Management of COVID-19 in Pregnancy in South Australia

v8 24/03/2022

Introduction

South Australia currently has a high level of the Omicron variant of COVID-19 circulating in the general population. The pathways that were initially established across the state in November and December did not anticipate the large volume of pregnant women exposed to the virus. In addition, the population of SA now has a vaccination rate in excess of 90%. As a result of both factors the morbidity from COVID-19 has decreased significantly.

These factors have required the management plans discussed in the original document to be significantly modified.

As it is a statewide guidance, internal logistics have not been included and the protocol from each local health network should also be consulted.

As the treatments for COVID-19 have changed as well, detailed sections within this document on medications have been removed and placed in an appendix at the back for reference if required.

Contents

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Special thanks to Monash Medical Centre

Common Acronyms

SALHN	Southern Adelaide Local Health Network
CALHN	Central Adelaide Local Health Network
NALHN	North Adelaide Local Health Network
WCHN	Women's and Children's Health Network
rLHNs	Regional Local Health Networks
LHN	Local Health Network
FMC	Flinders Medical Centre
LMH	Lyell McEwin Hospital
WCH	Women's and Children's Hospital
SAAS	South Australian Ambulance Service
CDCB	Communicable Diseases Control Branch
DOB	Date of birth
ICCU	Intensive and Critical Care Unit
MDT	Multi-disciplinary Team
CCU	COVID Care Unit
PPE	Personal protective equipment
CTG	Cardiotocograph
sCOVID	Suspected COVID
CCC	COVID Care Centre
MAB	Monoclinal Antibody Infusion
LSCS	Lower Segment Caesarean Section

Treatment Streaming and Options

Treatment of COVID-19 in pregnant patients will involve sound teamwork between SALHN, CALHN, NALHN, WCHN, Regional LHN's and the CDCB. The aim of these guidelines is to stratify each model of care and create simple flowcharts that can be utilised from each centre with COVID-19 positive obstetric patients with each degree of severity of illness. There will be individual cases that fall outside of this framework and will need to be managed on a case-by-case basis with these key stakeholders.

Once a person is diagnosed with COVID-19 they will then be contacted by SA health with their positive result via text message, all those that receive a positive COVID diagnosis are directed to complete an online survey via HealthDirect.

Patients who are positive should be encouraged to contact their local GP or HealthDirect for further advice. This will enable the LHN to plan their next obstetric review and organise a telehealth appointment if required. Patients who contact the LHN with more than mild symptoms will be invited in for review.

Local Health Network obstetric care

Obstetric COVID Care will be vary with each maternity unit depending on resources. Management of COVID patients will vary from network to network depending on the resources of the health service and the needs of the patient. Care will be undertaken in conjunction with Infectious Diseases, Infection Control, Obstetric Medicine, General Medicine/Respiratory, Anaesthetic, Intensive Care and Neonatology as required. Advice may be face to face or via telehealth depending on the location of the patient.

Routine review of COVID positive pregnant women is not required. If the woman has mild or no symptoms, then she can be cared for following the routine processes.

The LHN should have processes in place to determine whether the next appointment/investigations can be deferred, proceed via telehealth or requires a face-to-face appointment during the isolation period. Most patients should be able to have their review deferred.

Patient who contact their booking hospital or local GP with symptoms or concerns, or who are determined to be high risk should be invited in for review or scheduled with a telehealth appointment with 24 hours.

Additional options will need to be made available for smaller services, such as regional hospitals and private care providers, who may not have adequate case numbers or the expertise to coordinate Telehealth care for positive patients. These providers may choose to reallocate care of their patient to an appropriate metropolitan health network (e.g. NALHN, SALHN or WCHN), either for the duration of their infectious period or the remainder of the pregnancy on a case-by-case basis.

Classification of COVID-19 in pregnancy should be as per the National COVID-19 Evidence Taskforce, with classifications of mild, moderate, severe and critical.

Patients identified as at additional risk, may have any of the following comorbidities:

- Hypertension
- Asthma
- Diabetes requiring treatment prior to pregnancy
- BMI ≥ 35
- Aboriginal or Torres Strait Islander background
- Other ethnic minority background
- Chronic respiratory or kidney disease
- Cardiovascular disease
- Other immunocompromised
- Significant psychosocial factors
- Significant mental health conditions
- Active cancer
- Unvaccinated

Telehealth Reviews

COVID-19 Obstetric Telehealth Review Form (see appendix C)

If a COVID positive woman contacts a health service with more than mild symptoms, a telehealth review should be organised. During the telehealth reviews, patients should be screened for escalating symptoms and fetal concerns. These questions should include:

Maternal:

- Are you short of breath or having difficulty breathing?
- Do you need to catch your breath on walking around the room?
- Are you able to finish your sentences without breathlessness?
- Have you had any blood on coughing? Amount? (escalate if >1 teaspoon)
- Do you have any chest pain or pressure, particularly with coughing?
- Are you able to keep fluids down?
- Any dizziness with standing?
- Any drowsiness?
- Are you making a normal amount of urine?
- Screening questions for specific obstetric concerns relevant to the patient e.g. pre-eclampsia symptoms, symptoms of chorioamnionitis, symptoms of preterm labour

Fetal:

- Fetal movement patterns
- PV loss/bleeding
- Signs of labour

It should be checked that patients have received the appropriate written literature on when to escalate their care and the numbers to call to do this.

At the end of the review follow up should be planned/amended as required to take into consideration the period of exclusion from high-risk settings.

In Hospital Review and Inpatient Management

If the patient has symptoms during the telehealth review that warrant escalation of care, the patient should be invited into the health service for medical review.

COVID-19 Obstetric Escalation Guide

Designed for utilisation within SA Health for patients who are symptomatic or considered high risk for other reasons

Category	Oxygen requirements	Maternal Care	Fetal considerations (>23 weeks)
Green ***(mild disease)***	SpO2 >95% Room air and RR ≤ 20	Exclude other obstetric or medical issues **OUTPATIENT CARE** May be discharged for in home care Consider monoclonal antibody infusions and thromboprophylaxis	
Yellow ***(moderate disease)***	SpO2 92-98% on < 4L/min And/or RR ≥ 21	**INPATIENT CARE** - obstetric doctor review **Notify** - obstetric consultant - obstetric anaesthetist - COVID medical team	Assess fetal well being Discuss timing of birth Consider - steroids for fetal lung maturity - MgSO4 for neuroprotection
Orange ***(severe disease)***	Sp02 92-98% on ≥ 4L/min And/or RR ≥ 25	**URGENT** Obstetric review Refer for URGENT ICU review	Discuss risks and benefits of emergency caesarean Notify neonatal team
Red ***(critical disease)***	SpO2 <92% on 15L/min via non-rebreather mask	**URGENT ICU** review Immediately activate MET call URGENT Obstetric attendance Consider awake proning/high flow oxygen	Discuss risks and benefits of emergency caesarean
Peri-arrest	**33# OBSTETRIC, NEONATAL MET/MER (CODE BLUE)** Multidisciplinary team discussion regarding possible intubation of mother +/- delivery of neonate		

* Adapted from **Coronavirus (COVID-19) in Pregnancy, Information for Health Professionals. RCOG** and **National COVID-19 Clinical Evidence Taskforce'** Mild Illness

Disease-modifying agent in pregnancy	**Asymptomatic or Mild illness**	**Moderate illness** (requiring supplemental oxygen)	**Severe illness**	**Critical illness**
Sotrovimab	Consider in second and third trimester	Not Recommended	Not Recommended	Not Recommended
Casirivimab/Imdevimab (Ronapreve®)	Consider **(A)**	Consider if seronegative	Consider if seronegative	Not Recommended
Dexamethasone[b]	Not Recommended	Start **(C)**	Start or continue **(C)**	Start or continue **(C)**
Remdesivir	Not Recommended	Consider **(D)**	Continue if commenced **(do not start)**	Continue if commenced **(do not start)**
Baricitinib	Not Recommended	Given the limited data on Baricitinib in pregnant and breastfeeding patients, should only be used in clinical trials		
Sarilumab	Not Recommended	Given the limited data on Sarilumab in pregnant and breastfeeding patients, should only be used in clinical trials		
Tocilizumab	Not Recommended	Consider **(E)**	Consider **(E)**	Consider **(E)**

(A) Consider using Sotrovimab within five days or Casirivimab/Imdevimab within 7 days of symptom onset in pregnant or breast-feeding patient who do not require oxygen, are not fully vaccinated or immunosuppressed and who have one or more risk factors for disease progression (refer to individual drug monographs below)

(B) Seek specialist advice for patients talking long term or high dose corticosteroids prior to admission

(C) Obtain guidance from obstetric medicine, prednisolone or hydrocortisone may be preferred in the first trimester.

(D) Paucity of evidence of efficacy in COVID-19 infection. Consider using Remdesivir for selected pregnant or breastfeeding patients hospitalised with moderate to severe COVID-19 who do not require ventilation with ID guidance. Pregnant patients were excluded from all clinical trials of Remdesivir in COVID-19.

(E) Consider using tocilizumab for the treatment of COVID-19 in pregnant or breastfeeding women who require supplemental oxygen, particularly where there is evidence of systemic inflammation.

VTE prophylaxis

Background

Active COVID-19 is a major risk factor for VTE, with obstetric patients sitting at an elevated baseline risk. Studies in non-obstetric patients have shown up to 22% VTE rate in patients admitted to ICU with early strains of COVID-19. It is not yet known the exact effect the Omicron variant will have on VTE rate; however each patient should be assessed for risk factors for VTE if they present with symptoms of COVID-19.

As there is a very large amount of COVID-19 in our community at this point, we will also need to focus on teaching patients to self-administer ? VTE prophylactics to limit our usage of community services.

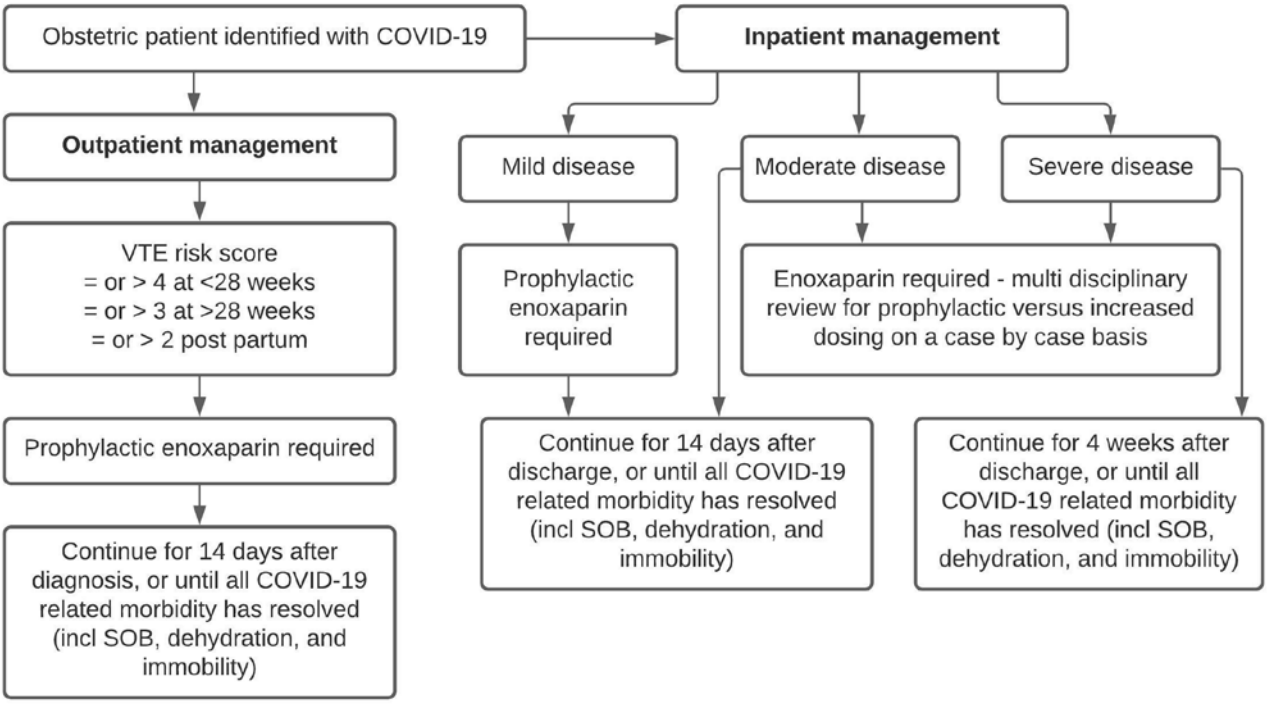
Basic information regarding VTE should be discussed with patients, including the need for hydration and mobilisation, and the signs and symptoms to be aware of. When admitted, there should be consideration for compression stockings and mechanical prophylaxis (calf stimulators) as appropriate for each case.

Who Needs VTE Prophylaxis?

All patients admitted to hospital with COVID-19 will require VTE prophylaxis. The dosing and length of continuance on discharge will depend on their severity of illness.

Patients who are reviewed because they are symptomatic and managed in the community may require VTE prophylaxis if they are at increased risk.

VTE Prophylaxis



VTE Scoring

All patients requiring medical review for symptoms or due to their high-risk status should have a VTE risk score calculated and documented at their first review once they have been diagnosed with COVID-19. The scoring system will follow that suggested in the RCOG Greentop Guideline 37.a and as recommended in the updated Coronavirus (COVID-19) Infection in Pregnancy published Dec 2021.

Thresholds for Treatment

Outpatient management

< 28 weeks	Score ≥ 4
≥ 28 weeks	Score ≥ 3
Post-partum	Score ≥ 2

Inpatient management

Any admitted patient Any score

One point should be added to the score if the patient is dehydrated or immobile.

Risk factors for VTE

Pre-existing risk factors	Tick	Score
Previous VTE (except a single event related to major surgery)		4
Previous VTE provoked by major surgery		3
Known high-risk thrombophilia		3
Medical comorbidities e.g. cancer, heart failure; active systemic lupus erythematosus, inflammatory polyarthropathy or inflammatory bowel disease; nephrotic syndrome; type I diabetes mellitus with nephropathy; sickle cell disease; current intravenous drug user		3
Family history of unprovoked or estrogen-related VTE in first-degree relative		1
Known low-risk thrombophilia (no VTE)		1[a]
Age (> 35 years)		1
Obesity		1 or 2[b]
Parity ≥ 3		1
Smoker		1
Gross varicose veins		1
Obstetric risk factors		
Pre-eclampsia in current pregnancy		1
ART/IVF (antenatal only)		1
Multiple pregnancy		1
Caesarean section in labour		2
Elective caesarean section		1
Mid-cavity or rotational operative delivery		1
Prolonged labour (> 24 hours)		1
PPH (> 1 litre or transfusion)		1
Preterm birth < 37+0 weeks in current pregnancy		1
Stillbirth in current pregnancy		1
Transient risk factors		
Any surgical procedure in pregnancy or puerperium except immediate repair of the perineum, e.g. appendicectomy, postpartum sterilisation		3
Hyperemesis		3
OHSS (first trimester only)		4
Current systemic infection		1
Immobility, dehydration		1
TOTAL		

Abbreviations: ART assisted reproductive technology; IVF in vitro fertilisation; OHSS ovarian hyperstimulation syndrome; VTE venous thromboembolism.

[a] If the known low-risk thrombophilia is in a woman with a family history of VTE in a first-degree relative postpartum thromboprophylaxis should be continued for 6 weeks.

[b] BMI ≥ 30 = 1; BMI ≥ 40 = 2

Dosing of Enoxaparin

Therapeutic anticoagulation should be given in the form of enoxaparin as a first line.

Prophylaxis	**Dosing**
Creatinine Clearance (CrCl) <30mL/min or body weight < 50kg	Enoxaparin 20mg daily or Unfractionated Heparin 5000 units BD*
Weight 50-90kg + CrCl >30mL/min	Enoxaparin 40mg subcut daily
Weight 91-130kg + CrCl >30mL/min	Enoxaparin 60mg subcut daily
Weight 131-170kg + CrCl >30mL/min	Enoxaparin 80mg subcut daily
Weight >170kg + CrCl >30mL/min	Consult Obstetrics Medicine or Haematology

Cautions and contraindications for VTE Prophylaxis

- Imminent delivery
- Known bleeding disorder (e.g. haemophilia, von Willebrand's disease or acquired coagulopathy)
- Active antenatal or post-partum bleeding
- Increased risk of major haemorrhage (e.g. placenta praevia)
- Thrombocytopenia (Plt <75 x 10^9/L)
- Acute stroke in previous 4 weeks (haemorrhagic or ischaemic)
- Severe renal disease (GFR <30ml/minute/1.73m^2)
- Severe liver disease (prothrombin time above normal range or known varices)
- Uncontrolled hypertension (blood pressure >200mmHg systolic or >120 mmHg diastolic)

Post-Partum

Active COVID-19 within the first 6 weeks after birth

If a patient develops COVID-19 in the first 6 weeks after birth and is suitable for outpatient management, they should be assessed and offered prophylactic enoxaparin if their VTE risk score is ≥2. This should continue for 14 days post diagnosis or until their symptoms have completely resolved.

If a patient requires admission post-partum for COVID-19, they should be offered prophylactic enoxaparin as per the mild, moderate and severe guidance above, with continued dosing on discharge as per antenatal patients.

Women who have had COVID-19 in pregnancy but are negative at the time of birth.

If a patient was managed as an outpatient during her COVID-19 infection but has recovered at the point of birth, she should be offered 14 days of prophylaxis if her VTE risk score is ≥2.

Women who have had COVID-19 during pregnancy requiring hospitalisation for their illness will all require post-partum prophylaxis.

Mild-moderate illness	14 days prophylaxis
Severe-critical illness	6 weeks prophylaxis

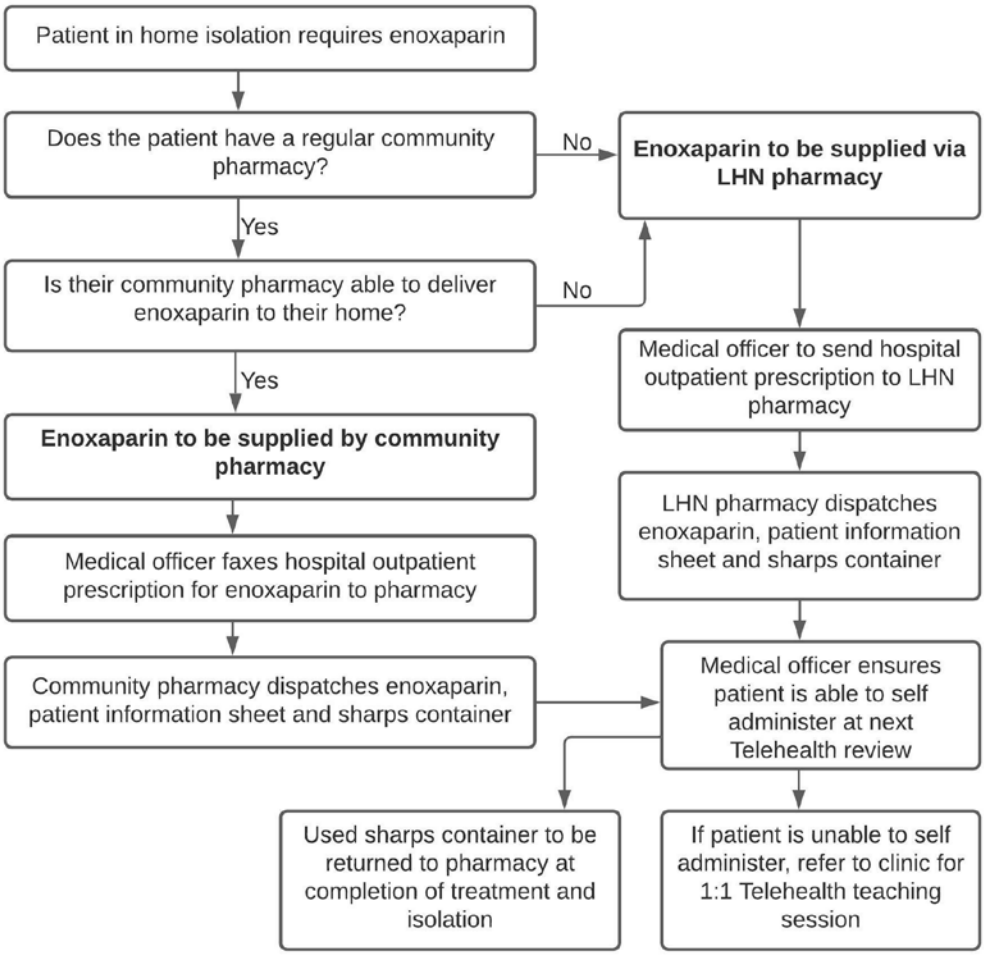
Administration Logistics

Antenatal Outpatients

Patients who are identified as requiring VTE prophylaxis whilst in home isolation will require the medication to be delivered to their house and will need written and/or virtual education for administration.

If the patient has a community pharmacy they are linked in with for their normal medications, the enoxaparin can be ordered through this pharmacy. The contact details of the pharmacy should be obtained and a hospital outpatient prescription faxed through. The pharmacy can then deliver the enoxaparin, product brand instruction sheet and sharps container to the patient.

If the patient does NOT have a regular community pharmacy, or their regular community pharmacy is unable to deliver medication to their home, the enoxaparin should be obtained through the LHN pharmacy.



Once a script for enoxaparin is sent to the Hospital pharmacy, the pharmacy team will dispense the medication with the patient information and video link together with a small sharps' container to the patient's home address via courier. Instructions to the patient will include advice to return the sharps container to their local pharmacy following isolation period.

Antenatal Inpatients

Patients admitted with COVID-19 should be taught to self-administer their own enoxaparin so that they are as comfortable and confident as possible at the point they are discharged back to the community.

The medical officer responsible for discharge should order their enoxaparin and sharps' container from the hospital pharmacy that can be sent home with the

patient. The patient will have ongoing Telehealth reviews through their LHN, through which the timing to cease can be decided (i.e. 14 days post discharge, or longer if the patient remains symptomatic).

Post-partum patients

Patients identified as requiring prophylactic enoxaparin post-partum should be taught to self-administer during their inpatient stay for birth. The medical officer responsible for discharge should order their enoxaparin and sharps' container that can be sent home with the patient.

Monoclonal Antibody Infusions

Monoclonal antibody infusions should be considered in symptomatic or high-risk patients in early disease to reduce the likelihood of development of moderate-severe COVID-19.

Sotrovimab appears to have greater efficacy against the Omicron variant than Casirivimab/Imdevimab and as such, is the current monoclonal antibody infusion being offered through the COVID Care Centres.

To be eligible for a MAB infusion, pregnant women need to be in their second or third trimester and:

- with symptom onset of no more than 7 days
  AND
- who do not require oxygen
  AND
- Immunosuppressed irrespective of vaccine status

  OR
- who have reduced immunity to COVID-19 e.g. not vaccinated, not fully vaccinated (including patients who received a second dose of vaccine < 2 weeks prior) AND who have one or more risk factors for severe or critical illness.

Risk factors for severe or critical illness include:

i. Risk factors for progressing to severe illness
   - Age ≥ 55 years or ≥ 35 for Aboriginal and Torres Strait Islander
   - Diabetes or pregestational diabetes AND requiring medication
   - Chronic kidney disease (eGFR < 60 mL/min)
   - Chronic liver disease (cirrhosis)
   - Obesity (BMI > 30kg/m^2)
   - Moderate to severe asthma (on inhaled corticosteroid or prescribed course of oral steroid in previous 12 months)
   - Chronic lung disease (chronic bronchitis, COPD, emphysema with dyspnoea on exertion)
   - Congestive heart failure (NHYA Class II or above)
   - Cardiovascular disease

i. Immunocompromising conditions
   - Haematological neoplasm (leukaemia, lymphoma or myelodysplastic syndrome)
   - Haematopoietic stem cell transplant within 24 months
   - Solid organ transplant on immunosuppressive therapy
   - Primary or acquired (HIV/AIDS) immunodeficiency
   - Current or recent immunosuppressive therapy
   - Chemotherapy or radiotherapy
   - High dose corticosteroids (≥ 20mg prednisolone per day or equivalent) for ≥ 14 days
   - Biological therapy or disease-modifying anti-rheumatic drugs

If a patient is a potential candidate for a MAB infusion, the centralised online form should be completed:

https://forms.office.com/Pages/ResponsePage.aspx?id=9yilvan8L0O8mL1-kNQJBkHkTVb2yj1EgO3yQqVPjONUNTVTWjlGTDROU1pNUTlQSVcxWTJRQkY1Qi4u

The application will be reviewed by SA Health and Infectious Diseases, the patient will then be contacted by the COVID Care Centre (CCC) to arrange infusion timing and location if suitable.

Mild Illness

Adults not presenting any clinical features suggestive of moderate or severe disease or a complicated course of illness

Characteristics

- No symptoms
- Or mild upper respiratory tract symptoms
- Or cough, new myalgia or asthenia without new shortness of breath, a reduction in oxygen saturation

Monitoring of Pregnant COVID Patients

Pregnant patients who have contacted their LHN with mild disease only and are asymptomatic can be managed at home with Telehealth appointments if required without any changes to their routine care.

Investigations: no routine investigations are required at this point.

When to Escalate Care

- Increasing shortness of breath
- Difficulty breathing
- Blue lips or face
- Pain or pressure in the chest
- Cold, clammy or pale mottled skin
- New confusion or becoming difficult to rouse
- Little or no urine output
- Coughing up blood

Treatments

Disease modifying treatments are available for mild disease and are appropriate for use in pregnancy. Providing all appropriate criteria are fulfilled, pregnant patients may be considered for monoclonal antibody infusions. VTE prophylaxis should be discussed for all patients.

Moderate/Severe Illness

Moderate Illness

Stable adult patient presenting with respiratory and/ or systemic symptoms or signs. Able to maintain oxygen Saturation above 92% (or above 90% for patients with chronic lung disease) with up to 4L/min oxygen via nasal prongs

Characteristics:

- Prostration, sever asthenia, fever >38 °C or persistent cough
- Clinical or radiological signs of lung involvement
- No clinical or laboratory indicators or clinical severity or respiratory impairment

Severe Illness

Adult patients meeting any of the following criteria

- Respiratory rate >30 breaths/min – this is not necessarily the same as in the table above
- Oxygen saturation <92% at rest state
- Arterial partial pressure of oxygen (PaO2) inspired

Investigations: baseline CBC, EUC, LFT, CXR and ECG

Observations: all patients with moderate illness will begin on 4 hourly observations. If there is any clinical deterioration or progression to severe illness, observations will be hourly. Clinical escalation may be based on any observations, however guidance by oxygen requirements and respiratory rate is attached as an addendum to this document.

Fetal monitoring: should be decided on a case-by-case basis by the Obstetric COVID Care team taking into account the gestation and clinical status of the mother. Any acute deterioration >28 weeks should prompt a baseline CTG, with the decision for continuous monitoring to be decided by the clinical scenario.

Treatment

Once a patient is diagnosed with moderate disease, there are increased options for pharmacotherapies.

Corticosteroids are recommended as part of the supportive care once oxygen administration has begun. Disease modifying treatments include Remdesivir for patients who are not ventilated and Casirivimab plus Imdevimab for patients who are seronegative. Once there are biochemical signs of systemic inflammation (CRP >75, Ferritin >500) if is recommended to treat with either Tocilizumab. Given the worldwide shortage of Tocilizumab, any immunomodulators in this group should be started after multidisciplinary input including infectious diseases and pharmacy.

Thromboprophylaxis

Should be considered for all patients with moderate to severe disease. Consideration of 40mg enoxaparin SC BD in patients with severe disease.

Corticosteroid Treatment

Corticosteroid treatment is recommended for the treatment of ≥ moderate disease, however the choice of steroid will be guided by Obstetric Medicine, Infectious Disease and ICU at the time of treatment. Patients may be offered dexamethasone or prednisolone depending on their gestation, pregnancy details, comorbidities and other illness factors.

Other Considerations

Bacterial pneumonia:

Treat with antibiotics as appropriate in consultation with respiratory????

Antenatal corticosteroids:

Should be given if there is concern for preterm delivery <34+6. Does not need to be given if patient on dexamethasone.

Magnesium sulphate

Should be given for eclampsia prophylaxis and neuroprotection of the preterm neonate as routinely indicated.

Delivery

This is a multidisciplinary team decision within the Obstetric COVID Care Team and potentially in conjunction with ICCU. Decision for delivery will be decided on a case-by-case basis and encompass maternal health status, gestation and disease progression. All patients with ≥ moderate disease will need to have a delivery plan discussed and documented in case of acute deterioration.

Critical Illness

Critical Illness

Adult patient meeting any of the following criteria:

Respiratory failure

- Occurrence of severe respiratory failure (paO2/Fi02 <200) respiratory distress or acute respiratory distress syndrome (ARDS).
  This includes patients deteriorating despite advanced forms of respiratory support (non-invasive ventilation (NIV), high flow nasal oxygen (HFNO) OR patients requiring mechanical ventilation

OR other signs (or) ? of significant deterioration

- Hypotension or shock
- Impairment of consciousness
- Other organ failure

Patients with critical illness in pregnancy will be managed in the Intensive and Critical Care Unit. The patient will need to be managed in a multi-disciplinary context, with liaison between ICCU, obstetrics, obstetrics physicians, anaesthetics, infectious diseases and neonatology.

Patient who require transfer for care, either to access an ICU with experience in treating COVID patients, or because at the time of the ICU admission the LHN cannot manage the neonate if delivery was required, should be transferred to Flinders Medical Centre for care. Transfer should be considered earlier rather than later.

Medications:

These patients may be offered dexamethasone, Tocilizumab / Baricitinib however will not be suitable for treatment with Remdesivir if mechanical ventilation is required. Each medication recommendation is as per the COVID-19 National Evidence Taskforce.

All patients in ICCU should have thromboprophylaxis unless there is a major contraindication or delivery is imminent

- Enoxaparin SC 40mg twice daily or
- Dalteparin 5000IU twice daily

Mechanical calf stimulators should also be considered for this group.

If delivery is planned, betamethasone should be considered for fetal lung maturity. Dexamethasone will cross the placenta, and if the patient has already been commenced on steroids, betamethasone may not need to be administered.

Consider a loading dose of magnesium sulphate (4g IV over 20 minutes) for neuroprotection for all deliveries <30 weeks.

Positioning:

Pregnant patients >24 weeks gestation will need to be managed at 30° left lateral tilt whilst supine to prevent aortocaval compression.

Proning is recommended for patients with critical illness and patients on mechanical ventilation should be managed in the prone position for up to 12 hours per day, noting prone position may be less feasible later in pregnancy as per national guidelines due to the risk of hypofusion, compartment syndrome, pressure ulcers, airway swelling and peripheral arterial compression. A pictorial and video tutorial for appropriate positioning is available through the Green Journal at the following link:

https://journals.lww.com/greenjournal/fulltext/2020/08000/prone_positioning_for_pregnant_women_with.7.aspx

Delivery:

Any patient admitted to ICCU should have a delivery plan discussed and documented. If the patient requires intubation there should be a robust discussion regarding the timing of her delivery plans in consultation with their partner / family.

Gestation at admission	Pregnancy planning
<28 weeks	Expectant management
≥ 28-34 weeks	Individualised care balancing maternal and fetal health
>34 weeks	Low threshold for delivery of fetus in deteriorating mother

Birthing Management and Considerations

The birthing plan of a patient affected by COVID-19 may be altered by their disease, however in patients with mild disease or who have recovered it is important to aim to normalise care as much as possible. In patients with severe and critical disease, the birthing plan may be dictated by maternal instability with the decision to deliver made by the multidisciplinary team involved in patient care.

Patients who are birthing whilst positive for COVID-19 will need to be managed with appropriate personal protective equipment as per the SA Health matrix. It is important for the midwifery and obstetric team to remember that standard interventions may take longer due to the need for donning and doffing, which may complicate care in an acute emergency. Caution should be taken with abnormal CTGs, and delivery interventions such as caesarean section or instrumental deliveries offered in a timely manner to limit the need for high category emergency cases or rapid neonatal resuscitation. Whilst fetal scalp sampling is not contraindicated in a patient with COVID-19, the practitioner should be aware of the complexities of management of potential delays in resuscitation if an emergency situation arises at the end of labour.

Mode of delivery:

In patients with mild disease and recovered disease, the mode of delivery should be based on obstetric indications alone. If the patient had previously planned a vaginal delivery, then this plan can remain.

Delayed cord clamping and skin to skin contact may remain as per standard procedure, as can breastfeeding plans and rooming in of well infants. With each of these items, it is important to ensure appropriate hand hygiene and masks are used during the mother's infectious period at times of close contact, to reduce the risk of transmission to the neonate.

CTG Monitoring:

Patients that are positive with mild COVID-19 and asymptomatic do not need continuous electronic fetal monitoring, they will require CTG evaluation for the same reasons as per standard guidelines.

Any patient that is symptomatic regardless of severity, will require continuous CTG monitoring throughout labour.

Support persons:

A nominated person will be able to attend as a support person. It must be assumed that they are COVID-19 positive or likely to become positive, so they will be required to wear PPE as per the SA Health matrix, they should remain within the room with the patient and are not to walk through other areas of the hospital. They can attend when the patient is in active labour and will have to leave within a specified timeframe based on current LHN restrictions.

<u>The support person must be someone in the same household who is also in isolation for COVID-19</u>

Observations:

Observations should be taken as per routine care throughout labour and include standard obstetric observations (heart rate, blood pressure, contractions, fetal heart rate) respiratory rate, oxygen saturations and oxygen requirements should also be documented.

Increasing oxygen requirements should be escalated as per the escalation chart in this document. Obstetric and ICU review sought at appropriate intervals.

Observations may be increased to 15 minutely in unwell patients as dictated by the obstetric and intensive care treating teams.

Analgesia

Patients should be offered analgesia throughout the induction and labour process:

- water immersion in first stage
  - patients who are positive for COVID-19 will not be able to utilise water immersion for first stage of labour
  - water immersion in a shower may be utilised provided the patient is clinically well with mild disease and no medical contraindications
  - water immersion for second stage is not recommended due to the presence of COVID-19 within faecal particulate matter and the increased risk of exposure to staff and the neonate
- inhaled nitrous oxide
  - inhaled nitrous oxide may be utilised provided a single-patient filter is available on the handpiece or mouth piece?
- opiate medication
  - oral paracetamol + codeine, oxycodone, IM morphine and IV/SC fentanyl can all be used as per normal management
- epidural anaesthesia
  - epidural should be offered early in the labour process
  - early placement will allow time for the anaesthetist to don PPE and set up appropriately
  - placement of an epidural may reduce the need for a general anaesthetic in the event of fetal or maternal compromise. A general anaesthetic in these circumstances may incur more risks for a mother with COVID-19, and potentially expose staff at the time of intubation.

Fluid management:

Patients with COVID-19 will need cautious fluid monitoring to avoid fluid overload and pulmonary oedema. The aim should be for euvolaemia throughout the labour process with hourly fluid input matching output, measured on a strict hourly fluid balance chart.

Third Stage:

Active management of the third stage is recommended to reduce the risk of post-partum haemorrhage and need for additional resuscitation for the patient.

Medications for management of third stage may be as per local guidelines and may include IM or IV stat oxytocin, IM Syntometrine or IV Carbetocin.

- Medications for post-partum haemorrhage may be given on obstetric indications, with standard considerations for asthma and underlying hypertensive disorders
- Oxytocin infusion should be given in a low volume regimen as described for Cardiac Disease in Pregnancy in the South Australian Perinatal Practice Guidelines
    - 40 units' oxytocin diluted in a 100mL bag of Normal Saline
    - Infusion run at 25mL/hour for 4 hours

Placental Histology:

All patients who have had COVID-19 at any stage of pregnancy should be offered placental histology. The severity of illness and any sequelae should be noted on the pathology form.

If the patient has active disease at the time of delivery, the placenta will need to be appropriately labelled and double bagged as per local guidelines for sending COVID-19 specimens to the laboratory.

Neonatal Management

Please refer to the state neonatal and paediatric guidance for further information.

COVID-19 Admission Testing in Pregnancy

It is advised that all patients admitted to hospital have screening for COVID-19. Each unit should have protocols in place for this purpose.

Discharge Planning

All patients leaving hospital who are still required to isolate should have a plan in place to ensure routine care is completed in a timely fashion, ensuring regional patients have referrals to the appropriate services and plan for follow up care prior to discharge

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The Northern Hospital COVID VTE Prophylaxis Guidelines. Updated 21.12.2021

Appendix A

NALHN / SALHN / WCHN / Other **COVID-19 Telehealth Review Form**	**PATIENT LABEL** UR Number: ..... Surname:..... Given Name: ..... DOB: ..... Sex: .....

Details:

Date: ..... Gravida: ..... Parity: ..... Gestation: .....

□ COVID-19 positive Date of infection: ..... Isolation end date: .....

□ Interpreter, please specify language: ..... Thromboprophylaxis required Yes/No

Medical Evaluation:

Maternal medical concerns:

Are you short of breath or having difficulty breathing?	Yes / No
Do you need to catch your breath on walking around the room?	Yes / No
Are you able to finish your sentences without breathlessness?	Yes / No
Have you had any blood on coughing? Amount? (escalate if >1 teaspoon)	Yes / No
Do you have any chest pain or pressure, particularly with coughing?	Yes / No
Are you able to keep fluids down?	Yes / No
Any dizziness with standing?	Yes / No
Any drowsiness?	Yes / No
Are you making a normal amount of urine?	Yes / No

Comments/Other .....

.....

.....

.....

Red Flag Symptoms:
- severe breathlessness
- unable to finish sentences
- blood on coughing >1 teaspoon
- chest pain/pressure
- unable to keep fluids down
- dizziness with standing/syncope
- drowsiness
- low urine output

Fetal concerns:.....

.....

.....

.....

Mental health concerns (*mental health support line)*: .....

.....

.....

Ongoing Plan:

□ Routine antenatal care (convert next antenatal visit to Telehealth if still in isolation)
□ Escalate to Obstetric Telehealth Review
□ Other .....
.....

Next planned review
Date: ..... Time: ..... Location: .....

Comments: .....
.....

Signed: ..... Name:..... Date:.....

Appendix B

Elective LSCS “Outsourcing” During the COVID Pandemic

The following list is a guide to patients who may be suitable for outsourcing of their elective LSCS to decant public hospitals during the COVID pandemic.
It would be expected that the patient is seen at a mutually convenient time for the patient and surgeon prior to the LSCS but in some circumstances this might be deferred to the day of surgery.

Suitable

- BMI <40 (level 4 facility can take BMI up to 45 if no other contraindications)
- Gestation >37 weeks
- Primary CS – maternal request, previous 3rd / 4th degree tear
    - LGA
    - Breech
    - Uncomplicated DC/DA twins >+37wks
    - Primary genital herpes
- Repeat CS (=<3) - maternal request or medical recommendation for repeat
    - Other conditions listed for primary CS

Relative Exclusions

- BMI 40-45
- CS for maternal medical condition
    - type 1 DM
    - inflammatory bowel conditions
    - Musculoskeletal & neurological conditions
    - Stable cardiac conditions
- CS for fetal placental condition not requiring admission
    - Minor anterior placenta previa
    - Posterior major previa
    - No evidence of accrete
- Previous history of postnatal obstetric, medical or mental health issues
- Patients who required inpatient management during the pregnancy
- Complex DC/DA twins >37+ weeks gestation (although if complicated would usually be delivered before 37 weeks)

Absolute Exclusions

- BMI >45
- Unstable lie
- Suspected placenta accrete
- Placenta previa not managed in the community
- Vasa previa
- Significant cardiac condition (any condition needing cardiac opinion during pregnancy)
- Significant anemia (Hb <100)
- Bleeding disorder
- MC/MA twins or triplets or higher order pregnancy (*would most likely be delivered before 37 weeks GA)

Appendix c

VTE prophylaxis

Patients with mild disease in home isolation with no other risk factors for VTE do not require thromboprophylaxis and should be counselled regarding hydration and mobility.

VTE prophylaxis should be considered for patients who are isolating at home/ Hospital in the Hotel (dedicated positive site) with any of the following risk factors:

- Prior VTE
- Age >35
- BMI >30 Plus another risk factor
- BMI >40
- Blood dyscrasias
- Smoking
- Multiple pregnancy
- Pre-eclampsia
- Immobility

VTE prophylaxis should consist of 40mg enoxaparin daily unless delivery imminent and continue for at least 14 days or until all COVID-19 morbidity has resolved. Consider increased dosage to 60mg daily if maternal weight >100kg. Refer to National COVID-19 Evidence Taskforce if enoxaparin is not appropriate for any specific patient

Thromboprophylaxis required:	□ Yes	□ No
Medication:	Dosage:	
Route:	Timing:	
Signed:	Name/Designation:	

Appendix D: Medications

Sotrovimab

Mechanism of Action	Monoclonal antibody targeting the spike protein of SARS-CoV-2, designed to block virus attachment and entry into human cells
Dose	500mg IV single dose Give over 30 minutes (no dosing adjustment required for hepatic or renal impairment)
Indications	Treatment of COVID-19 within 5 days of symptom onset in adults weighing >40kg who do not require oxygen and who have one or more risk factors for disease progression. These include • Diabetes prior to pregnancy requiring medication • BMI >30 • Chronic kidney disease (eGFR < 60) • Congestive heart failure (NYHA ≥II) • Moderate to severe asthma (requiring inhaled corticosteroid, or has been prescribed oral steroids in the last 12 months) • Age ≥ 55 Only for use in • Unvaccinated or partially vaccinated patients who meet the above criteria • Immunocompromised: consider regardless of vaccination status • Women in their second or third trimester **Do NOT** use in fully vaccinated patients unless immunocompromised, such as • Primary or acquired immunodeficiency o Hematologic neoplasms: leukaemia's, lymphomas, myelodysplastic syndromes o Post-transplant: solid organ (on immunosuppressive therapy), haematopoietic stem cell transplant (within 24 months) o Immunocompromised due to primary or acquired (HIV/AIDS) immunodeficiency o Other significantly immunocompromising conditions • Immunosuppressive therapy (current or recent) o Chemotherapy or radiotherapy o High-dose corticosteroids (≥ 20mg of prednisolone per day, or equivalent) for ≥ 14 days o All biologics and most disease-modifying anti-rheumatic drugs (DMARDs)
Pregnancy	There is no data on use of Sotrovimab in pregnant or breastfeeding patients. However, its use should be considered in pregnant or breastfeeding patients, particularly for patients in their second and third trimesters of pregnancy, with additional risk factors for severe COVID-19. Sotrovimab is a monoclonal antibody directed specifically against the SARS-CoV-2 virus and therefore is not expected to have significant off target effects. Because Sotrovimab is a large protein molecule, the amount in breast milk is likely to be very low. It is also likely to be partially destroyed in the infant's gastrointestinal tract and absorption both infant is probably minimal. There are no available data on the excretion of Sotrovimab in human milk, and the potential benefits and risks to a breastfed baby are not known. The median elimination half-life of Sotrovimab is 49 days, and human IgGs are known to be excreted in breast milk. A decision whether to discontinue breastfeeding or to abstain from Sotrovimab therapy should consider the benefit of breastfeeding for the baby and the benefit of therapy for the woman.
Contraindications	For discussion in first trimester
Adverse effects	Allergy, diarrhoea, transfusion reaction, fever, rash
Monitoring	Observe for 1-hour post infusion

Casirivimab/Imdevimab

Mechanism of Action	Combination of 2 monoclonal antibodies targeting different sites on the receptor binding domain of the SARS-CoV-2 spike protein.
Dose	**Post-exposure prophylaxis:** 1200mg (600mg Casirivimab + 600mg Imdevimab) as a single dose via subcutaneous injection or intravenous infusion as soon as possible following exposure to COVID-19 **Treatment:** 1200mg (600mg Casirivimab + 600mg Imdevimab) as a single dose via intravenous infusion. o Larger doses can be used in severe infections in seronegative patients. Advice on dosing will be provided by Infectious Diseases in these cases. o Subcutaneous injection is an alternative route if IV infusion is not feasible or would lead to a delay in treatment however IV infusion is preferred.
Indications	**Post-exposure prophylaxis:** Prevention of COVID-19 infection in adults and adolescents (aged ≥ 12 years and weighing ≥ 40kg) who have been exposed to COVID-19 and who have: Been a close contact of a confirmed COVID-19 case within the previous 96 hours **AND** A medical condition making them unlikely to respond to or be protected by vaccination (i.e. immunosuppressed) **OR** Are considered at high risk of developing severe illness and are not vaccinated or only partially vaccinated against COVID-19 **Treatment:** Treatment of mild to moderate COVID-19 infection in adults and adolescents (aged ≥ 12 years and weighing ≥ 40kg) who: o do not require supplemental oxygen **AND** are at an increased risk of progressing to severe COVID-19 and are not vaccinated or only partially vaccinated against COVID-19 OR are immunosuppressed **AND** are between day 5 and 7 of symptom onset (if < 5 days since symptom onset use Sotrovimab) OR if pregnant and within 7 days of symptom onset
Pregnancy	**Consider using Casirivimab plus Imdevimab within 7 days of symptom onset in pregnant or breastfeeding women who are outpatients with mild COVID-19 and who have one or more risk factors for disease progression:** • Age ≥ 50 years • Obesity (≥ 30 kg/m2) • Cardiovascular disease (including hypertension) • Chronic lung disease (including asthma) • Type 1 or 2 diabetes mellitus • Chronic kidney disease, including those that are on dialysis • Chronic liver disease Immunocompromised patients (including individuals with rheumatoid arthritis, HIV/AIDS and systemic lupus erythematosus)

	There are no available data on the excretion of Casirivimab plus Imdevimab in human milk, and the potential benefits and risks to a breastfed baby are not known. Human IgGs are known to be excreted in breast milk. A decision whether to discontinue breastfeeding or to abstain from Casirivimab plus Imdevimab therapy should consider the benefit of breastfeeding for the baby and the benefit of therapy for the woman. **Consider using Casirivimab plus Imdevimab in pregnant or breastfeeding women who are seronegative patients hospitalised with moderate to critical COVID-19 with ID guidance.**
Contraindications	Hypersensitivity to Casirivimab / Imdevimab including previous anaphylactic reactions
Adverse effects	It may be difficult to distinguish between adverse effects of Casirivimab/Imdevimab and signs and symptoms of COVID-19. As a new medication, adverse reactions to Casirivimab / Imdevimab continue to be investigated. Refer to the product information for a complete list of possible adverse effects. To date reactions include: **Common/uncommon**: injection site reactions, nausea, dizziness, rash and lymphadenopathy **Rare**: urticaria, flushing, anaphylaxis Suspected or confirmed adverse reactions should be reported via Safety Learning System and also via the Therapeutic Goods Administrations adverse effects online form: TGA adverse event reporting
Monitoring	Observe the patient for 60 minutes after the infusion is completed in case of infusion reaction or anaphylaxis

Dexamethasone

Mechanism of Action	Immunosuppressant and anti-inflammatory, including suppression of cytokine release
Dose	6mg once daily (oral or intravenously) for up to a total of 10 days (can be discontinued if patient is well enough for discharge) Alternative steroids may be used at equivalent doses
Indications	Adults with moderate, severe or critical COVID-19 including those on mechanical ventilation who are requiring oxygen supplementation
Contraindications	Adults who do not require oxygen supplementation, other than for other non-COVID-19 based indications
Adverse effects	Infection, oedema, hypertension, hyperglycaemia, dyspepsia/peptic ulceration, mood and sleep disturbance
Monitoring	Serology for Hepatitis B (surface antigen, surface antibody, core antibody), Hepatitis C, HIV, Strongyloidiasis (serology) and tuberculosis (QuantiFERON gold), however this should not delay use of the medication QID blood glucose monitoring for at least 72 hours after the first dose of dexamethasone For patients in ICU or those with persistent, severe hyperglycaemia, Endocrinology review +/- insulin infusion may be required *Blood glucose monitoring can be ceased in patients without diabetes if all blood glucose levels are <7.8mmol/L after 72 hours without the need for glucose lowering therapy and there is no plan to increase the glucocorticoid dose*

Prednisolone/Hydrocortisone

Mechanism of Action	Immunosuppressant and anti-inflammatory, including suppression of cytokine release
Dose	Prednisolone: 50mg oral daily for up to 10 days Hydrocortisone: 50mg intravenously 6-hourly for up to 10 days (can be discontinued earlier if patient is well enough for discharge)
Indications	**Pregnant patients in the first trimester** with moderate, severe or critical COVID-19 including those on mechanical ventilation who are requiring oxygen supplementation.
Contraindications	Adults who do not require oxygen supplementation, other than for other non-COVID-19 based indications
Adverse effects	Infection, oedema, hypertension, hyperglycaemia, dyspepsia/peptic ulceration, mood and sleep disturbance
Monitoring	Serology for Hepatitis B (surface antigen, surface antibody, core antibody), Hepatitis C, HIV, Strongyloidiasis (serology) and tuberculosis (QuantiFERON gold), however this should not delay use of the medication **QID blood glucose monitoring for at least 72 hours after the first dose of prednisolone/hydrocortisone.** For patients in ICU or those with persistent, severe hyperglycaemia, Endocrinology review +/- insulin infusion may be required *Blood glucose monitoring can be ceased in patients without diabetes if all blood glucose levels are <7.8mmol/L after 72 hours without the need for glucose lowering therapy and there is no plan to increase the glucocorticoid dose*

Remdesivir

Mechanism of Action	Prodrug metabolised to a C-adenosine nucleotide triphosphate analogue inhibits RNA-dependent RNA polymerase
Dose	200mg IV loading dose, then 100mg daily (from day 2) Total course 5 days (can be discontinued if patient well enough for discharge)
Indications	Adult patients who require supplemental oxygen, but NOT invasive or non-invasive ventilation, ALT < 5x upper limits of normal (ULN) and/or ALT <3x ULN and Bilirubin <2 ULN
Pregnancy	Paucity of evidence of efficacy in COVID-19 infection. Consider using Remdesivir for selected pregnant or breastfeeding patients hospitalised with moderate to severe COVID-19 who do not require ventilation with ID guidance. Pregnant patients were excluded from all clinical trials of Remdesivir in COVID-19. Animal studies do not suggest reproductive toxicity, and use for COVID-19 in pregnant or breastfeeding patients overseas has not shown safety concerns
Contraindications	Ventilated patients Evidence of multi-organ failure including coagulopathy, hepatic failure or renal failure (low urine output or eGFR <30 mL/min or dialysis) or significant cardiomyopathy with low cardiac output. Known hypersensitivity to Remdesivir, the metabolite, or formulation excipient
Adverse effects	Bradycardia, hypotension, gastrointestinal disturbance, rash, hypalbuminaemia, hypokalaemia, anaemia, thrombocytopenia, abnormal LFTs, AKI, respiratory distress
Monitoring	Monitor CBC/EUC/LFTs regularly

Tocilizumab

Mechanism of Action	Humanised anti-IL-6 receptor monoclonal antibody which antagonises IL-6 binding and thus inhibiting its pro-inflammatory effects, reducing inflammation
Dose	For intravenous administration over 60 minutes 800mg if weight >90kg 600mg if weight between 65 – 90kg 400mg if weight 40 – 65kg 8 mg/kg if weight <40kg A second dose should be considered 12-24 hours if no clinical improvement is noted, or the CRP of ferritin do not start to fall
Indications	Adults with hypoxia requiring oxygen supplementation (with oxygen saturations below 92-94% on room air) and signs of inflammation
Pregnancy	Tocilizumab safety information is largely derived from pregnant patients with non-COVID indications such as rheumatoid arthritis. There is no Embryopathy at doses used to treat COVID-19. There is insufficient data to estimate other effects on the pregnancy, but they are likely to be less significant than the effect of COVID. For the babies of patients who received Tocilizumab during pregnancy (after 20 weeks' gestation), live vaccines (rotavirus and BCG) should be avoided in the first 6 months of life. All non-live vaccinations are safe and should be undertaken. Only small amounts of Tocilizumab are detected in breastmilk in patients who receive Tocilizumab whilst breastfeeding only, live vaccines (rotavirus and BCG) can be given to the baby.
Contraindications	• Presence of serious bacterial, fungal or serious viral infection (non-COVID) • Active tuberculosis infection • Bowel perforation/diverticulitis • Abnormal ALT/AST >5 times limit of normal • Platelet <50, neutrophil count <0.5 • Prior hypersensitivity to Tocilizumab
Adverse effects	Infections, gastritis, mouth ulcers, hypertension, allergic reactions, gastrointestinal perforation, Cytopenia and hepatotoxicity
Monitoring	Before commencing treatment measure CBC and LFTs, screen for Hepatitis B (surface antigen, surface antibody, core antibody), Hepatitis C, HIV, Strongyloidiasis (serology) and tuberculosis (QuantiFERON gold), however this does not delay use of the medication. Observe for hypersensitivity reactions for 30 minutes Monitor inflammatory markers 12 hours after dose