



### Multisystem Inflammatory Syndrome in Children

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Maryland Medicaid Advisory Committee

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# What is Multisystem Inflammatory Syndrome in Children (MIS-C)?

- Multisystem inflammatory syndrome in children (MIS-C) is a new health condition associated with COVID-19 that is appearing in children the US and elsewhere. The syndrome was previously called pediatric multisystem inflammatory syndrome or PMIS.
- Features of Kawasaki Disease and Toxic Shock Syndrome
- Previously healthy children presenting with a severe inflammatory syndrome with Kawasaki disease-like features
- Most positive for current or recent infection by SARS-CoV-2, or had an epi link to a COVID-19 case



### **Situational Descriptions**

#### May 5, 2020 case series in the UK

	UPPORTUNITY.	of Health	
ANDREW Governor	M. CUOMO	HOWARD A. ZUCKER, Commissioner	M.D., J.D. SALLY DRESLIN, M.S., R.N. Executive Deputy Commission
			May 6, 202
то:	Hospital Op	erators, Health Care Providers, Heal	th Care Facilities, Clinical Laboratories, and
FROM:	New York S Control (BC	tate Department of Health (NYS DOI DC)	H) Bureau of Communicable Disease
	HEALTH AD POTENTI	ISORY: PEDIATRIC MULTI-SYS ALLY ASSOCIATED WITH COR IN CHILDRI	STEM INFLAMMATORY SYNDROME ONAVIRUS DISEASE (COVID-19) EN
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	Age; weight; BMI; comorbidities	Clinical presentat	lon	Organ support	Pharmacological treatment	Imaging results	Laboratory results	Microbiology results	PICU length of stay; outcome
		Initial	PICU referral						
Patient 1 (male, Afro- Caribbean)	14 yean; 95 kg; BMI 33 kg/m <sup>3</sup> ; no comorbidities	4 days >40°C; 3 days non-bloody diamhoea; abdominal pain; headache	BP 80/40 mmikg; HR 120 beats/min; RR 40 breaths per min; work of breathing; SatO2 99% NCO2	MV, RRT, VA-ECMO	Dopamins, norachenaline, argiptesis, actenaline militinons, hydroxicottisons, NIG, ceftriarons, clindamycin	RV dysfunction/ elevate RVSP; lietts, GE oedema and dilated billary tree, ascites, bilateral basal lung consolidations and diffuse nodules	Ferttin (220 µg1, D-dimen 13-4 mg1; troponin 6/5 ng1; prolNP=35000; CRP 556 mg1; procaktionin=100 µg1; albumin 20 g1; plateiets 123=10 <sup>4</sup>	SARS-CoV-2 positive (post mortem)	6 days; demise (right MCA and ACA ischaemic infarction)
Patient 2 (maie, Afro- Caribbean)	8years; 30 kg; BMI 18 kg/m <sup>4</sup> ; no comorbidities	5 days>39°C; non-bloody diamhoea; abdominal pain; conjunctivitis; rash	BP 81/37 mmHg; HR 165 beaty/min, RR 40 breaths/ min; SVIA	MV	Noradrenaline, adrenaline, IVIG, infliximati, methylprednisolone, ceftriarone, clindamycin	Mild biventricular dysfunction, severely dilated coronaries; ancites, pieural effusions	Ferritin 277 µg/L; D-dimers 4.8 mg/L; troponin 25 ng/L; CRP 295 mg/L; procalitionin 8.4 µg/L; alturnin 18 g/L; platelets 61.x 10°	SARS-CoV-2 negative; likely COVID-19 exposure from mother	4 days; alive
Patient 3 (male, Middle- Eastem)	4yeam; 18 kg; BMI 17 kg/m²; no comorbidities	4 days >39°C; dianthoea.and vomiting; abdominal pain; raph; conjunctivitis	BP 90/30 mmHg; HR 170 beats/min; RR 35 breaths/ min; SVIA	MV	Noradrenaline, adrenaline, IVIG orftriazone, clindarnych	Ascites, pleural effusions	Ferritin 574 µg/L; D-dimens 117 mg/L; trophin 45 ng/L; CRP 322 mg/L; procakitonin 10-3 µg/L; albumin 22 g/L; platelets 103×10*	Adenovirus positive; HERV positive	4 days; allve
Patient 4 (female, Afro- Caribbean)	13yean; 64 kg.8Mi 33 kg/m²; no comorbidities	5 days >39°C; non-bloody diamhora; abdominal pain; conjunctivitis	BP 77/41 mmHg; HR 127 beats/min; RR 24 breaths/ min; SVIA	HFNC	Noradrenaline, milrinone, IVK, ceftriacone, clindamycin	Moderate-severe LV dysfunction; ascites	Ferritin 631 µg/L; D-dimens 3-4 mg/L; troponin 250 ng/L; proBNP 13427 ng/L; CRP 307 mg/L; procakitonin 12-1 µg/L; abornin 21 g/L; piatelets 146×107	SARS-CoV-2 negative	5 days; allve
Patient 5 (male, Asian)	6years; 22 kg; BMI 14 kg/m <sup>1</sup> ; autism; ADHD	4 days > 39°C; odynophagia; rash; conjunctivitis	BP 85/43 mmHg HR 150 beab/min; RR 50 breaths/ min; SVIA	NN	Milrinone, MG, methylprednisoione, aspirin, ceftriaxone	Dilated IV, AVVR, pericoronary hyperechogenicity	Ferritin 550 µg/l; D-dimers 11.1 mg/l; troponin 4/ ng/l; NT-proBNP 7004 ng/l; CBP 183 mg/l; abumin 24 g/l; platelets 165 x 10 <sup>5</sup>	SARS-CoV-2 positive; likely COVID-19 exposure from father	4 days; ailve
Patient 6 (fernale, Afro- Caribbean)	6years; 26 kg; BMI 15 kg/m²; no comorbidities	5 days >39°C; myaigla; 3 days diarrhoea and vomiting; conjunctivitis	BP 77/46 mmHg; HR 120 beats/min; RR 40 breaths/ min; SVIA	NIV	Dopamine, noradrenaline, militinone, MKG, methylpredhisokone, aspini, ceftriaxone, clindamycin	Mild IV systolic Impairment	Ferritin 1023 µg/L; D-dimers 9-9 mg/L; troponin 45 ng/L; NT-pro8NP 9376 ng/L; CBP mg/L; 169; proakitonin 11-6 µg/L; abumin 25 g/L; platelets 158	SARS-CoV-2 negative; confirmed COVID-19 exposure from grandfather	3 days; allve
Patient 7 (maik, Afro- Caritibean	12yean; 50kg. BMI 20 kg/m²; alopecia areata, hayfever	4 days>39°C; 2 days diarrhoea and vomiting; abdominal pain; rash; odynophagia; headache	BP 80(48 mmHg; HR 125 beats/min, RR 4/ breaths/ min; SatOr 98%; HFNC FIO: 0.35	MV	Noradrenaline, adrenaline, milifinone, NIG, methylprednisolone, heparin, ceftrfacone, cindamy.cin, metronidazole	Severe biventricular Impairment; lieitis, ascites, pieural effusions	Fertilin 958 µg/L; D-dimer 24.5 mg/L; troponin 813 ng/L; NT-proBNP >35000 ng/L; CBP 251 mg/L; procakitonin 71.5 µg/L; alburnin 24.g/L; platelets 27.3 × 10 <sup>4</sup>	SARS-CoV-2 negative	4 days; allve
Patient 8 (female, Afro- Caribbean)	8yean; 50 kg BMI 25 kg/m <sup>3</sup> ; no comorbidities	4 days > 39°C odynophagla; 2 days diarrhoea and vomitting; abdominal rain	IIP 82/41 mmHg HR 130 beats/min; RR 35 breaths/ min; SatOr 97% NCO2	MV	Dopamine, noradrenaline, miltinone, NVG, apirin, ceftriacone, clindamycin	Moderate LV dysfunction	Ferritin 460 µg/L; D-dimens 4-3 mg/L; troponin 120 ng/L; CRP 347 mg/L; procakitonin 7-42 µg/L; albumin 22 g/L; plateletis 206 x 10 <sup>4</sup>	SARS CoV-2 negative; likely COVID-19 exposure from parent	7 days; allve

May 6, 2020 case series in the UK

#### May 13, 2020 one case series in Italy

	Articles
n outbreak of severe Kawasaki-like disease at the Italian picentre of the SARS-CoV-2 epidemic: an observational obort study	€
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DEPARTMENT OF HEALTH

## **Signs and Symptoms**

- Prolonged fever (temperature of 100.4 degrees F or 38.0 degrees C or greater)
- Irritability or decreased activity
- Abdominal pain without another explanation (often very severe), diarrhea, vomiting
- Rash, Swollen hands and feet, which might also be red
- Conjunctivitis (red or pink eyes)
- Poor feeding
- Hypotension
- Multiorgan involvement (cardiac, gastrointestinal, renal, hematologic, dermatologic and neurologic)
- Respiratory symptoms NOT present in all cases



# Centers for Disease Control and Prevention: HAN (5/14/2020)

- Situational summary
- Case definition
- Reporting requirements





### **CDC Case Definition**

#### Case Definition for Multisystem Inflammatory Syndrome in Children (MIS-C)

- An individual aged <21 years presenting with fever<sup>i</sup>, laboratory evidence of inflammation<sup>ii</sup>, and evidence of clinically severe illness requiring hospitalization, with multisystem (≥2) organ involvement (cardiac, renal, respiratory, hematologic, gastrointestinal, dermatologic or neurological); AND
- No alternative plausible diagnoses; AND
- Positive for current or recent SARS-CoV-2 infection by RT-PCR, serology, or antigen test; or COVID-19 exposure within the 4 weeks prior to the onset of symptoms

#### <sup>i</sup>Fever ≥38.0°C for ≥24 hours, or report of subjective fever lasting ≥24 hours

<sup>ii</sup>Including, but not limited to, one or more of the following: an elevated C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), fibrinogen, procalcitonin, d-dimer, ferritin, lactic acid dehydrogenase (LDH), or interleukin 6 (IL-6), elevated neutrophils, reduced lymphocytes and low albumin

#### Additional comments

- Some individuals may fulfill full or partial criteria for Kawasaki disease but should be reported if they meet the case definition for MIS-C
- Consider MIS-C in any pediatric death with evidence of SARS-CoV-2 infection



## **Reporting MIS-C in Maryland**

- May 14: Clinician letter distributed
- Required reporting of MIS-C cases
- No case report form (at this time)



# **Reporting MIS-C in Maryland**

- Information to Collect
  - Patient demographic information
  - Date of symptom onset
  - Maximum temperature
  - Laboratory value(s) fulfilling the above listed laboratory evidence of inflammation
  - Hospitalization status
  - Types of organ system involvement
  - SARS-CoV-2 testing results
  - Other relevant testing results (for example, those that have been used to exclude an alternative diagnosis)



### Serum specimen

- Serum specimen
  - Must be prior to administration of IVIG
  - Tube types: Red top, tiger top, or gold top serum separator tube
  - Refrigerate to 2-8 degrees C
  - Serological Testing requisition <u>https://health.maryland.gov/laboratories/docs/MDH%204677%20Serological%20Tes</u> <u>ting%20Form%20and%20Instructions%202-2018.pdf</u>



### **MIS-C Resources**

• CDC HAN

https://emergency.cdc.gov/han/2020/han00432.asp

• MDH One-Pager

https://phpa.health.maryland.gov/Documents/MIS-C\_onepage\_051920.pdf

• MDH Clinician Letter

https://content.govdelivery.com/attachments/MDMBP/2020/05/15/file\_attachments/14525 16/COVID%20MIS-C%20Clinician%20Letter\_5.15.2020%20FINAL.pdf

