Guideline

The management and treatment of children with acute SARS-CoV-2 infection (COVID-19)

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Supersedes	3.0				
Applicable to	All Clinical Staff				
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Purpose

Most children with a positive SARS-CoV-2 PCR are asymptomatic or suffer from a mild respiratory illness. A small proportion may present with a disease that spans from acute respiratory illness to an acute viral syndrome resembling adult SARS-CoV-2 respiratory disease. Rarely a delayed hyperinflammatory response state called Paediatric Multisystem Inflammatory Syndrome Temporally Associated with COVID-19 (PIMS-TS, also called "multisystem inflammatory syndrome in children [MIS-C]) can occur. This guideline describes the presentation and management of severe acute **COVID-19 lung disease**. PIMS-TS is covered in CHQ-GDL-63400 Paediatric Inflammatory Multisystem Syndrome Temporally Associated with COVID-19 .

Scope

This guideline covers the clinical presentation, investigations and treatment modalities for children diagnosed with SARS-CoV-2 respiratory disease and applies to all medical, nursing and allied health staff working in a CHQ department (includes general ward, ED and HDU/PICU) where children with confirmed and provisional COVID-19 infection may be admitted. It does not specifically cover the initial assessment. management and placement of children presenting with respiratory illnesses with suspected SARS-CoV-2 to ED.

Related documents

Procedures, Guidelines, Protocols

- CHQ-WI-80135 Paediatric Respiratory Care during the COVID-19 Pandemic for all acute and chronic inpatients with respiratory disease.
- CHQ-PROC-63002 Infection Control Guidelines for the Management of Coronavirus (MERS, SARS or Novel Coronavirus)
- CHQ-PROC- 63317 Donning and Doffing of Personal Protective Equipment (PPE)

- CHQ-PROC-63110 Standard, Transmission and Protective Based Precautions
- Respiratory pandemic sub-plan
- Queensland Paediatric Consensus Statement: Respiratory therapies in ED during the COVID-19 outbreak
- CHQ-PROC- 63317 Donning and Doffing of Personal Protective Equipment (PPE)
- CHQ-GDL-00759 Community Acquired Pneumonia - Emergency management in children
- Queensland Health: Information for Queensland clinicians and healthcare workers - novel coronavirus (COVID-19)

For national guidance from the Communicable Diseases Network Australia (CDNA): https://www1.health.gov.au/internet/main/publishing.nsf/Content/cdna-song-novel-coronavirus.htm

And on testing: https://www.health.gov.au/sites/default/files/documents/2020/03/phln-guidance-on-laboratory-testing-for-sars-cov-2-the-virus-that-causes-covid-19.pdf

Other (Provide to family on discharge)

Fact Sheet: Paediatric inflammatory multisystem syndrome (For parents and guardians)

Guideline

Management of Acute Severe COVID Disease

For advice on the management of PIMS-TS (MIS-C) see CHQ-GDL-63400 Paediatric Inflammatory Multisystem Syndrome Temporally Associated with COVID-19

Clinical Presentation

- Clinical findings include: fever, respiratory distress, hypoxia, cough, haemoptysis, chest pain, abdominal symptoms, and diarrhoea.
- Infants may present with abnormal breathing patterns / apnoea and an oxygen requirement.
- In older children / adolescents the symptoms and signs may be very similar to adult COVID pneumonitis.
- Most children have a history of SARS-CoV-2 exposure, either in a family member or educational setting.

Diagnostic testing

- Infection is confirmed when a respiratory sample is positive for SARS-CoV-2 by PCR
- In symptomatic children it is extremely important to consider differential diagnoses and investigate as per usual practice. Detection of SARS-CoV-2 dose not necessarily mean this is the cause of symptoms.
- Ensure multiplex respiratory PCR in addition to SARS-CoV-2 PCR is requested for admitted inpatients
- If children have severe community acquired pneumonia investigate also as for severe community-acquired pneumonia and discuss with the ID team

Assessment of children for hospital admission

Where possible and safe, children with a provisional or confirmed COVID-19 diagnosis should be managed and quarantined at home, as risks of severe illness or death from COVID-19 are extremely low in children and young people. Even though vulnerable groups have a slightly higher risk, this also remains low. High risk groups may however require hospital assessment before admission to the Virtual COVID Ward to ensure exclusion of other diagnoses eg febrile neonates, febrile neutropenia.

If a child with a COVID-19 diagnosis is suitable for care at home, community care and support will be provided either by the CHQ Virtual COVID Ward or primary care after risk stratification by Health Direct when activated. The Virtual COVID Ward will reinforce the importance of self-isolation and facilitate safety netting and the identification of the deteriorating child. Agreement to quarantining at home is an essential pre-requisite for Virtual management of COVID-19 and will be monitored. Refer to Virtual COVID Ward pathways.

Consider medical admission to hospital if supportive care is required for example:

- haemodynamic instability
- hypoxia (SaO_2 on room air <92%)
- severe abdominal pain
- gastrointestinal symptoms requiring supportive care

ALERT

Previously healthy children who require admission to hospital with a provisional or confirmed COVID-19 diagnosis should be admitted under the on-call general paediatric team. Children with complex conditions requiring specialty input should be admitted under the most appropriate specialty.

All children admitted with symptomatic COVID-19 should be discussed with the Infectious Diseases consultant on call.

General management

Respiratory support

- Give supplemental oxygen if necessary, starting with low flow nasal oxygen if O_2 saturations <92% or significantly below baseline.
- Follow CHQ guidelines for respiratory support as per the usual escalation pathway. High flow nasal prong oxygen therapy should be reserved for children who fail sub-nasal or mask oxygen therapy (see alert below). A senior clinician should review the patient to aid with respiratory support escalation.
- Avoid the use of nebulisers
  - Use metered dose inhalers with spacers where possible. Salbutamol delivered via metered dose inhaler and spacer is the preferred delivery mode. It can be used in conjunction with low flow nasal oxygen in hypoxic patients and allows faster, more effective medication delivery.
  - Nebulised salbutamol should be reserved for patients in extremis, with consultant approval, ideally in a negative pressure room with staff in appropriate Airborne-plus personal protective equipment (PPE).
  - Sodium chloride 0.9% nebulisation should not be used in COVID-19 positive patients.

  - Nebulised adrenaline should be reserved for croup patients with significant stridor at rest causing significant increased work of breathing or hypoxia at rest. It should have consultant approval, ideally in a negative pressure room with staff in appropriate Airborne-plus PPE.

Antimicrobials

- Most children with COVID-19 do not need antibiotics. Prescribe antibiotics for bacterial pneumonia if suspicion of secondary bacterial infection (persistent and high fever, significantly elevated inflammatory markers, extensive consolidation or pleural effusion). Antibiotics should be prescribed in line with the CHQ-GDL-00759 Community acquired pneumonia guidelines.
- Do not overlook other causes such as sepsis in children who appear seriously unwell.
- Influenza is currently very rare; only when influenza circulating within the community, consider oseltamivir if critically unwell pending respiratory multiplex PCR (or influenza GeneXpert) if symptom onset less than 48 hours ago. Cease if influenza PCR negative.

Other supportive measures

- Check vitamin D level and correct as per local dosing, if necessary
- Nasogastric fluids, intravenous fluid therapy, antipyretics should be as per routine practice in a child with a viral infection.

Pro-coagulant Risk

- In adults, COVID lung disease, is associated with a significant increased risk of coagulopathy, including pulmonary and elsewhere. Cases have also been described in older children / adolescents, so patients should receive prophylactic low molecular weight heparin and TED stockings, if over 12 years of age.
- If the patient has abnormal coagulation/D-dimer/fibrinogen results, discuss with the Haematology team.
- Infants and children under 12 years should only be started on prophylactic anticoagulation after discussion with Haematology
- Consider pulmonary embolism (PE) in the unwell patient with sudden worsening of hypoxaemia, arterial blood pressure or tachycardia. Echocardiography and possibly a CT chest angiography should then be performed urgently.
- For further guidance on thromboprophylaxis, refer to Appendix 5. Seek Haematologist advice.

Imaging

- Imaging should follow the CHQ guidelines for imaging in a child with respiratory illness during COVID-19.
- All children requiring oxygen therapy should have a chest radiograph.
- There is no need for routine CT scanning, only CT scan if clinically indicated
- CT could be considered if there is a diagnostic dilemma, e.g. to delineate consolidation from lymphadenopathy / effusion etc.
- If there is concern about pulmonary embolism, then CT PA should be undertaken.

- CT should NOT be done for COVID diagnostics (over 1/3 will be normal in proven Covid) but consider if there are concerns about another diagnosis.
  - Ground glass opacities are the most common abnormality and compared to adults these are more likely to be unilateral. They are usually peripheral.
  - Pleural effusions and adenopathy are rare (< 0.5%)
  - The incidence of pulmonary embolism is not specified in any of the studies, and there is also no separation between infants and older children.

Cardiac Investigations

- All children with COVID lung disease should have a baseline ECG, and cardiac blood tests. As per Appendix 1.
- ECHO should be considered case by case depending on clinical presentation and findings.

Laboratory Investigation (Appendix 1)

- Thorough screen for other causes of symptomatic respiratory infection should be undertaken, as these may co-exist with SARS-CoV-2 infection.
- Monitor FBC, urea and electrolytes and liver function tests with frequency according to clinical severity.
- Establish SARS-CoV-2 serostatus ASAP.
- If patient is critically unwell, monitor coagulation, troponin and perform bedside echocardiography

Escalation of care

- Refer urgently for PICU assessment children who remain hypoxic despite low flow nasal oxygen, or who are haemodynamically unstable

ALERT

For any patients suspected of COVID-19 infection nasal high flow oxygen should only be used when indicated and necessary. See guideline for use of respiratory therapies here. Nasal high flow oxygen should only be used in suspected or confirmed COVID-19 cases if strict airborne precautions are adhered to. Consultant approval should be sought. Patients should be in a negative pressure room, or otherwise a single room with the door closed. Convert to low flow for transport through hospital corridors. Do NOT transport on high flow. Where possible, expedite management so escalating therapy given at definitive location

COVID specific therapy (See also: http://covid19evidence.net.au)

Principles

- All children admitted because of symptomatic COVID-19 requiring oxygen will be discussed with the CHQ Infectious Diseases (ID) team, or outside CHQ, local Paed ID.
- Request SARS CoV-2 genotyping on samples from children symptomatic or at highest risk of disease progression
- Escalation of therapeutic care requiring COVID-specific therapies (excluding dexamethasone) should be discussed with the COVID MDT (see below) and when required expert groups such as the ANZPID COVID-19 Clinical Reference Group. See National COVID-19 clinical evidence taskforce guidance.
- COVID MDT includes senior medical representatives from Infectious Diseases, the child's treating team, rheumatology, intensive care, immunology. Decisions should be made by at least 2 consultants in addition to treating SMO.
- In the absence of randomised controlled trials in Australian children, severely unwell children will be considered for novel therapies with plausible effect on COVID-19. If required these treatment decisions may be discussed with the Australia and New Zealand Paediatric Infectious Disease (ANZPID) COVID-19 Clinical Reference Group. This group has been convened to provide timely, consensus expert opinion on anti-viral and adjunctive therapy in the absence of paediatric trial data.

Treatment (see Flow chart Appendix 3)

Mild disease

- most children with mild symptomatic disease (coryza, URTI, sore throat, fevers, cough) require only symptomatic care at home. Some children at high risk of progression to severe disease may be offered therapy within the first 5 days of symptoms. Refer to Appendix 2 for priority risk groups for consideration of antiviral or monoclonal antibody treatment (where available). Therapy is generally considered only for those in HIGH RISK category and within this category only for those at highest risk.
- Ensure Respiratory PCR panel requested on all children with mild disease admitted to hospital. Other seasonal respiratory viruses may be the cause of more symptomatic disease eg. RSV, influenza.

Moderate to Severe Disease

- **Corticosteroids.** All patients hospitalised for COVID 19 requiring oxygen and/or invasive ventilation should be considered for corticosteroid therapy. The decision to prescribe corticosteroids should take into account patient's pre-existing conditions, risks and benefits.
  - Corticosteroids **are not used** in non-severe COVID-19 disease, with the exception of acute croup or asthmatic presentations where steroids may be used as per standard practice using croup/asthma steroid dosing.
  - Adult type COVID disease in children ≥ 5 years with an oxygen requirement use dexamethasone as per flow chart (Appendix 3)
  - **Infants 1 month to 5 years** should be prescribed corticosteroids after discussion with the Paediatric Infectious Diseases (ID) specialist or MDT and considered on a case-by-case basis.
    - Dexamethasone dose: 0.15 mg/kg IV or oral (maximum 6 mg/day) once daily for 10 days or until day of discharge from hospital if this is before completion of 10 days.
  - **Neonates** should only be prescribed hydrocortisone after Paediatric ID Specialist / MDT discussion.
    - Hydrocortisone dose: 0.5 mg/kg IV every 12 hours for 7 days then 0.5 mg/kg IV once daily for 3 days. Stop course on hospital discharge.
  - Always start a proton pump inhibitor (PPI) as gastroprotectant whilst on systemic corticosteroids.
  - Monitor blood glucose level whilst receiving dexamethasone.

- **Remdesivir**.
  - **Mechanism of action:** Inhibits viral replication through inhibition of the SARS-CoV-2 RNA-dependent RNA polymerase
  - Consider Remdesivir for up to 3 day course for early use in very high-risk patients with mild symptoms within the first 5 days (for dosing, refer to Appendix 4).
  - Consider use of Remdesivir for up to 5 days for mild to moderate disease within 10 days of symptom onset as per flow chart in Appendix 3 (for dosing, refer to Appendix 4).
  - Remdesivir should only start after MDT discussion with Paediatric ID / MDT and usually only 24 hrs after response to dexamethasone evaluated.
  - Remdesivir should not be initiated in patients who present to hospital and are more than 10 days after symptom onset.
  - Remdesivir should not be initiated if the patient is on non-invasive ventilation or has already been intubated /ventilated /ECMO, however if already receiving Remdesivir then subsequently intubated it may continue but review at 48 hours.
- **Sotrovimab**
  - **Mechanism of action:** Recombinant human IgG1 monoclonal antibody targeting the spike protein of SARS-CoV-2. In vitro data suggests Sotrovimab is less effective in Omicron BA.2 variant. Where this variant is the predominant circulating variant Sotrovimab is unlikely to be effective.
  - Sotrovimab should be considered only in exceptional circumstances for children and adolescents aged 12 years and over and weighing at least 40 kg who have mild COVID-19, who do not require oxygen and who are unvaccinated or immunocompromised AND at high risk of deterioration within 5 days of symptom onset.
    - **Dosing recommendations** in children less than 12 years of age or weighing less than 40 kg is based on early clinical trial data – seek Paediatric ID specialist advice on appropriate dosing.
    - CHQ Approvals: Paediatric use in children under 12 years of age or weighing less than 40 kg in Australia is considered off label/off license- ID approval and EDMS approval on IPA required in addition to the completion of QLD Health Notification form (with appropriate annotations reflecting off label/off license use).
  - These children would not require hospital admission for symptoms of acute COVID (as by definition they would have mild disease) but will need admission to a health care facility for administration of Sotrovimab.
    - Eligibility for Sotrovimab in children is based on the patient's individual risk of severe disease, including age, multiple risk factors, and COVID-19 vaccination status and requires agreement of child's treating specialist and ID consultant. See Appendix 2 for risk factors for progression to severe disease.
    - Administration of Sotrovimab will be facilitated by the COVID Virtual ward and arranged on an individualised basis in the most appropriate available setting at the time and managed either by General Paediatrics/Virtual wards or the subspeciality team primarily responsible for child's care.
    - Patient / parent information, consent and administration will follow QH Statewide processes.

- In children and adolescents age over 12 years of age and weighing more than 40 kg, the recommended dose is 500 mg as a single dose intravenous infusion over 30 minutes with 60 minutes observation post completion of infusion.

- **Casirivimab plus Imdevimab (Ronapreve®)**
  - Mechanism of action:
    - Recombinant human mAbs that bind to nonoverlapping epitopes of the spike protein RBD of SARS-CoV-2. In vitro data suggests Ronapreve® is less effective in Omicron variant. Where this variant is the predominant circulating variant, Ronapreve® is unlikely to be effective.
  - Consider using Casirivimab plus Imdevimab (Ronapreve®), in exceptional circumstances, in children and adolescents aged 12 years and over and weighing at least 40 kg at high risk of deterioration (see Appendix 2 and for dosing information, Appendix 4) AND
    - who do not require oxygen and who are unvaccinated or immunocompromised AND at high risk of deterioration within 7 days of symptom onset. These children would not require hospital admission for symptoms of acute COVID (as by definition they would have mild disease). Patient / parent information, consent will follow QH Statewide processes when available as per Sotrovimab as above.
    - with moderate to critical COVID-19 and SARS-CoV2 antibody negative AND at high risk of deterioration with MDT discussion.

ALERT

Monoclonal antibody therapy is a limited resource and is currently reserved for those at the very highest risk of disease progression. Fulfilling eligibility criteria does not automatically result in its prescription. Use in mild disease should be based on the circulating variant of concern (VOC) and efficacy of monoclonal against this, patient's individual risk of severe disease, including age, multiple risk factors, and COVID-19 vaccination status and requires agreement of child's treating specialist and paediatric ID consultant.

As new monoclonal antibodies become available for therapeutic use these will be added.

- **Nirmatrelvir and Ritonavir (Paxlovid®)**
  - **Mechanism of action:** the nirmatrelvir component blocks the activity of a protease enzyme that the coronavirus needs in order to replicate; ritonavir inhibits the cytochrome P450, family 3, subfamily A (CYP3A)-mediated metabolism of nirmatrelvir, thereby providing increased plasma concentrations of nirmatrelvir.
  - Paxlovid® has provisional TGA approval for the treatment of coronavirus disease 2019 (COVID 19) in adults 18 years of age and older, The FDA has authorized the emergency use of Paxlovid® for the treatment of mild-to moderate COVID-19 in adults and children 12 years of age and older weighing at least 40 kg and who are at high risk for progression to severe COVID-19, including hospitalization or death, under an EUA.

- Paxlovid® should be considered only in exceptional circumstances for children and adolescents aged 12 years and over and weighing at least 40 kg who have mild COVID-19, who do not require oxygen and who are unvaccinated or immunocompromised AND at high risk of deterioration within 5 days of symptom onset. For dosing recommendations and safe prescribing/administration considerations, please refer to the QLD Statewide guideline.
- Eligibility for Paxlovid® in children is based on the patient's individual risk of severe disease, including age, multiple risk factors, and COVID-19 vaccination status and requires agreement of child's treating specialist and ID consultant. See Appendix 2 for risk factors for progression to severe disease.
- **CHQ Approvals:** Paediatric use in Australia is considered off label/off license- ID approval and EDMS approval on IPA required in addition to the completion of QLD Health Notification form (with appropriate annotations reflecting off label/off license use).

ALERT

Due to significant drug interactions with Paxlovid®, every patient requires a complete medication history (including prescribed and non-prescribed medications, vitamin and herbal supplements) to be taken and a drug interaction check before administration of nirmatrelvir plus ritonavir.

Drug interactions should be checked in the COVID-19 drug interactions checker provided by the University of Liverpool. (Liverpool COVID-19 Interactions (covid19-druginteractions.org)

- **Molnupiravir**
  - **Mechanism of action:** Molnupiravir (Lavegrio®) works by inhibiting replication of the SARS-CoV-2 virus.
  - Molnupiravir has provisional TGA approval for the treatment of coronavirus disease 2019 (COVID 19) in adults 18 years of age and older, Molnupiravir is not authorized for use in patients younger than 18 years of age because molnupiravir may affect bone and cartilage growth.
  - **CHQ Approvals:** Paediatric use in Australia is considered off label/off license- ID approval and EDMS approval on IPA required in addition to the completion of QLD Health Notification form (with appropriate annotations reflecting off label/off license use).
- **Tocilizumab**
  - **Mechanism of action:** Recombinant, interleukin-6 receptor antagonist
  - Consider Tocilizumab for the treatment of COVID-19 in children and adolescents (Appendix 3):
    - who require supplemental oxygen, have received corticosteroids with or without Remdesivir and have evidence of systemic inflammation (CRP > 75 mg/L)
    - OR continue to deteriorate despite corticosteroids with or without Remdesivir and are within 24 to 48 hours of commencement of respiratory support (high-flow nasal oxygen, continuous positive airway pressure (CPAP) or non-invasive ventilation, or invasive mechanical ventilation) regardless of the CRP
  - Tocilizumab is in very short supply worldwide. Alternatives as below should be considered by COVID MDT.

  - Dose: infants (>1 month of age) and children
    - Limited dosing data in children <2 years of age. Seek Specialist advice.
    - < 30 kg:12 mg/kg as a single IV infusion,
    - ≥ 30 kg: 8 mg/kg (maximum 800 mg) as a single IV infusion.
    - See CHQ-PMG-01201 Intravenous Tocilizumab for Rheumatology for Tocilizumab administration and monitoring guidance.
- **Anti-cytokine monoclonal antibodies**
  - Baricitinib and Sarilumab should only be used if possible, within randomised trials. Where no trial is open or available a decision to use any of these treatments should be discussed and agreed within the COVID Multi-disciplinary team (MDT) and where possible the ANZPID Clinical Reference Group (CRG).
- **Budesonide**
  - Inhaled Budesonide may be considered in children at very high risk of diseases progression with confirmed COVID-19 who do not require oxygen and who are not eligible for monoclonal antibody treatment.
  - Budesonide may decrease the requirement for supplemental oxygen in adults if taken within 14 days of onset of symptoms. It is unclear how much benefit might be seen in children.

Inpatient de-escalation of isolation and transmission-based precautions

- Children may be discharged home when clinically appropriate and hospital supportive care no longer required. Home isolation to continue until the child is at least 10 days from the onset of the acute illness and will follow current QH Public health guidelines.
- Prior to ceasing patient isolation and transmission-based precautions for children requiring ongoing in hospital admission, the case should be discussed with ID Consultant.
  - The child has been afebrile for the previous 72 hours
  - Symptoms of the COVID-19 illness have resolved for >24 hours
  - The child is at least 7 days from the onset of the acute illness
  - PCR testing is negative on two samples taken at least 24 hours apart after the resolution of symptoms
    - Children with conditions that may result in viral shedding for a prolonged period of time (e.g. because of immune status and medications) should be taken into consideration
    - In children with symptoms such as chronic cough the treating team should make an assessment as to whether the signs and symptoms of COVID-19 have resolved.
    - A small proportion of children may have illness that has completely resolved but their respiratory specimens remain persistently PCR positive. A decision on release from isolation for these people should be made on a case-by-case basis after consultation between the treating team and ID.
    - Follow up should include the child being reviewed seven days after release from isolation to ensure full symptom resolution.

Consultation

Key stakeholders who reviewed this version:

- Infection Management and Prevention Service Director
- Paediatric Infection Specialists
- PICU SMO
- Director, General Paediatrics SMO
- Emergency SMOs
- Medical Lead, CHQatHome
- Clinical Pharmacist Lead- Antimicrobial Stewardship
- Director of Pharmacy
- Medicines Advisory Committee – endorsed 11/05/2022

Audit/evaluation strategy

Level of risk	Very High
Strategy	Improve the care of patients with suspected and confirmed COVID-19
Audit/review tool(s) attached	
Audit/Review date	Updated as required as new information regarding the pandemic becomes available
Review responsibility	Infection Management and Prevention Service.
Key elements / Indicators / Outcomes	

Work Instruction revision and approval history

Version No.	Modified by	Amendments authorised by	Approved by
1.0 14/04/2020	CNC Infection Management and Prevention Service	Director Infection Management and Prevention Service	Executive Director Clinical Services, QCH
2.0 10/12/2021	Clinical Pharmacist Lead - AMS	Director Infection Management and Prevention Service	Divisional Director Medicine
3.0 21/01/2022	Haematologist, Clinical Pharmacist Lead - AMS	Director Infection Management and Prevention Service	CHQ Medicines advisory committee (CHQMAC)
4.0 12/05/2022	Director, IMPS, Clinical Pharmacist Lead - AMS	Divisional Director Medicine	Executive Director Medical Services

Keywords	COVID-19, Coronavirus, SARS CoV 2, Pandemic, HITH, remdesivir, tocilizumab, dexamethasone, hydrocortisone, sotrovimab, sarilumab, anakinra, budesonide, Ronapreve®, Casirivimab plus Imdevimab, baracitinib, paxlovid, nirmatrelvir, ritonavir, molnupiravir, 63327

Accreditation references	NSQHS Standards (1-8): 3 Preventing and controlling to healthcare associated infections ISO 9001:2015 Quality Management Systems: (4-10)

Appendix 1: Acute COVID in children Investigation List

(in order of priority)

Bloods – initial	**Other - initial**
FBC and film	Viral Respiratory NPA PCR panel
Chem 20	SARS-Cov 2 PCR
CRP	SARS CoV 2 genotyping
Blood culture	Throat swab MCS
Glucose	CXR
	urine MC&S
Second Line – as advised	
SARS-CoV-2 serology	ECG
Coagulation and fibrinogen	
ASOT	ECHO
EBV & CMV serology	urine for pneumococcal & legionella antigens if > 3years of age
EBV, CMV, adenovirus & enterovirus blood PCR	
Vit D	
Triglycerides	
Ferritin	
Troponin	
Pro Bnp	
CK	
Amylase	
HBV/HCV/HIV and strongyloides serology and Quantiferon Gold before anti-cytokine therapy	

Appendix 2. Risk factors for progression to severe disease – Monoclonal antibody criteria

- Use this table to assess risk and eligibility for monoclonal antibody therapy and antiviral therapy in children **with mild disease** [ie Sotrovimab, Ronapreve, Remdisivir, Paxlovid®, Molnupiravir, Evusheld®]
- Children rarely progress to severe disease. Although established adult COVID-19 risks do extend into younger age groups (i.e. age, non-white ethnicity, obesity, comorbidity) children remain at lower risk of severe disease than adults.
- Recent child specific data highlights risks to include **two or more co-morbidities**, those with **cardiac or neurological conditions and obesity**.
- Monoclonal antibody therapy is a limited resource and is currently reserved for those at the very highest risk of disease progression. **Fulfilling eligibility criteria does not automatically result in its prescription.** Use in mild disease should be based on the patient's individual risk of severe disease, including age, multiple risk factors, and COVID-19 vaccination status.

<table>
<tr><th colspan="3">Paediatric risk factors for severe disease</th></tr>
<tr><th>Regardless of vaccination status</th><th colspan="2">Unvaccinated</th></tr>
<tr><th>Immunocompromised
High to Moderate Risk
In Priority order -Highest Priority first</th><th>Any one risk factor Plus Unvaccinated =
High Risk</th><th>Any 2 or more comorbidities / risk factors High Risk</th></tr>
<tr><td>Lung transplant recipient
Allogeneic stem cell transplant within 6 months
Allogeneic SCT on immunosuppression / chronic GVHD
Autologous stem cell Transplant within 3 months
Solid organ transplant within 1 year
SOT > 1 year post transplant & unvaccinated
Alemtuzumab within 3 months</td><td>Chronic lung disease
- CF (or bronchiectasis) with FEV1 <60%
- congenital tracheal stenosis
- chronic lung disease with O2 treatment
- pulmonary hypertension
- neuromuscular dis (with daytime resp support)
- tracheostomy with ventilation</td><td rowspan="3">Diabetes (insulin-dependent)

Severe asthma
Not fulfilling criteria

Chronic kidney disease
(GFR <15 ml/min/1.73m2)

Sickle cell disease

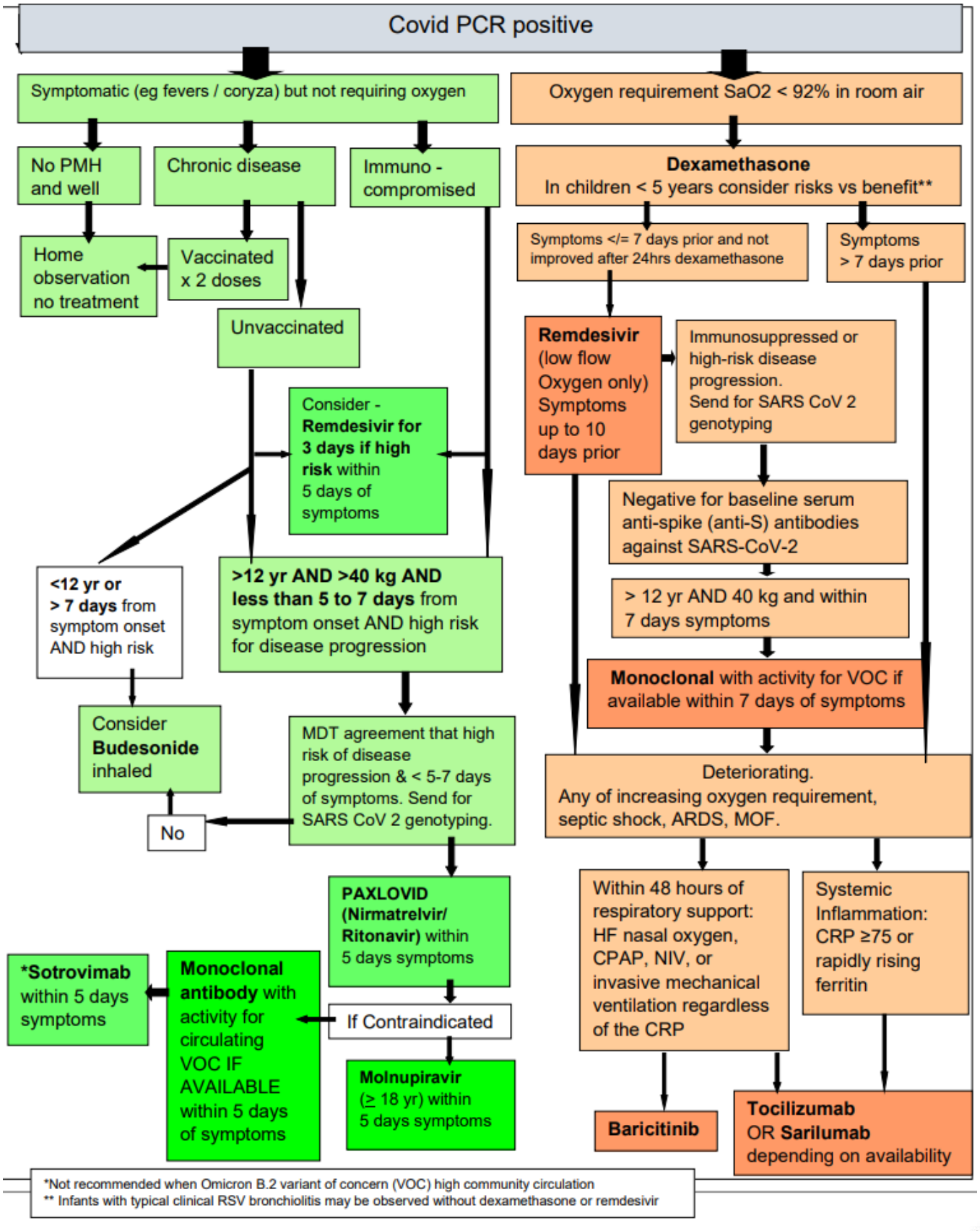
Complex genetic, metabolic disease, gastrointestinal or multiple congenital anomalies

Trisomy 21

All biologics and most disease- modifying antirheumatic drugs (DMARDs)</td></tr>
<tr><td>Allogeneic stem cell transplant within 12 months
Autologous stem cell Transplant within 6 months
Rituximab / obintuzumab plus additional immunosuppressive agents within 6 months
CAR-T within 12 months
High-dose corticosteroids (≥0.5 mg/kg/day or ≥20 mg/day prednisolone, or equivalent) for ≥ 4 weeks</td><td>Heart failure
- cardiomyopathy (requiring diuretics)
- shunt-dependent pulmonary blood flow
- pulmonary hypertension (PH) (requiring PH-specific therapy)
- single ventricle</td></tr>
<tr><td>Haematologic malignancy on active chemotherapy (as per Paediatric Oncologist)
Solid tumour on active highly intensive chemotherapy (as per Paediatric Oncologist)
Primary immune deficiency (as per Immunology consultant)
Other significantly immunocompromising conditions (as per Paed ID)
HIV with CD4 count < 50 cells/mm^3</td><td>Severe asthma
- in last 12 months, ≥1 severe exacerbation requiring ICU admission or iv treatment
OR
- high-dose inhaled corticosteroid to control symptoms
OR
- moderate-dose inhaled corticosteroid</td></tr>
</table>

	plus LABA to control symptoms	
	- **Obesity** (BMI ≥ 95th [CDC] / ≥ 97th [WHO] centile for age)	
	Complex life limiting neurodisability with respiratory involvement	
Unvaccinated = Not received at least 2 Covid vaccines or as defined by ATAGI (https://www.health.gov.au/news/atagi-statement-on-defining-up-to-date-status-for-covid-19-vaccination)		
Adapted from adult risk factors for sotrovimab and literature on risks for paediatric outcomes *As guided by Paediatric Oncologist and see also Coronavirus advice (cclg.org.uk)		

Appendix 3. Treatment Flow chart



Appendix 4. Summary of disease-modifying therapies for COVID-19 in Paediatric patients

For Statewide guidelines and National Medical Stockpile notification and consent forms, refer to Queensland Health COVID-19 therapeutics webpage

Medication	Eligible patients	Contraindications	Dose and administration	Total duration	Special considerations
Dexamethasone IV or oral	Infants and children with O2 sat <92% on RA Excluded: neonates	Risk versus Benefit considerations by Treating Consultant.	0.15 mg/kg IV or oral once daily (maximum 6 mg/day)	Up to 10 days	Always start proton pump inhibitor (PPI) as gastroprotectant whilst on systemic corticosteroids. For selection of appropriate PPI, see local guideline.
Hydrocortisone IV	Neonates, in consultation with Paediatric ID/ MDT discussion.		0.5 mg/kg IV every 12 hours for 7 days then 0.5 mg/kg IV once daily for 3 days.	Stop course on hospital discharge	
Budesonide inhaled	More than 4 years and less than 12 years old or > 7 days from symptom onset AND high risk (One or more risk factors for disease progression) Excluded: Patients on supplemental oxygen AND/OR already taking inhaled or systemic corticosteroids		**4 to 11 years of age:** Inhaled 400 microgram twice daily by dry powder inhaler **More than 11 years of age:** Inhaled 800 microgram twice daily by dry powder inhaler **Pulmicort ® Turbuhaler on the QH LAM**	Up to 14 days	
Remdesivir IV Inhibits viral replication through inhibition of the SARS- CoV-2 RNA-dependent RNA polymerase	O2 sat < 92% RA Excluded: O2 sat >92% on RA Patients requiring ventilation including NIV and ECMO. Evidence of multi-organ failure, including significant cardiomyopathy	Hypersensitivity to Remdesivir or excipients in the vial. ALT ≥ 5 ULN CrCl <30mL/min > 10 days after symptom onset Patients requiring ventilation	**Dosing recommendations for 3 day and 5 day course:** **< 40 kg**: Loading dose of 5 mg/kg then Maintenance dose of 2.5 mg/kg daily **≥ 40 kg:** Loading dose of 200 mg then Maintenance dose of 100 mg daily **Neonates:** Seek Paediatric ID advice. For neonatal dosing information, refer to ANMF Neomed monograph. **Reconstitution and administration:** Remdesivir | Paediatric Injectable Guidelines Online (rch.org.au)	Up to 3 days in mild disease. Up to 5 days in children requiring respiratory support	CYP 450 drug interactions – in particular CYP 3A4 Liverpool COVID-19 Interactions (covid19-druginteractions.org) QT prolongation and severe bradycardia Liver dysfunction – baseline CHEM20 before starting Remdesivir. Consult Paediatric ID specialist if ALT >5 times ULN

Medication	Eligible patients	Contraindications	Dose and administration	Total duration	Special considerations
Tocilizumab IV Recombinant, interleukin-6 receptor antagonist	Patients requiring oxygen delivery (may include mechanical ventilation) AND dexamethasone AND evidence of systemic inflammation	Active severe non-viral infection Tuberculosis ALT > 5 times ULN ANC< 2 x 10^9/L Live/ live-attenuated vaccines	**< 30kg**: 12 mg/kg **≥ 30kg:** 8 mg/kg (maximum 800 mg) **Reconstitution and administration:** See CHQ-PMG-01201 Intravenous Tocilizumab for Rheumatology	Single IV infusion	Note: Critical medication shortage (October 2021)
Anakinra SC or IV Recombinant interleukin-1 receptor antagonist	Only use in research setting. Upon advice of COVID MDT and the ANZPID CRG	Active severe non-viral infection Caution: Tuberculosis (active/latent) Live/ live-attenuated vaccines	Anakinra 2 mg/kg/dose (max 100 mg/dose) by subcutaneous injection every 6 hours on day 1, every 8 hours on day 2, every 12 hours on day 3, every 24 hours days 4 to 5.	Tapering course over 5 days. Can be given IV if critically unwell.	Dose adjust in severe renal impairment.
Baricitinib oral Janus kinase (JAK) inhibitor	Upon advice of COVID MDT	Active severe non-viral infection Tuberculosis (active/latent) Thrombosis Hb <80 g/L, Lymphocytes <0.2 x 10^9/L, ANC <0.5 x 10^9/L CrCl <15 mL/min Live/ live-attenuated vaccines	**Children 2 to <9 years:** Oral: 2 mg once daily **Children ≥9 years and Adolescents:** Oral: 4 mg once daily. Tablets can be crushed/dispersed in small amount of water before administration. For administration via NGT or Gastrostomy, disperse dose in a minimum of 15 mL water and flush well after administration	14 days or until hospital discharge	Dose adjust in severe renal impairment. Increases in ALT or AST are observed and drug-induced liver injury is suspected
Sarilumab IV Recombinant, interleukin-6 receptor antagonist	Upon advice of COVID MDT	Hypersensitivity to Sarilumab or excipients in the vial. Active severe non-viral infection Tuberculosis (active/latent) ANC< 2 x 10^9/L Platelets < 150 x 10^9/L ALT > 5 times ULN Live/ live-attenuated vaccines	**> 12 years and > 40kg**: 400 mg IV single dose infuse over 60 minutes.	Single IV dose	The sarilumab (Kevzara®) product is presented as subcutaneous pre-filled syringes (PFS). An intravenous (IV) formulation is not commercially available. Refer to NSW TAG Sarilumab drug guideline for more information.

Medication	Eligible patients	Contraindications	Dose and administration	Total duration	Special considerations
Sotrovimab IV Recombinant human IgG1 monoclonal antibody targeting the spike protein of SARS-CoV-2.	Considered in exceptional circumstances for children and adolescents aged 12 years and over and weighing at least 40 kg with mild COVID-19, not requiring oxygen and unvaccinated or immunocompromised and at high risk of deterioration within 5 days of symptom onset. (appendix 2)	Hypersensitivity to Sotrovimab or excipients in the vial	**<12 years or <40kg:** Sotrovimab use in children less than 12 years of age or weighing less than 40 kg is based on early clinical trial data – seek Paediatric ID specialist advice on appropriate dosing. **> 12 years and > 40kg**: 500 mg IV single dose infuse over 30 minutes with 60 minutes observation post completion of infusion. **Reconstitution and administration:** Sotrovimab | Paediatric Injectable Guidelines Online (rch.org.au)	Single IV dose	Mild to moderate infusion reactions possible – slow infusion or stop and manage/ monitor accordingly. Anaphylactic reactions are rare. Additional resources: QLD Statewide Sotrovimab guideline Sotrovimab Notification Form - Paediatrics | Queensland Health
Casirivimab plus Imdevimab (Ronapreve®) IV or SC injection Recombinant human mAbs that bind to nonoverlapping epitopes of the spike protein RBD of SARS-CoV-2	Considered in exceptional circumstances, in seronegative children and adolescents aged 12 years and over and weighing at least 40 kg at high risk of deterioration (appendix 2)	Hypersensitivity to casirivimab and imdevimab or excipients in the vials It is recommended that vaccines against COVID-19 should not be administered for at least 90 days after a dose of Ronapreve®	**> 12 years and > 40kg**: **Treatment and post exposure prophylaxis (single dose):** Give 600 mg casirivimab and 600 mg imdevimab (combined dose of 1 200 mg) as a single dose either IV or by subcutaneous injection **Ongoing prophylaxis (once every 4 weeks after loading dose):** 300 mg casirivimab and 300 mg imdevimab (combined dose of 600 mg) either IV or by subcutaneous injection **Note:** Off label use as Treatment for COVID-19 – high dose Ronapreve(® recommended – see Paediatric ID specialist advice on dosing. Dose preparation and administration: AIDH - CASIRIVIMAB PLUS IMDEVIMAB (hcn.com.au)	See dose recommendations for details Casirivimab and imdevimab prescribing guideline | Queensland Health	No dose adjustment for renal or liver impairment. Mild to moderate infusion reactions possible – slow infusion or stop and manage/ monitor accordingly. Anaphylactic reactions are rare. **Medication safety alert:** Casirivimab plus imdevimab (Ronapreve®) comes as two vials – use both to prepare the dose. 1 vial contains 1332 mg/11.1 mL of casirivimab (120 mg/mL) 1 vial contains 1332 mg/11.1 mL of imdevimab (120 mg/mL). The vials are labelled 20 mL, but only contain 11.1 mL. At QCH, Ronapreve® doses to be compounded by Pharmacy in aseptic production unit.

Appendix 5. Haematology guidance for Thromboprophylaxis in Acute SARS-CoV-2 infection

Children's Health Queensland

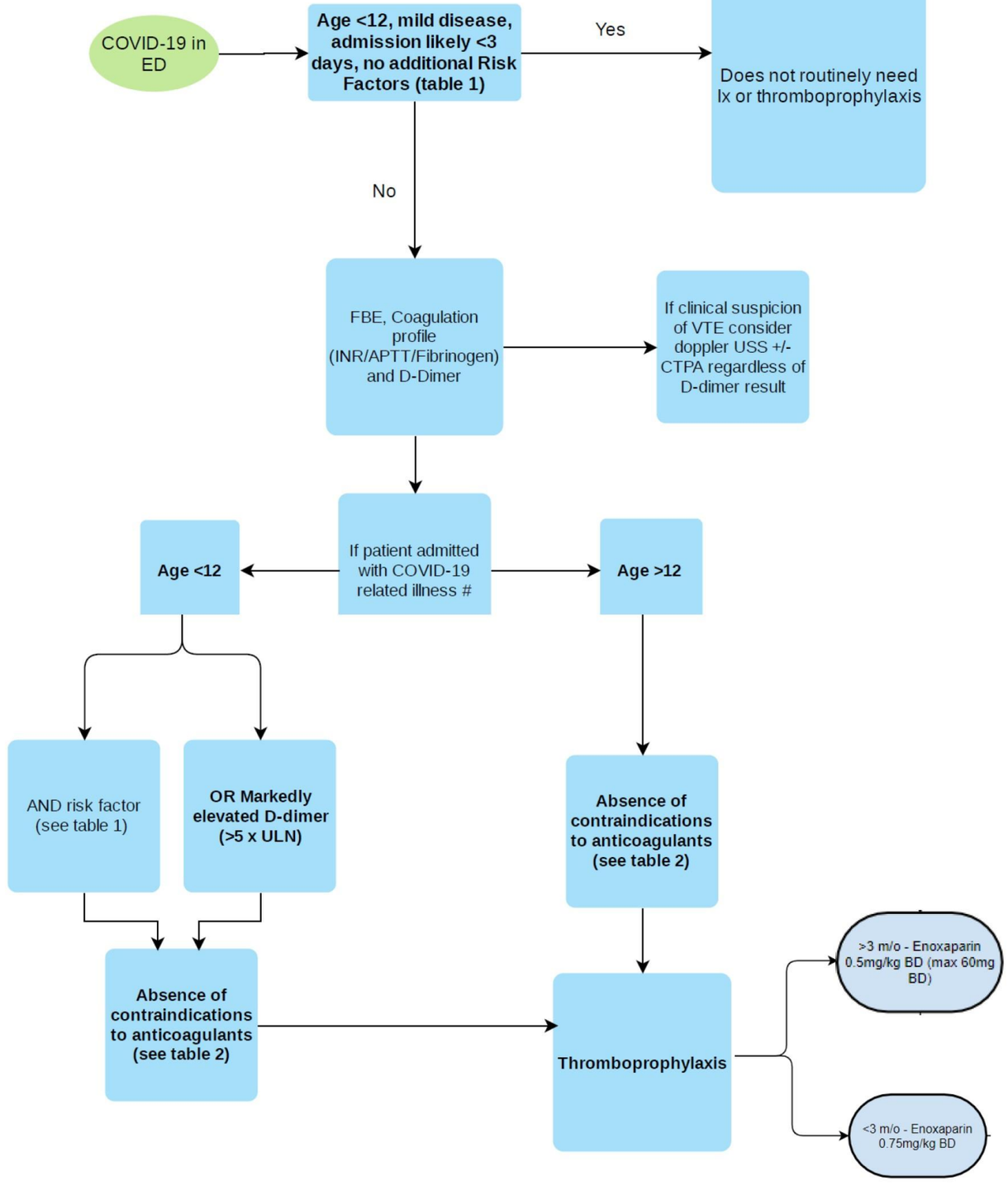


Table 1.
Admission to PICU Obesity (BMI >95th Centile) Oestrogen containing OCP CVC Length of stay anticipated > 3 days Immobility that is not longstanding Personal Hx of VTE Known thrombophilia First degree relative with VTE Active malignancy Recent surgery/trauma Severe dehydration
Underlying medical condition (Nephrotic syndrome, CF, Sickle cell disease, Cardiac disease, Chronic inflammatory disorder (eg JIA, IBD), post splenectomy)

Table 2. Contraindications to thromboprophylaxis
Stroke/intracranial haemorrhage Uncontrolled bleeding Likely to need surgery in <24/24 Congenital bleeding disorder Platelets <50x10^9/L Uncontrolled hypertension * Consider UFH if CrCl <30ml/min

 # Mechanical thromboprophylaxis
Consider mechanical thromboprophylaxis for all patients admitted for COVID-19 reasons - TED Stockings - And/or pneumatic calf compressors