazzi EM, Frigerio L, Cetin I, Vergani P, Spinillo A, Prefumo F, Pellegrini E, Gargantini G. COVID-19 Obstetrics Task Force, Lombardy, Italy: executive management summary and short report of outcome. Int J Gynaecol Obstet. 2020 Apr 8. doi: 10.1002/ijgo.13162. [Epub ahead of print]
31. https://www.icnarc.org/About/Latest-News/2020/04/04/Report-On-2249-Patients-Critically-Ill-With-Covid-19
32. China Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19) 16-24 February 2020. Report submitted 28 February 2020
33. Wen R et al., A patient with SARS-CoV-2 infection during pregnancy in Qingdao, China, Journal of Microbiology, Immunology and Infection 2020, March 20
34. Liu D, Li L, Wu X, Zheng D, Wang J, Yang L, Zheng C. Pregnancy and Perinatal Outcomes of Women With Coronavirus Disease (COVID-19) Pneumonia: A Preliminary

Analysis. AJR Am J Roentgenol. 2020 Mar 18:1-6. doi: 10.2214/AJR.20.23072. [Epub ahead of print]
35. Lin Qiu, Xia Liu, Meng Xiao, Jing Xie, Wei Cao, Zhengyin Liu, Abraham Morse, Yuhua Xie, Taisheng Li, Lan Zhu. SARS-CoV-2 is not detectable in the vaginal fluid of women with severe COVID-19 infection. Clinical Infectious Diseases, ciaa375, Apr 2
36. Chen H, Guo J, Wang C, Luo F, Yu X, Zhang W, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. 2020;6736(20):1–7.
37. Zhu H, Wang L, Fang C, Peng S, Zhang L, Chang G, et al. Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia. 2020;9(1):51–60.
38. https://ripe-tomato.org/2020/04/05/covid-19-in-pregnancy-news-reports/
39. Dong L, Tian J, He S, Zhu C, Wang J, Liu C, Yang J. Possible Vertical Transmission of SARS-CoV-2 From an Infected Mother to Her Newborn. JAMA. 2020 Mar 26. doi: 10.1001/jama.2020.4621. [Epub ahead of print]
40. Hui Zeng, Chen Xu, Junli Fan, Yueting Tang, Qiaoling Deng, Wei Zhang, Xinghua Long. Antibodies in Infants Born to Mothers With COVID-19 Pneumonia. JAMA. Published online March 26, 2020. doi:10.1001/jama.2020.4861
41. Qiu H, Wu J, Hong L, Luo Y, Song Q, Chen D. Clinical and epidemiological features of 36 children with coronavirus disease 2019 (COVID-19) in Zhejiang, China. Lancet Infect Dis 2020 Published Online March 25
42. S Wang, L Guo1 L Chen, W Liu, Y Cao, J Zhang, and L Feng. A Case Report of Neonatal 2019 Coronavirus Disease in China. Clin Infect Dis 2020
43. Yu N, Li W, Kang Q, Xiong Z, Wang S, Lin X, Liu Y, Xiao J, Liu H, Deng D, Chen S, Zeng W, Feng L, Wu J. Clinical features and obstetric and neonatal outcomes of pregnant patients with COVID-19 in Wuhan, China: a retrospective, single-centre, descriptive study. Lancet Infect Dis. 2020 Mar 24. pii: S1473-3099(20)30176-6. doi: 10.1016/S1473-3099(20)30176-6. [Epub ahead of print]
44. Lingkong Zeng, Shiwen Xia, Wenhao Yuan, Kai Yan, Feifan Xiao, Jianbo Shao, Wenhao Zhou. Neonatal Early-Onset Infection With SARS-CoV-2 in 33 Neonates Born to Mothers With COVID-19 in Wuhan, China. JAMA Pediatr. Published online March 26, 2020. doi:10.1001/jamapediatrics.2020.0878
45. Hanley B, Lucas SB, Youd E3, Swift , Osborn M. Autopsy in suspected COVID-19 cases. J Clin Pathol. 2020 Mar 20. pii: jclinpath-2020-206522. doi: 10.1136/jclinpath-2020-206522. [Epub ahead of print]
46. 2013 Code of Practice for the Safety, Health and Welfare at Work (Biological Agents) Regulations 2013 (S.I. No. 572 of 2013)
47. Tian S, Hu W, Niu L, et al. Pulmonary pathology of early phase 2019 novel coronavirus (COVID-19) pneumonia in two patients with lung cancer. J Thorac Oncol 2020:S1556-0864(20)30132-5.
48. Xu Z, Shi L, Wang Y, et al. Pathological findings of COVID-19 associated with acute respiratory distress syndrome. The Lancet respiratory medicine.
49. Chen S, Huang B, Luo DJ, Li X, Yang F, Zhao Y, Nie X, Huang BX. Pregnant women with new coronavirus infection: a clinical characteristics and placental pathological analysis of three cases. Zhonghua Bing Li Xue Za Zhi. 2020 Mar 1;49(0):E005. doi: 10.3760/cma.j.cn112151-20200225-00138. [Epub ahead of print] Chinese.
50. Clinical Practice Guidelines Directions for a New Program. Institute of Medicine (US) Committee to Advise the Public Health Service on Clinical Practice Guidelines; Editors: Marilyn J. Field and Kathleen N. Lohr. Washington (DC): National Academies Press (US); 1990.
51. 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.

Professional guidance documents referenced

Royal College of Obstetricians and Gynaecologists, London. Coronavirus (COVID-19) Infection in Pregnancy. Version 7. 9 April 2020

Royal College of Obstetricians and Gynaecologists, London. Guidance for maternal medicine services in the evolving coronavirus (COVID-19) pandemic. Version 2. 9 April 2020

Royal College of Obstetricians and Gynaecologists, London. Guidance for antenatal and postnatal services in the evolving coronavirus (COVID-19) pandemic. Version 1. 30 March 2020

Royal College of Obstetricians and Gynaecologists, London. Guidance for fetal medicine units (FMUs) in the evolving coronavirus (COVID-19) pandemic. Version 1. 23 March 2020

Royal College of Obstetricians and Gynaecologists, London. Guidance for antenatal screening and ultrasound in pregnancy in the evolving coronavirus COVID-19) pandemic. Version 1. 23 March 2020

Royal College of Obstetricians and Gynaecologists, London. Guidance for rationalising early pregnancy services in the evolving coronavirus (COVID-19) pandemic. Version 1. 3 April 2020.

Poon LC et al. ISUOG Safety Committee Position Statement: safe performance of obstetric and gynecological scans and equipment cleaning in the context of COVID-19. ISUOG 2020.

Bourne T et al. ISUOG Consensus Statement on rationalization of early-pregnancy care and provision of ultrasonography in context of SARS-CoV-2. ISUOG 2020

Dotters-Katz S and Hughes BL. Coronavirus (COVID-19) and Pregnancy: What Maternal-Fetal Medicine Subspecialists Need to Know. SMFM. 17 March 2020.

Abuhamad A and Stone J. The Society for Maternal-Fetal Medicine COVID-19 Ultrasound Practice Suggestions. SMFM. Version 2. 24 March 2020.

Society for Maternal-Fetal Medicine and Society for Obstetric and Anesthesia and Perinatology: Labor and Delivery COVID-19 Considerations. SMFM. 27 March 2020.

Royal College of Paediatrics and Child Health, British Association of Perinatal Medicine, COVID-19 - guidance for neonatal settings. 8 April 2020

16 Useful Links

Ireland

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

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

https://hselibrary.ie/covid-19-evidence-sources/

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

https://www.rcsi.com/dublin/coronavirus/surgical-practice

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

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://icmanaesthesiacovid-19.org/

http://covid19.sccm.org/nonicu.htm

https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen

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

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://www.ecdc.europa.eu/en/coronavirus

APPENDIX 1

Lead Author	Date published	Journal	Location	Number of cases	Main findings
Zhu, H	Feb 10	Transl Ped	Union Hospital, Tongji Medical College	9†	1 NND 34 weeks – not infected Fetal distress in 6 cases 6/9 delivered preterm
Chen, H	Feb 12	Lancet	Zhongnan Hospital of Wuhan University	9	No adverse outcomes
Liu, W	Feb 25	Preprints	Union Hospital, Tongji Medical College	3*†	No adverse outcomes
Wang, X	Feb 28	Clin Infect Dis	Affiliated Infectious Hospital of Soochow University	1	Maternal ICU admission 30 week EM CS delivery -fetal distress Good outcome
Chen, S	Mar 1	Zhonghua Bing Li Xue Za Zhi	Union Hospital, Tongji Medical College	3 (*same cases Liu)	No unusual findings in placental pathology
Liu, Y	Mar 4	J Infect	Sun Yat-sen University, Guangzhou	13	1 stillbirth – no detail 1 maternal ICU admission with ECMO, ongoing 6/13 preterm labour
Li, Y	Mar 5	Emerg Infect Dis	Zhejiang University, Hangzhou	1	No adverse outcomes
Zhang, L	Mar 7	Zhonghua Fu Chan Ke Za Zhi	Eastern Hospital of Wuhan University People's Hospital	16	No adverse outcomes, 1 severe case *(abstract only but Schwartz translated and included)*
Wen, R	Mar 10	J Microbiol Immunol	Quingdao	1	No adverse outcomes, ongoing
Wang, S	Mar 12	Clin Infect Dis	Tongji Medical College, Wuhan	1‡	Infected neonate at 36h (born by CS)
Fan, C	Mar 17	Clin Infect Dis	Renmin Hospital, Wuhan	2	No adverse outcomes
Liu, D	Mar 18	AJR	Union Hospital, Tongji Medical College	15† (includes Zhu + Liu; ?adds 3)	No adverse outcomes reported - maternal 4 ongoing pregnancies
Kang, X	Mar 24	Zhejiang Da Xue Xue Bao Yi Xue Ban	Zhejiang University School of Medicine, Hangzhou	1	No adverse outcomes
Yu, N	Mar 24	Lancet Infectious Dis	Tongji Medical College, Wuhan	7‡ (includes Wang neonate)	One infected neonate No maternal adverse outcomes
Breslin, N	Mar 27	AJOG MFM	NYC Presbyterian	7±	2 maternal ICU admissions, both peripartum
Lan Dong	Mar 26	JAMA	Renmin Hospital, Wuhan	1	Neonate with IgM antibodies 23 days after maternal infection, negative for infection
Zeng, H	Mar 26	JAMA	Zhongnan Hospital	6	All neonates had antibodies, 2 had

			of Wuhan University		IgM, all negative for infection No maternal adverse outcomes
Zeng, L	Mar 26	JAMA Pediatrics	Wuhan Children's Hospital	33 neonates	3 infected neonates on day 2 (all born by CS), normal outcomes
Chen, S	Mar 28	J Med Virol	Maternal and Child Hospital of Hubei Province	5	No adverse outcomes
Zambrano, L	Mar 20	Travel Med Infect Dis	Hospital Escuela of Tegucigalpa, Honduras	1	Preterm labour at 32 weeks, neonate well
Iqbal, S	Apr 1	NEJM	MedStar Washington Hospital Center	1	Term SVD, no adverse outcomes
Lingkong, Z	Apr 1	Chinese Journal of Pediatrics	Wuhan Children's Hospital	1	Parents infects day 14 post-delivery, neonate infected day 17, recovered
Hwan , D	Apr 2	KJA	Korea	1	No adverse outcomes
Karimi-Zarchi	Apr 3	Fetal Ped Pathol	Iranian Health Ministry – website source	3 (part of a review)	2 mothers reported developed ARDS and died -, all neonates survived, no detail
Gidlof, S	Apr 6	AOGS	Stockholm South General Hospital, Stockholm	1	Multiple pregnancy 36/40, severe PET, EM CS then COVID positive, neonates well
Juusela, A	Apr 6	AJOG MFM	Newark Beth Israel Medical Center	7	2 women critically unwell with cardiomyopathy (one CPA, remains in ICU) 5 ongoing
Breslin, N	Apr 6	AJOG MFM	Columbia University Medical Center AND NYC Presbyterian NYC	43± (includes previous Breslin 7)	37 – mild disease 4 (9%) – severe 2 (5%) – critical (PN) 14 initially asymptomatic 4 readmissions All neonates well
Kalafat, E	Apr 6	UOG	Ankara University, Turkey	1	ICU admission (ongoing postnatal) Neonate not infected
Li, N	Apr 7	Clin Infect Dis	Maternal and Child Health Hospital of Hubei Province	16	3/16 preterm delivery No critical illness No infected neonates
Ferrazzi, E	Apr 8	Int J Gynaecol Obstet	Lombardy region, Italy (6 hubs)	42	7 severe – CPAP and/or ICU admission 2 preterm deliveries

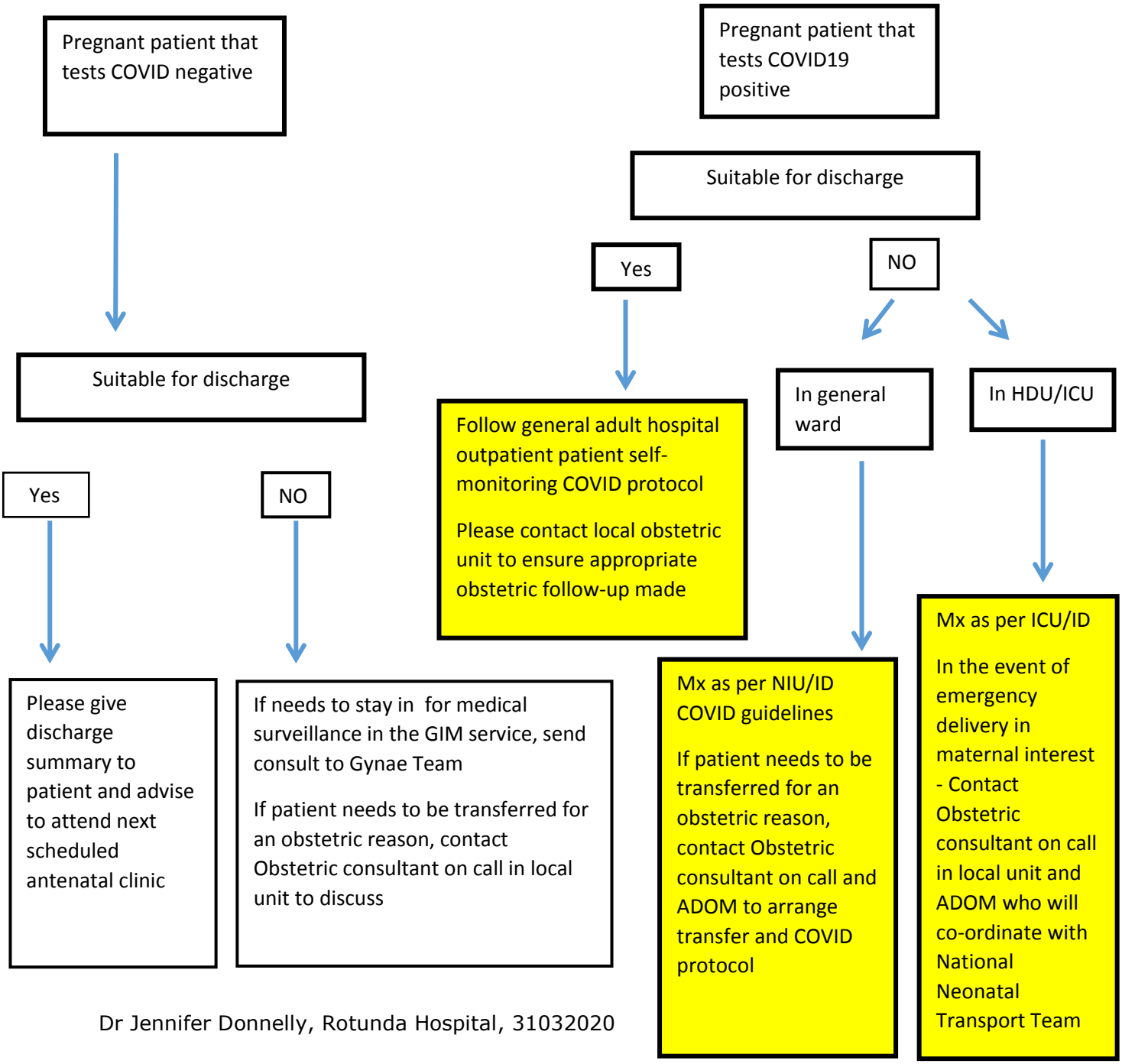
Published Literature: COVID-19 infection and Pregnancy

9 April 2020

APPENDIX 2

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

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

C Frise 290320

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

Examination

Observations: consider use of maternal early warning score chart

BP ≥ 140/90 mmHg **hypertension** - repeat BP in 30 minutes
BP ≥ 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 ↑ in pre-eclampsia
D-dimer	Not currently recommended for assessment of possible VTE

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

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

*PCR – protein:creatinine ratio

APPENDIX 3

Labour Ward Care Pathway for
Suspected/Confirmed COVID-Positive Patient

The **Designated** COVID Rooms =

ON ADMISSION OF A SUSPECTED/CONFIRMED COVID-19-POSITIVE PATIENT

1. Inform ALL MEMBERS of Obstetric, Anesthetic and Neonatal teams
2. **Obstetric Consultant to be in-house if Instrumental delivery /CS required**
3. Insert IV Cannula
4. FBC, U+E, LFTs, COAG, G+S (LDH, Ferritin in COVID-Positive Patient)
5. Consideration should be given to **early epidural anaesthesia**

ROOM	• Minimum: Delivery Pack + Catheter Pack • Ensure Resuscitaire working and Neonatal SaO_2 monitor in-situ • **REMOVE** all disposable equipment
CUPBOARD + TROLLEY OUTSIDE room	○ Blood-form Pack ○ IV Fluids + Giving Set ○ Epidural Pack ○ CS Pre-Med Pack ○ Instrumental Delivery Equipment
MIDWIFERY	○ All communication via phone ○ All medical reviews, unless an emergency, **must be run through the CMM** ○ Designated 2nd **SENIOR** MW to relieve for breaks/assistance

PATHWAY FOR INSTRUMENTAL DELIVERY	
CALL	Alert Obstetric SpR + CMM
OUTSIDE	Labour Ward CMM • Buddies ALL personnel entering room • Contacts ○ Neonatal SHO to attend ○
INSIDE	Designated SENIOR MW + Obstetric SpR ONLY to enter room initially **Full PPE** *Treat as your skin, i.e. if VE – apply sterile gloves over PPE*
DECISION INSTRUMENTAL	• CMM to remain present OUTSIDE ○ Contact Obstetric Consultant to attend ○ Make Anaesthetics/OT aware • Neonatal SHO enters LW Room • Anaesthetist ONLY enters LW Room if epidural top-up required

<table>
<tr><th colspan="3">PATHWAY FOR EMERGENCY CS</th></tr>
<tr><td>CALL</td><td colspan="2">Alert Obstetric SpR + CMM</td></tr>
<tr><td>OUTSIDE</td><td colspan="2">Labour Ward CMM
Buddies ALL personnel entering room
Contacts
Anaesthetist
Obstetric REG + SHO
Neonatal REG + SHO
Theatre + Portering Team
Obstetric Consultant to attend</td></tr>
<tr><td>INSIDE</td><td colspan="2">Designated SENIOR MW + Obstetric SpR ONLY to enter room initially
Full PPE
Treat as your skin, i.e. if VE – apply sterile gloves over PPE</td></tr>
<tr><td>DECISION CS</td><td colspan="2">Verbal Consent
SpR: Ensure Urinary Catheter in situ, MW: Administer Pre-Meds
SpR DOFFS Gown + Gloves ONLY, EXITS room to communicate plan and proceed to OT directly
Anaesthetist ONLY enters LW Room if epidural top-up required
DO NOT DOFF on exit and proceed to OT directly.
Neonatal SHO sets up Resuscitaire in OT and ensures incubator present</td></tr>
<tr><td>TRANSFER OT</td><td colspan="2"><u>BY</u> 2 MW in Room *DO NOT doff* + Porter
<u>VIA</u> corridor (as sign-posted)
<u>AFTER</u> patient transfers onto bed in OT, LW bed is returned to LW Room by Porter in full PPE. Porter DOFFS there with buddy.</td></tr>
<tr><td>OUTSIDE OT</td><td colspan="2">1 Theatre Nurse to facilitate communication/equipment requests/buddy</td></tr>
<tr><td rowspan="2">INSIDE OT</td><td colspan="2">Full PPE: DON + DOFF as per signage, into designated bins
* U S E C L O S E D L O O P C O M M U N I C A T I O N *</td></tr>
<tr><td>2 Anaesthetists
1 Anaesthetic Nurse
1 Obstetric SpR
1 Obstetric Assistant (SHO/REG)</td><td>1 Scrub Nurse
1 Labour Ward Midwife (MN-CMS/Scribe)
1 Labour Ward Midwife or Theatre Nurse to Circulate/Take Baby</td></tr>
<tr><td>NEONATOLOGY</td><td colspan="2">See Separate Pathway</td></tr>
<tr><td>GA</td><td colspan="2"><u>Intubation</u> MINIMAL personnel to be in OT @ MAXIMAL distance
<u>Extubation</u> ALL staff + baby OUT, except Anaesthetic OT Team</td></tr>
<tr><td>RECOVERY + TRANSFER OUT</td><td colspan="2">Recover in OT
Transfer to COVID-19 isolation ward by ward Staff +/- Porter</td></tr>
</table>

Dr Noirin Russell, CUM, 31032020