



Multisystem Inflammatory Syndrome (MIS-C)

Information for Healthcare Providers about Multisystem Inflammatory Syndrome in Children (MIS-C)

Case Definition for MIS-C

As described in the Health Advisory, "[Multisystem Inflammatory Syndrome in Children \(MIS-C\) Associated with Coronavirus Disease 2019 \(COVID-19\)](#)," the case definition for MIS-C is:

- An individual aged <21 years presenting with fever*, laboratory evidence of inflammation**, 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 exposure to a suspected or confirmed COVID-19 case within the 4 weeks prior to the onset of symptoms.

*Fever $\geq 38.0^{\circ}\text{C}$ for ≥ 24 hours, or report of subjective fever lasting ≥ 24 hours

**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.

Clinical Presentation

Patients with MIS-C have presented with a persistent fever, fatigue, and a variety of signs and symptoms including multiorgan (e.g., cardiac, gastrointestinal, renal, hematologic, dermatologic, neurologic) involvement, and elevated inflammatory markers. Not all children will have the same signs and symptoms, and some children may have symptoms not listed here. MIS-C may begin weeks after a child is infected with SARS-CoV-2. The child may have been infected from an asymptomatic contact and, in some cases, the child and their caregivers may not even know they had been infected.

Evaluation

Laboratory Testing

- Testing aimed at identifying laboratory evidence of inflammation as listed in the Case Definition section is warranted.
- Similarly, SARS-CoV-2 detection by RT-PCR or antigen test is indicated.
- Where feasible, SARS-CoV-2 serology testing is suggested, even in the presence of positive RT-PCR or antigen testing. Any serology testing should be performed prior to administering IVIG or any other exogenous antibody treatments.

Other Evaluations

Given the frequent association of MIS-C with cardiac involvement, many centers are performing^[1-3] baseline cardiac testing including, but not limited to:

- echocardiogram;
- electrocardiogram;
- cardiac enzyme or troponin testing (per the center's testing standards); and
- B-type natriuretic peptide (BNP) or NT-proBNP.

Other testing to evaluate multisystem involvement should be directed by patient signs or symptoms. Additionally, testing to evaluate for other potential diagnoses should be directed by patient signs or symptoms.

Treatment

There are currently no published guidelines or CDC recommendations regarding treatment for MIS-C and no studies comparing efficacy of various treatment options. However, there are published reports of the treatments that many institutions^[1-3] have been using.

Treatments have consisted primarily of supportive care and directed care against the underlying inflammatory process. Supportive measures have included:

- fluid resuscitation;
- inotropic support;
- respiratory support; and
- in rare cases, extracorporeal membranous oxygenation (ECMO).

Anti-inflammatory measures have included the frequent use of intravenous immunoglobulin (IVIG) and steroids. The use of other anti-inflammatory medications and the use of anti-coagulation treatments have been variable. Aspirin has commonly been used due to the concern for coronary involvement, and antibiotics are routinely used to treat potential sepsis while awaiting bacterial cultures.

There have been very few cases of death reported in hospitalized patients.

Reporting

Healthcare providers who have cared or are caring for patients younger than 21 years of age meeting MIS-C criteria described in the case definition above should report suspected cases to their local, state, or territorial health department. After hour phone numbers for health departments are available at the [Council of State and Territorial Epidemiologists website](#) [↗](#). For additional reporting questions, please contact CDC's 24-hour Emergency Operations Center at 770-488-7100.

Case Report Form

- [Instructions for Multisystem Inflammatory Syndrome Associated with COVID-19 Case Report Form](#) [↗](#) [164 KB, 5 pages]
- [Fillable Multisystem Inflammatory Syndrome Associated with COVID-19 Case Report Form](#) [↗](#) [411 KB, 3 pages]
- [Printable Multisystem Inflammatory Syndrome Associated with COVID-19 Case Report Form](#) [↗](#) [119 KB, 3 pages]

References

1. Belhadjer Z, Meot M, Bajolle F, et al. [Acute heart failure in multisystem inflammatory syndrome in children \(MIS-C\) in the context of global SARS-CoV-2 pandemic](#) [↗](#). *Circulation* 2020.
2. Riphagen S, Gomez X, Gonzalez-Martinez C, Wilkinson N, Theocharis P. [Hyperinflammatory shock in children during COVID-19 pandemic](#) [↗](#). *Lancet* 2020.
3. Verdoni L, Mazza A, Gervasoni A, et al. [An outbreak of severe Kawasaki-like disease at the Italian epicentre of the SARS-CoV-2 epidemic: an observational cohort study](#) [↗](#). *Lancet* 2020.

Additional Resources

- [Clinical Outreach and Communication Activity \(COCA\) Webinar, May 19, 2020: Multisystem Inflammatory Syndrome in Children \(MIS-C\) Associated with Coronavirus Disease 2019 \(COVID-19\)](#)
- [CDC Health Advisory \(5/14/20\): Multisystem Inflammatory Syndrome in Children \(MIS-C\) Associated with Coronavirus Disease 2019 \(COVID-19\)](#)
- [COVID-19 Information for Pediatric Healthcare Providers](#)
- [Clinical Questions about COVID-19: Questions and Answers](#)
- [Interim Clinical Guidance for Management of Patients with Confirmed Coronavirus Disease \(COVID-19\)](#)
- [Kawasaki Disease](#)
- [For Parents: Multisystem Inflammatory Syndrome in Children \(MIS-C\)](#)