Dear Colleagues

We are writing to you in regards to a clinical alert published by the Royal College of Paediatrics and child Health on the 1st of May 2020 highlighting a new COVID-19-associated paediatric hyper-inflammatory presentation (Guidance - Paediatric multisystem inflammatory syndrome temporally associated with COVID-19).

Although COVID-19 respiratory presentation in children has been rare, several children have recently presented to hospitals in the South Thames region with the described Paediatric multisystem inflammatory syndrome temporally associated with COVID-19. Many of the children have been severely unwell at presentation requiring resuscitation and transfer to paediatric intensive care.

As the anaesthetic team you may be asked to review and assist in their resuscitation and stabilisation. We thought it may be helpful to summarise some of the salient features of the presentation in this group of patients to date, and the associated anaesthetic considerations.

Paediatric multisystem inflammatory syndrome temporally associated with COVID-19

Presentation

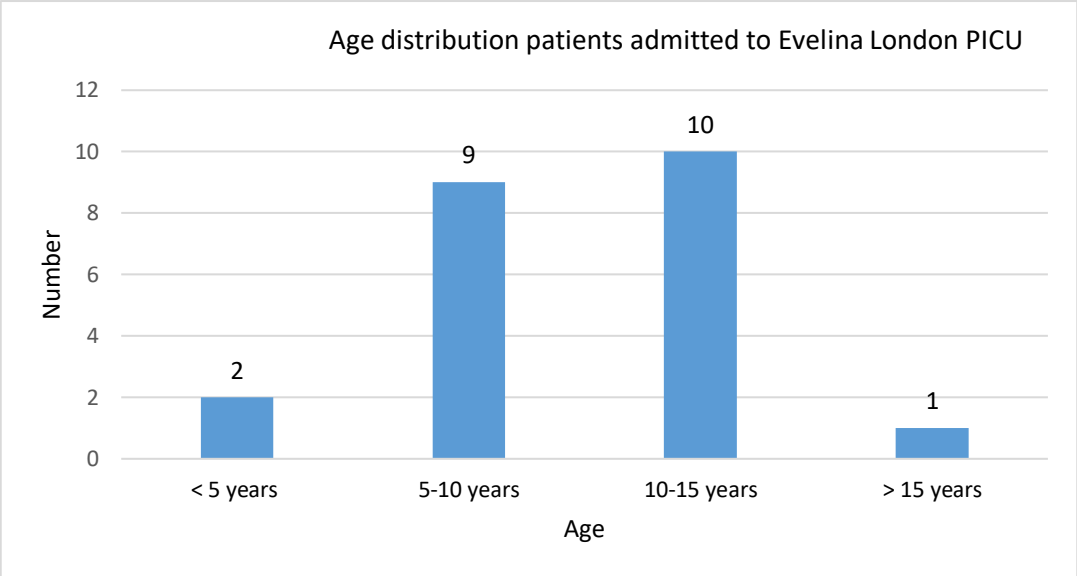
The clinical presentation has clinical overlap with Kawasaki shock and toxic shock syndromes.

Clinical Features	Laboratory Features	
Persistent high temperature > 39 degrees	Hyponatraemia	↑ D- Dimers
Lethargy, myalgia	↑ CRP	Lymphopaenia
Diarrhoea & vomiting, abdominal discomfort	↑ Troponin / BNP	Platelets ↓/ normal
Rash/ conjunctivitis	↑ Ferritin	Renal dysfunction
Hypotension (wide pulse pressure)+/- Shock	↑Fibrinogen	

The vast majority of children are testing COVID-19 negative on PCR of respiratory secretions at presentation, many do however have serological evidence of recent COVID-19 infection (antibody testing). One of the proposed mechanisms of disease is a delayed antibody-mediated dysregulated immune response to COVID-19 infection.

The median age of presentation to date has been 9 years (range 4 to 16 years) with a median weight of 31kg. Children of Afro-Caribbean decent have been disproportionately represented within this clinical cohort.

Age distribution of 22 cases admitted to Evelina PICU thus far is displayed in the graph below



Cardiac Involvement

The majority of patients have had myocardial involvement of varying severity. Of note dysfunction may be acute in onset and rapidly progressive. The disease process is resulting in a pancarditis which may manifest as one or more of the following:

Possible cardiac manifestations
Bi-ventricular dysfunction
Mitral valve/ tricuspid valve regurgitation
Pericardial effusion
Conduction abnormalities/ arrhythmias
Coronary artery dilatation which may develop into coronary artery aneurysm formation

Some children have had cardiomegaly with enlarged cardio-thoracic index on chest X-ray at presentation. If present assume myocardial dysfunction, however many have had significantly impaired function on admission to ICU with a normal cardio-thoracic index on presentation.

Abdominal Manifestations

Patients may present with marked abdominal tenderness, may even appear to be peritonitic. A few children in the United Kingdom have progressed to negative laparotomy for appendicitis. If patients present with this constellation of clinical and biochemical features and significant abdominal concerns, advanced imaging modalities (e.g. ultrasound and/CT) scan are encouraged prior to embarking on laparotomy unless very clear surgical abdomen.

Ultrasound/CT findings may include: colitis, ileitis, lymphadenopathy and ascites.

Acute right ventricular dysfunction with hepatic capsular distension may also cause abdominal pain – examine for hepatomegaly.

Management

Anaesthetic Considerations:

- Recommendation is to wear full PPE per local trust guidance for suspected COVID-19 infection

- Systems Management:

  Airway & Breathing:

  - The vast majority of children are testing COVID-19 negative on PCR of respiratory secretions.
  - Respiratory symptoms have not been prominent feature at presentation. Some children have developed oxygen requirement/ respiratory distress often associated with evolving pleural effusions.
  - Some have been manged on Non-invasive ventilation (high flow nasal cannula oxygen cPAP/ BiPAP). If this is considered staff should wear appropriate PPE and patient should be in an appropriate care area.
  - Proceed to intubation if felt to be required for respiratory and/or cardiac support. Early discussion with South Thames Retrieval Service is encouraged.

  Circulation:

  - Many are hypotensive at presentation and may have manifestations of shock. They may be vasodilated with features of "warm" shock.
  - Good initial response to fluid resuscitation may be observed. In light of propensity to cardiac involvement we suggest administering fluid in 10mL/kg aliquots with careful observation of clinical response.
  - IVIG if available should be commenced as soon as possible.
  - If patient is no longer fluid responsive or has had > 40-60mL/kg inotropes should be commenced. Vasoplegia has been a prominent feature. We suggest following inotrope strategy:

Inotrope	Dose
No central venous access	
Dopamine	5-10mcg/kg/min If requiring > 10mcg/kg/min commence noradrenaline via central access/ IO
Central access venous access	
Noradrenaline	0.01-0.5 mcg/kg min If requiring > 0.3mcg/kg/min consider adding low dose adrenaline infusion

  - **Central venous access:** the majority of the cohort presenting are > 4 years of age. In children who do not have marked respiratory distress requiring invasive

ventilation our strategy has been to attempt awake femoral venous access with local anaesthesia and a small amount of sedation where clinically feasible to do so. In children in extremis we would advise a low threshold for siting IO needles for inotrope delivery until central venous access can be secured.

Disability:

- Profound obtundation in this context should be regarded as a marker of severe shock – ensure adequately resuscitated.
- There may be an associated vasculitic component to the disease, if patient has focal neurology CT brain should be obtained as soon as possible after stabilisation

Exposure:

Pyrexia will exacerbate tachycardia, hypotension and tachypnoea. Regular paracetamol with passive cooling measures.

Induction of anaesthesia

In children with refractory shock and/or worsening respiratory dysfunction requiring intubation we would advise the following:

- Profound vasoplegia has resulted in some patients having significant haemodynamic instability on moving from trolley to bed/ being sat upright. Patients are preload dependent. Have fluid boluses available prior to moving.
- If an echo cannot be obtained immediately prior to induction, assume the patient has at least moderate myocardial dysfunction. We would recommend that inotropic support is running prior to induction (via IO needle if no other suitable access). Select cardiac stable induction agents.
- Patient should be optimally pre-oxygenated (PEEP may be required).
- Have cardiac arrest drugs prepared, along with short acting alpha agonist.
- If patient has significant CXR changes/ evolving large pleural effusions a cuffed oral tube in anticipation of high ventilation pressure requirements may be preferable.
- Bagging at high intrathoracic pressures may exacerbate haemodynamic instability – may require further volume resuscitation

If faced with a patient meeting this case definition we encourage the paediatric team to discuss the patient with the retrieval service as soon as possible.

Further Reading:

Hyperinflammatory shock in children during COVID-19 pandemic. www.thelancet.com Published online May 7, 2020 https://doi.org/10.1016/S0140-6736(20)31094-1 1

Kind Regards

South Thames Retrieval Service Consultants