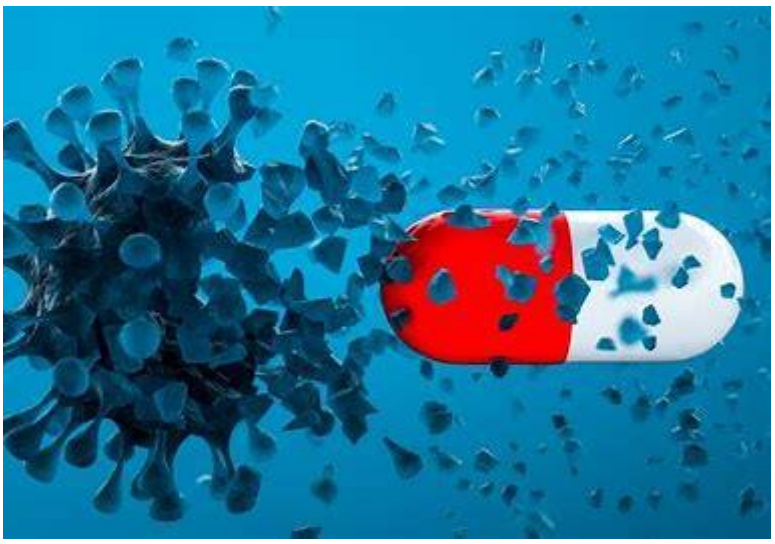

TREATMENT OF COVID-19 PATIENTS

MINISTRY OF HEALTH AND WELLNESS

MAURITIUS

October 2024

Contents

Approval Form

Version: 4.0 **Effective date:** 15 Oct 2024

TREATMENT OF COVID-19 PATIENTS			
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This protocol was sent to all heads of departments of the public sector through their Regional Health Directors for review.

16 July 2024

Date of next review: December 2026

Updates

July 2024

- Formatting and presentation of the entire document was modified.
- Grammatical mistakes were corrected.
- Paragraphs in French were translated to English.
- Risk categories for COVID-19 were aligned with protocols from the World Health Organization (WHO).
- Recommendations for the use of nirmatrelvir-ritonavir and baricitinib were added based on recommendations from WHO.
- A section on patient observation was added.
- The section on the use of tocilizumab was updated to reflect recent international recommendations.
- The chapter on antibiotic use places more emphasis on stewardship, the rise of multi-drug resistant organisms and misuse of antibiotics.
- Tests and treatment modalities that are not easily accessible in the public hospitals were removed i.e., lactate level and use of anakinra and voriconazole.
- Removal of isolation of newborns no longer requires two consecutive negative PCRs; a single negative PCR is sufficient.
- References were included.

Version history

Version	Date
Version 1.0: Created	29 Nov 2020
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Signs and Symptoms of COVID-19

Symptoms

Symptoms associated with COVID-19 include:

- fever (83–99%),
- cough (59–82%),
- fatigue (44–70%),
- anorexia (40–84%),
- shortness of breath (31–40%), and
- myalgias (11–35%).[2]

Other non-specific symptoms, such as sore throat, nasal congestion, headache, diarrhoea, nausea and vomiting, have also been reported. Loss of smell (anosmia) or loss of taste (ageusia) preceding the onset of respiratory symptoms can also occur.[2]

Complications

These include:

- Viral pneumonia,
- Hypoxemic respiratory failure / ARDS,
- Sepsis and septic shock,
- Cardiomyopathy and arrhythmia,
- Acute kidney injury,
- Complications from prolonged hospitalization like nosocomial infections and thromboembolism,
- Gastrointestinal bleeding, and
- Critical illness polyneuropathy / myopathy.

Classification of Severity

WHO definitions of disease severity for COVID-19[1]

Critical COVID-19 is defined by the criteria for acute respiratory distress syndrome (ARDS), sepsis, septic shock, or other cond[1]itions that would normally require the provision of life-sustaining therapies such as mechanical ventilation (invasive or non-invasive) or vasopressor therapy.

Severe COVID-19 is defined by any one of the following:

- oxygen saturation < 90% on room air;
- major signs of pneumonia (e.g., diffuse opacities on chest x-ray);*
- signs of severe respiratory distress (in adults, accessory muscle use, inability to complete full sentences, respiratory rate > 30 breaths per minute; and, in children, very severe chest wall in-drawing, grunting, central cyanosis, or presence of any other general danger signs including inability to breastfeed or drink, lethargy, convulsions or reduced level of consciousness).

Non-severe COVID-19 is defined as the absence of any criteria for severe or critical COVID-19.

Patients with risk factors for complications[1]

Patients at high risk (> 6%) of hospitalization includes those with diagnosed immunodeficiency syndromes, those who have undergone solid organ transplant and are receiving immunosuppressants, and those with autoimmune illness receiving immunosuppressants.

Patients at moderate risk (3-6%) of hospitalization are those over 65 years, those with obesity, diabetes and/or chronic cardiopulmonary disease, chronic kidney or liver disease, active cancer, those with disabilities, and those with comorbidities of chronic disease.

Admission criteria[3]

Indications for hospitalization include the following:

- An oxygen saturation of <94 percent on room air;
- Respiratory rate of >30 breaths/minute;
- PaO_2/FiO_2 <300 mmHg; and
- Lung infiltrates >50 percent.

Most patients with non-severe COVID-19 will not require admission to a hospital. However, they should receive counseling on infection control measures, duration of isolation, warning symptoms, and how to manage their symptoms at home.

Some patients with non-severe COVID-19 may still require admission in a general ward for other medical reasons (e.g., if they have a stroke or suffer from a myocardial infarction) or if they cannot isolate themselves safely at home or if the treating doctor anticipates they will have difficulties taking care of themselves when alone at home.

Patients with severe COVID-19 should be admitted in a High Dependence Unit for close observation.

Patients suffering from critical COVID-19 should be admitted to an intensive care unit.

*Subtly modified from WHO's definition to be more specific

Treatment of Asymptomatic SARS-CoV-2 Cases

Asymptomatic patients do not require treatment.

If such patients develop any worsening symptoms (such as light headedness, difficulty breathing, chest pain, dehydration, etc.), they should seek urgent care at their nearest healthcare facility or call 8924. Caregivers of children with mild COVID-19 should monitor for signs and symptoms of clinical deterioration requiring urgent re-evaluation.

Warning signs of SARS-CoV-2 infection can include:

- difficulty breathing/fast or shallow breathing;
- blue lips or face;
- chest pain or pressure;
- new confusion;
- inability to awaken/not interacting when awake;
- inability to drink or keep down any liquids; or
- for infants: grunting or inability to breastfeed.[2]

Post-exposure and pre-exposure prophylaxis are currently not indicated for COVID-19 in Mauritius.

Treatment of Non-Severe COVID-19[1, 2]

Basic management

Patients with mild COVID-19 should be given symptomatic treatment such as antipyretics for fever and pain, adequate nutrition and appropriate rehydration (especially if suffering from gastrointestinal symptoms such as diarrhea or vomiting).

Routine use of steroids is not indicated.

Antibiotic therapy or prophylaxis should not be used in patients with mild COVID-19 (unless indicated for another reason). Since 2020, it has been noted that multiple mild COVID-19 patients have been prescribed amoxicillin or amoxicillin/clavulanate by the Flu Clinics – this is considered an abuse of antibiotic.

Patients at high risk of deterioration are advised to monitor their oxygen level via pulse oximetry at home if they have the necessary equipment; otherwise, they can go to the nearest dispensary to seek such care.

Nirmatrelvir-ritonavir

Nirmatrelvir-ritonavir is recommended in patients with non-severe COVID-19 at moderate or high risk of hospitalization. It is not recommended for patients with a low risk of hospitalization.

The recommended dose for nirmatrelvir-ritonavir in adults is 300 mg (two 150 mg tablets) of nirmatrelvir and 100 mg of ritonavir every 12 hours daily for 5 days.

In renal insufficiency (eGFR 30–59 mL/min) the dose should be reduced to 150 mg of nirmatrelvir and 100 mg of ritonavir every 12 hours daily for 5 days.

Use in patients with eGFR < 30 mL/min including those on dialysis is not recommended. Seek expert advice if needed.

Administration should be as early as possible in the time course of the disease, preferably within 5 days of symptom onset.

Given possible benefit and residual uncertainty regarding potential undesirable effects, clinicians should discuss with pregnant or breastfeeding individuals to reach a fully informed and shared decision regarding the use of nirmatrelvir-ritonavir.

Use of nirmatrelvir-ritonavir can be considered in children aged ≥ 12 years and weighing ≥ 40 kg – the dose and duration are the same as for adults. Do not use it in children less than 12 years old or weighing less than 40 kg, given the lack of data.

Common side effects include diarrhea and dysgeusia.

Viral rebound and recurrence of COVID-19 symptoms have been reported in some patients after completing treatment.

Ritonavir is an HIV-1 protease inhibitor. There may be a risk of HIV-1 developing resistance in patients with uncontrolled or undiagnosed HIV-1 infection. Consult the patient's HIV doctor for more details.

Drug-drug interactions are common with ritonavir. Consult a drug interaction app for management recommendations.

Molnupiravir

If nirmatrelvir-ritonavir is unavailable, molnupiravir can be used to treat patients with non-severe COVID-19 at high risk of hospitalization. It is not recommended for use in patients with moderate to low risk of hospitalization.

The recommended dose for molnupiravir is 800 mg tablet every 12 hours daily for 5 days. Administration should be as early as possible in the time course of the disease, preferably within 5 days of symptom onset.

Molnupiravir is not authorized for use in those aged < 18 years due to potential effects on bone and cartilage growth.

It is contraindicated for use during pregnancy and lactation.

Common side effects include diarrhea, vomiting, nausea, dizziness and rash.

No dose adjustment is required for patients with renal impairment, including those on dialysis.

Patient observation[9]

- Vital signs include heart rate, respiratory rate, oxygen saturation, temperature and blood pressure.
- Other observations include consciousness level, pain level and glucose level.
- All observations must be charted at the time they are measured.
- Oxygen saturations must be measured if the patient is tachypneic or dyspneic.
- All patients are to be visually checked every 30 minutes at night with rise and fall of chest during respiration observed.
- For routine observation, check vitals every eight hours with the maximum gap allowed being ten hours.
- Patients may require more frequent vital sign observations if they are newly admitted, they are recently transferred from the ICU, they have a change in their treatment (including when they are receiving blood transfusions) or when they don't appear well.
- If the patient has an abnormal vital sign, repeat the test and if it remains abnormal, inform the doctor on call.

Treatment of severe and critical COVID-19[1, 2]

Immediate care

Immediate administration of supplemental oxygen therapy to any patient with emergency signs during resuscitation to target SpO2 ≥ 94% is recommended.

Diagnostics

Hematology and biochemistry laboratory testing, electrocardiogram and chest imaging should be performed at admission and as clinically indicated to monitor for complications, such as ARDS, acute liver injury, acute kidney injury, acute cardiac injury, disseminated intravascular coagulation (DIC) and/or shock.

Chest x-rays may show ground-glass opacities. When clinically indicated, CT chest, if available, can be used to look for:

- Pulmonary embolism,
- Alternative sources of infection like tuberculosis and aspergillosis, or
- Pulmonary fibrosis.[4]

Basic lab tests that should be considered include a full blood count, urea and electrolytes, creatinine, liver function tests, glucose level, C reactive protein, D-dimer, INR/PTT and arterial blood gas. Procalcitonin may be sent if bacterial infection is suspected.

An echocardiogram can be requested if cardiac complications are in the differential diagnosis.

Steroids

Steroids should be administered for 7 to 14 days - 6mg dexamethasone IV OD, 50mg hydrocortisone IV Q8h, 40mg prednisone PO OD or 8mg methylprednisolone IV Q6h.

Glucose level should be monitored while the patient receives steroids.

Tocilizumab

Tocilizumab is an interleukin-6 inhibitor that should be given with steroids in patients with severe or critical COVID-19.

Tocilizumab is dosed at 8 mg per kilogram of actual body weight, up to a maximum of 800 mg, given intravenously over one hour.

While a single dose is usually sufficient in most cases, depending on the clinical condition of the patient, a second dose may be given 8-48 hours after the first dose.

Renal dose adjustment is not currently warranted for this drug.

Tocilizumab can be used at the same dose in children ≥ 2 years of age.

Routine bloodwork including neutrophil count, platelets, transaminases and total bilirubin should be checked prior to initiation of therapy.

All patients should be monitored for signs and symptoms of infection, given the increased risk with immunosuppression in addition to systemic corticosteroids. Patients on longer term interleukin-6 receptor blocker therapy are at risk of active tuberculosis, invasive fungal infections and opportunistic pathogens. Caution is advised when considering the use of tocilizumab in patients with a history of recurring or chronic infections or with underlying conditions which may predispose them to infections.

This medication should not be initiated if absolute neutrophil count is <1,000/mm^3, platelets <50,000/mm^3, or ALT or AST >10 times upper limit of normal.[5]

Avoid treatment if there is concomitant bacterial or fungal sepsis.

Tocilizumab is not recommended for use during pregnancy or during breastfeeding.

Significant side effects include gastrointestinal perforation, neutropenia, thrombocytopenia, hepatitis and serious infections.[5]

Baricitinib[6]

If available and the risk of super-infection is low, baricitinib, a Janus kinase inhibitor, should also be started with steroids and tocilizumab.

The recommended dose is 4 mg daily orally in adults with eGFR ≥ 60 mL/min/1.73 m^2 for 14 days.

For an eGFR of 30 to <60 mL/minute/1.73 m^2, the dose is reduced to 2 mg once daily while the dose should be 1 mg daily if the eGFR 15 to <30 mL/minute/1.73 m^2. Use is not recommended in patients undergoing dialysis or when eGFR < 15 mL/min/1.73 m^2.

Use with caution in severe hepatic impairment.

The adult dose can be utilized in children nine years or older. In children two to eight years old, administer 2 mg daily. This medication should not be prescribed in children younger than two years old.

Do not initiate if absolute lymphocyte count is <200 cells/mm^3 or if absolute neutrophil count is <500 cells/mm^3. Baricitinib is also contraindicated in patients suffering from bacterial or fungal sepsis.

Significant side effects include hepatotoxicity, leukopenia, severe sepsis from bacterial (including tuberculosis) or fungal infections, lymphoma, myocardial infarctions, gastrointestinal perforations and thromboembolic events.

During treatment, monitor the patient's liver function tests, lymphocyte count and neutrophil count.

Use of this medication during pregnancy and breastfeeding is controversial – seek expert advice before such use.

Thromboprophylaxis

Monitor patients with COVID-19, for signs or symptoms suggestive of thromboembolism, such as stroke, deep venous thrombosis, pulmonary embolism or acute coronary syndrome. If these are clinically suspected, proceed immediately with appropriate diagnostic and management pathways.

In the absence of contraindications, thromboprophylaxis with enoxaparin should be administered. Enoxaparin 40 mg by subcutaneous injection every 24h is the standard dose; if the patient's weight is > 120kg, the dose of enoxaparin is 40mg by subcutaneous injection every 12h.[2]

For COVID-19 patients on dialysis or with chronic kidney disease stage 4/5, enoxaparin 20 mg daily for those ≤ 80kg and 40 mg daily for those above 80kg may be administered.

Of note, 0.1ml of enoxaparin = 10mg = 1,000iu.

Consider stopping enoxaparin if bleeding or when requiring invasive procedures.

D-dimer levels should not guide prophylactic dosing of enoxaparin.

Antibiotic Use in COVID-19 Patients

Antibiotics are not needed to treat most COVID-19 patients. Indiscriminate use of antibiotics has led to a rise in multi-drug resistant organisms among COVID-19 patients in Mauritius and in other countries.

Therefore, do not prescribe antibiotics to suspected or confirmed COVID-19 patients with low suspicion of a bacterial infection. The National Antibiotic Guidelines should be consulted to treat infections from suspected bacterial causes.

In all hospitalized patients with COVID-19, a septic screen should be performed prior to starting antibiotics i.e. two blood cultures, a urine culture (if indicated) and a sputum culture (if the patient can provide one) should be sent.

Antibiotics should be de-escalated once cultures are obtained which is typically three to five days after the cultures were ordered.

The National Antibiotic Guidelines provide additional guidance on dose adjustment in patients with renal impairment and on pediatric doses.

The usual duration of antibiotic therapy in most cases is 7 days – check the National Antibiotic Guidelines for further details.

Antibiotic therapy should be considered if:

- The Sequential Organ Failure Assessment (SOFA) score is ≥ 2, OR
- CT scan of the lungs show lobar / segmental / nodular / cavitary consolidation or loculated pleural effusions, OR
- Leukocytosis with neutrophilia, multi-organ failure and a procalcitonin > 0.5 μg/L are noted, OR
- Culture results are positive for an organism that is not a contaminant or a colonizer.[7]

Procalcitonin and C-reactive proteins are inflammatory markers that may be elevated in COVID-19, and they do not indicate bacterial infection on their own.

COVID-19 patients who are on immunosuppressants for several days may get infected with aspergillus. Contact the microbiology lab of Candos to check if galactomannan assays are available for diagnosis. Amphotericin IV can be used to treat such patients.

ICU Care of COVID-19 Patients

Initial oxygen therapy

In patients with an SpO_2 on room air less than 94%, start by providing oxygen using a venturi mask, a face mask or nasal cannula.

If saturation is not maintained (i.e., PaO_2 < 60 mmHg), High Flow Nasal Cannula (HFNC) should be used – it can provide an oxygen flow rate of up to 60 L/min with 100% FiO_2. Of note, supplying oxygen at 15 L/min via a face mask or nasal cannula is not HFNC.

If HFNC is not available, start non-invasive ventilation (NIV) i.e., continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BiPAP).

Patients with hypoxemic respiratory failure and hemodynamic instability, multiorgan failure or abnormal mental status should not receive HFNC or NIV in place of other options such as invasive ventilation.

If the patient's respiratory status is worsening 24 hours after starting NIV, he / she should be intubated.

Patients receiving a trial of HFNC or NIV should be in a monitored setting and cared for by personnel experienced with HFNC and/or NIV and capable of performing endotracheal intubation in case the patient acutely deteriorates or does not improve after a short trial (of about one hour). Intubation should not be delayed if the patient acutely deteriorates or does not improve.[2]

Intubation

Minimize the number of staff present during intubation of a COVID-19 patient in order to reduce the risk of cross-infection. Airborne precautions should be followed during the procedure – additional details are provided in the National Guidelines on Infection Prevention and Control.

The technique of rapid sequence induction (RSI) should be utilized together with a video laryngoscope. Intubation of COVID-19 patients should preferably be carried out by an experienced anesthetist.

Indications for intubation include:

- Cardiopulmonary arrest
- Severe hypoxemia i.e., PaO_2<50 mmHg or SaO_2<90% despite maximal non-invasive support defined as follows:
    - 15L/min on a non-rebreather face mask OR
    - NIV with a setting of FiO_2 50%, respiratory rate 25 / min, PEEP 8cmH_2O and pressure support 12cmH_2O.
- Lost or jeopardized airway including risk of airway inhalation
- Moderate to severe acute respiratory distress syndrome (ARDS)
- Acute and rapid alteration of consciousness
- Severe decompensated acidosis i.e., a pH < 7.2
- Respiratory rate above 30 per minute with signs of respiratory distress like the use of accessory respiratory muscles, sweating, dyspnea, tachycardia and increased blood lactate levels.

Mechanical ventilation

Mechanical ventilation using lower tidal volumes (4–8 mL/kg predicted body weight [PBW]) and lower inspiratory pressures (plateau pressure < 30 cmH_2O) is recommended. In children, a lower level of

plateau pressure (< 28 cmH_2O) is targeted. Tidal volumes should be adapted to disease severity: 3–6 mL/kg PBW in the case of poor respiratory system compliance, and 5–8 mL/kg PBW with better preserved compliance.[2]

In patients with moderate or severe ARDS, a trial of higher positive end-expiratory pressure (PEEP) is suggested (up to 30cmH_2O in adults and 15cmH_2O in children) – this can be part of alveolar recruitment maneuvers.[2]

The formula for calculating PBW (kg) is 50 + 2.3 (height (in) - 60) for men, and PBW (kg) = 45.5 + 2.3 (height (in) - 60) for women.[8]

The usual targets during ventilation are:

- P plat < 30 cmH_2O
- Driving pressure < 15 cmH_2O
- PEEP of 6-14 cmH_2O
- Respiratory rate of 22-35/min
- SpO_2 goal no higher than 96 %
- Maintain minimum FiO_2 to reach saturation > 88 % or PaO_2 > 60 mmHg.

Prone positioning

Awake prone positioning of severely ill patients hospitalized with COVID-19 requiring supplemental oxygen (including high-flow nasal oxygen or mechanical ventilation) or non-invasive ventilation is recommended.[2]

In adult patients with severe ARDS (PaO_2/FiO_2 < 150) prone ventilation for 12–16 hours per day is also recommended:[2]

- Turn the patient's head to his right and to his left alternatively every 4 hours.
- Protect his eyes with eye pads.
- Ensure that his genitals are protected while turning in prone position.
- Use the sushi method to prone the patient.

Nutrition

The Basal Energy Expenditure can be calculated to be 25 kcal/kg. A patient's protein requirement is estimated to be 1.5 gm protein/kg /day. The daily energy requirement is usually around 1800 – 2000 kcal/day.

For enteral nutrition, Nutrison, Fortimel and Fortimel Diacare are available in public hospitals. The protocol for use of Nutrison is as follows:

- Day 1: 50 ml per hour for 10 hours (500 ml),
- Day 2: 50 ml per hour for 10 hours, then pause for 4 hours, then 50 ml for 10 hours (i.e., 1,000 ml in total),
- Day 3: 100 ml/h for 5 hours, then pause for 3 hours, then 100 ml/h for 5 hours, then pause for 11 hours (i.e., 1,000 ml in total),
- Day 4: Depending on how the patient is tolerating the enteral feeding, top up with Fortimel or Fortimel Diacare so that the targets in terms of calories and proteins are met.

Rehydration

A conservative fluid strategy should be adopted. Daily requirement for fluid depends on size and comorbid issues.

1-1.5 cc/kg/hour can be used for maintenance in adults while in the pediatric group, use the 4-2-1 rule. All fluid deficits should be replaced in addition to the administration of maintenance fluids.

It is mandatory to keep an input/output chart for each ICU patient daily so as to keep track how much fluid has been administered to the patient.

Sedatives and relaxants

Relaxants should be used in patients with a PaO_2/FiO_2 ratio < 150 i.e., in severe ARDS. In such cases, patients should remain relaxed for a maximum of 48 hours in order to improve gas exchange via enhancement of patient-ventilator synchrony and thus, the ability to provide proficient lung-protective ventilation.

Medication	Dose
Midazolam	Loading dose: 0.03-0.3 mg/kg in increments of 1-2.5 mg Maintenance dose: 0.03-0.2 mg/kg/h
Fentanyl	Loading dose: 1-2 mcg/kg (25 to 100 mcg) Maintenance dose: 0.35-0.5 mcg/kg every 0.5-1 hour intermittently (25 to 50 mcg) AND/OR Infusion: 0.7-10 mcg/kg/h infusion (50 to 700 mcg). For most patients, 1-3 mcg/kg/h infusion (50 to 200 mcg/h) with as needed intermittent bolus doses is sufficient.
Propofol	Initiation: 0.005 mg/kg/min IV for at least 5 min; titrate to desired clinical effect; increase by 0.005-0.01 mg/kg/min over 5-10 min intervals until desired sedation level is achieved; allow a minimum of 5 min between adjustments for onset of peak effect. Maintenance: 0.005-0.05 mg/kg/min IV individualized and titrated to clinical response; 0.005 mg/kg/min increment increase every 5 mins
Cisatracurium (Nimbex)	IV direct: 0.15-0.2 mg/kg IV infusion: 0.03-0.6 mg/kg/h equal to 0.5-10 mcg/kg/min infusion for 48 hours
Atracurium	IV direct: 0.3-0.6 mg/kg Maintenance: 0.3-0.6 mg/kg/h
Vecuronium	IV direct: 0.08-0.1 mg/kg For RSI: 0.l-0.2 mg/kg IV with the onset of intubation conditions occurring in less than 2 to 3 minutes. Maintenance: 0.05-0.07 mg/kg/h
Rocuronium	RSI: 0.6-1.2 mg/kg IV Tracheal Intubation: 0.45-0.6 mg/kg IV

	Maintenance: 0.1-0.2 mg/kg IV Repeat PRN or continuous infusion: 0.01-0.012 mg/kg/min IV

Vasopressors

Medication	Dose
Dobutamine	IV infusion: 0.5-1 mcg/kg/min initially, then 2-20 mcg/kg/min not to exceed 40 mcg/kg/min
Noradrenaline	Acute hypotension or cardiac arrest Initial: 8-12 mcg/min IV Infusion; titrate to effect Maintenance: 2-4 mcg/min IV infusion Septic shock IV infusion: 3.3 mcg/kg/min; aim to keep mean arterial pressure (MAP) > 65 mmHg
Adrenaline	Use a 1:10,000 diluted solution Cardiac arrest IV push: 0.5-1.0 mg (5-10 ml); give every 5 min Septic shock IV infusion: 0.05-2 mcg/kg/min; titrate to desired MAP; may adjust dose every 10-15 mins by 0.05-0.2 mcg/kg/min to achieve desired blood pressure goal Symptomatic bradycardia unresponsive to atropine or pacing IV infusion: 2-10 mcg/min or 0.1-0.5 mcg/kg/min (7-35 mcg/min in a 70 kg patient); titrate to patient response
Dopamine	To increase urine output by increasing renal blood flow IV infusion: 1.5 mcg/kg/min To increase cardiac output by increasing heart rate and cardiac contractility IV infusion: 5-15 mcg/kg/min Septic shock IV infusion: 20-50 mcg/kg/min

Reduction of hospital-acquired complications

Reduce ventilator-associated pneumonia	Use weaning protocols that include daily assessment for readiness to breathe spontaneously Reduce the use of sedatives Oral intubation is preferred

	Patient should be semi-recumbent position i.e., head of bed is 30-45 degrees up Use a close suctioning system Use a new ventilator circuit for each patient Change antimicrobial filters every 5-7 days
Reduce thromboembolism	Use prophylactic enoxaparin whenever possible If enoxaparin is contraindicated, use intermittent pneumatic compression devices
Reduce the incidence of catheter-related bloodstream infections	Daily catheter check Remove catheter if not required
Reduce the incidence of pressure ulcers	Turn the patient every 2 hours
Reduce stress ulcers	Start enteral feeding within 24 hours of intubation Give proton pump inhibitors as prophylaxis
Reduce ICU-related myopathy	Provide physiotherapy twice daily while intubated Early mobilization when extubated

Hemodialysis

This protocol applies to hemodialysis patients who are found to be positive on routine COVID-19 screening.

Admission criteria

Admit a COVID-19 patients on hemodialysis if he / she:

- has an O_2 saturation of <94% on air OR
- is feeling too unwell to be at home OR
- has another health problem that requires admission OR
- is not fully vaccinated against SARS-CoV-2.

COVID-19 patients on hemodialysis meeting all the following criteria can be managed as an outpatient:

- is fully vaccinated against SARS-CoV-2 AND
- is symptomatically well AND
- has satisfactory temperature, pulse, blood pressure, oxygen saturation and respiratory rate AND
- maintains O_2 saturation >94% on air (ideally after 5 min of walking) AND
- has been stable on hemodialysis for more than a month AND
- is compliant with fluid restrictions and medications AND
- has signed a consent form to go home with the understanding that sudden deterioration may occur as late as in the second week of the illness.

Patients should be instructed to call 8924 in a timely manner if signs of complications arise.

Upon discharge, the patient should be given a prescription for all the necessary medications; the Regional Public Health Superintendent should be notified by the Charge Nurse of the ward of the patient's discharge.

Organization of outpatient hemodialysis

Dialysis should be arranged in the COVID-19 positive cohort as long as the patient is considered infectious.

The patient should be transported to dialysis either by a relative or the Rapid Response Team.

Strict infection prevention and control measures should be applied while the patient is considered contagious – consult the relevant infection prevention and control guidelines for details. Contact the Public Health representative or verify the pertinent protocol from the Communicable Disease Control Unit to know whether the patient is still in the infectious period.

Annex 1 contains a checklist that should be filled in by the dialysis nurse during each dialysis session while the patient is infectious.

If the dialysis nurse is concerned about the clinical status of the patient, he / she should call the Registered Medical Officer.

Administer enoxaparin 0.4ml at the start of each dialysis if less than 60kg in weight, 0.6ml if 60 to 90kg and 0.8ml if above 90kg. The usual dose of heparin will not be required.

Management of COVID-19-Associated Acute Kidney Injury

This guideline should be read in conjunction with the 2020 MOHW AKI and Hyperkalemia Guidelines and the advice of a nephrologist should be sought sooner rather than later.

Pathophysiology of acute kidney injury (AKI) in COVID-19

Most causes of COVID-19 AKI are the same as in non-COVID19 critically ill patients: mostly acute tubular injury (with rhabdomyolysis not uncommon). However, other causes of AKI particular in COVID-19 include thrombotic microangiopathy and complement and/or immune dysfunction leading to vasculitis or glomerulonephritis.

KDIGO Classification of AKI

KDIGO AKI Staging		
Stage	**Serum creatinine**	**Urine Output**
1	1.5 to 1.9 x baseline OR increase by ≥ 26 μmol/L within 48hrs	<0.5 mL/kg/h for > 6 consecutive h
2	2 to 2.9 x baseline	<0.5 mL/kg/h for > 12h
3	≥3 x baseline OR increase to ≥ 354 μmol/L OR initiation on renal replacement therapy	<0.3 mL/kg/h for > 24h OR anuria for 12h

Identification patients with COVID-19 at risk of AKI

Demographic: Age, diabetes, hypertension, obesity, chronic kidney disease, heart disease, immunosuppression or smoker

COVID-19 related: respiratory status, inflammatory markers or hematological abnormalities

Drugs and nephrotoxins: Use of angiotensin-converting enzyme inhibitors, angiotensin II receptor blockers, non-steroidal anti-inflammatory drugs (NSAID), contrast, statins or inotropes

Exposure: Hypovolemia/dehydration, sepsis, fluid overload or high PEEP ventilation

Early detection of AKI in at risk patients

Monitor daily for (1) fluid status and balance, (2) urine output and (3) urea, electrolytes and creatinine.

Consider checking urine dipstick and urine albumin to creatinine ratio (ACR) for new hematuria and/or albuminuria.

Investigation of AKI in COVID-19 patients

Urine: Dipstick, ACR, microscopy, culture and sensitivity

Blood: Urea and electrolytes, creatinine, liver function tests, calcium, phosphate, uric acid, full blood count with differential, blood film, clotting screen with D-dimers, creatine kinase, arterial blood gas

Imaging: Ultrasound of kidneys and urinary tract

Further investigations may be required, and the advice of a nephrologist should be sought. It is very unlikely that a native renal biopsy will alter management in COVID-19 AKI.

Management of AKI in COVID-19 patients

Measurement of kidney function	Monitor at a minimum serum creatinine and urine output with careful consideration of the limitations of both
Hemodynamic optimization	We recommend individualized fluid and vasopressor based on dynamic assessment of cardiovascular status
Fluid management	Use balanced crystalloids (Ringer's lactate) as initial management for volume expansion unless an indication for other fluids exists. Fluid losses can be important in high fever and diarrhoea, but fluid overload will compromise patients with ARDS. The volume of fluids should be individualized according to the clinical context with achieving euvolemia as target.
Exclude urinary obstruction	Check for palpable bladder. Urethral catheterisation is NOT mandatory. It is only indicated if the patient is immobile, obstructed, uncooperative or critically ill. Urgent ultrasound abdomen is needed if obstruction is suspected.
Sepsis	Early recognition and treatment of secondary and opportunistic infections.
Glucose management	Both hyperglycemia due to insulin resistance and hypercatabolism, and hypoglycaemia due to severe sepsis and multi-organ failure can occur. Close monitoring of blood glucose is required.
Nephrotoxin management	Limit nephrotoxic drug (including NSAIDS and aminoglycosides) exposure where possible. Careful monitoring is needed.
Medicine management	Dosage and timing of drugs should take into account the reduced renal clearance. Stop nephrotoxins.
Use of contrast media	Optimization of intravascular volume status is the only specific intervention to prevent contrast nephropathy. Sodium bicarbonate or N-acetylcysteine are not useful. Do not withhold contrast if no other diagnostic options are available.
RAAS inhibitors	Renin-angiotensin-aldosterone system (RAAS) inhibitors should only be stopped if there is hyperkaliemia or hypotension. They should be restarted as soon as clinically possible.
Lung-protective mechanical ventilation	Excessive PEEP might result in high systemic venous pressure and a reduction in kidney perfusion and glomerular filtration. Therefore, individualization of PEEP with consideration of its risks and benefits is recommended.
Risk of malnutrition vs impaired renal clearance	Increase protein intake to 3g/kg/d in AKI not on renal replacement therapy and if on intermittent hemodialysis, and up to 1.7 g/kg/d if on continuous venovenous hemodiafiltration (CVVHD). Early enteral feeding (prone position is not a contraindication) is preferred over parenteral nutrition. Limitation of sodium, phosphate, potassium or fluid intake may be required in individual patients.
Proton pump inhibitors	Patients with AKI are at risk of upper gastrointestinal bleed and a proton pump inhibitor should be prescribed prophylactically.

Anticoagulation	Please refer to the main *National COVID-19 Guidelines.*

Timing of the initiation of RRT (renal replacement therapy/dialysis)

Do not start RRT uniquely on the basis of urea and creatinine levels but also on the following:

- The clinical status of the patient,
- Prolonged oligo-anuria, or
- The presence of life-threatening complications that *cannot be treated medically* i.e., hyperkalemia, metabolic acidosis, fluid overload, uremic pericarditis or other uremic symptoms.

Recent clinical trials show no advantage in pre-emptive start of RRT for AKI in critically ill patients. RRT initiation may be delayed by a judicious and safe use of diuretics in fluid overload as long as the patient is diuretic responsive, is given enteral or IV sodium bicarbonate for worsening metabolic acidosis and is administered calcium resonium for hyperkalemia.

RRT use in patients with COVID-19 AKI

The advice of a nephrologist should be sought well before considering the initiation of RRT.

Indications	Consider acute RRT when metabolic and fluid demands exceed total kidney capacity. Consider the broader clinical context and conditions that can be modified by RRT rather than urea or creatinine alone.
Modality	CVVHD should be considered for hemodynamically unstable patients, those with marked fluid overload, or in whom shifts in fluid balance are poorly tolerated. Intermittent hemodialysis should be used in more stable patients.
Dose	CVVHD: 12-24h/day with a prescribed effluent dose of 25–30 ml/kg/h Intermittent hemodialysis: First session should be limited to 2 hours at 150-200ml/min pump speed to avoid dialysis disequilibrium syndrome and can be repeated the next day. Once established, continue for a minimum of three times per week (alternate days) for 3 to 4 hours at 200 to 300ml/min pump speed.
Vascular access	Right internal jugular is the preferred site. Prone position, obesity and hypercoagulability may affect vascular access performance.
Anticoagulation	The decision to use anticoagulation to maintain circuit patency should be based on the individual potential risks and benefits.

Management of the COVID-19 Elderly Patient

History taking

In addition to the normal process of assessment and treatment conducted for patients of any age with COVID-19, in a patient 70 years or older, multiple other potential issues should be assessed and treated.

Note that a collateral history taken from the family in person or by phone is sometimes essential in obtaining the relevant information.

Delirium

- Score the Glasgow Coma Score and in particular whether the patient is well-orientated
- Observe and note any agitation
- Is there a known background of dementia?
- Has there been the onset of delirium (fluctuating alertness, confusion, hyperactivity or hypoactivity of behaviour in relation to the patient's normal behavior)?
- Check and record the blood glucose level
- Consider psychiatry referral, especially if the patient is agitated or severely distressed (e.g. with hallucinations)
- Avoid mechanically restraining the patient as far as possible, unless there is an immediate health risk to the patient or to others that cannot be otherwise dealt with (if so, record this in the patient notes)
    - Mechanical restraints besides possibly causing emotional trauma may increase the risk of injury to the patient, further increasing agitation through pain or frustration due to restriction of freedom of movement and positioning, and impair feeding, urination and defecation.

Falls

- Did the patient usually have a falling tendency even before contracting COVID-19?
- If so, the falling tendency is likely to be exacerbated with the illness, increasing the risk of fracture, other injuries, and functional incontinence due to loss of mobility or loss of confidence in mobility to the toilet.
- Reducing number and dosage of prescribed medications, especially in the case of anti-hypertensive and medications acting on the central nervous system (e.g. benzodiazepines, anti-depressants or anti-psychotics) has been shown to significantly decrease falls risk in the elderly.

Incontinence of urine and/or faeces

- Is there urinary and/or faecal incontinence?
- Urinary catheterization is generally a poor solution for urinary incontinence as it increases the risk of infections, hematuria, falls and delirium
- Incontinence pads should generally be used

Urinary retention

- If urinary catheterization is used, the necessity for keeping the catheter in must be re-assessed on a daily basis, as it otherwise increases the risk of complications as mentioned above
- Irrespective of the cause of urinary retention, check whether the patient is constipated, as constipation commonly increases the risk of developing urinary retention in the elderly

Pressure sores

- Assess for pressure sores (especially sacral) and note size, depth, discharge, smell and appearance of sores
- Primary and secondary prevention are essential, as these can develop very quickly in the elderly
- Avoid or remove any unnecessary lines and catheters, as these restrict freedom of movement
- Ensure through communication with nursing staff that incontinence pads are checked and changed as fast as possible after urination or defecation
- Recommend regular re-positioning of the patient (at least every 2 hours) paying particular attention to avoiding pressure on the sacrum, heels, elbows, greater trochanters and neck
- Recommend a ripple mattress if available
- Check the albumin level and recommend/prescribe protein supplementation if no contraindications
- Refer early to the orthopedics team

Anorexia and poor feeding

- Assess the state of hydration and nutrition (e.g. is the patient cachectic?) and presence of dentures
- Chronic conditions such as dementia may cause poor feeding, as may acute conditions
- Temporary nasogastric insertion for feeding may or may not be appropriate after discussion with the family
    - This option may cause distress to the patient, especially in the case of confused patients with delirium or dementia
    - The patient may pull on the tube, especially at night, therefore dislodging the tube and/or causing harm to self
    - Discussion of the pros and cons with family is therefore often needed in order to prevent recurrent attempts at tube insertion that may in some cases distress the elderly confused patient unnecessarily, especially if the medical prognosis is estimated to be poor

Comorbidities

- The elderly may suffer from a range of pathologies like myocardial infarction, fracture or schizoaffective disorder. If suspected, these should be appropriately assessed and treated.

Polypharmacy and drug dosing

- Polypharmacy:

    - Polypharmacy means being on too many prescription drugs, and is an independent risk factor for falls, and for a broad range of other adverse reactions causing complications requiring prolonged hospitalization.
    - Do not “reflex-prescribe” in the elderly. Limit the number of drugs and reduce their doses and duration wherever other options are available. For example, some types of pain may respond to using a heat pack together with low doses of paracetamol.
- The weight of the patient:
    - Many elderly patients have lost weight compared to when they were younger, and this will affect doses for many drugs, such as enoxaparin, phenytoin, etc.
- Renal impairment:
    - Many elderly patients have renal impairment, and this will affect doses for a broad range of drugs.
- Hepatic impairment:
    - Many elderly patients have liver dysfunction, and this will affect doses for a broad range of drugs.
    - In particular, for paracetamol, do not exceed the dose of 1 g three times a day.
- Congestive cardiac failure:
    - Several drugs can worsen congestive cardiac failure, e.g. NSAIDs.
- Electrolyte disturbance:
    - Several drugs can cause hyponatremia or disturbances in potassium and magnesium levels in the elderly, for example proton-pump inhibitors.
    - Prescribe the minimum effective dose and stop the drug when no longer needed.
- Falls risk:
    - Medications treating high blood pressure, and medications acting on the central nervous system, increase falls risk in the elderly.
- Osteoporosis:
    - Steroids such as prednisolone, and proton pump inhibitors, are among a range of drugs associated with osteoporosis.
    - Prescribe the minimum effective dose and stop the drug when no longer needed.
- Antibiotic resistance:
    - Avoid unnecessary prescription of antibiotics, for example for asymptomatic bacteriuria in elderly females, for which evidence for the prescription of antibiotics is poor.
- Comorbidities:

- The elderly often have a number of diseases affecting them concurrently. Safe prescription must take into account comorbidities, e.g. a history of gastric ulcers before prescribing dual anti-platelet therapy or prescribing NSAIDs.

- Drug interactions:
    - The elderly often take several drugs every day. It is important to consider potential drug interactions before adding a drug, especially with warfarin, lithium and other drugs where the “therapeutic window” is important to preserve.

Immunosuppressed Patients Infected with COVID-19

Definition

The following groups of patients are considered to be immunosuppressed:

- Patients with severe or critical neutropenia,
- HIV / AIDS patients with CD4 count < 200 cells / mm^3,
- Patients with primary immunodeficiency, and
- Patients on immunosuppressive therapy e.g., transplant patients, cancer patients on chemotherapy in the last 4 weeks and patients treated for auto-immune disease e.g., on methotrexate, azathioprine, mycophenolate mofetil, cyclosporine, tacrolimus, cyclophosphamide or rituximab.

The immunosuppressive effect of some drugs may persist for a few months after the last dose and possibly beyond six months for rituximab and anti-thymocyte globulin.

Clinical presentation

- Many patients will present in a similar manner to any other COVID-19 patients who are not immunosuppressed.
- Consider atypical presentations of COVID-19 (e.g., absence of fever or presence of loin pain in patients with lower lobe infection).
- Exclude other causes for symptoms (e.g., cytomegalovirus infection, pneumocystis, community or hospital acquired pneumonia, influenza, urinary sepsis, lymphoma and fluid overload).
- A negative swab result requires repeat if clinical suspicion is high.
- Patients may have prolonged periods of SARS-CoV-2 PCR positivity although they may not necessarily be infectious.

General management

- In general, treatment recommendations do not differ from those of non-immunocompromised patients.
- Immunosuppressed patients are at higher risk of secondary and opportunistic infections. Consider adjunctive antimicrobials if superadded bacterial infection is suspected.
- Deterioration and requirement for ventilation may occur precipitously and early transfer to ICU is advised.
- Hydroxychloroquine, chloroquine and sulfasalazine can be continued in patients with active COVID-19.
- For most infected patients, withhold immunomodulators and biologics for at least 2 weeks while monitoring the patient. Seek expert advice from the treating specialist.
- Interrupting anti-cancer treatment in patients with active COVID-19 should be based on the risk of interrupting treatment versus the risk of adverse COVID-19 outcomes in patients receiving active cancer treatment. Contact the treating oncologist.
- Ensure drug-drug interactions are minimized.

HIV / AIDS patients

- The treatment of COVID-19 in patients with HIV is the same as that for patients without HIV.
- When starting treatment for COVID-19 in patients with HIV, clinicians should pay careful attention to potential drug-drug interactions.
- For more details on the management of HIV patients, contact the AIDS physician.

Renal transplant patients

- Patients with kidney transplants, lupus nephritis, renal vasculitis, nephrotic syndrome and various glomerular diseases may be on significant immunosuppression.
- These patients are at risk of acute kidney injury (AKI). Fluid administration is necessary to maintain circulating volume but avoid significant overload. Please refer to "Management of COVID-19 associated Acute Kidney Injury" guidelines.

<table>
<tr><th>Immunosuppressant</th><th>Non-severe COVID-19</th><th>Severe COVID-19</th><th>Critical COVID-19</th></tr>
<tr><td>Steroids</td><td>Continue maintenance dose steroids.</td><td colspan="2">Start dexamethasone 6mg daily for 10 days or any other steroids as indicated in the section of this document on the treatment of patients with severe or critical COVID-19.</td></tr>
<tr><td>Antiproliferative agents (mycophenolate mofetil / azathioprine)
Cytotoxic drugs (cyclophosphamide)
Antimetabolite drugs (methotrexate)</td><td colspan="3">STOP</td></tr>
<tr><td rowspan="2">Calcineurin inhibitors (cyclosporine / tacrolimus)</td><td>Review overall burden of immunosuppression. If high, reduce accordingly.</td><td>Consider reducing or stopping pre-emptively.</td><td>Dramatically reduce or stop calcineurin inhibitors pre-emptively.</td></tr>
<tr><td colspan="3">If AKI, levels must be requested urgently.</td></tr>
</table>

- Recommencement of immunosuppression is best done by the (treating) nephrologist. Regular monitoring of renal function is essential. It is essential to organize a clear follow-up with the nephrology team.
- <u>If asymptomatic or mild disease:</u> Consider restarting immunosuppression 14 days after onset of symptoms if symptom-free in absence of antipyretics for a minimum of 3 days.
- <u>If moderate or severe disease:</u> There may be a rather prolonged period (during which immunosuppression should be kept low) before full recovery of the immune system leads to acute rejection or kidney disease relapse depending on the individual patient.
- For more details on the management of renal transplant patients, contact the nephrologist.

Pregnant Women

Infrastructure

Isolation rooms should be set up for safe labor and delivery and neonatal care. Since maternity and newborn care units vary in physical configuration in the 5 regional hospitals, each facility should consider their appropriate space and staffing needs to prevent transmission of the virus that causes COVID-19.

The following setup facilities should be ensured:

- An isolation ward for ante/postpartum patients,
- A separate room for delivery, and
- OT facilities to perform C-section.

ICU facilities should be close by if ever the need to transfer a critical patient arises.

Infection prevention and control

All medical staff involved in management of infected women should wear personal protective equipment (PPE) as required – refer to the national guidelines on wearing of PPE for additional details regarding contact and droplet precautions. Airborne precautions are mandated during birthing, resuscitation and intubation.

All staff engaged in obstetrics should receive training in infection prevention and control.

For the transfer of confirmed cases, the attending medical team should wear PPE and keep themselves and their patient a minimum distance of 1–2 meters from any individuals without PPE.

Pregnant healthcare professionals should follow risk-assessment and infection control guidelines following exposure to patients with suspected, probable or confirmed COVID-19.

Diagnostics

Chest imaging, including CT scan, can be included in the work-up of pregnant women with COVID-19 infection if clinically indicated.

Following radiological scanning of a suspected, probable or confirmed COVID-19-infected pregnant patient, surfaces of transducers and equipment should be cleaned and disinfected.

Antepartum care

A detailed history regarding recent travel, occupation, significant contact and cluster and clinical manifestations should be acquired routinely from all pregnant women attending for routine care.

Obstetrical patients with respiratory symptoms should be asked to wear a surgical mask immediately upon presentation to the health care facility.

Women suspected of having or having been exposed to COVID-19 should be triaged quickly, given a mask to wear, and transferred to the isolation ward as quickly as possible and referred to the medical unit.

Threshold for testing for SARS-CoV-2 in pregnant women should be low.

Those with confirmed infection who are asymptomatic or recovering from mild illness, should be monitored with 2–4weekly ultrasound assessment of fetal growth and amniotic fluid volume, with umbilical artery Doppler if necessary.

Intrapartum care

All stages of labour should be carried out in a dedicated isolated room. Patients should be given a mask to wear. Only essential staff should enter the room; such should be kept to a minimum.

Given that intubation is considered an aerosol-generating procedure, the surgical team should wear N95 respirators for cesarean delivery in case there is a need to convert from neuraxial to general anesthesia.

Elective cesarean delivery should be delayed, if possible, until a woman is no longer considered infectious. Appropriate patient transfer planning should be made so as to minimize exposure of other patients in the hospital.

Miscarried embryos/fetuses and placentae of COVID-19-infected pregnant women should be treated as infectious tissues and disposed of appropriately.

Delayed cord clamping should be encouraged as it is unlikely that SARS-CoV-2 will be transmitted by cord blood.

Postpartum care

Regardless of the gestational age at which a pregnant woman was infected COVID-19, the newborn infant should be tested for COVID-19 at birth (i.e., nasopharyngeal swab and umbilical swab for COVID-19 polymerase chain reaction).

If the patient is asymptomatic or mildly affected, breastfeeding and co-location (also called rooming-in) can be considered by the mother in coordination with healthcare providers.

Mothers may also express breast milk after appropriate breast and hand hygiene. Caregivers who are not infected may feed the breast milk to the infant.

Outside of breastfeeding, the baby should be kept at least 6 feet away from the mother to prevent spread via droplets till the mother is not contagious anymore.

Women should practice good handwashing before and use of a mask while engaging in infant care. Mothers who request direct breastfeeding should comply with strict preventive precautions that include meticulous breast hygiene.

There is currently no evidence to suggest that the virus can be transmitted through breast milk. Women who choose to breastfeed should be allowed to do so after appropriate handwashing and while wearing a mask.[2]

Clean and disinfect surfaces with which the mother has been in contact.

Management of Babies Born to COVID-19 Positive Mothers

Infection Prevention and Control

Vertical transmission of SARS-CoV-2 remains rare. Bathe newborns after birth to remove viruses potentially present on skin surfaces.

Universal isolation of the infant from the COVID-19 mother is not recommended. However, depending on a family's values and availability of resources they may choose to separate infant from mother until isolation precautions for the mother can be formally discontinued.

Infants born from mothers with COVID-19 should be isolated from other newborns until their PCR test for SARS-CoV-2 is negative. Droplet and contact precautions should be followed by visitors and staff when in touch with these infants during the period of isolation.

If the newborn cannot be isolated, he / she should be kept at least six feet from the mother (preferably in a closed incubator), outside the period of breastfeeding.

ICU care

Newborns who are positive for SARS-CoV-2 and who require care in an ICU should be transferred to Dr. A. G. Jeetoo Hospital. Contact the pediatrician on-call before transfer.

Diagnostics

Babies born from SARS-CoV-2 positive mothers should be tested by PCR at two hours of age. If positive, tests can be repeated every 72 hours till a PCR is negative at which point isolation is discontinued. If results are not available within 24 hours, the treating doctor should contact the lab to get the results.

Treatment

Most babies who are infected with SARS-CoV-2 are asymptomatic and do not require treatment. However, close follow-up may be needed as indicated by the treating specialist.

Discharge

Babies who are SARS-CoV-2 negative by PCR can be discharged home if otherwise well. If the mother is still considered contagious, she should continue to follow isolation precautions at home as indicated above i.e., keep a distance of six feet away from the newborn, wear a mask and follow hand hygiene.

Multisystem Inflammatory Syndrome in Children

Case definition[2]

The following conditions should be met for a diagnosis of multisystem inflammatory syndrome in children (MIS-C) or pediatric inflammatory multisystem syndrome temporally associated with SARS-CoV-2 infection (PIMS-TS):

- Children and adolescents 0–19 years of age with fever > 3 days AND
- At least two of the following:
    - Rash or bilateral non-purulent conjunctivitis or muco-cutaneous inflammation signs (oral, hands or feet);
    - Hypotension or shock;
    - Features of myocardial dysfunction, pericarditis, valvulitis, or coronary abnormalities (including echo findings or elevated troponin / NT-proBNP);
    - Evidence of coagulopathy (by PT, PTT, elevated D-dimers);
    - Acute gastrointestinal problems (diarrhoea, vomiting, or abdominal pain); AND
- Elevated markers of inflammation such as ESR, C-reactive protein, or procalcitonin AND
- No other obvious microbial cause of inflammation, including bacterial sepsis, staphylococcal or streptococcal shock syndromes AND
- Evidence of COVID-19 (RT-PCR, antigen test or serology positive), or likely contact with patients with COVID-19.

Differential diagnosis

- Kawasaki disease
- Toxic shock syndrome
- Acute COVID-19
- Macrophage activation syndrome
- Scarlet fever
- Septic shock

Treatment

Mild manifestations can be managed conservatively with close outpatient follow-up and observation for progression of disease.

Early initiation of IV immunoglobulin and methylprednisolone for patients presenting in shock under consideration for MIS-C is critical given that early treatment may be associated with rapid clinical improvement and improved overall outcome:

- The usual dose of IV immunoglobulin is 2 g/kg (maximum of 100g).
- Broad spectrum empiric antibiotics should be started pending the results of cultures – deescalate once culture results are obtained.

- The typical dose of methylprednisolone is 1-2 mg/kg/day.
- Low-dose aspirin (3-5 mg/kg/day; maximum dose of 81 mg/day) is recommended for patients with MIS-C who do not have contraindications for aspirin therapy like active bleeding, significant bleeding risk, or platelet count less than or equal to 100,000/µL.

Patients who deteriorate despite the above therapy should receive pulsed steroid therapy e.g., methylprednisolone IV 10-30 mg/kg/day.

For patients with refractory disease, consider tocilizumab (if ≥ 2 years old) or infliximab.

Complications

- Coronary artery aneurysms
- Cardiac dysfunction
- Systemic thrombosis
- Respiratory failure
- Renal failure
- Neurologic complications e.g., Guillain-Barré syndrome
- Severe encephalopathy

References

1. Therapeutics and COVID-19: living guideline, 10 November 2023. Geneva: World Health Organization; 2023 (WHO/2019-nCoV/therapeutics/2023.2). Licence: CC BY-NC-SA 3.0 IGO.
2. COVID-19 Clinical Management: Living guidance, 25 January 2021. Geneva: World Health Organization; 2021.
3. Pieter Cohen and Kelly Gebo. COVID-19: Evaluation of adults with acute illness in the outpatient setting. UpToDate. 15 Dec 2022.
4. Cao B, Iredell J, Middleton P, Young N. Chest CT in COVID-19 patients: A clinical need. J Med Radiat Sci. 2023 Mar;70(1):40-45. doi: 10.1002/jmrs.642. Epub 2023 Jan 2.
5. Tocilizumab. Lexidrug. UpToDate. Accessed 20 June 2024.
6. Baricitinib. Lexidrug. UpToDate. Accessed 20 June 2024.
7. Dueñas-Castell C, Polanco-Guerra CJ, Martinez-Ávila MC, Almanza Hurtado AJ, Rodriguez Yanez T, Gutierrez-Ariza JC, Rico-Fontalvo J. When to Use Antibiotics in COVID-19: A Proposal Based on Questions. Cureus. 2022 Jul 28;14(7):e27398. doi: 10.7759/cureus.27398.
8. http://www.ardsnet.org/tools.shtml. Accessed 20 June 2024.
9. Royal Prince Alfred Hospital - Patient Observation (Vital Signs) Policy – Adult. Sydney Southwest Area Health Service. June 2010.

Annex 1

Nephrology Unit, Ministry of Health and Wellness

NURSING CHECKLIST ON EACH DIALYSIS SESSION DURING ISOLATION PERIOD						
Patient's name:			Vaccination:			
D0:		Discharge date:			D7/D10:	
Date:						
General state						
Respiratory rate						
Respiratory distress?						
Cyanosis						
O2 Sat at start of HD						
O2 Sat at end of HD						
BP at start of HD						
BP at end of HD						
Confusional state?						
Altered consciousness?						
Other worrying symptoms/signs?						
Patient fit to						

return home?						
If fit to go home, administer lovenox 0.4ml at the start of each dialysis if less than 60kg, 0.6ml of 60 to 90kg and 0.8ml if above 90kg						
Nursing Officer Signature						

21 Feb 22

Note: D0 is the day of first positive RAT or PCR, D10 is 10 full days after D0

IF CONCERNED, CALL THE RMO ON CALL FOR ADVICE OR REVIEW