The management of children with COVID-19

Purpose

The purpose of this document is to provide guidance on the inpatient (including hospital in the home, HITH) management of children with confirmed, probable or suspected COVID-19 as defined below.

This document is a working document in the early stages of the pandemic response in Queensland, and as such will be frequently updated as the impact of the pandemic on hospital services becomes clear. The document should be read in conjunction with the complementary policies relating to the hospital response to COVID-19 including:

- 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


Background

COVID-19 is caused by a novel strain of coronavirus (SARS-CoV-2) affecting humans. Some coronaviruses can cause an illness similar to the common cold and others can cause more serious diseases such as Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS). Understanding of the behaviour of COVID-19 is still developing.

Early modelling suggests that up to 60% of the Australian population could become infected with the majority of cases (>80%) experiencing a mild illness. The first wave of illness at scale is projected to come 10 weeks after person to person transmission in the community begins. For Queensland, this period will likely overlap with winter planning and flu season. COVID-19 is moderately severe in the adult population but highly transmissible.

Early evidence from the large outbreaks in China and Italy suggests that children make up a small percentage of cases. Only 1% of >70,000 cases reported in China occurred in children under 10 years, and a similar proportion were reported from the first 20,000 cases reported from Italy. Children have largely experienced a mild illness course, with <5% of >2000 children being considered ‘severe’ (defined by hypoxia), and <0.5% requiring critical care.

Scope

This document applies to all medical, nursing and allied health staff working in a CHQ inpatient department (includes general ward, ED and HDU/PICU) where children with confirmed and provisional COVID-19 infection may be admitted.
Definitions (6th April 2020. Link to CDNA National Guidance for Public Health Units)

**Confirmed case**
A child who tests positive to a validated specific SARS-CoV-2 nucleic acid test.

**Probable case**
A child who has not been tested, with fever (≥38°C) or history of fever (e.g. night sweats, chills) OR acute respiratory infection (e.g. cough, shortness of breath, sore throat) **AND** who is a household contact of a confirmed case of COVID-19, where testing has not been conducted.

**Suspect case**
A child who meets the following epidemiological and clinical criteria:

<table>
<thead>
<tr>
<th>Epidemiological criteria</th>
<th>Clinical criteria</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Very high risk</strong></td>
<td>Fever (≥38°C) or history of fever <strong>OR</strong> acute respiratory infection (e.g. cough, shortness of breath, sore throat)</td>
<td>Test</td>
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<tr>
<td>• Close contact in the 14 days prior to illness onset with a confirmed or probable case</td>
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<td>• International travel in the 14 days prior to illness onset</td>
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<td>• Cruise ship passengers and crew who have travelled in the 14 days prior to illness onset</td>
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<tr>
<td><strong>High risk setting</strong></td>
<td>Fever (≥38°C) or history of fever (e.g. night sweats, chills) <strong>OR</strong> acute respiratory infection (e.g. cough, shortness of breath, sore throat)</td>
<td>Test</td>
</tr>
<tr>
<td>1. Two or more plausibly-linked cases of illness clinically consistent with COVID-19 (see clinical criteria) in the following settings:</td>
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<td>• Aged care and other residential care facilities</td>
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<td>• Military operational settings</td>
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<td>• Boarding schools</td>
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<td>• Correctional facilities</td>
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<td>• Detention centres</td>
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<td>• Aboriginal and Torres Strait Islander rural and remote communities, in consultation with the local PHU</td>
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<td>• Settings where COVID-19 outbreaks have occurred, in consultation with the local PHU</td>
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<td>2. Individual patients with illness clinically consistent with COVID-19 (see clinical criteria) in a geographically localised area with elevated risk of community transmission, as defined by PHUs</td>
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<tr>
<td>Epidemiological criteria</td>
<td>Clinical criteria</td>
<td>Action</td>
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<tr>
<td>Moderate risk</td>
<td>Fever (≥38°C) or history of fever (e.g. night sweats, chills) OR acute respiratory infection (e.g. cough, shortness of breath, sore throat)</td>
<td>Test</td>
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<tr>
<td>Healthcare workers</td>
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<tr>
<td>Background risk</td>
<td>Hospitalised patients with fever (≥38°C) AND acute respiratory symptoms (e.g. cough, shortness of breath, sore throat) of an unknown cause</td>
<td>Test</td>
</tr>
</tbody>
</table>

- Testing household contacts of confirmed or probable cases of COVID-19 may not be indicated where resources are constrained. These cases would be considered ‘probable cases’ (see definition above).

- Clinical judgement should be exercised in testing hospitalised patients. All patients should attend an emergency department if clinical deterioration occurs.

- Clinicians are reminded that if the treating clinician has a strong index of suspicion of COVID-19 and if a positive case would have significant public health implications, then testing outside the case definition should be considered.

**Rationale for current case definitions**

The case definitions are based on what is currently known about the clinical and epidemiological profile of cases of COVID-19 presenting to date both in Australia and internationally. Health authorities are constantly monitoring the spectrum of clinical symptoms as cases arise, and, if there are any significant shifts, they will be reflected in the above definitions in future versions of this document.

The 14 day period is based upon what is currently known to be the upper time limit of the incubation period. As more precise information about the incubation period emerges, this will be reviewed.

**Emergency Department (ED) patient placement and infection prevention considerations**

All children with suspected COVID-19 should be assessed in a single room (negative pressure if available) in the ED, using Droplet and Contact precautions with additional eye protection, in line with the Infection Control Guidelines for the Management of Coronavirus (MERS, SARS or Novel Coronavirus) CHQ-PROC-63002.

Where possible, place a surgical mask on the patient and carer upon entry into the ED and place patient in a room, with negative pressure air-handling (if available).

Avoid aerosol-generating procedures (AGPs), but if these are unavoidable use Airborne Plus precautions and perform procedures in a negative pressure single room. See the following for details of the approach to respiratory therapies in children with suspected or proven COVID-19.
Aerosol-generating procedures include but are not limited to nebulised medications, high-flow nasal prong oxygen, non-invasive ventilation, bronchoscopy, respiratory physiotherapy interventions, tracheal intubation and cardiopulmonary resuscitation.

If AGPs can’t be avoided, a combination of measures should be used to reduce exposures when performing these on suspected or confirmed Coronavirus patients:

- Only perform AGPs when medically necessary
- Limit the number of HCWs present during the procedure to those essential for patient care and support
- **Airborne Plus** PPE should be worn as recommended.
- Conduct the procedures in a negative pressure room
- Conduct environmental cleaning following these procedures as described in the environmental cleaning section of the infection control guidelines for the management of coronavirus. If performed in a single room, the door must remain closed for 30 minutes
- The minimum number of carers for the child, and no visitors should be present.

All patients meeting the case definition of suspected or confirmed Coronavirus who require admission to hospital should be managed in a negative pressure room where possible (or single room) under Droplet and Contact precautions with additional eye protection. Children with suspected or confirmed Coronavirus who require admission to hospital and have severe acute respiratory infection should be managed under **Airborne Plus** precautions. Use the following COVID-19 PPE flowchart to determine the most appropriate PPE to use.

Assessment of children for hospital admission from the Emergency Department

Where possible and safe, children with a provisional or confirmed COVID-19 diagnosis should be managed and quarantined at home. If a child with a provisional COVID-19 diagnosis is suitable for care at home, a decision can be taken in the first instance to transfer the child home with the support of the Hospital in the Home (HITH) service. HITH will reinforce the importance of self-isolation, and facilitate safety netting and the identification of the deteriorating child. See criteria for transfer to HITH below. Agreement to quarantining at home is an essential pre-requisite for HITH management of COVID-19 and will be monitored.

Consider admission to hospital if any of the following are present:

- haemodynamic instability
- hypoxia (SaO2 on room air <92%)
- significant comorbidities including respiratory, cardiac, and oncological conditions or neonates
- unsuitable home environment, or lack of parental support
- Any concern that quarantine will not be adhered to

**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 paediatrics team. Children with complex conditions requiring specialty input should be admitted under the most appropriate specialty. All cases should be discussed with the Infectious Diseases consultant on call.
Diagnostic testing

- COVID-19 testing (SARSCoV-2 PCR) is indicated in all children meeting the criteria above.
- Consider important differential diagnoses and assess as per usual practice.
- If children have severe community acquired pneumonia and a COVID-19 test pending, investigate as for severe community-acquired pneumonia and discuss with the ID team.
- Ensure multiplex respiratory PCR in addition to SARSCoV-2 PCR is requested in admitted patients. Take baseline serum (1ml) for storage only if blood tests are being performed for other clinical indications in case paired SARSCoV-2 serology needed later on.

General management

- Give supplemental oxygen if necessary, starting with low flow nasal oxygen if O₂ saturations <92% or significantly below baseline.
- Caution should be applied for respiratory interventions. Avoid the use of nebulisers - use metered dose inhalers with spacers where possible. Salbutamol for example 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 if needed, 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 PPE. Saline nebs 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.
- Assess and support hydration and nutritional intake as per the care of other respiratory infections in children.
- 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 Community acquired pneumonia guidelines.
- Consider oseltamivir if critically unwell pending respiratory multiplex PCR (or influenza GeneXpert) if symptom onset <48 hours ago. Cease if influenza PCR negative.

**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.
Monitoring of proven or suspected cases

- Monitor FBC, urea and electrolytes and liver function tests with frequency according to clinical severity.
- Perform baseline 12-lead ECG if significant respiratory symptoms, or if there is any consideration of COVID-19 specific therapy.
- Perform CXR only if clinically indicated (e.g., if child is deteriorating). Imaging should follow the CHQ guidelines for imaging in a child with respiratory illness during COVID-19. There is no need for routine CT scanning, only CT scan if clinically indicated.
- If SARS-CoV-2 PCR is negative and strong clinical suspicion for COVID-19 remains (e.g., bilateral pneumonia or severe pneumonia in ICU with no other cause identified):
  - Continue isolation and treatment of patient as provisional COVID-19 diagnosis.
  - Repeat SARS-CoV-2 swab daily with a lower respiratory tract sample if possible, and consider stool PCR if loose stool.
  - Consider differential diagnoses and perform CT chest if not already done.
- Refer urgently for PICU assessment children who remain hypoxic despite low flow nasal oxygen, or who are haemodynamically unstable.
- If patient is critically unwell, monitor coagulation, troponin I and perform bedside echocardiography.

Adjunctive therapies and antivirals

- There are no proven effective pharmaceutical treatments for COVID-19 other than supportive care.
- Avoid corticosteroids unless there is an evidence-based indication for them e.g., severe asthma.
- No antiviral or immunomodulatory agent has thus far been proven effective in clinical trials, and they may be harmful and/or in short supply.
- All children with COVID-19 will be managed with input from the IMPS team. 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. These treatment decisions will only be taken in consultation with the Australia and New Zealand Paediatric Infectious Disease 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.

Inpatient de-escalation of isolation and transmission-based precautions

- Prior to ceasing patient isolation and transmission-based precautions for children requiring ongoing hospital admission, the case should be discussed with IMPS Consultant.
- Following discussion with the IMPS consultant, a child with confirmed or probable COVID-19 may be released from inpatient isolation only if they meet all of the following criteria:
  - 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 10 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. This will be undertaken via HITH.
- Faecal sampling is not recommended as a standard test, however, it may be done in discussion with ID for some children with gastrointestinal symptoms. For children who do have persistently positive PCR in stool after release from isolation criteria are met, further or extended precautions and exclusions should be implemented on a case-by-case basis:
  - Parents of children with diarrhoea and persistently positive stool PCR should have the importance of proper hand hygiene reinforced. Soap and water should be used if possible, though alcohol hand gel may be used.
  - Children do not require repeat testing until they are PCR negative in faecal samples.

**Transfer to the Hospital in the Home service (HITH)**

Patients who do not meet the criteria for inpatient admission at diagnosis in the community or in ED, or those who are considered suitable may be transferred home with the support of the HITH service. Children able to be cared for at home who have yet to meet the above criteria for de-escalation of isolation and transmission-based precautions (and so potentially symptomatic and infectious) should receive strict guidance to remain in isolation. It is a requirement for transfer to HITH that families agree to be quarantined and monitored until de-isolated.

Children transferred to the HITH service will be admitted under the ID SMO of the week. Children admitted to the HITH service from the community (who have not received a clinical evaluation in the hospital) will received a virtual assessment regarding symptoms by the ID SMO or Fellow, or HITH registrar on call. If children are considered to be acutely unwell at this evaluation, they will be advised to present to the QCH ED for formal assessment. The ID team will inform ED of the need for review to ensure appropriate transmission precautions are followed.
HITH Eligibility Criteria:

- Patient staying within 40km of QCH
- Parent/guardian contactable by phone
- Safe home environment
- Ability to represent to QCH as required

Clinical Criteria for HITH Admission with COVID-19

Children with confirmed or suspected COVID-19 require HITH admission for ongoing assessment and/or management for the following clinical features:

- Visible mild work of breathing but no current oxygen requirement
- Decreased fluid intake but no current requirement for IV fluid support
- Moderate presumed secondary bacterial pneumonia but no current oxygen requirement

Additionally, children may be admitted to HITH for observational care to ensure they stay well in the community.

- Children who are asymptomatic or have mild upper respiratory tract symptoms
- Patients remaining under CHQatHome until they are cleared from isolation (see below)

Clinical Exclusion Criteria for HITH Admission with COVID-19

1. Comorbidities including respiratory, cardiac, oncological conditions

Consideration for step-down to HITH following a period of ward observation will be made on an individual basis

HITH Interventions

All patients will be provided with the HITH nurse on call number for 24/7 support. The HITH service will re-inforce the importance of strict isolation until children and carers meet the criteria for de-escalation. The HITH service will also review the ability of children and families to maintain self-quarantine eg food and supplies

1. Children who are symptomatic will require at minimum a daily review, either via telehealth or face to face in-home assessment
2. In-home face to face assessment (with Droplet, Contact and eye protection precautions) as required for:
   a. Further testing
   b. IV antibiotics for moderate pneumonia (not requiring O2)
   c. If further clinical review or observation felt necessary following telehealth review
3. If children are admitted whilst asymptomatic or with mild URTI symptoms they will receive at minimum daily to second daily review via telehealth as per their clinical need. All patients will remain HITH patients for the duration of their stay
If parents have any concerns regarding their child with suspected or confirmed COVID-19 whilst they are on the HITH program they are directed to contact the HITH phone number which is 0438 015 145. The HITH nursing team will escalate any concerns as appropriate.

Assessment of children who need escalation of care from HITH

If at any stage during the HITH admission, the nurse or doctor has any concerns regarding the patient (socially or medically) then they are to be reviewed for possible admission to hospital. The HITH team should inform the ID consultant on-call who will facilitate review in hospital.

- Out of hours, or if the child is potentially unstable this review should take place in ED. Out of hours review may be facilitated by the ACE registrar on call if available.
- Physical review unlikely to need admission to the ward may take place in ED, and will be performed by the HITH team with support from ID. All such cases should take place with clear communication with the ED consultant.
- Children who have been transferred to HITH following an inpatient hospital stay may be reviewed on the ward by the admitting general paediatrics team. This will be clearly discussed between the on-call ID consultant and the on-call general paediatrician.

Personal protective equipment during the HITH admission

Members of the HITH team should take the following precautions when attending children who remain infectious to minimise the risk of HCW transmission:

- Screening questions prior to home visits should enquire about symptomatic family members to remind families of the importance of strict infection control.
- HITH should ideally not be exposed to symptomatic family members during the home visit. Family members in attendance (as close contacts of a case) should wear a surgical mask during the visit. Hospital recommendations for home visiting include the presence of only one carer and minimal siblings, while other family members should be encouraged to move to another area of the house.
- Children who have not yet been cleared should if possible wear a surgical mask during the visit.
- HITH team members should adhere to strict Droplet, Contact and eye protection precautions, and should apply strict hand hygiene while performing home visits.
- Aerosol generating procedures should not be performed by staff or the family while the child is on HITH.

De-escalation of isolation and transmission-based precautions from HITH

1. Children admitted to the HITH service direct from the community or ED (that is, with mild or asymptomatic infections not requiring inpatient admission) may be released from isolation when they meet the following criteria:

- At least 10 days have passed since the onset of symptoms
There has been complete resolution of symptoms of the COVID-19 illness for at least 72 hours

In these circumstances, children and families will be advised to continue to maintain strict hand hygiene and cough etiquette and practise social distancing, as is indicated for the rest of the community, in order to assist in reducing transmission.

2. Children transferred to the HITH service from the hospital ward who have not fulfilled the criteria for de-escalation of isolation and transmission-based precautions detailed above should be transferred to the HITH service with ongoing isolation. De-escalation may occur when:

- At least 10 days have passed since hospital discharge
- There has been resolution of all symptoms of the acute COVID-19 illness for the previous 72 hours

Children and families will again be advised to continue to maintain strict hand hygiene and cough etiquette and practise social distancing, as is indicated for the rest of the community, in order to assist in reducing transmission.

Consultation

- Infectious Diseases
- Infection Management and Prevention Service
- Hospital in the Home
- Pharmacy
- Emergency Department
- PICU
- Physiotherapy
- General Paediatrics

Audit/evaluation strategy

<table>
<thead>
<tr>
<th>Level of risk</th>
<th>Very High</th>
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<tbody>
<tr>
<td>Strategy</td>
<td>Improve the care of patients with suspected and confirmed COVID-19</td>
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<td>Audit/Review tool(s) attached</td>
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<td>Audit/Review date</td>
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<td>Review responsibility</td>
<td>Infection Management and Prevention Service.</td>
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<td>Key elements / Indicators / Outcomes</td>
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Work Instruction revision and approval history

<table>
<thead>
<tr>
<th>Version No.</th>
<th>Modified by</th>
<th>Amendments authorised by</th>
<th>Approved by</th>
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<tr>
<td>1.0 (14/04/2020)</td>
<td>CNC Infection Management and Prevention Service</td>
<td>Director Infection Management and Prevention Service</td>
<td>Executive Director Clinical Services, QCH</td>
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Keywords: COVID-19, Coronavirus, SARS, Pandemic, HITH, 63327

Accreditation references:
- NSQHS Standards (1-8): Standard 3
- ISO 9001:2015 Quality Management Systems: (4-10)

Related resources

- 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
- CHQ respiratory pandemic sub-plan
- Queensland Paediatric Consensus Statement: Respiratory therapies in ED during the COVID-19 outbreak
- CHQ-GDL-00759 Community Acquired Pneumonia - Emergency management in children
- Queensland Health: Information for Queensland clinicians and healthcare workers - novel coronavirus (COVID-19)
- Optimus BONUS simulation packages - Use of nebulisers for children during a Covid-19 outbreak
- Hospital in the Home Society