# Guidelines on the Management of COVID-19 in Obstetrics

Updated on 24th February 2022

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A. Introduction

All pregnant mothers and household contacts are recommended to be fully vaccinated and to have had their boosters administered before or during pregnancy.

This should be taken at any opportunity, without delay and healthcare professionals should encourage all pregnant and lactating mothers to complete their vaccination and booster doses as to reduce ICU admissions and deaths.

COVID-19 positive patients should be managed as per best evidence by a team of experts. All COVID-19 positive patients should be assessed at the CAC if pregnant or unwell and guidelines should be strictly adhered.

Physical distancing, appropriate masking and hand hygiene remains imperative.

While Malaysia is in the midst of the Omicron wave which is expected to peak in the next few weeks, this update on the management of COVID-19 among pregnant and breastfeeding mothers is timely.

Although the maternal and fetal implications of the highly infective Omicron strain among pregnant and lactating mothers continues to be evaluated, the delta strain was associated with significant maternal and fetal implications where one in seven symptomatic mothers infected with the delta strain required ICU admissions.

41% of the total maternal deaths in Malaysia for 2021 was directly due to severe COVID-19 infections with a total of 191 maternal deaths which remains a global concern. Most common comorbidities associated with COVID-19 maternal infection were obesity and Diabetes Mellitus.

There were no congenital anomalies, while the risk of vertical transmission was low but the incidence of stillbirth among infected mothers was almost increased by two fold while there was a two to three fold increase in the risk of iatrogenic preterm deliveries.

The MOH COVID-19 vaccination in pregnancy guidelines November 2021 recommends the booster dose for all pregnant mothers as an essential initiative to flatten the Omicron curve and this recent update is based on updated information with regards to the evolving science related to COVID-19.

Evidence-based, multi-professional approach is essential and shared decision-making is central to the management of COVID-19 mothers. Life-saving interventions should not be withheld in pregnancy and breastfeeding.
Progression from pandemic to endemic: Facing Omicron variant.

Although individual risk for severe disease with Omicron is lower than with other variants, the high number of associated cases can still result in high numbers of hospitalizations and excess burden on the health care system.

Optimization of health resources is essential to reduce the stress to the health systems.

Since first reported in November 2021, as of to date, Omicron accounted for the majority of new infections in most of the country including Malaysia.

Omicron appear to have higher rate of replication than Delta variant, making it more infectious and higher risk of reinfection in individual previously infected with a different strain.

Observational data suggest that the risk of severe disease with Omicron infection is lower than with other variants.

The reduced risk for severe disease however may reflect partial protection conferred by prior infection or vaccination, hence emphasis on completing vaccination and booster dose should continue to be a major strategy in dealing with the infection especially in pregnancy.

In dealing with possible high number of patient requiring hospitalization, individual O&G department, together with other relevant discipline such as infectious disease physician, PKRC, CAC and Primary Health Care Team should have an agreed admission policy in order to optimize resources such as hospital bed and manpower.

The policy should be based on available national guidelines and may be modified in tandem with unique problems and situations faced by local hospital or institution.
B. General Advice for Pregnant and Lactating Mother

Although vaccination reduces the incidence of hospital admissions and deaths, it does not prevent infections. Physical distancing, appropriate masking and hand hygiene remains imperative.

It is important that all pregnant mothers, their household and close contacts adhere to the MOH recommendations on physical distancing, wearing a mask and maintaining hand hygiene.

If anyone in the household or close contacts are confirmed to be positive for COVID-19, it is important for them to self-isolate from others, especially pregnant mothers. If pregnant mothers are symptomatic or have significant contact, it is important to be tested, diagnosed early and appropriately risk stratified.

Routine supplementation of Vitamin C or Vitamin D to prevent COVID-19 infection is not recommended, although it has been used in patients who have been confirmed positive. No other additional supplements have been proven to be beneficial.

C. Home Monitoring of COVID-19 Pregnant Mothers

All newly-diagnosed pregnant mothers with COVID-19 should be risk stratified at physical CAC to identify the most appropriate monitoring facility.

All women who are planned for home quarantine should be given advice on red flag signs, are able to utilize the Home Assessment Tool and know when to seek help.

This updated guideline is based on current COVID-19 surge which is presumably due to Omicron variant with less severe disease. This variant is still likely to be associated with adverse outcomes especially in unvaccinated pregnant women.

Cases of COVID-19 pregnant mother of Hospital Sungai Buloh and Hospital Ampang were analyzed to produce the following recommendation. (new Feb 2022)

COVID-19 pregnant mothers can be either managed in hospital (or low risk quarantine centres), if these facilities are available, according to local arrangement) or at home with monitoring, according to criteria and situation.
There are 2 entry points of recruitment for home quarantine: *(new Feb 2022)*

a) **Direct recruitment**: category 1 & 2a and fulfilling criteria – direct recruitment from CAC or PAC (walk-in patients / incidental COVID-19 patients)

b) **Early discharge of admitted COVID-19 patients**: category 2b / 3 patients who have improved clinically, stable for 24 hours with optimized comorbidities and fulfilling criteria.

1. **Direct recruitment for home quarantine**

The criteria for direct recruitment for home quarantine of COVID-19 pregnant mothers are:

- **Category 1 or Category 2A**
- **Vaccinated (fully or partial) (new Feb 2022)**
- **Stable medical & obstetric co-morbidities (e.g. pre-existing diabetes mellitus, chronic hypertension, etc. *Note: this list is NON-EXHAUSTIVE) (new Feb 2022)**
- **BMI < 35 kg/m2 at booking**
- **No obstetrics complaints (e.g. hyperemesis gravidarum /per vaginal bleeding / reduced fetal movements, etc)**
- **Does not require thromboprophylaxis. COVID-19 infection is a transient risk factor and VTE assessment must be performed (appendix 2).**
- **Absence of RED FLAG SIGNS**
- **Adequate understanding and adherence to protocol**
- **Able to contact nearest healthcare facility and easily accessible in emergency situation**
- **Contactable at all times**

Identified patients for home monitoring will be briefed on *Surat Perintah Pengasingan Atau Pengawasan Orang Yang Dijangkiti Penyakit Coronavirus 2019 (COVID-19)* (Annex 14c) / digital HSO and *Borang Pelepasan Dari Menjalani Pengasingan Atau Pengawasan* (Annex 17a). Patients will be provided with and briefed regarding Home Assessment Tool (appendix 1).
There are various methods of monitoring, including digital health apps (e.g. MySejahtera, SELangkah) Google Form, Home Assessment Tool form (appendix 1) and phone calls. The most suitable method should be whatever is available and the best for the local setting.

Patients who do not fulfill the Home Quarantine criteria should be ideally admitted to hospital, unless an alternative arrangement can be made, according to situation and local setting (such as PKRC).

2. Early discharge of suitable patients for home quarantine (new Feb 2022)

Patients may also be discharged early for home quarantine from the ward after stabilization, with clinical improvement and remained stable for at least 24 hours (no red flags, afebrile, stable co-morbidities, no obstetric or gynecological issues).

Postpartum women who are well and stable for at least 24 hours can be discharged as usual, for Home Quarantine if isolation period has not been completed.

Arrangement must be made to ensure that discharged patients who require thromboprophylaxis are able to continue it at home.

Category 3 and below patients who have been admitted to hospitals and have improved clinically can be considered for early discharge for home quarantine if they fulfil these criteria:

- Vaccinated
- 6-minute walk test and SpO2 above 95%
- Stable for at least 24 hours (afebrile / no red flag symptoms)
- Obstetrics co-morbidities are stable

If in doubt, consult medical / ID colleague.

This guideline for home monitoring of COVID-19 pregnant mothers may be modified according to local settings and resources.
a. General advice for home quarantine patients and caregivers

i. Compliance to home assessment tool
ii. Basic infection prevention control measures such as cough etiquette and hygiene including the need to sanitize bathroom with soap and water after each use if it a shared bathroom
iii. Self-monitoring: symptoms / temperature / oxygen saturation / pulse rate
iv. Continuation of prenatal vitamins & supplements
v. To contact nearest health care facility if urgent medical/obstetric issue
vi. RED FLAGS and importance of seeking immediate attention

b. Pathway for emergency cases of home quarantine patients

If there are any urgent obstetric issues that develop within this isolation period, these patients should be managed according to MOH guidelines and retrieval should be arranged by the nearest health care facility to the nearest Hospital. Similarly, any escalation of patient’s covid symptoms should be referred to the nearest hospital. Patients can reach hospital either by themselves, Rapid Response Team from PKD or MECC Ambulance Call / Obstetric Retrieval Team.

c. Home monitoring including Home Assessment Tool

Local hospital and PKD must have an agreement on the method of monitoring during home quarantine for COVID-19 pregnant mothers before home quarantine is allowed. Proper passing over of patients from hospital to PKD must be carried out to ensure continuity of care.

A dedicated Home Monitoring team for COVID-19 pregnant mothers must be established at local level. This is to ensure safe and appropriate monitoring of pregnant and postpartum mothers with COVID-19.

In general, the management of pregnant patients with COVID-19 should be the same for non-pregnant patients.

However, If she has any obstetrics or gynaecological complaints (e.g. hyperemesis, miscarriage, severe pre-eclampsia, PPROM / PROM, reduced fetal movements, in labour, etc), she should be treated like any other pregnant patient, whilst taking additional COVID-19 precautions (PPE, treatment, etc).
# HOME QUARANTINE
## STANDARD OPERATING PROCEDURE

1. Able to adhere to Standard Operating Procedures:
   a. Stay home, maintain physical distance with other household members, limit movements in the house and avoid visitors;
   b. Comply with basic preventive measures e.g. wear face mask, regular hand washing, and practice cough etiquettes;
   c. Report health status daily through MySejahtera/ attend phone calls from health care provider; and
   d. Separate eating utensils, tableware (fork, knife, plate etc.), towels for their personal use.

2. Caregiver might be needed for certain COVID-19 patients who will be monitored at home. Ideally, a caregiver should be healthy and vaccinated. They must observe strict hygiene practices to avoid becoming infected. They should be able:
   a. To help patient follow instructions for self-care;
   b. To assist patient in reporting HAT in My Sejahtera
   c. To ensure patient have meals, stay hydrated and get sufficient rest;
   d. To clean and disinfect areas frequently used or touched by the patient e.g. door knobs, bathroom; and
   e. To call CAC for consultation or 999 if patient’s condition deteriorates.

3. The following conditions are necessary to ensure a safe home monitoring:
   a. Have access to telephone and contactable all the time;
   b. Able to adhere to home isolation
   c. Personal transport available to bring patient from their home to the clinic/ hospital (avoid using public transport); and
   d. Visitors should not be allowed in the home.

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## RED FLAG SIGNS

- Fever more than 2 days
- Reduced level of consciousness
- Dehydration / Not passing urine for more than 8 hours
- Unable to ambulate without assistance
- SPO2 less than 95% (at rest or after exertion)
- Chest pain
- Per vaginal bleeding
- Persistent abdominal pain
- Leaking of liquor
- Show
- Reduced fetal movement
Flowchart for home monitoring of COVID-19 pregnant mothers *(new Feb 2022)*

Start

Positive COVID-19 Pregnant Mothers

COVID-19 Category 1 / 2A

Assessment at CAC

Yes

Fulfill Home Quarantine Criteria

Issue Home Quarantine Order by CAC

Home Quarantine Monitoring by PKD

Worsening of symptoms

Pass Over case to PKD

* subject to local arrangement and resources

** local hospital and PKD must agree on home quarantine monitoring method before home quarantine is allowed

No

COVID-19 Category >2B

Assessment by Hospital O&G Team

Clinically safe and suitable for Home Quarantine

Yes

Admit Hospital / PKRC

No

Issue Home Quarantine Order by Hospital
D. Safety of imaging in pregnancy

- Imaging is an important adjunct to facilitate diagnosis and guide management.
- Fetal radiation dose of <50mGy is considered safe and does not cause any harm.
- Ultra-low-dose HRCT can be reliably used during the COVID-19 pandemic to reduce the hazards from radiation exposure. Its sensitivity exceeds 90%.

<table>
<thead>
<tr>
<th>Gestational age (weeks)</th>
<th>Effects of &lt;50mGy</th>
<th>Effects of 50-100mGy</th>
<th>Effects of &gt;100mGy</th>
<th>Estimated threshold dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>50-100mGy</td>
</tr>
<tr>
<td>3-4</td>
<td>None</td>
<td>Probably none</td>
<td>Possible miscarriage</td>
<td>50-100mGy</td>
</tr>
<tr>
<td>5-10</td>
<td>None</td>
<td>Uncertain</td>
<td>Possible congenital anomalies, IUGR</td>
<td>200-250mGy</td>
</tr>
</tbody>
</table>
| 11-17                  | None              | Uncertain            | Risk of diminished IQ, microcephaly | 60-310mGy  
|                        |                   |                      | 25 IQ point loss per 1000mGy |             |
| > 18 weeks             | None              | None                 |                   |                          |

<table>
<thead>
<tr>
<th>TYPE OF EXAMINATION</th>
<th>FETAL RADIATION DOSE (mGy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low dose examination (&lt;0.1mGy)</td>
<td></td>
</tr>
<tr>
<td>Chest X-ray (two views)</td>
<td>0.0005 - 0.01</td>
</tr>
<tr>
<td>Low to moderate dose examination (0.1–10 mGy)</td>
<td></td>
</tr>
<tr>
<td>Chest CT or CT pulmonary angiography (CTPA)</td>
<td>0.01 - 0.66</td>
</tr>
<tr>
<td>High resolution CT thorax Low dose protocol</td>
<td>1.6 ± 0.3</td>
</tr>
<tr>
<td>Ultra-low dose protocol</td>
<td>1.1 ± 0.3</td>
</tr>
<tr>
<td>Low-dose perfusion scintigraphy</td>
<td>0.1 - 0.5</td>
</tr>
<tr>
<td>Pulmonary digital subtraction angiography (DSA)</td>
<td>0.5</td>
</tr>
<tr>
<td>Higher dose examination (10–50 mGy)</td>
<td></td>
</tr>
<tr>
<td>Abdominal CT</td>
<td>1.3 - 35</td>
</tr>
<tr>
<td>Pelvic CT</td>
<td>10.50</td>
</tr>
</tbody>
</table>
E. Cessation of Aspirin Among Mothers with Thrombocytopenia

- Aspirin, when started for preeclampsia prophylaxis, should be withheld in women with COVID-19 and moderate or severe thrombocytopenia (<100 x 10^9/L)

In 2003 when the first SARS outbreak occurred, thrombocytopenia was reported in 20-55% of patients. In comparison, 5-42% of patients with COVID-19 were reported to have thrombocytopenia, which were typically mild (100-150 x 10^9/L).

The incidence is higher in severe COVID-19 where 58-95% of patients have thrombocytopenia, with the average platelet count approximately 30 x10^9/L lower than non-severe cases.

It has been suggested that SARS-CoV-2-associated thrombocytopenia has several distinct causes, due to increased platelet destruction and impaired production.

These include including disseminated intravascular coagulation, pulmonary tissue and capillary damage and reduced hematopoiesis from an infected marrow.

Prophylactic administration of low-dose aspirin in pregnancy is common for those at risk of preeclampsia and those with anti-phospholipid syndrome.

Concerns have arisen in women with COVID-19 infection as it results in thrombocytopenia and therefore, risk of bleeding.

In addition, observational studies have shown that non-steroidal anti-inflammatory drugs (NSAIDS) can alter intrinsic neutrophil function, delay resolution of inflammation and cause progression of pulmonary disease (pleuropulmonary complications such as empyema, excavation or abscess).

However, these were largely in non-pregnant patients, involved bacterial infections and non-aspirin NSAIDS.

The guideline committee is in the opinion that aspirin prescribed for preeclampsia prophylaxis should be withheld in pregnant women with SARS-CoV-2 and moderate to severe thrombocytopenia (<100 x 10^9/L). This may be restarted once women have recovered from the disease (for simplicity, completed quarantine period).
F. VTE Risk Assessment of COVID-19 Mothers and Update on Thromboprophylaxis

- VTE risk assessment should be done for all pregnant women routinely at the CAC.
- Interval VTE assessment is required during in-patient care. In the event of deterioration, treatment should be escalated, with a low threshold to exclude pulmonary embolism.
- Anti-coagulation therapy during labour and delivery should be managed as per standard obstetric protocol.
- High prophylactic or treatment dose of LMWH is NOT routinely recommended for severe COVID-19 infection. However, the threshold for starting treatment dose should be low where pulmonary embolism is suspected.

Normal physiological changes in pregnancy result in alteration of maternal blood volume and reduced fibrinolysis.

This hypercoagulable state coupled with the microthrombotic nature of COVID-19, makes pregnant mothers susceptible to venous thromboembolism (VTE).

All pregnant women should have an individualized risk stratification for VTE by using the VTE risk scoring table at COVID-19 Assessment Centres (CAC), regardless if she requires home quarantine or admission to a health facility.

This is consistent with the MOH “VTE in Pregnancy and Puerperium” guidelines published in 2018. In healthcare facilities without diagnostic imaging services, where the suspicion is high for a thromboembolic event, the patient should be treated with therapeutic doses of LMWH while awaiting further management.

Thrombocytopenia is observed in 5-42% of pregnant women with COVID-19 infection but only a small subset is severe enough to cause concern with routine thromboprophylaxis.
Annex 23a

Non-pregnant patients with critically-ill COVID-19 infection who were started on therapeutic/treatment dose of LMWH have not shown to have better outcomes. There was no greater probability of survival to hospital discharge or number of days free of cardiovascular or respiratory organ support than those given prophylactic doses. Therefore, the previous recommendation has been revised in this guideline.

In contrast, subgroup analysis of the same trial showed benefit of starting treatment doses in moderately-ill patients; organ support-free days with therapeutic dosing versus prophylactic dosing (80 versus 76 percent; OR 1.27, 95% CI 1.03-1.58).

This difference barely crossed the threshold for statistical significance and there were no other benefits such as reduction in thrombotic events or survival to hospital discharge.

Interestingly the risk of bleeding was 1.9% vs 0.9% in women who received therapeutic compared to prophylactic dose respectively, although this did not achieve statistical significance.

In the INSPIRATION trial, 600 patients with critical COVID-19 in the ICU did not show improvement in the composite outcome of mortality, ECMO use or thrombosis when escalated to high prophylactic dose compared to standard doses of enoxaparin.

<table>
<thead>
<tr>
<th>Category of disease</th>
<th>Quarantine location</th>
<th>VTE score</th>
<th>LMWH dose</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1 &amp; 2</td>
<td>Home / CAC / PKRC</td>
<td>1</td>
<td>LMWH if VTE score is ≥ 3</td>
<td>Based on VTE score</td>
</tr>
<tr>
<td>Category 1 &amp; 2</td>
<td>Hospital admission</td>
<td>3</td>
<td>Prophylactic dose</td>
<td>From admission till at least 10 days post discharge</td>
</tr>
<tr>
<td>Category 3 &amp; above</td>
<td>Hospital admission</td>
<td>3</td>
<td>Prophylactic dose</td>
<td>From admission till at least 10 days post discharge</td>
</tr>
</tbody>
</table>
G. Steroids for COVID-19 Mothers and Steroids for Fetal Lung Maturity

- Pregnant women who require steroids for other medical conditions, including inhalational steroids, may continue their use.
- If steroids are indicated for obstetric reasons in addition to COVID-19 infection, dexamethasone is appropriate.
- If steroids are not required for obstetric reasons, oral prednisolone or hydrocortisone can be considered.

Pregnant women with medical comorbid may have been on steroids prior to SARS-Cov-2 infection and this should not be ceased abruptly, especially if women have been on long term steroids.

In RECOVERY, a multicenter, open-label trial in the United Kingdom, hospitalized patients with COVID-19 were randomized to receive either dexamethasone plus standard of care or standard of care alone (control arm).

In the subgroup of participants who did not require supplemental oxygen at enrollment, no survival benefit was observed for dexamethasone; 17.8% of participants in the dexamethasone arm and 14% in the control arm died within 28 days of enrollment (rate ratio 1.19; 95% CI, 0.91–1.55).

In this trial, low-dose dexamethasone (6 milligrams) reduced mortality by up to one-third among COVID-19 patients on mechanical ventilation and one-fifth among those who received supplemental oxygen.

Pregnant women in this trial received either oral prednisolone or intravenous hydrocortisone. Unlike dexamethasone, prednisolone and hydrocortisone are extensively metabolized in the placenta with minimal transfer to the fetus.

While the neonatal benefits of fluorinated antenatal corticosteroids are well-established when administered to women at risk of imminent preterm birth, exposure to repetitive doses of steroids is associated with adverse neonatal outcomes.

Furthermore, the WHO REACT meta-analysis, which included data from the RECOVERY trial, suggested that the benefit of glucocorticoid was a class effect. However, it did not specifically recommend any steroid regimen for pregnant women with COVID-19.

The Royal College of Obstetricians and Gynaecologists (RCOG) suggest that corticosteroid therapy should be considered for 10 days or up to discharge, whichever is sooner, for women who are unwell with COVID-19 and requiring oxygen supplementation or ventilatory support. The following steroid regimen was proposed:
<table>
<thead>
<tr>
<th>Type of steroid</th>
<th>Plasma half-life (min)</th>
<th>Biological half-life (hours)</th>
<th>Glucocorticoid potency</th>
<th>Mineralocorticoid potency</th>
<th>Placental transfer (%)</th>
<th>Maternal-fetal ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocortisone</td>
<td>90</td>
<td>Short acting (8-12)</td>
<td>1</td>
<td>1</td>
<td>15</td>
<td>6.7:1</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>200</td>
<td>Intermediate acting (12-36)</td>
<td>4</td>
<td>0.8</td>
<td>10-12.5</td>
<td>8-10 : 1</td>
</tr>
<tr>
<td>Methylprednisolone</td>
<td>180</td>
<td>Intermediate acting (12-36)</td>
<td>5</td>
<td>0.5</td>
<td>44</td>
<td>2.24 : 1</td>
</tr>
<tr>
<td>Dexamethasone</td>
<td>200-300</td>
<td>Long acting (36-54)</td>
<td>20-30</td>
<td>0</td>
<td>50</td>
<td>2 : 1</td>
</tr>
<tr>
<td>Betamethasone</td>
<td>300</td>
<td>Long acting (36-54)</td>
<td>20-30</td>
<td>0</td>
<td>33</td>
<td>3 : 1</td>
</tr>
</tbody>
</table>

If steroids are indicated for obstetric reasons (fetal lung maturity)

- IM dexamethasone 6mg 12 hourly for 4 doses then oral prednisolone 40 mg OD or IV hydrocortisone 80mg BD
- For 10 days or until discharge, whichever is sooner

If steroids are not indicated for obstetric reasons (fetal lung maturity)

- Oral prednisolone 40mg OD or IV hydrocortisone 80mg BD
- For 10 days or until discharge, whichever is sooner
H. Update on Other Medication

1. Safety of tocilizumab in pregnancy

**Tocilizumab is safe in pregnancy. If unavailable, consider Baricitinib as an alternative.**

The REMAP-CAP trial was an essential trial which showed improved outcomes and survival among critically ills patients being given interleukin 6 receptor antagonist, namely tocilizumab and sarilumab. It remains a targeted therapy among patients with clinical evidence of a cytokine storm.

The UK teratology information service guidelines on the use of tocilizumab in pregnancy recommends no evidence related to tocilizumab with regards to teratogenicity and fetal toxicity.

It was widely being used among patients with rheumatoid arthritis in pregnancy. The global safety database for the use of tocilizumab in pregnancy showed no association with teratogenicity even if used in the first trimester.

However, in resource-limited settings where access to tocilizumab may be limited or not available, the alternative option of Baricitinib can be used if deemed essential as the pregnant mother should not be denied a lifesaving medication or intervention.

2. Remdisivir in pregnancy

Remdesivir, a RNA polymerase inhibitor inhibits the replication of SARS-CoV-2 and has in recent times showed some promise as a potential treatment for COVID-19 patients.

Beigel et al demonstrated that a ten-day course of intravenous Remdesivir was associated with a shortened time to recovery and hospital discharge compared with placebo. It was also associated with a lower mortality rate with adverse outcomes which are similar to placebo.

The FDA, in May 2021 has approved the use of Remdesivir among hospitalised children and adults. A single centre outcomes among 41 pregnant who were given early remdesivir administration was associated with lower rates of ICU admission, reduced progression to critical disease and reduction in the duration of hospitalization.
Although the evidence continues to evolve and while data on the safety of remdisivir in pregnancy is hugely anticipated, Remdisivir can be considered as an option in the management of COVID-19 pregnant mothers especially when the multidisciplinary team perceives that the benefits of this antiviral outweighs the lack of safety data in pregnancy which is still in clinical trials at the time of writing.

3. Monoclonal antibody in pregnancy

Monoclonal antibodies can be considered for unvaccinated pregnant and lactating mothers who are infected by COVID-19 and unwell.

4. Medications which should not be used in the treatment of COVID-19

The following medications have been shown to be ineffective in improving outcomes in COVID-19 and should not be used solely for its management:

- Hydroxychloroquine
- Lopinavir or ritonavir
- Ivermectin
I. Prone Positioning of Pregnant Mothers

Pregnant mother can be nursed in a prone position, with certain modifications, without the immediate need for delivery.

The benefits of prone positioning among selected group of COVID-19 mothers have been established and remains a standard of care. Pregnancy is not an absolute contraindication for this positioning and delivery should not be performed solely to facilitate prone positioning.

1. Prone positioning of an awake mother

https://www.youtube.com/watch?v=7orutHYuXFQ

2. Prone positioning of an intubated mother

https://www.youtube.com/watch?v=SOgwakxeyXE
J. Delivery of COVID-19 Pregnant Mothers

1. Delivery in ill obstetric patients

- The decision for delivery in pregnant women with COVID-19 is complex and should involve consultants across various specialties, namely obstetricians, intensivist, anaesthetist, infectious diseases specialist and paediatrician.

- Expedient delivery may be indicated in women with increasing ventilatory requirements especially if the managing team perceives that the cardiorespiratory benefits following delivery is far beneficial to the mother as compared to the benefits of prolonging the pregnancy.

- Resuscitative hysterotomy (perimortem caesarean section) should be considered in maternal collapse due to COVID-19.

Generally, timing of delivery should be determined by obstetric indications rather than the diagnosis of COVID-19. However, in ill pregnant women, such decisions are complex, involves many clinical variables yet may have to be made within a short period of time. Therefore, it is recommended that these decisions are multidisciplinary, involving the consultant obstetrician, anaesthetist, infectious disease physician and paediatrician, amongst others, in addition to the patient’s family. Appendix 3 shows the process flow chart of intrapartum care of COVID-19 mothers.

It is also recognized that severely ill women beyond the age of viability with increasing ventilatory requirements may benefit from early delivery. These include women with severe hypoxemia unresponsive to incremental increases in positive end expiratory pressure (PEEP), prone positioning and/or deep sedation with chemical paralysis.

Care in high-dependency unit (HDU) or intensive care unit (ICU) alone is not an indication for delivery.

Antenatal mothers who have recovered from COVID-19 earlier in pregnancy would require no alteration in their timing of delivery.
2. Surgical considerations during caesarean section

- The senior-most personnel should perform the operation to avoid delays in managing complications due to the additional time incurred by donning of PPEs.
- Tranexamic acid and carboprost can be used to arrest bleeding
- Meticulous haemostasis is essential to reduce postoperative bleeding
- Consider intraperitoneal / subrectus drains and protamine sulphate where appropriate

To avoid potential delays in managing surgical complications, including massive obstetric haemorrhage, the **senior-most personnel available** should perform surgeries in pregnant women with COVID-19. Operating under less than optimal conditions due to these circumstances can make it difficult for less experienced personnel. Consideration has to be given to the time taken for donning of personal protective equipment (PPE) when calling for additional help.

Although there is concern with the prothrombotic state in COVID-19 in addition to the risks conferred by pregnancy itself, **tranexamic acid and carboprost use is not contraindicated** to arrest bleeding. It may be reasonable to avoid routine prophylactic use of tranexamic acid.

Intraperitoneal and subrectus drains may be considered, especially in women on higher than prophylactic dose of heparin and when associated with severe thrombocytopenia. Meticulous haemostasis is essential to reduce the likelihood of post-operative haematoma and additional surgery for wound closure.

Protamine sulphate may be considered where bleeding is due to anticoagulation use. A maximum dose of 50mg protamine sulphate can be used.

<table>
<thead>
<tr>
<th>Time since last UFH dose (min)</th>
<th>Protamine sulfate dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 30</td>
<td>1mg per 100 units heparin received</td>
</tr>
<tr>
<td>30 – 60</td>
<td>0.5-0.75mg per 100 units heparin received</td>
</tr>
<tr>
<td>60 – 120</td>
<td>0.375-0.5mg per 100 units heparin received</td>
</tr>
<tr>
<td>Greater than 120</td>
<td>0.25-0.375mg per 100 units heparin received</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time since last LMWH dose received</th>
<th>Protamine sulfate dose</th>
</tr>
</thead>
</table>
| Less than 8 hours                  | First dose: 1mg per 1mg enoxaparin received  
Second dose: (if required*) 0.5 mg per 1mg enoxaparin received  |
| 8 to 12 hours                      | 1mg per 1mg enoxaparin received  |
| Greater than 12 hours              | Dose may not be necessary  |
3. Vaginal delivery and intrapartum care for patient with COVID-19 infection

All COVID-19 positive mothers should be managed in a dedicated COVID-19 labour room and all staffs managing such patients should at least use a face shield, a N95 mask, gloves and aprons (Subject to local infection control policy).

The labour room should ideally be well ventilated and have dedicated access to the operation theatre and COVID-19 wards.

COVID-19 positive per se is NOT an indication for delivery or a caesarean section unless in the circumstances of abnormal fetal heart rate abnormalities, maternal collapse or mothers with refractory hypoxemia.

The indications for a caesarean section for COVID-19 positive mothers should be determined by obstetric indications rather than the diagnosis of COVID-19.

Elective or planned delivery such as an elective caesarean section or induction of labour should ideally be delayed for at least 5-7 days as to ensure the mother is no longer infective as the risk of transmission via respiratory droplets and platelet dysfunction remains significant during the infective phase of the infection.

The benefits of avoiding elective deliveries should be weighed against the risk of prolonging the pregnancy with close maternal and fetal monitoring and it is important to involve senior obstetricians in the decision making.

Vaginal delivery is NOT A CONTRAINDICATION among COVID-19 positive mothers as labour, especially the second stage of labour is not an aerosol generating procedure.

The risk of vertical transmission has been quoted to be around 4% but despite conflicting evidence, this is perhaps as a consequences of direct respiratory contact rather than via vertical transmission which is unaffected by the mode of delivery.

The mother should wear a mask throughout the labour process and routine fetal monitoring is recommended based on her obstetric risk. COVID-19 positive mothers per se is not an indication for continuous electronic fetal heart monitoring while labour should be managed as per routine.

There is inconclusive evidence with regards to the benefits of active management of labour.

The number of staffs managing such patients should be kept to a minimum.
Maternal observations should include hourly respiratory rate, temperature and oxygen saturations while staffs should be vigilant of red flags such as the need for oxygen requirements, respiratory rate of above 30 per minute, oxygen saturations below 94%, reduction in urine output or drowsiness.

Entonox with a single patient microbiological filter can be used as intrapartum analgesia while it is best to avoid intramuscular opiates which may cause sedation and mask an unwell mother although it is not an absolute contraindication.

Epidural is also not contraindicated unless in the event of moderate to severe thrombocytopenia or a mother who had treatment doses of anticoagulation within the last 24 hours.

A vaginal birth after caesarean section or a GBS positive mother are also not a contraindication while antibiotics should be initiated as per standard obstetric management.

COVID-19 positive mothers per se is not an indication for antibiotics or active management of labour.

Partners and birth companions are however discouraged for mothers who are COVID-19 positive as to reduce the risk of infection.

Routine shortening of the second stage of labour is also not recommended since it is not an aerosol generation procedure but standard infective control measures should be strictly adhered to.

A delayed amniotomy is preferred although internal scalp electrodes are not contraindicated while labour can be augmented as per routine. Delayed cord clamping is also not contraindicated among COVID-19 positive patients.

There is also no evidence that COVID-19 infection can be transmitted to the baby via skin to skin contact while active management of the third stage of labour is recommended and one should be vigilant of the risk of platelet dysfunction and thrombosis which may be significant amount such mothers.

Caesarean section is not without its own risk and hence it is best reserved for mothers with the standard obstetric indications. Although the initial guidelines recommended caesarean section as a preferred option, this was more related to available resources and protection of staffs.

Since the evidence is now clear that the mode of delivery does not affect the risk of transmission while most of the healthcare staffs are now vaccinated and are better equipped with PPE's, the current recommendations is to deliver these mothers vaginally as to limit caesarean section for the standard obstetric indications of fetal heart rate abnormalities or for those with dysfunctional labour.
However, it is recommended for each and every obstetric unit to develop their own intrapartum care plan based on available staffing and resources.

Thromboprophylaxis and breastfeeding should be initiated as per recommendations.

### K. Fetal Optimization

**Consider the use of magnesium sulphate infusion of at least 4 hours for fetal neuroprotection for women up to 31+6 weeks of gestation. Delayed cord clamping is not a contraindication.**

**Antenatal steroids**

Clinical considerations for the use of corticosteroids for fetal lung maturity and treatment of COVID-19 patients requiring oxygen has been explained in the previous section.

**Magnesium sulphate**

Magnesium sulfate therapy is recommended for neuroprotection of the neonate, and should be offered to women up to 31+6 weeks of gestation. The dose is similar to those given for prevention of eclampsia and should ideally be administered for at least 4 hours preceding delivery.

**Delayed cord clamping can be performed as usual during delivery**

There is a theoretical concern that a partially detached placenta in women with infectious diseases could expose the baby to maternal blood leading to microtransfusion to the baby.

However, findings from 405 women with SARS-CoV-2 infection who were enrolled in a prospective observational study where 231 newborns (57.3%) had early cord clamping (ECC) and 172 newborns (42.7%) had delayed cord clamping (DCC) were reassuring. 1.7% of newborns had a positive nasopharyngeal PCR in the first 12 hours postpartum; 2 (1.7%) ECC vs 3 (3.6%) DCC.

This was in spite of a higher proportion of women in the ECC cohort who had skin-to-skin contact and breastfeeding immediately in the postpartum period.
L. **Post-COVID Patients**

Pregnant mothers who recovered from COVID-19 should be assessed within 14 days post discharge. Category 1 & 2 mothers can be assessed at the health clinic while category 3,4 or 5 should be reviewed in the O&G specialist clinic.

Patients who had Category 1 or 2 disease should ideally be assessed within 14 days following discharge in the nearest health clinic to ensure they remain well. A holistic approach looking for possible complications of long or post-COVID syndrome, namely fatigue, pain, fever, cardiovascular, respiratory and psychological implications should be systematically assessed. If there are concerns, they should be referred to the nearest specialist O&G clinic for an early review. A VTE risk assessment is also essential.

Patients who recovered from category 3, 4 or 5 should ideally be reviewed in the O&G specialist clinic within 14 days from discharge. Although there are no specific fetal implications, assessing for complications such as thromboembolism, organizing pneumonia, secondary infections or breathlessness are part of a holistic approach to detection of long-COVID syndrome (refer Appendix 4: Flow chart for Follow up of long COVID-19 patients).
M. Management of Unvaccinated Pregnant and Lactating Mothers

Adults who are unvaccinated or who refuse COVID-19 vaccination and boosters are at an increased risk of severe COVID-19 infections, especially pregnant and breastfeeding mothers irrespective of age, BMI and comorbidities.

It is important to explore the reasons for refusal of vaccination in terms of personal perception, religious or cultural believes and these women should be counselled together with their partners on the benefits and safety of vaccination and boosters.

They should be given sufficient opportunity to address their concerns while efforts should be made to provide them with updated and verified information on the benefits of vaccination and booster to them for their pregnancy. If they are concerned with the side effects, they can alternatively be offered the vaccination under close surveillance which they may find it reassuring.

For pregnant and breastfeeding mothers who refuse and still remain unvaccinated, they should be treated as higher risk and offered additional counseling by the FMS or a specialist irrespective of their past history of COVID-19 infection.

An opportunity to be vaccinated should be made available at each antenatal visit and in the event of an illness of fever, they should be advised to seek early health attention for early diagnosis, admission and management as they remain most vulnerable. They are not recommended for home quarantine as their risk of severe infection is high.

Monoclonal antibodies can be considered if such unvaccinated pregnant and breastfeeding mothers are unwell.
N. Mental Health and COVID-19

- Mental health screening should be performed on each encounter, with the aid of the Whooley’s questionnaire.
- Perinatal mental health team should be involved in the joint management of women with mental health conditions.
- All healthcare professionals should be able to recognise and respond to perinatal mental health problems.

The COVID-19 pandemic has had a major impact on pregnant women who are vulnerable to the risk of severe COVID-19 infection, coping with preterm birth and mental health conditions such as anxiety, self-isolation, depression, dissociative conditions, and domestic violence. Women should be advised on:

- Maintaining a healthy lifestyle, proper diet and regular exercise
- Availability of online support groups for pregnant mothers
- Availability of mental health helplines
- Practice relaxation techniques (breathing exercises)
- RED flag signs and to seek help immediately if present
- Connect with family members and loved ones

RED FLAGS
- Suicidal ideation
- Poor sleep quality
- Poor appetite
- Harm to baby
- Psychotic symptoms

Women should be assessed and onward referral to the perinatal mental health team performed where indicated.
O. Pregnant Frontliners

If feasible, pregnant healthcare professionals and frontliners beyond 22 weeks of pregnancy should not directly be involved in the management of COVID-19 patients.

Appreciating the significance and occupational hazards of pregnant healthcare frontliners who serve beyond their call of duty, it is advisable that our frontliners are protected and not directly involved in the management of COVID-19 patients beyond 22 weeks of pregnancy, despite being fully vaccinated. The rationale for this consensus is based on the risk of developing severe COVID-19 infection in the late second and third trimester. This however, should be based on available local resources and the extent of the pandemic.
# HOME ASSESSMENT TOOL FOR COVID-19 IN PREGNANCY

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<td>* Symptoms getting worse from previous day (e.g. cough, nausea, vomiting, diarrhoea)</td>
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<td>* Feeling lethargic until it affects daily activities</td>
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<td>* Difficulty in breathing</td>
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<td>* Chest pain</td>
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<td>* Unable to tolerate food and drinks</td>
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<td>* Feeling faint, drowsy or having reduced level of consciousness</td>
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<td>* Reduced urination in the last 24 hours</td>
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<td>* Oxygen saturation &lt;95% (if pulse oximeter available)</td>
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<td>* Abdominal pain</td>
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<td>* Per vaginal bleeding</td>
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<td>* Leaking of liquor</td>
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<td>* Reduced fetal movement</td>
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</table>
## VTE risk assessment

<table>
<thead>
<tr>
<th>VTE RISK FACTORS</th>
<th>VTE SCORE</th>
<th>PRE-PREGNANCY/BOOKING</th>
<th>ADMISSION/NEW ILLNESS</th>
<th>POSTPARTUM</th>
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<tbody>
<tr>
<td><strong>DATE OF ASSESSMENT</strong></td>
<td><strong>PRE-EXISTING RISK FACTORS</strong></td>
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<tr>
<td>Previous VTE</td>
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<tr>
<td>High Risk Thromobophilia a</td>
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<tr>
<td>Medical Co-Morbidities b</td>
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<tr>
<td>BMI &gt;40 kg/m2</td>
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<tr>
<td>BMI 30-39 kg/m2</td>
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<tr>
<td>Family history of VTE</td>
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<tr>
<td>Low risk thrombophilia t</td>
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<tr>
<td>Current smoker &gt;10/day</td>
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<td><strong>OBSTETRIC RISK FACTORS</strong></td>
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<tr>
<td>Caesarean section</td>
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<tr>
<td>Pre-eclampsia</td>
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<tr>
<td>IVF (First Trimester)</td>
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<tr>
<td>Rotational Instrumental delivery</td>
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<tr>
<td>PPH &gt;1000mls or requires blood transfusion</td>
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<tr>
<td>Stillbirth (current)</td>
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<td>Prolonged labour &gt;24 hours</td>
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<td><strong>TRANSIENT RISK FACTORS</strong></td>
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<td>Surgical procedures d</td>
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<tr>
<td>Hyperemesis Gravidarum /OHSS</td>
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<tr>
<td>Immobility/Dehydration</td>
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<td>Admission (&gt;3 days)</td>
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<td>Long distance travel &gt; 4hours</td>
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<tr>
<td>Current/postpartum infection</td>
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<td><strong>COVID-19 RISK FACTORS</strong></td>
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<td>PKRC/CAC Admission</td>
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<td>Hospital Admission</td>
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<tr>
<td>Category 4</td>
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<tr>
<td>Category 5</td>
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<tr>
<td><strong>TOTAL SCORE</strong></td>
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VTE score 3 for each Cat 4 & 5

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a: Anti-thrombin deficiency, protein C or S deficiency  
b: Malignancy, cardiac failure, SLE, HIV, TB, nephrotic syndrome, DM nephropathy, Thalassemia major or intermedia post splenectomy,  
c: Prothrombin gene mutation or Factor V Leiden  
d: Surgical procedures excluding episiotomy, first and second degree perineal repair, EPOC
Flow chart for intrapartum care of COVID-19 mothers

1) For fetal lung maturity
   IV/IM Dexamethasone
   12mg BD x 1 day

2) For fetal neuroprotection (<32 week)
   IV MgSO4 4g bolus +
   1g/hr maintenance dose
   minimum 4 hrs

- For fetal lung maturity
  Delivery as per routine

- For fetal neuroprotection (<32 week)
  Delivery as per routine
Flow chart for follow up of long COVID-19 patients

LONG COVID-19

ABLE TO WEAN OFF O²

YES

DISCHARGE

NO

MDT (ID/IPR/PSY)

DISCHARGE TX

1) S/C Clexane prophylactic dose x 2wks if NO PE
2) Steroid as prescribed
3) VIT C 1000MD OD
4) VIT D 800IU OD

TCA O&G sp clinic 2wks
References

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