

**SOP for Management** **of and timing of delivery in COVID-19 or suspected COVID-19 positive women with significant respiratory compromise**

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***Approved date:***

***Based on Birmingham Women’s Hospital SOP and RCOG guidance (originals can be accessed through the network email from*** [***England.midsmatneocovid19@nhs.net***](mailto:England.midsmatneocovid19@nhs.net)***)***

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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, 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.

**Within Maternity Unit:**

If oxygen saturations are ≤94% on air or requiring supplemental O2 to maintain sats >94% OR the respiratory rate is ≥ 30/min OR there is radiological evidence of pneumonia: (*see Appendix A: 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 / neonatologist. If specific respiratory input required phone **Markham Ward (2429)** where a respiratory consultant will be present **8am-4pm daily**. Outside these hours please discuss with Consultant on call for General Medicine
* If **34+0 weeks or more**, 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+0 – 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 transfer of care outwith the maternity unit is indicated for ongoing respiratory support consider delivery prior to transfer, with MgSO4 cover for fetal neuroprotection (see Appendix B), irrespective of steroid status (do not delay indicated delivery for steroid administration).
* **23+0 - 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 out of the Maternity Unit (HDU/ITU/Markham) :

ED / medical wards must notify the 989 bleep holder and / or the O&G consultant on call through Switchboard of all pregnant women admitted with signs or symptoms suggestive of COVID-19 OR are positive for COVID-19 . The following information must be given to the on call consultant who will then liaise and pass the information on to the Labour Ward Co-ordinator:

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

The responsibility if the consultant obstetrician on call is:

* Daily review of any pregnant woman with suspected/confirmed Covid-19 and liaison with the consultant intensivist on call (bleep 837) if the woman is on HDU or ITU/ obstetric anaesthetist on call (bleep 010) if she is in another part of the hospital
* Viability will be checked daily during the obstetric review
* These women are at increased risk of VTE and should be prescribed LMWH prophylaxis unless contraindicated. If LMWH contraindicated use TEDS, or if the woman is post surgery, TEDS should be used in addition to LMWH.
* All pregnant woman with COVID-19 discharged antenatally will require 4 weeks of prophylactic LMWH following discharge, and for those diagnosed around the time of birth they will require 6 weeks of postanatal LMWH for VTE prophylaxis (see Appendix C)

NB – 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:

If oxygen sats ≤94% on air or requiring supplemental O2 to maintain sats >94% OR the respiratory rate is ≥ 30 OR there is radiological evidence of pneumonia:

* Consultant level MDT discussion with obstetrician / anaesthetist / neonatologist / respiratory physician/intensivist.
* If **34+0 weeks or more**, 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+0 – 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) – the respiratory physician/intensivist may be resistant to this but this is NICE and WHO guidance. If intubation / ventilation is being considered, deliver with MgSO4 cover for fetal neuroprotection (Appendix B), irrespective of steroid status (do not delay indicated delivery for steroids).
* **23+0 - 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 (Appendix B).
* **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 and the on call intensivist for ITU-19 (bleep 837) and individualized clinical parameters 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/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 Birmingham 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 – Appendix B).

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. This will require specific liaison with Steve Smith or Indranil Dutta.

* + 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.

**Thromboprophylaxis :**

* All pregnant women admitted with COVID-19 infection (or suspected COVID-19 infection) should receive prophylactic dose LMWH, unless birth is expected within 12 hours .There is a risk not only of pulmonary embolus but also pulmonary thrombosis and DIC.

***NB. Tranexamic acid is contraindicated in DIC***

* Check coagulation screen and D- Dimer on admission as a baseline.
* Where women with complications of COVID-19 are under the care of other teams, such as intensivists or acute physicians, the appropriate dosing regimen of LMWH should be discussed with consultant obstetrician and a local VTE expert (Peter Toth or other Haematologist). Use usual LMWH thromboprophylaxis (see RCOG guidance) in pregnant COVID inpatients if there is no absolute contraindication for anticoagulation  and PLT > 30-50G/l. Using higher (intermediate, treatment ) doses of LMWH as thrombosis prophylaxis  is not recommended routinely but may need to be considered for individual patients. If contraindication or PLT <30-50G/l consider mechanical thrombosis prophylaxis.
* If the woman is post -surgery, TEDS should be used in addition to LMWH.
* Following birth, women should be risk assessed for VTE and the first dose of LMWH administered as soon as possible after delivery provided there is no postpartum haemorrhage and regional analgesia has not been used. Where regional analgesia has been used, LMWH can be administered 4 hours after the last spinal injection or removal of the epidural catheter
* Maintain high index of suspicion for VTE in pregnant COVID patients. The diagnosis of PE should be considered in women with chest pain, worsening hypoxia (particularly if there is a sudden increase in oxygen requirements) or in women whose breathlessness persists or worsens after expected recovery from COVID-19.
* All women admitted to hospital with COVID-19 infection should receive at least 10 days   of prophylactic LMWH following discharge from hospital (RCOG). Consider extending this on a case by case basis  based on repeated postnatal VTE risk assessments ( 4-6 weeks may be appropriate)

***Appendix A***

**Triggers for escalating care/referral in obstetric COVID-19 positive / suspected COVID-19 positive patients who require admission**

Does the patient have a history of any of the following?

* Organ transplant
* Cardiac condition
* Severe lung condition eg severe asthma
* A condition which leaves her prone to infections
* On Immunosuppressants
* Blood or bone marrow malignancy eg leukaemia

Admit to HDU for hourly obs incl. SaO2 Monitor fluid balance to maintain neutral balance – remember insensible losses which may be high

Admit to WHU (COVID bay) / CBC for 4 hourly obs & hourly RR & SaO2

Monitor fluid balance to maintain neutral balance – remember insensible losses which may be high

**YES**

**NO**

If SaO2 on air ≤94% or needing supplemental O2 to maintain > 94%

OR

RR ≥30

OR

Radiological evidence of pneumonia

**Needs consultant obstetrician +/- consultant anaesthetist review**

**Does the patient have any of the following?**

SaO2 on air ≤94% or needing supplemental O2 to maintain > 94%

OR

RR ≥30

OR

Radiological evidence of pneumonia

**YES**

**NO**

**Continue with care on CBC / WHU COVID Bay**

**Is Delivery Indicated?**

**YES**

**NO**

**Contact appropriate Respiratory physician to discuss transfer / review (Markham ext 2429 0800-1600) – if ventilation required contact ITU consultant on bleep 837**

**Follow COVID Delivery SOP**

**The following indicate significant deterioration and require immediate escalation to consultant obstetrician, consultant obs anaesthetist and rapid referral to ITU consultant via bleep 837 or Respiratory Consultant on call depending on clinical status (ext 2429 0800-1600 or on call med consultant out of hours**

**•Oxygen saturation ≤ 94% on FiO2 50% (or 6l/min via Hudson mask) or**

**•A respiratory acidosis (pH < 7.3) or**

**•A decreased conscious level**

***Appendix B***

**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
* See below for details

**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.

**Loading dose**:

* Pulse, blood pressure, respiratory rate should be performed before the loading dose, 10 minutes after loading dose infusion has started and at the end of the loading dose infusion (15 minutes)
* Observe for adverse effects (see below)
* Stop 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; or 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 less than 12 breaths per minute; if patellar reflexes are absent, if hypotension occurs or if urine output is less than 100ml over 4 hours
* If on calcium channel blockers (eg nifedipine) or evidence of renal impairment, observations must be carried out hourly

**Side Effects**

* 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 (eg nifedipine).
* If hypotension occurs, nifedipine and magnesium sulphate administration should cease and urgent medical review requested.

**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 at plasma concentrations between 3.5 and 5 mmol/L. Respiratory paralysis occurs at 5 to 6.5 mmol/L. Cardiac conduction is altered at greater than 7.5 mmol/L, and cardiac arrest can be expectedwhen concentrations of magnesium exceed 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

**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-**](http://www.gov.uk/drug-safetyupdate/magnesium-sulfate-risk-of-) **skeletal-adverse-effects-in-the-neonate-followingprolonged-or-repeated-use-in-pregnancy).**