



CATS Guideline for management of Children with SARS-CoV-2 infection (including PIMS-TS)

Author	Randle/Ramnarayan	Author Position	CATS Consultant
Document Owner	Clement	Document Owner Position	Coordinator CATS
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CATS Guideline for management of Children with SARS-CoV-2 infection including PIMS-TS

Introduction

Presentations of children with SARS-CoV-2 infection to paediatric critical care continue to evolve. This guideline is to support decision making and management of critically ill children with the following presentations:

- Respiratory failure
- PIMS-TS including associated cardiac involvement

Children may present with other symptoms (e.g. seizures, coma, abdominal pain, diarrhoea). Please discuss any child requiring intensive care with the CATS team.

Definitions

SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus type 2

COVID-19: disease caused by SARS-CoV-2

PIMS-TS: Paediatric multisystem inflammatory syndrome temporally associated with SARS-CoV-2 infection

Respiratory Failure

Neonates and young children may present with apnoea, while adult-type pneumonitis or lower respiratory tract infection is more commonly seen in older children.

Children with underlying respiratory conditions such as asthma may also have SARS-CoV-2 infection and require management of their underlying respiratory condition.

Assessment and Initial Management

- Ensure airway patency
- Assess oxygen saturations and give oxygen to achieve saturations >91%.
- Assess work of breathing and oxygenation. Consider the need for positive end expiratory pressure (PEEP) using high flow nasal cannula oxygen (maximum flow 50 L/min) or continuous positive airways pressure (CPAP).
- Consider chest physiotherapy.
- Consider naso/orogastric tube to prevent abdominal distention
- Review chest x-ray for presence of bilateral infiltrates suggestive of COVID-19 pneumonitis.
- If there is concern regarding a pulmonary embolism (level of hypoxia disproportionate to chest x-ray changes), a CTPA may be required.
- Establish IV access, send bloods including cultures, nil by mouth, IV maintenance fluids.
- Consider antibiotics for community acquired bacterial lower respiratory tract infection.
- Steroids (commonly dexamethasone) should be considered for all children needing supplemental oxygen to maintain SpO₂ >91%. The dose is 0.15 mg/kg IV or PO once a day for up to 10 days. Discuss with regional ID team.
- Add gastric protection (e.g. proton pump inhibitor) if treated with steroids.
- Consider antiviral medication (commonly remdesivir) after discussion with ID team.
- Consider thromboprophylaxis (usually prophylactic low molecular weight heparin).

Indications for intubation and referral to PICU

- Worsening hypoxaemia (SpO₂ <91% with FiO₂ >0.6)
- Recurrent apnoeas
- Reduced level of consciousness
- Signs of exhaustion with increased work of breathing
- Worsening hypercarbia and respiratory acidosis

Intubation should be performed following the joint RCOA/AAGBI/ICM guidelines for airway management in children with COVID19 – reference at end of this guideline.

Management following intubation

- Check endotracheal tube position on chest x-ray
- Target SpO₂>91%, permissive hypercapnia: tolerate high CO₂ if pH>7.25
- Minimise disconnections from ventilator – clamp endotracheal tube if disconnection necessary, use in-line suction, ensure viral filters in ventilation circuit, turn off ventilators when disconnected
- PEEP initially 5-7 cm H₂O
- Monitor for air-trapping, respiratory rate <30 bpm, I:E ratio of at least 1:2
- Consider physiotherapy
- Consider prone positioning if severe hypoxia

Transport considerations

- Prepare equipment for decompression of pneumothoraces, place in airway bag
- Confirm EtCO₂ is in use

- Confirm in-line suction and catheters have been placed in circuit/airway kit as suction may be required on transport

PIMS-TS

This syndrome has been defined by the RCPCH as:

- Child with fever, signs of inflammation (e.g. neutrophilia, elevated CRP, lymphopaenia), and single or multi-organ dysfunction. May include children fulfilling full or partial criteria for Kawasaki's disease
- Exclusion of alternative cause
- SARS-CoV-2 PCR testing may be positive or negative

Children suspected of having PIMS-TS should be discussed with regional paediatric infectious disease teams.

If a child requires intensive care, please discuss with the CATS team.

Assessment and Initial Management

Children with PIMS-TS present with:

- Shock (sepsis-like presentation, raised lactate, fluid and inotrope requirement)
- Fulfilling criteria for Kawasaki disease
- Other inflammatory type symptoms (GI/Neuro/Renal/incomplete Kawasaki-like illness)

All these presentations may have cardiac involvement.

Initial management varies according to phenotype.

Shock presentation:

- Initial fluid bolus (10-20 ml/kg), reassess, monitor for fluid overload
- Consider early inotrope administration, peripheral adrenaline is commonly used, vasopressors such as peripheral noradrenaline may be required as children often have vasodilatory shock. This should be discussed with the CATS Consultant.
- Give antibiotics – broad spectrum antibiotics and clindamycin
- Consider steroids and IVIG – discuss with the Regional Infectious Diseases team as this may be as part of a clinical trial (e.g. RECOVERY)
- Consider thromboprophylaxis (commonly LMWH)

Kawasaki disease presentation:

- Discuss with infectious disease team and treat as per Kawasaki disease
- If poor response to IVIG, re-discuss PIMS-TS

Other inflammatory type symptom presentation:

- Discuss with regional infectious disease team – consider steroids, IVIG, biologics
- Consider thromboprophylaxis (commonly LMWH)
- GI presentations may mimic surgical abdominal presentations and need surgical review and investigation. Ultrasound and CT abdomen may be required to distinguish from acute appendicitis.
- Neurological presentations may require neurology investigation including imaging (CT, MRI)

Cardiac involvement

Cardiac involvement can present in different ways:

- Cardiac failure/myocarditis

- Pericarditis/pericardial effusion
- Cardiac ischaemia
- Arrhythmias

A child with suspicion of cardiac disease should be discussed with paediatric cardiology.

If a child requires intensive care, please discuss with the CATS team.

Assessment and initial management

When to consider cardiac presentation:

History

- Breathlessness, exercise intolerance, cough
- Chest pain
- Dizziness, sudden collapse

Examination

- Tachypnoea, increased work of breathing, crackles or wheeze on chest auscultation
- Cardiac murmur, gallop rhythm, cardiomegaly, poor volume peripheral pulses, irregular pulses, hepatomegaly

Investigations

- Chest x-ray – assess for cardiomegaly
- 12 lead ECG – assess for sinus rhythm, conduction abnormalities, ischaemia
- Echocardiogram – most paediatric presentations are in older children, adult cardiologists or ED physicians may be able to assist
- Bloods – troponin, CK, BNP

For all these presentations:

Send full panel of PIMS-TS bloods (see RCPCH guideline)

Consider cardiac involvement – see above

Discuss with regional infectious disease team

Indications for intubation or referral to PICU

If a child with PIMS-TS requires ANY organ support, they should be transferred to a PICU.

Children who have received large volumes of fluid resuscitation may need non-invasive or invasive respiratory support in the PICU.

Children requiring one or more inotropes will need PICU.

Most children with cardiac disease will require an echocardiogram and cardiology review. These children are often transferred without the need for intubation and may be transferred to cardiac wards or intensive care units in cardiac centres. Discuss with CATS if time allows.

The majority of children with PIMS-TS are transferred un-intubated on a single inotrope.

Some children will require intubation.

Indications are:

- Respiratory Failure – hypoxia or respiratory acidosis
- Increasing inotrope requirements
- Reduced GCS
- Cardiac failure

Intubation in PIMS-TS should be performed following the joint RCOA/AAGBI/ICM guidelines for airway management in children with COVID-19.

Additionally:

- Have a fluid bolus, and adrenaline and noradrenaline infusions prepared
- Have cardiac arrest drugs and flushes prepared
- Have defibrillator and appropriate size pads available
- Prepare 'cardiostable' anaesthetic induction agents (eg. ketamine or fentanyl)
- In the case of cardiac involvement, normalise potassium, magnesium and calcium if possible

Management following intubation

- Chest x-ray for endotracheal tube position and heart size
- Cardiac monitoring
- Aim for normal gas exchange and normal pH
- Establish two points of IV access
- Consider central venous and arterial access
- Have adrenaline and noradrenaline infusions available if not running
- If on two vasoactive drugs, consider preparing vasopressin and steroids if not already given – discuss steroids with receiving infectious disease team
- Confirm antibiotics have been given
- Discuss with CATS regarding need for IVIG (this can be a significant intravenous volume for children with cardiac failure)
- Echocardiogram if possible

Transport considerations

- Have fluid bolus available
- Have inotrope infusions, cardiac arrest drugs and flushes available

- Have defibrillator available for arrhythmia management and consider using this as the transport monitor to enable timely defibrillation if necessary
- If not intubated, have 'cardiostable' induction agents and intubation equipment available in case of deterioration
- Have IO needle available in case of emergency loss of IV access
- Consider equipment for pericardiocentesis if a child has a pericardial effusion

References

Guidelines from the Association of Anaesthetists, the Difficult Airway Society, the Intensive Care Society, the Faculty of Intensive Care Medicine, the Royal College of Anaesthetists, **Paediatric Intensive Care Society** and Association of Paediatric Anaesthetists. <https://icmanaesthesiacovid-19.org/covid-19-paediatric-airway-management-principles>

RCPCH PIMS-TS Guideline is available from <https://www.rcpch.ac.uk/resources/paediatric-multisystem-inflammatory-syndrome-temporally-associated-covid-19-pims-guidance>