

CDC Guidelines on Pediatric Multisystem Inflammatory Syndrome

Updated May 15, 2020 https://www.cdc.gov/coronavirus/2019-ncov/hcp/pediatric-hcp.html#anchor_1589580133375

Information for Pediatric Healthcare Providers

Updated May 15, 2020

Revisions were made on May 15, 2020, to reflect the following:

- Includes current information and guidance related to [multisystem inflammatory syndrome in children \(MIS-C\)](#)

Who this is for: Pediatric Healthcare Providers

What this is for: To inform pediatric healthcare providers of information available on children with COVID-19.

How to use: Refer to this information when managing pediatric patients with confirmed or suspected COVID-19.

Maintaining Childhood Immunizations During COVID-19 Pandemic

As states develop plans for reopening, there is an opportunity for healthcare providers to ensure their patients are up to date with routine vaccinations. With stay-at-home and shelter-in-place orders limiting movement outside the home, declines in outpatient pediatric visits have resulted in [fewer vaccine doses being administered](#), leaving children at-risk for vaccine-preventable diseases, including measles and whooping cough. Healthcare providers, particularly primary care teams who provide comprehensive care in a medical home, are encouraged to work with families to bring children up to date with their vaccinations as quickly as possible. Primary care practices in communities affected by COVID-19 should continue to use [strategies to separate well visits from sick visits](#)[external icon](#). Examples could include:

- Scheduling sick visits and well child care visits during different times of the day
- Reducing [crowding in waiting rooms](#), by asking patients to remain outside (e.g., stay in their vehicles, if applicable) until they are called into the facility for their appointment, or setting up triage booths to screen patients safely
- Collaborating with healthcare providers in the community to identify separate locations for providing well visits for children

Healthcare providers should identify children who have missed well-child visits and/or recommended vaccinations and contact them to schedule in person appointments, starting with newborns, infants up to 24 months, young children and extending through adolescence. State-based immunization information systems and electronic health records may be able to

support this work. Providers also can assure parents about the safety protocols already implemented in their offices. CDC will continue to provide guidance as new information becomes available.

On This Page

- [Burden of Disease](#)
 - [Clinical Presentation in Children](#)
 - [Clinical Course and Complications in Children](#)
 - [Multisystem Inflammatory Syndrome in Children \(MIS-C\)](#)
 - [Treatment and Prevention](#)
 - [Additional Information](#)
 - [References](#)
-

Burden of COVID-19 Among Children

Pediatric cases of coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), have been reported. However, there are relatively fewer cases of COVID-19 among children compared to cases among adult patients.¹⁻⁵

- In the United States, 2% of confirmed cases of COVID-19 were among persons aged <18 years.⁴
- In China, 2.2% of confirmed cases of COVID-19 were among persons aged <19 years old.¹
- In Italy, 1.2% of COVID-19 cases were among children aged ≤ 18 years.²
- In Spain, 0.8% of confirmed cases of COVID-19 were among persons aged < 18 years.⁵

Among cases in children reported from China, most had exposure to household members with confirmed COVID-19.⁶⁻¹⁰

Clinical Presentation in Children

Symptoms in Pediatric Patients

Illness among pediatric cases appear to be mild, with most cases presenting with symptoms of upper respiratory infection such as:

- Fever
- Cough
- Nasal congestion
- Rhinorrhea
- Sore throat

Outcomes in Pediatric Patients

Relatively few children with COVID-19 are hospitalized, and fewer children than adults experience fever, cough, or shortness of breath. Severe outcomes have been reported in

children including SARS-CoV-2 associated deaths. Hospitalization was most common among pediatric patients aged <1 year and those with underlying conditions.

Although most cases reported among children to date have not been severe, clinicians should maintain a high index of suspicion for SARS-CoV-2 infection in children and monitor for progression of illness, particularly among infants and children with underlying conditions.

Incubation Period

While data on the incubation period for COVID-19 in the pediatric population are limited, it is thought to extend to 14 days, similar to adult patients with COVID-19.¹¹ In studies from China, the reported incubation period among pediatric patients ranged from 2 to 10 days.^{7,12}

Clinical Presentation

Pediatric patients with COVID-19 may experience the following signs or symptoms over the course of the disease:^{3,4,6,13-15}

- Fever
- Cough
- Nasal congestion or rhinorrhea
- Sore throat
- Shortness of breath
- Diarrhea
- Nausea or vomiting
- Fatigue
- Headache
- Myalgia
- Poor feeding or poor appetite

The predominant signs and symptoms of COVID-19 reported to date among all patients are similar to other viral respiratory infections, including fever, cough, and shortness of breath. Although these signs and symptoms may occur at any time during the overall disease course, children with COVID-19 may not initially present with fever and cough as often as adult patients.^{4,15,16} In a report of nine hospitalized infants in China with confirmed COVID-19, only half presented with fever.⁹ Gastrointestinal symptoms, including abdominal pain, diarrhea, nausea, and vomiting, were reported in a minority of adult patients.¹⁷ In one pediatric case of COVID-19, diarrhea was the only symptom reported.¹⁰

There have been multiple reports to date of children with asymptomatic SARS-CoV-2 infection.^{3,6,14,15} In one study, up to 13% of pediatric cases with SARS-CoV-2 infection were asymptomatic.¹⁶ The prevalence of asymptomatic SARS-CoV-2 infection and duration of pre-symptomatic infection in children are not well understood, as asymptomatic individuals are not routinely tested.

Signs and symptoms of COVID-19 in children may be similar to those for common viral respiratory infections or other childhood illnesses. It is important for pediatric providers to have an appropriate suspicion of COVID-19, but also to continue to consider and test for other diagnoses, such as influenza (see [CDC's Flu Information for Healthcare Professionals](#) for more information).

Clinical Course and Complications in Children

The largest study of pediatric patients (>2,000) with COVID-19 from China reported that illness severity ranged from asymptomatic to critical.¹⁶

- Asymptomatic (no clinical signs or symptoms with normal chest imaging): 4%
- Mild (mild symptoms, including fever, fatigue, myalgia, cough): 51%
- Moderate (pneumonia with symptoms or subclinical disease with abnormal chest imaging): 39%
- Severe (dyspnea, central cyanosis, hypoxia): 5%
- Critical (acute respiratory distress syndrome [ARDS], respiratory failure, shock, or multi-organ dysfunction): 0.6%

Based on these early studies, children of all ages are at risk for COVID-19; however, complications of COVID-19 appear to be less common among children compared with adults based on limited reports from China¹⁶ and the U.S.^{4,18} In children, SARS-CoV-2 may have more affinity for the upper respiratory tract (including nasopharyngeal carriage) than the lower respiratory tract.¹⁶

As of April 2, 2020, infants aged <1 year accounted for 15% of pediatric COVID-19 cases in the U.S.⁴ However, this age group remains underrepresented among COVID-19 cases in patients of all ages (0.3%) compared to their percentage in the U.S. population (1.2%). Relative to adult patients with COVID-19, there were fewer children with COVID-19 requiring hospitalization (6–20%) and ICU admission (0.6–2%).⁴ Although severe complications (e.g., acute respiratory distress syndrome, septic shock) have been reported in children of all ages,^{4,9,12,19} they appear to be infrequent. Based on limited data on children with either suspected or confirmed infection with SARS-CoV-2, infants (<12 months of age) may be at higher risk of severe or critical disease compared with older children,¹⁶ with hospitalization being most common among children aged <1 year and those with underlying conditions, such as chronic lung disease (including asthma), cardiovascular disease, and immunosuppression.⁴ Other reports describe a mild disease course, including in infants.^{7,9,16}

In the United States, as of April 2, 2020, there have been three deaths among children with laboratory-confirmed SARS-CoV-2 infection that have been reported to CDC, but the contribution of SARS-CoV-2 infection to the cause of death in these cases is unclear.⁴

There are limited data on laboratory findings associated with COVID-19 in pediatric patients. Unlike adult patients with COVID-19,^{20,21} there have been no consistent leukocyte abnormalities

reported in pediatric patients.²² Additional studies are required to understand the laboratory findings associated with pediatric cases of COVID-19.

Chest x-rays of children with COVID-19 show patchy infiltrates consistent with viral pneumonia, and chest CT scans have shown nodular ground glass opacities;^{14,23,24} however, these findings are not specific to COVID-19, may overlap with other diagnoses, and some children may have no radiographic abnormalities. Chest radiograph or CT alone is not recommended for the diagnosis of COVID-19.

The American College of Radiology also does not recommend CT for screening or as a first-line test for diagnosis of COVID-19. (See [American College of Radiology Recommendationsexternal icon](#))

Multisystem Inflammatory Syndrome in Children (MIS-C)

CDC is collaborating with domestic and international partners to investigate reports of multisystem inflammatory syndrome in children (MIS-C) associated with COVID-19. CDC and partners are working to better understand this new syndrome, including how common it is and its risk factors, and to begin tracking cases.

Patients with MIS-C have presented with a persistent fever 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 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 asymptotically infected and, in some cases, the child and their caregivers may not even know they had been infected.

For children who may have MIS-C, evaluation for signs of this syndrome may include (but are not limited to) chest radiograph, echocardiography, and blood testing to evaluate for evidence of inflammation. Healthcare providers who have cared or are caring for patients younger than 21 years of age meeting MIS-C criteria 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 websiteexternal icon](#). For additional reporting questions, please contact CDC's 24-hour Emergency Operations Center at 770-488-7100. For more information including a full case definition, please visit the [CDC Health Alert Network](#).

Treatment and Prevention

Currently, there are no specific drugs approved by the U.S. Food and Drug Administration (FDA) for treatment or prevention of COVID-19. Treatment remains largely supportive and includes prevention and management of complications. Healthcare facilities should ensure that [infection prevention and control policies](#) and universal source control are in place to minimize chance of exposure to SARS-CoV-2 among providers, patients, and families. For infection prevention and

control considerations for infants born to mothers with known or suspected COVID-19, please visit [Considerations for Inpatient Obstetric Healthcare Settings](#). For infection prevention and control considerations for other pediatric healthcare facilities, please visit [Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 \(COVID-19\) in Healthcare Settings](#).

The decision to manage a pediatric patient with mild to moderate COVID-19 in the outpatient or inpatient setting should be decided on a case-by-case basis. Pediatric healthcare providers should consider the patient's clinical presentation, requirement for supportive care, underlying conditions, and the ability for parents or guardians to care for the child at home. For more information on home care of patients not requiring hospitalization visit: [Interim Guidance for Implementing Home Care of People Not Requiring Hospitalization for Coronavirus Disease 2019 \(COVID-19\)](#). There have been limited data on which underlying conditions in children might increase their risk of infection or disease severity. People of all ages, including children and adolescents, with [certain underlying medical conditions](#) such as chronic lung disease or moderate to severe asthma, serious heart conditions (e.g., congenital heart defects), immunocompromised conditions (e.g., cancer undergoing treatment), severe obesity (body mass index [BMI]≥40), diabetes, chronic kidney disease on dialysis or liver disease might be at higher risk for severe illness from COVID-19 and should be monitored for symptoms or signs of concern by their caregivers at home and by their clinical providers.

Severe complications associated with COVID-19 in pediatric patients have not been well-described. One newly described severe complication, multisystem inflammatory syndrome (MIS-C), is being investigated by CDC and partners. The treatment of severe and critical cases of pediatric patients with COVID-19 in the hospital may include management of pneumonia, respiratory failure, exacerbation of underlying conditions, sepsis or septic shock, or secondary bacterial infection. Situations in which a patient requires prolonged hospitalization may also result in secondary nosocomial infections.

The National Institutes of Health recently published guidelines on prophylaxis use, testing, and management of COVID-19 patients. For more information, please visit: [National Institutes of Health: Coronavirus Disease 2019 \(COVID-19\) Treatment Guidelines](#)[external icon](#). The recommendations in the guidelines were based on scientific evidence and expert opinion and will be updated as more data becomes available.

The World Health Organization has published guidelines for the management of adult and pediatric patients with COVID-19 in the inpatient setting or ICU. For more information visit: [Interim Guidance on Clinical Management of Severe Acute Respiratory Infection when Novel Coronavirus \(nCoV\) Infection is Suspected \(WHO\)](#)[external icon](#).

The Surviving Sepsis Campaign has published guidelines for the management of septic shock and sepsis-associated organ dysfunction in children. For more information visit: [Surviving Sepsis Campaign International Guidelines for the Management of Septic Shock and Sepsis-Associated Organ Dysfunction in Children](#)[external icon](#).

For information regarding discontinuing transmission-based precautions and disposition of patients with COVID-19 in healthcare settings, please see: [Discontinuation of Transmission-Based Precautions and Disposition of Patients with COVID-19 in Healthcare Settings \(Interim Guidance\)](#)

For information about clinical trials involving remdesivir or other investigational therapeutics, please visit [Information for Clinicians on Therapeutic Options for COVID-19 Patients](#) .

Additional Information

- [What Healthcare Personnel Should Know about Caring for Patients with Confirmed or Possible COVID-19 Infection](#)
- [Interim Clinical Guidance for Management of Patients with Confirmed COVID-19](#)
- [Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed COVID-19 in Healthcare Settings](#)
- [Frequently Asked Questions and Answers: COVID-19 and Pregnancy](#)
- [Pregnancy, Breastfeeding, and Caring for Young Children](#)
- [Guidance on Care for Breastfeeding Women](#)
- [Health Alert Network \(HAN\): Multisystem Inflammatory Syndrome in Children \(MIS-C\) Associated with Coronavirus Disease 2019 \(COVID-19\)](#)
- [Steps Healthcare Facilities Can Take to Prepare for COVID-19](#)
- [National Institutes of Health: Coronavirus Disease 2019 \(COVID-19\) Treatment Guidelines](#)

References

1. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72314 Cases From the Chinese Center for Disease Control and Prevention. *JAMA*
2. Livingston E, Bucher K. Coronavirus Disease 2019 (COVID-19) in Italy. *JAMA*
3. Su L, Ma X, Yu H, et al. The different clinical characteristics of corona virus disease cases between children and their families in China – the character of children with COVID-19. *Emerging Microbes and Infection* 2020; 9(1): 707-13.
4. CDC COVID-19 Response Team. Coronavirus Disease 2019 in Children — United States, February 12–April 2, 2020. *MMWR Morbidity and Mortality Weekly Report*. ePub: 6 April 2020. DOI: <http://dx.doi.org/10.15585/mmwr.mm6914e4>
5. Tagarro A, Epalza C, Santos M, et al. Screening and Severity of Coronavirus Disease 2019 (COVID-19) in Children in Madrid, Spain. *JAMA Pediatr*
6. Qiu H, Wu J, Hong L, Luo Y, Song Q, Chen D. Clinical and epidemiological features of 36 children with coronavirus disease 2019 (COVID-19) in Zhejiang, China: an observational cohort study. *Lancet Infect Dis*
7. Cai J, Xu J, Lin D, et al. A Case Series of children with 2019 novel coronavirus infection: clinical and epidemiological features. *Clin Infect Dis*

8. Chan JF, Yuan S, Kok KH, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. *Lancet* 2020; **395**(10223): 514-23.
9. Wei M, Yuan J, Liu Y, Fu T, Yu X, Zhang ZJ. Novel Coronavirus Infection in Hospitalized Infants Under 1 Year of Age in China. *JAMA*
10. Ji LN, Chao S, Wang YJ, et al. Clinical features of pediatric patients with COVID-19: a report of two family cluster cases. *World journal of pediatrics : WJP*
11. Lauer SA, Grantz KH, Bi Q, et al. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. *Ann Intern Med*
12. Sun D, Li H, Lu XX, et al. Clinical features of severe pediatric patients with coronavirus disease 2019 in Wuhan: a single center's observational study. *World journal of pediatrics : WJP*
13. Zheng F, Liao C, Fan QH, et al. Clinical Characteristics of Children with Coronavirus Disease 2019 in Hubei, China. *Curr Med Sci*
14. Xu Y, Li, Xufang, et al. Characteristics of pediatric SARS-CoV-2 infection and potential evidence for persistent fecal viral shedding. *Nature Medicine*
15. Lu X, Zhang L, Du H, et al. SARS-CoV-2 Infection in Children. *New England Journal of Medicine*
16. Dong Y, Mo X, Hu Y, et al. Epidemiological Characteristics of 2143 Pediatric Patients With 2019 Coronavirus Disease in China. *Pediatrics*
17. Wang D, Hu B, Hu C, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA*
18. Team CC-R. Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) – United States, February 12-March 16, 2020. *MMWR Morb Mortal Wkly Rep* 2020; **69**(12): 343-6.
19. Kamali Aghdam M, Jafari N, Eftekhari K. Novel coronavirus in a 15-day-old neonate with clinical signs of sepsis, a case report. *Infect Dis (Lond)* 2020: 1-3.
20. Guan WJ, Ni ZY, Hu Y, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med*
21. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020; **395**(10223): 497-506.
22. Henry BM, Lippi G, Plebani M. Laboratory abnormalities in children with novel coronavirus disease 2019. *Clin Chem Lab Med*
23. Chen F, Liu ZS, Zhang FR, et al. [First case of severe childhood novel coronavirus pneumonia in China]. *Zhonghua er ke za zhi = Chinese journal of pediatrics* 2020; **58**(3): 179-82.
24. Feng K, Yun YX, Wang XF, et al. [Analysis of CT features of 15 Children with 2019 novel coronavirus infection]. *Zhonghua er ke za zhi = Chinese journal of pediatrics* 2020; **58**(0): E007.