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Commentary

SHEA Pediatric Leadership Council commentary: Personal protective equipment during care of children with multisystem inflammatory syndrome in children (MIS-C)

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In April 2020, amid the coronavirus disease 2019 (COVID-19) pandemic, providers in the United Kingdom described a group of pediatric hospital admissions secondary to fever and multisystem inflammation which has subsequently been described in several countries, including the United States.[1–4] Since then, several countries have described an epidemiologic association of severe acute respiratory coronavirus virus 2 (SARS-CoV-2) and this clinical presentation,[5] with the development of cases noted a few weeks following peaks in community COVID-19 activity.[1] The condition has been named Multisystem Inflammatory Syndrome in Children (MIS-C) in the United States and Paediatric Inflammatory Multisystem Syndrome temporally associated with SARS-CoV-2 (PIMS-TS) in Europe.[5]

Patients present variably along a spectrum, including fever, conjunctival injection, rash, abdominal pain, and vomiting.[1,2,4] Laboratory evidence of inflammation is routinely present.[1,4] The clinical presentation in patients has been similar to other pediatric inflammatory conditions, to include Kawasaki disease, toxic shock syndrome, bacterial sepsis, and macrophage activation syndrome.[1,3,4,6–9] Although MIS-C has been compared to Kawasaki disease, several symptoms are more notable in MIS-C disease: presentation in older aged children, a predominance of abdominal symptoms, frequent lymphopenia, increased incidence of left ventricular systolic dysfunction, and acute heart failure.[3,4,10,11] MIS-C is likely a rare complication of SARS-CoV-2 infection,[1,4,12] with a reported incidence of ˜2 in 100,000 persons <21 years of age.[19] Reported mortality is ˜1%–2%.[23–25]

The pathogenesis of this syndrome is not completely delineated.[19–22] However, it is thought to be a post–SARS-CoV-2 infection inflammatory syndrome based on the following (1) MIS-C incidence generally reaches its peak ˜1 month after a region's peak in acute COVID-19 cases; (2) preceding symptoms consistent with acute COVID-19 are noted in certain children; and (3) many of the affected children demonstrate the presence of SARS-CoV-2 antibody in the setting of negative RT-PCR testing.[19,22]

Role of SARS-CoV-2 testing in MIS-C for personal protective equipment (PPE) considerations

Several case reports and case series describing pediatric patients with MIS-C have been published, and some of these include information about the SARS-CoV-2 infection status.[1–4,6,9,13] In these studies, SARS-CoV-2 reverse-transcriptase polymerase chain reaction (RT-PCR) positivity ranged from 13% to 70% of patients, and evidence of serologic conversion was noted in 73%–100%.[1–4,6,9,13] The presence of IgG in many of the patients with MIS-C suggests a postinfectious syndrome occurring outside the primary infection.[8] However, the demonstration of SARS-CoV-2 virus RT-PCR positivity in these patients potentially suggests that the syndrome may occur in a later stage of primary infection.[8]

Testing strategy and validity play important roles in PPE determination. Several factors influence the outcome of viral detection with RT-PCR, including intermittent viral shedding,[14] low viral levels in the upper respiratory tract,[15] and sampling error.[15] However, Greninger et al[16] reported only 3.5% of a cohort of patients who initially tested negative for SARS-CoV-2 RT-PCR

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Table 1. Admission and De-escalation Recommendations for SARS-CoV-2 Isolation Precautions in Children with Suspected MIS-C

Clinical Scenario	Recommendation
SARS-CoV-2 RT-PCR positive	Continue isolation with discontinuation according to CDC recommendations: either time-based or testing-based
SARS-CoV-2 RT-PCR negative[a]	Discontinue isolation
Patient has a history of positive SARS-CoV-2 RT-PCR in the last 90 d and has completed isolation[b]	Isolation not indicated
No SARS-CoV-2 RT-PCR testing performed	Continue isolation with discontinuation according to hospital policy

Note. MIS-C, multisystem inflammatory syndrome in children; RT-PCR, reverse-transcriptase polymerase chain reaction.
[a]Some institutions may require ≥2 consecutively negative SARS-CoV-2 RT-PCR testing.
[b]Some institutions may require repeat SARS-CoV-2 RT PCR testing if admission presentation concerning for active COVID-19 infection.

developed a positive test within 7 days, while most of those necessitating additional testing for any reason within the 7-day period remained negative for any additional testing.

Much remains unknown regarding the infectivity of patients with MIS-C who demonstrate SARS-CoV-2 RT-PCR positivity upon hospital admission. In light of current evidence, this article provides guidance on potential strategies for managing PPE in pediatric patients diagnosed with MIS-C.

PPE and testing recommendations

PPE, testing strategy, and de-escalation should generally be guided by local COVID-19 and MIS-C hospital policy. Pediatric patients admitted with concerns for MIS-C without a previous history of SARS-CoV-2 testing should have initial SARS-CoV-2 RT-PCR testing to help guide isolation precautions and to assist in establishing a diagnosis. Because MIS-C most likely represents a postinfectious, inflammatory disease process, the need for repeated SARS-CoV-2 RT-PCR in patients with confirmed disease is unclear. The Infectious Diseases Society of America (IDSA) does not recommend repeat SARS-CoV-2 RT PCR testing if there is a low clinical suspicion for COVID-19.[26] Even in the setting of a positive SARS-CoV-2 PCR, most patients with MIS-C would not require isolation according to current recommendations by the Centers for Disease Control and Prevention (https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-hospitalized-patients.html). Additionally, although SARS-CoV-2 RNA has been identified in upper respiratory tract specimens of infected patients for as long as 90 days after illness starts, viral infectiousness is reduced as patients begin to demonstrate clinical improvement (https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-hospitalized-patients.html).

Most patients admitted with suspected MIS-C have symptoms that may also be consistent with other systemic viral syndromes (ie, respiratory tract symptoms, gastrointestinal symptoms, etc). These patients should have SARS-CoV-2 RT-PCR tests, even if they present within 90 days of a previously positive SARS-CoV-2 RT-PCR test result.

At admission and pending additional evaluation, N95 respirator (or N99 or PAPR), eye protection, gloves, and gowns should be donned during the care of patients requiring aerosol-generating procedures. For care of patients not requiring aerosol-generating procedures, the minimum level of PPE that should be used includes surgical mask, eye protection, gloves, and gown to care for patients. Notably, specific hospital policy should be followed because some hospitals may require N95 or similar type of respirator for all persons under investigation for COVID-19.

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