WOMEN AND CHILDREN DIVISION

Standard Operating Procedure (SOP)

Title: Management of and timing of delivery in COVID-19 or suspected COVID-19 women with significant respiratory compromise
Department: Maternity & Gynaecology Directorate
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Approved by: Women & Children Divisional Management Team - 30/04/2020
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Target Organisation: Worcestershire Acute Hospitals NHS Trust
Target Departments: All maternity areas & EGAU
Target Staff Categories: Midwives, Gynaecology Nurses, Maternity Support Workers, Theatre Staff, Consultant Anaesthetists, Consultant Obstetricians & Gynaecologists.

Introduction:

Experience is limited in pregnant women with significant respiratory compromise and the current literature does not sufficiently address this point (Ashokka B et al. Care of the pregnant woman with COVID-19 in labour and delivery: Anaesthesia, emergency caesarean delivery, differential diagnosis in the acutely ill parturient, care of the newborn and protection of the healthcare personnel. Am J Obstet Gynecol (2020), https://doi.org/10.1016/j.ajog.2020.04.005).

The fetal placental unit represents an oxygen burden which is relieved by delivery. This may significantly improve the woman's oxygenation and reduce or avoid the need for respiratory support. In addition, the gravid uterus itself causes a degree of diaphragmatic elevation and splinting, decreasing lung compliance.

Preterm delivery has a gestation related impact on the outcome for the baby, therefore the risk benefit analysis must consider the gestational age of the fetus. Due to the current lack of evidence, a pragmatic approach is required when making decisions regarding delivery in COVID-19 positive or suspected COVID-19 positive women with respiratory compromise or septic shock. Senior multidisciplinary decision making is essential. In this situation caesarean section will usually be the most appropriate mode of birth and it must be accepted that there is likely to be an increase is perinatal morbidity and mortality, but the health of the mother must come first. In some situations below 23+0 weeks gestation, termination pregnancy under Clause A or Clause F of the 1967 Abortion Act may be necessary. Given the need to achieve this rapidly, termination should be achieved by surgical means.

Management within the Maternity Unit:

If oxygen saturations are ≤94% on air **OR** requiring supplemental O2 to maintain saturations >94% **OR** the respiratory rate is ≥ 30/min **OR** there is radiological evidence of pneumonia:
(see Appendix 1: Triggers for escalating care/referral in obstetric COVID-19 positive / suspected COVID-19 positive patients who require admission)

- Consultant level MDT discussion with obstetrician/obstetric anaesthetist /Intensive Care Unit (ICU) team/Outreach. If intubation required contact ICU consultant via switchboard -/+ neonatologist.

- If ≥34+0 weeks, consider delivery as this may improve oxygenation and avoid the need for ventilation. This is especially pertinent if oxygen saturations can only be maintained with high flow oxygen. Do not give steroids for fetal lung maturation as there is less evidence of benefit *(NICE Clinical Guideline 25 – Preterm Birth & Labour 2015, 2019 update)* and there are concerns that high dose therapeutic steroids may have a detrimental effect on progression of COVID-19 and clinical outcomes.

- If 28-33+6 weeks, consider administration of antenatal corticosteroids for fetal lung maturity *(NICE 2015, 2019 update; WHO Interim Guidance: Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected. March 2020)* if time allows (even 1 dose may be of benefit).

- If 23-27+6 weeks and in the absence of an obstetric reason for immediate delivery, give antenatal corticosteroids as above and employ appropriate respiratory support in the correct clinical environment.

- Below 20 weeks gestation, the benefits of emptying the uterus to relieve aortocaval compression and decrease oxygen requirements are less pronounced.

If Patient Outside Maternity Unit (WAHT):

- The Obstetric Consultant on call should be alerted as soon as practicable using bleep 217.

- ICU must notify Delivery Suite of all pregnant women admitted with signs or symptoms of suggestive or confirmed COVID-19 by asking for the Delivery Suite Shift Leader. The following information must be given to the shift leader:

    - Patients name and NHS number
    - Location
    - Gestational age if known
    - Clinical/ventilatory status
    - Whether urgent review is required

Expectations for Care:

- All pregnant women will be reviewed daily by ICU and/or Obstetric Consultant.
- Fetal viability will be checked daily.
- These women are at increased risk of VTE and should be prescribed LMWH prophylaxis unless contraindicated. If LMWH contraindicated use TEDS. If the woman is post-surgery, TED stockings should be used in addition to LMWH.
- All pregnant woman with COVID-19 discharged antenatally will require 4 weeks of prophylactic LMWH following discharge. Those diagnosed around the time of birth will require 6 weeks of postnatal LMWH for VTE prophylaxis.
- Consider additional investigations to rule out differential diagnoses e.g. ECG, CTPA as appropriate, echocardiogram. Do not assume all pyrexia is due to COVID-19 and also perform a full sepsis screening.

If Not Ventilated:

- Ensure Consultant level MDT discussion with obstetrician, anaesthetist, neonatologist, respiratory physician and intensivist if:
    - oxygen saturations ≤94% on air **or**
    - requiring supplemental oxygen to maintain saturations >94% **or**
    - respiratory rate is ≥ 30 **or**
    - there is radiological evidence of pneumonia

- **≥34+0 weeks**: consider delivery as this may improve oxygenation and avoid the need for ventilation. This is especially the case if oxygen saturations can only be maintained with high flow oxygen. Do not give steroids for fetal lung maturation as there is less evidence of benefit *(NICE Clinical Guideline 25 – Preterm Birth & Labour 2015, 2019 update)* and there are concerns that high dose therapeutic steroids may have a detrimental effect on progression of COVID-19 and clinical outcomes.

- **28-33+6 weeks**: if time allows, consider administration of antenatal corticosteroids for fetal lung maturity *(NICE 2015, 2019 update; WHO Interim Guidance: Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected. March 2020)*. Even 1 dose may be of benefit. The respiratory physician and intensivist may be resistant to this but this is NICE and WHO guidance. If

intubation and ventilation is being considered, deliver with MgSO4 cover for fetal neuroprotection, irrespective of steroid status (do not delay indicated delivery for steroids).

- **23-27+6 weeks**: in the absence of an obstetric reason for immediate delivery, give antenatal corticosteroids as above and employ appropriate respiratory support in the correct clinical environment. If respiratory support fails to maintain oxygenation, individualise care involving the woman regarding delivery with MgSO4 cover for fetal neuroprotection OR intubation and ventilation to assess response before moving to delivery with MgSO4 cover for fetal neuroprotection.

- **Below 23+0 weeks:** employ appropriate respiratory support in the correct clinical environment. If respiratory support fails to maintain oxygenation, individualise care involving the woman regarding termination of pregnancy under Clause A or Clause F by surgical means or intubation and ventilation to assess response before moving to delivery.

If Ventilated:

- These women require consultant level MDT discussion with obstetrician, anaesthetist, neonatologist, intensivist to facilitate appropriate decision-making regarding delivery.

- The woman must be reviewed daily on ICU by Consultant Obstetrician with the ICU Consultant. Individualized clinical parameters should be set which would trigger second review by Consultant Obstetrician +/- decision to deliver if clinical picture deteriorating.

- If oxygenation is being maintained, continue the pregnancy and await recovery.

- Avoid acidosis and aim to keep pH>7.3 (to protect the fetus)

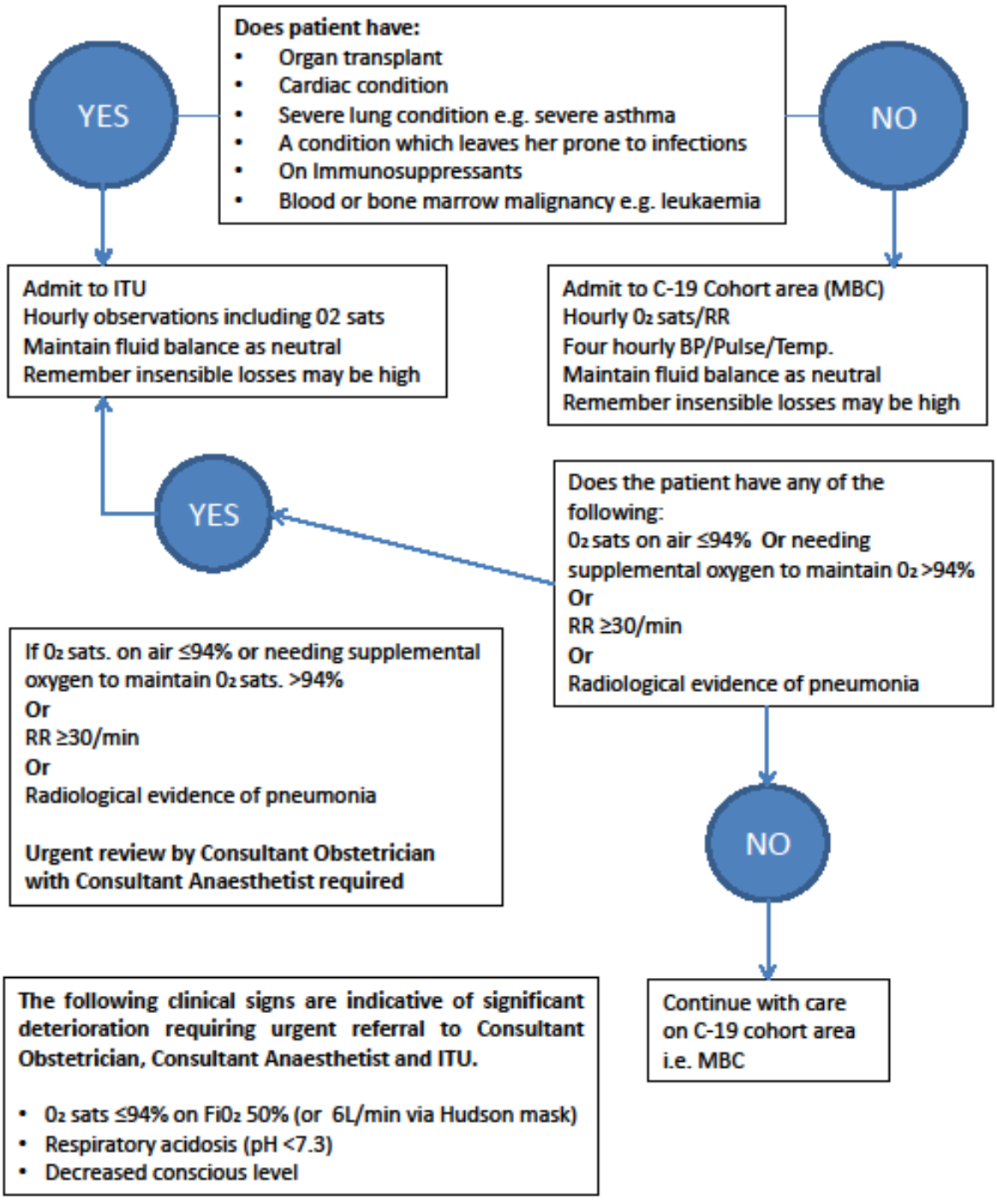
- Patients 20 weeks gestation or more should be nursed with left lateral tilt using a wedge under the pelvis. Proning may be difficult and/or impossible to achieve in the pregnant woman. As an alternative, the pregnant woman can be placed in complete lateral position (lateral decubitus position). The proning teams should be used to assist with the turns and the frequency of these turns determined by the proning protocols.

- Early ECHO after ICU admission must be performed as emerging evidence suggests increased tendency to develop cardiomyopathy in the sick COVID-19 pregnant women *(Juusela et al (2020) Two cases of COVID-19 related cardiomyopathy in pregnancy. Am J Obstet Gynecol https://doi.org/10.1016/jajogmf.2020.100113)*.

- Irrespective of gestation, based on the different maternal physiology due to pregnancy and our local experience, if oxygenation of the mother cannot be maintained (indicated by PaO2< 8kPa even on FiO2 0.8 and alternative therapies such as position change) or there is reduced lung compliance affecting CO2 clearance (as indicated by PaCO2>8kPa or pH<7.3) despite optimizing ventilator settings, consider expediting delivery in maternal interests (if the gestation is between 23+0 – 33+6 weeks administer MgSO4). Do not delay delivery for antenatal corticosteroids. Below 23+0 weeks, terminate the pregnancy by surgical means under clause A or Clause F of the 1967 Abortion Act.

- If ventilation is ongoing after 10 days, there should be an MDT discussion regarding the potential benefits of delivery to aid maternal oxygenation, and the potential timing of this.

Appendix 1: Triggers for the escalation of care for obstetric patients with either suspected or confirmed Covid-19 infection



The following clinical signs are indicative of significant deterioration requiring urgent referral to Consultant Obstetrician, Consultant Anaesthetist and ITU.

- O_2 sats ≤94% on FiO_2 50% (or 6L/min via Hudson mask)
- Respiratory acidosis (pH <7.3)
- Decreased conscious level

Appendix 2: Antenatal Magnesium Sulphate prior to Preterm Birth for Neuroprotection of the Fetus, Infant and Child

Dosage and Administration:

- To administer a loading dose of 4g (bolus) this should be given via an infusion pump **over 15 minutes.**
- Commence maintenance infusion immediately following loading dose at 1g/hr (10ml/hr) until delivery or for 24 hours, whichever is sooner.

Maternal Monitoring:

Magnesium toxicity is unlikely with the above regimens and magnesium levels do not need to be routinely measured (see Toxicity section for indications when levels should be monitored). However, it is important to warn the mother that magnesium can make her feel flushed and this can be unpleasant but it will only happen for a short time period.

Monitoring during the loading dose:

- Pulse, blood pressure, respiratory rate should be performed before starting the loading dose, 10 minutes after the loading dose infusion has started and at the end of the loading dose infusion.
- Observe for adverse effects.
- Stop the infusion and call for medical assessment if
    - respiratory rate decreases more than 4 breaths per minute below baseline, or is less than 12 breaths per minute
    - Diastolic blood pressure decreases more than 15 mm Hg below baseline level

Maintenance infusion:

- Observe for any adverse effects.
- Pulse, blood pressure, respiratory rate, O2 saturations, patellar reflexes and urine output **4-hourly**
- Stop infusion and call for medical assessment if
    - Respiratory rate is <12 breaths per minute.
    - Patellar reflexes are absent
    - Hypotension occurs
    - Urine output is less than 100ml over 4 hours
- **If on calcium channel blockers (eg nifedipine) or there is evidence of renal impairment, observations must be carried out hourly**

Side Effects of Magnesium Sulphate:

- Intravenous magnesium sulphate is associated with minor maternal side effects such as facial flushing, warmth, nausea and vomiting and headaches.
- Very rarely, hypotension, respiratory depression, muscle weakness and paralysis can occur (see section on toxicity).
- When given in conjunction with calcium channel antagonists, cardiovascular and neuromuscular effects may be exaggerated. Close monitoring is therefore required if used in conjunction with calcium channel blockers (e.g. nifedipine).
- If hypotension occurs, nifedipine and magnesium sulphate administration should cease and urgent medical review requested.
- There is no evidence of an effect on maternal death, cardiac respiratory arrest, pulmonary oedema, respiratory depression, severe postpartum haemorrhage or caesarean section rates.
- There is no association with adverse long-term fetal or maternal outcome in the doses relevant to neuroprotection1. However, there are concerns over longer term administration (5-7 days) and fetal skeletal effects as well as hypocalcaemia and hypermagnesiumaemia in neonates and therefore prolonged use or multiple repeated doses are not advised (ref https://www.gov.uk/drug-safetyupdate/magnesium-sulfate-risk-of-skeletal-adverse-effects-in-the-neonate-followingprolonged-or-repeated-use-in-pregnancy).

Magnesium Toxicity:

- Magnesium toxicity is unlikely with the regimens recommended in these guidelines and serum magnesium concentrations do not need to be routinely measured (RCOG 2006)
- Careful attention to the monitoring guidelines can prevent toxicity. Deep tendon reflexes, respiratory rate, urine output and serum concentrations are the most commonly followed variables.
- If toxicity is suspected, urgent medical review is required.
- The first warning of impending toxicity in the mother is loss of the patellar reflex (plasma concentrations 3.5-5 mmol/L).
- Respiratory paralysis occurs at plasma concentration 5-6.5 mmol/L.
- Cardiac conduction is altered at >7.5 mmol/L and cardiac arrest can be expected when concentrations of magnesium >12.5 mmol/L.
- In women with renal compromise or on calcium channel blockers (eg nifedipine),where the risk of toxicity is increased, closer observation is required
- **Calcium gluconate 1g (10 ml of 10% solution)** slowly via intravenous route over 10 minutes is the antidote for magnesium toxicity.

Drug Protocol for Magnesium Sulphate (MgS04) for Neuroprotection:

How to prepare LOADING DOSE (4g over 15 mins).

- Add **8ml** of 50% Magnesium Sulphate to **42ml** 0.9% Normal Saline, to make a total of 50ml (concentration 1g = 10ml, therefore 4g bolus).
- **Give infusion at 300ml/hr**. All solution should be administered in 15 mins.

How to prepare MAINTENANCE DOSE (commence immediately after loading dose).

- Add **10ml** of 50% Magnesium Sulphate solution to **40ml** 0.9% Normal saline, to make a total of 50ml (concentration 1g = 10ml).
- **Infuse at 10ml/hr** = 1g/hr.
- Discontinue after birth or at 24hrs, whichever is sooner.
- A Trust IV drug additive label must be completed and attached to the syringe, not obscuring the scale. This label must be visible at all times.

Serum Magnesium levels

- These should NOT be routinely taken. D/W Consultant.
- In the presence of renal compromise e.g. oliguria, or rising urea and creatinine.
- Muscle weakness / paralysis.
- Symptoms suggestive of magnesium toxicity.

Cardio-respiratory arrest

- Dial 2222 and crash bleep team.
- Stop Magnesium Sulphate infusion (and nifedipine if relevant).
- Intubate and ventilate if appropriate.
- Administer 10ml 10% Calcium Gluconate IV.

Appendix 3: Low molecular weight heparin dosing in pregnancy

Prophylactic dose in pregnancy

Maternal Weight	Enoxaparin
<50kg	20mg/daily
50-90kg	40mg/daily
91-130kg	40mg BD or 60mg daily
131-170kg	40mg BD or 80mg daily
>170kg	0.6mg/kg/day (can be given in divided doses)
High prophylactic dose for women weighing 50-90kg	40mg/BD

In renal impairment, use lowest dose, monitor and adjust based on Anti-Xa levels and discuss with Haematologist

Therapeutic dose in pregnancy

Maternal weight	Enoxaparin
<50kg	40mg BD
50-69kg	60mg BD
70-89kg	80mg BD
90-109kg	100mg BD
110-125kg	120mg BD
>125kg	Discuss with haematologist