

Clinical Guidance

Paediatric Critical Care: PIMS-TS Paediatric Multisystem Inflammatory Syndrome temporally associated with SARS-CoV2

Summary

This is to provide guidance regarding the diagnosis and management of Paediatric Multisystem Inflammatory Syndrome temporally associated with SARS-CoV-2. Please see STRS app or [Pharmacological management of PIMSTS](#) on GTi for immunomodulation dosing as being modified frequently.

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Relevant external law, regulation, standards	
<p>This clinical guideline has been produced by the South Thames Retrieval Service (STRS) at Evelina London for nurses, doctors and ambulance staff to refer to in the emergency care of critically ill children.</p> <p>This guideline represents the views of STRS and was produced after careful consideration of available evidence in conjunction with clinical expertise and experience. The guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient.</p>	

Change History		
Date	Change details, since approval	Approved by

Paediatric Critical Care

Paediatric Multisystem Inflammatory Syndrome temporally associated with SARS-CoV-2

The Covid-19 pandemic has been temporally associated with the emergence of a paediatric presentation of severe inflammation and shock. This syndrome has some clinical similarities to Kawasaki shock and toxic shock. Patients have presented with mild to severe illness. In the majority of patients, coronavirus has not been detected by PCR on throat/nasal swabs, however serological evidence of SARS-CoV-2 infection is present in some. The likeliest mechanism is a delayed antibody-mediated dysregulated host immune response.

Clinical features

May include one or more of the following:

- Persistent Fever > 39 C
- Lethargy and Myalgia
- Abdominal Symptoms: Pain, Diarrhoea and Vomiting
- Rash/Conjunctivitis
- Hypotension (Wide pulse pressure), tachycardia +/- Shock

Laboratory features

- | | |
|------------------------|-----------------------------------|
| Hyponatraemia | Raised CRP |
| Raised Ferritin (>500) | Raised Troponin and B-NP |
| Raised Fibrinogen | Lymphopenia / neutrophilia |
| Raised D-Dimer | Platelets initially low or normal |
| Renal dysfunction | |

Significant similarity in presentation with other paediatric conditions

Septic shock - may require higher volume fluid resuscitation and source control: senior clinical review

Peritonitis -negative laparotomy reported in some cases: cautious specialist surgical review with appropriate radiology

Initial management

Examination:

- Exclude potential septic foci and careful cardiac assessment (liver, JVP, cardiac / thoracic ratio on CXR)

Resuscitation:

- If signs of shock – fluid resuscitation (10ml/kg aliquots) with re-evaluation after each bolus and discuss with STRS
- If no improvement with fluid, start inotropes: Dopamine @ 5 - 10mcg/kg/min, until central access (consider noradrenaline)
- Ceftriaxone and Clindamycin as sepsis impossible to exclude
- Anaesthetic team review and discuss with STRS
- Early IVIG 2g/kg (use IBW) (must save serum before giving)

Severe myocardial dysfunction common:

- If intubation required: cardio-stable induction (ketamine+ draw up emergency drugs)
- Caution on moving or transferring ventilated patients - instability observed in presence of severe cardiac dysfunction (extremely preload dependant)

Investigations

Core investigations:

- FBC, Full biochemical profile (Na, K, Ur, Cr, Ca, Phos, Mg, LFTs)
- CRP, PCT, ESR
- Ferritin, Triglycerides, Trop-T, D-Dimers, CK, NT-proBNP, LDH
- Coagulation profile (Including Fibrinogen)
- Blood / Urine culture
- Save serum & EDTA sample
- Chest X-ray
- Consider abdominal imaging to exclude abdominal pathology

Additional investigations (PICU admission)

- Vitamin D, amylase, ASOT
- Group and Save (crossmatch if considering ECMO)
- Blood film
- Virology for SARS-CoV-2 PCR on Stool, NPA, BAL and blood, serology for SARS-CoV-2
- DIAMOND Trial pack
- M C & S: BAL, urine, throat swab
- Standard Respiratory Viral panel - NPA or throat swab
- Viral serology blood PCR: EBV, CMV, Adeno, Enterovirus
- Blood PCR: Pneumococ., Meningococ., Group A strep, Staph A

PICU management at specialist centre

Patient to be managed as COVID+ (even if PCR negative for SARS-CoV-2) – full PPE and management in appropriate area

- Central access: awake femoral line preferable in self ventilating patients-most require noradrenaline
- Temperature control – regular paracetamol, active cooling if ventilated
- Ensure IVIG was administered otherwise give a dose as above (out of hours stock kept on PICU to avoid delay), monitor for fluid overload during infusion.
- Enteral high dose aspirin with high dose PPI as per pharmacological management guideline
- Methylprednisolone as per pharmacological management guideline
- Pubescent teenagers to commence DVT prophylaxis: TED Stockings consider LMW heparin or IV UF heparin (check coagulation profile prior to starting)

Monitoring:

- Urgent Echo upon admission to PICU. Repeat as clinically indicated.
- 12 lead ECG at admission, repeat daily or if clinical concerns.
- If oxygen requirement repeat CXR
- Regular blood gas – measure lactate
- Repeat *core investigations* 12 hourly – if rising inflammatory markers discuss urgently with ID team.

Further immunomodulation may include (MDT discussion):

- Repeat IVIG dose
- Infliximab (monoclonal antibody)
- Anakinra (IL-1 receptor antagonist)
- Tocilizumab (IL-6 receptor antibody)

Cardiac Manifestations and Management

Pancarditis may include: bi-ventricular impairment, mitral/tricuspid valve regurgitation, diastolic dysfunction, pericardial effusion, coronary artery dilatation / aneurysm (may be better visualised on CT)

- Clinical course unpredictable with rapid deterioration observed in some.
- 12 lead ECG – arrhythmias reported
- Urgent Echocardiogram (transfer to ELCH)
- Low threshold for Milrinone infusion
- Severe cases consider levosimendan or argipressin based on clinical picture: cardiac function vs vasoplegia
- VA ECMO for refractory shock – crossmatch blood

Therapy Complications

- Fluid overload risk with IVIG infusion – consider diuretics
- Hypertension: high dose methyl prednisolone associated with severe hypertension and PRES. Treatment with Ca channel blockade or SNP if severe cardiac dysfunction.
- Hyperglycaemia: – may require insulin infusion.
- Gastritis: patients should all receive high dose PPI.
- Salicylate complications: AKI, Respiratory alkalosis

Step down

- Consider HDU step down when off Noradrenaline 6-12 h
- Milrinone to continue on HDU if impaired cardiac function
- Leave central line in situ – if twice daily bloods required
- Aspirin: reduce dose once afebrile and falling CRP
- Methylprednisolone, weaning plan as per pharmacological management guideline- usually reduce after 3-5 days

See [Pharmacological management of PIMSTS](#) or STRS app guideline for immunomodulation dosing