Chest and abdominal imaging in pediatric COVID-19 patient

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Although COVID-19 predominantly affects the adult population, recently there have been increasing reports in the media of infected pediatric patients and young adults.

Given the nonspecific clinical presentation of COVID-19, imaging studies are likely to play an important role in the diagnostic workup for affected pediatric patients.
imaging

- Multiple factors including sensitivity and specificity of radiologic examinations, availability and accuracy of reverse-transcription polymerase chain reaction (RT-PCR) tests, and radiation dose considerations should be considered when making decision regarding imaging in pediatric patients suspected of having COVID-19 infection.

- There is some overlap in the imaging presentation of COVID-19 and other entities, including infections (influenza A, influenza B, or Mycoplasma pneumoniae), inflammatory processes (hypersensitivity pneumonitis), and eosinophilic lung disease in the pediatric population, and therefore, a low COVID-19 prevalence could lead to false-positive results.
Imaging Findings of COVID-19 on Chest Radiographs in Pediatric Patient

- Although chest radiography is frequently the first imaging study in the evaluation of a pediatric patient presenting with fever, cough, and/or shortness of breath, the current literature describing COVID-19 findings on chest radiographs is relatively scare.
- The limited data available suggest that chest radiography, at least in adults, is less sensitive than CT.
- Chest radiography is perhaps even more essential in this patient population due to the increased radiation sensitivity of children.
Current Recommendations for Chest Radiography in Pediatric Patients with Suspected or Known COVID-19

- According to the American College of Radiology Appropriateness Criteria, imaging is not indicated in a well appearing immunocompetent child $\geq 3$ months of age who does not require hospitalization.
- If the child
  - is not responding to outpatient management,
  - requires hospitalization (moderate-to-severe),
  - is suspected of having hospital-acquired pneumonia,

- Chest radiography is considered the most appropriate first step in imaging evaluation.
due to limited sensitivity and specificity, a negative chest radiograph does not exclude pulmonary involvement in patients with laboratory-confirmed COVID-19 nor does it indicate the absence of COVID-19 infection in cases of suspected COVID-19 infection not yet confirmed by using RT-PCR testing
Structured Chest Radiography Reporting Recommendations in Pediatric Patients with Suspected or Known COVID-19

- structured reporting for chest radiographic findings for pediatric patients undergoing a workup for COVID-19 pneumonia divides imaging manifestations into four distinct categories: typical, indeterminate, atypical, and negative.

**Typical chest radiographic finding classification:**
- imaging pattern *most suggestive* of COVID-19 pneumonia,
- bilateral peripheral and/or sub-pleural ground glass opacities and/or consolidation
- The structured reporting language for this group should reflect that the chest radiographic imaging pattern is commonly seen in children with COVID-19 pneumonia; however, other viral or atypical pneumonia would also be differential considerations.

**Indeterminate chest radiographic finding classification:**
- findings that have been observed in COVID-19 pneumonia but are *less specific* than those of the typical group
- Unilateral peripheral/peripheral and central, non segmental/lobar, ground-glass or consolidative opacities or multifocal ground-glass/consolidative opacities without any particular distribution

- Features typical of viral pneumonia and reactive small airways disease, such as *peribronchial thickening and/or opacities* (*more frequently in pediatric COVID-19 pneumonia cases than in adults, nonspecific in adult*)
A 16-year-old female with tuberous sclerosis and a positive COVID-19 RT-PCR test who presented with acute hypoxic respiratory distress. The frontal chest radiograph shows **bilateral lower lung zone** predominant consolidation and **ground-glass** opacities, which are **typical chest radiographic** findings of pediatric COVID-19 pneumonia.

A 15-year-old female with asthma and a positive COVID-19 RT-PCR test who presented with fever and respiratory distress. The frontal chest radiograph shows **ground-glass** opacities in both peripheral (*) **and central** (arrow) distribution, which are **indeterminate** chest radiographic findings of pediatric COVID-19 pneumonia. Also noted is the right apical pneumothorax.
Atypical chest radiographic finding classification:

- **infrequently** observed in COVID-19 pneumonia and suggest that an alternative diagnosis should be considered
- Unilateral segmental or lobar consolidation suggestive of bacterial pneumonia, unilateral/ bilateral central distribution of parenchymal opacities, a single round consolidation (ie, round pneumonia with or without an air -bronchogram), pleural effusion, and lymphadenopathy.

Negative chest radiographic finding classification:

no evidence of pneumonia.
<table>
<thead>
<tr>
<th>Classification</th>
<th>Rationale</th>
<th>Chest Radiographic Findings</th>
<th>Suggested Reporting Language</th>
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</thead>
<tbody>
<tr>
<td>Typical</td>
<td>Commonly reported chest radiographic findings of COVID-19 pneumonia in children</td>
<td>Bilateral distribution peripheral and/or subpleural GGOs and/or consolidation</td>
<td>Imaging findings are commonly seen with COVID-19 pneumonia in children. Differential diagnosis also includes other viral or atypical pneumonia</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>Nonspecific chest radiographic findings of pediatric COVID-19 pneumonia</td>
<td>Unilateral peripheral or peripheral and central GGOs and/or consolidation Bilateral peribronchial thickening and/or peribronchial opacities Multifocal or diffuse GGOs and/or consolidation without specific distribution</td>
<td>Imaging findings can be seen with COVID-19 pneumonia in children. However, they are nonspecific and differential diagnosis includes both infectious and noninfectious etiologies</td>
</tr>
<tr>
<td>Atypical</td>
<td>Uncommon or not reported chest radiographic findings of pediatric COVID-19 pneumonia</td>
<td>Unilateral segmental or lobar consolidation Central unilateral or bilateral GGOs and/or consolidation Single round consolidation (ie, round pneumonia ± air bronchogram) Pleural effusion Lymphadenopathy</td>
<td>Imaging findings are atypical or uncommonly reported in cases of COVID-19 pneumonia in children. Recommend consideration of an alternative diagnosis</td>
</tr>
<tr>
<td>Negative</td>
<td>No chest radiographic findings suggestive of pneumonia in children</td>
<td>No chest radiographic findings suggestive of pneumonia</td>
<td>No chest radiographic findings present to suggest pneumonia (note: chest radiography has limited sensitivity for COVID-19, especially in early stages)</td>
</tr>
</tbody>
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Note.—Adapted from reference 17. GGO = ground-glass opacity.
Current Recommendations for Chest CT in Pediatric Patients with Suspected or Known COVID-19

- **RT-PCR** test is considered to be the **standard of reference for the diagnosis of COVID-19** pneumonia as it has been shown to have comparable (high COVID-19 prevalence areas) to superior sensitivity (low COVID-19 prevalence areas) and overall **better specificity compared with chest CT**. Thus, **the American College of Radiology currently recommends against using CT as a first line screening test to diagnose COVID-19** and states that chest CT should be reserved for **symptomatic hospitalized patients with specific clinical indications** (eg, to exclude a pulmonary embolism in a patient with elevated d-dimer).

- chest CT may be considered for pediatric COVID-19 patients with a **worsening clinical course and/or who are not responding appropriately to supportive therapy**.

- follow-up chest CT may be helpful to assess for development and/or evolution of fibrotic lung disease in patients with persistent alterations in pulmonary function tests following resolution of the acute infection.
Imaging Findings of COVID-19 on Chest CT in Pediatric Patients

- The chest CT findings observed in COVID-19, most commonly described as bilateral multifocal peripheral and/or sub-pleural ground-glass opacities, often in a posterior and/or lower lobe predominant distribution, with or without consolidation, have mainly been described in the literature on adults.
- (<18 years old) had a lower total number of pulmonary lesions and smaller size of pulmonary lesions compared with adults.
- The pediatric patients had a significantly lower rate of positive CT findings, lower number of pulmonary lobes involved, and lower overall semi-quantitative lung score.
- In pediatric patients with abnormalities found on CT, the most common findings are bilateral peripheral and/or sub-pleural ground-glass and/or consolidative opacities often in the lower lobes of the lungs. The “halo” sign, which describes a focal consolidation with a rim of surrounding ground-glass opacity, has been reported in up to 50% of cases and can help narrow the differential diagnosis when present.
- Three phases of evolution have been observed in pediatric COVID-19 cases demonstrating the “halo” sign: the “halo” sign is generally observed early in the disease course (early phase) and progresses to ground-glass (progressive phase) and eventually develops into consolidative opacities (developed phase).
- Fine mesh reticulations and “crazy paving” sign also been reported, although with less frequency across the literature. Pleural effusion and lymphadenopathy are rare.
group A, < 18 years old; group B, 18–44 years old; group C, 45–59 years old; and group D, ≥60 years old

- fewer cases of bilateral lung involvement in patients in group A than in patients in groups C and D
- the number of lesions per person in group A was less than that in groups C (P = 0.002) and D (P = 0.004), and that the number of lesions per person in group B was less than that in group C
- the number of lesions in the left upper and lower lobes of infected patients was not statistically significant between groups A and B and groups C and D. Lower lobes are more affected in all groups
- The involvement of peripheral lung lesions in group A was less than that in groups C and D
- Lesion density: there was no statistically significant difference among PGGO, mixed GGO with consolidation < 50% and mixed GGO with consolidation ≥50%, with complete consolidation (Fig. 5) in the different age groups
- Lesion size: There were no statistically significant differences between the lesions size of < 1 cm at different ages. Other sizes are more common in other groups than A
- There were no signs of air bronchogram in any of the lesions in group A
- No LAP
- PE one case (56yr)
bilateral peripheral and subpleural ground-glass opacities, which are typical CT findings in pediatric COVID-19.

Three different phases (early, progressive, and developed) of COVID-19 pneumonia in three different pediatric patients. A, Early phase. The axial lung window CT image shows a rounded ground-glass opacity (arrow) with a subtle area of central consolidation in keeping with the "halo" sign that is often seen in the early phase of pediatric COVID-19 pneumonia. B, Progressive phase of pediatric COVID-19. The axial lung window CT image demonstrates rounded ground-glass opacities (arrows) with a subtle area of central consolidation. Between these areas, ground-glass opacities (*) start to fill the lung parenchyma. C, Developed phase of pediatric COVID-19. The axial lung window CT image shows predominantly confluent consolidation (arrow) in the posterior left lower lobe.
Structured CT Reporting Recommendations for Pediatric Patients with Suspected or Known COVID-19

- the same four categories described in the chest radiography section of this article (ie, typical, indeterminate, atypical, and negative)
<table>
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<th>Classification</th>
<th>Rationale</th>
<th>CT Findings</th>
<th>Suggested Reporting Language</th>
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<tbody>
<tr>
<td>Typical</td>
<td>Commonly reported CT findings of COVID-19 pneumonia in children</td>
<td>Bilateral, peripheral and/or subpleural GGOs and/or consolidation in lower lobe predominant pattern “Halo” sign (early)</td>
<td>Imaging findings are commonly seen with COVID-19 pneumonia in children. Differential diagnosis also includes other viral or atypical pneumonia, hypersensitive pneumonitis, and eosinophilic lung disease. In addition, fungal infection is a differential consideration in immunocompromised children when the “halo” sign is present.</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>Nonspecific CT findings of pediatric COVID-19 pneumonia</td>
<td>Unilateral peripheral or peripheral and central GGOs and/or consolidation Bilateral peribronchial thickening and/or peribronchial opacities Multifocal or diffuse GGOs and/or consolidation without specific distribution “Crazy paving” sign</td>
<td>Imaging findings can be seen with COVID-19 pneumonia in children. However, they are nonspecific, and differential diagnosis includes both infectious and noninfectious etiologies.</td>
</tr>
<tr>
<td>Atypical</td>
<td>Uncommon or not reported CT findings of pediatric COVID-19 pneumonia</td>
<td>Unilateral segmental or lobar consolidation Central unilateral or bilateral GGOs and/or consolidation Discrete small nodules (centrilobular or tree-in-bud) Lung cavitation Pleural effusion Lymphadenopathy</td>
<td>Imaging findings are atypical or uncommonly reported in cases of COVID-19 pneumonia in children. Recommend consideration of an alternative diagnosis.</td>
</tr>
<tr>
<td>Negative</td>
<td>No CT findings suggestive of pneumonia in children</td>
<td>No CT findings suggestive of pneumonia</td>
<td>No CT findings present to suggest pneumonia (note: CT may be negative in the early stages of COVID-19)</td>
</tr>
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</table>

Note.—Adapted from reference 17. GGO = ground glass opacity.
ground-glass opacity with a small component of consolidation in the posterior left lower lobe, which are indeterminate CT findings of pediatric COVID-19 pneumonia.

bilateral central consolidation and ground-glass opacities, which are atypical CT findings of pediatric COVID-19 pneumonia. This patient’s CT findings are due to biopsy-proven varicella pneumonia.

bilateral discrete small nodules in the tree-in-bud pattern in the right middle lobe and lingula, which are atypical CT findings for pediatric COVID-19 pneumonia. This patient’s CT findings are due to a Mycobacterium infection.

peripherally located lung lesion with cavitation in the right lower lobe, which are atypical CT findings for pediatric COVID-19 pneumonia. This patient’s CT findings are due to a Staphylococcus aureus infection.
Imaging Recommendations Based on Clinical Indication

- Imaging recommendations are described for pediatric patients in three distinct clinical situations at the time of initial presentation,
- These situations include pediatric patients presenting with mild clinical features of COVID-19, with moderate-to-severe clinical features of COVID-19 in a without resource-constrained environment, and with moderate-to-severe clinical features of COVID-19 in a resource-constrained environment.
- Additional recommendations are described for situations involving sequential studies and post-recovery follow-up imaging.
- There are potential risks of imaging that include a potentially nondiagnostic study, radiation exposure, COVID-19 exposure to radiology staff, and increased imaging equipment/room turnaround time for appropriate cleaning and air turnover. These risks must be weighed against the potential benefits of imaging, such as informed decision making regarding patient triage and isolation, establishing baseline imaging, and identification of an alternative diagnosis or comorbid conditions when deciding to pursue chest radiography or chest CT in the pediatric population. Additional factors, including the prevalence of COVID-19 in the local population, travel history to a high COVID-19 prevalence area, and the presence of comorbid medical conditions that could increase the risk of disease progression/severity (such as asthma, cystic fibrosis, congenital heart disease, chronic lung disease of prematurity [also known as bronchopulmonary dysplasia], malignancy, chronic infection [eg, tuberculosis or HIV], and/or an immunosuppressed state as may be observed in pediatric patients with bone marrow or other visceral transplants) should also play a role in imaging decisions.
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<th><strong>Table 3: Definitions for Terms Described in Clinical Situations</strong></th>
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<tr>
<td><strong>Disease severity</strong></td>
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<tr>
<td>- <strong>Mild:</strong> Pediatric patient with mild clinical symptoms such as fever, cough, mild dyspnea, and/or rhinorrhea</td>
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<tr>
<td>- <strong>Moderate-to-severe:</strong> Pediatric patient with signs of more serious respiratory compromise (moderate-to-severe dyspnea or hypoxemia) or symptoms of cardiovascular compromise and/or pending shock (chest pain, tachycardia, hypotension, or altered mentation)</td>
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<tr>
<td><strong>Disease prevalence based on location</strong></td>
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<tr>
<td>- <strong>Low-prevalence area:</strong> Area with a small number of cases related to travel or to spread that can be traced to an individual known to have COVID-19 infection</td>
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<tr>
<td>- <strong>High-prevalence area:</strong> Endemic areas with known community spread of COVID-19 infection</td>
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<tr>
<td><strong>Underlying comorbidities increasing risk for disease severity/progression</strong></td>
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<tr>
<td>- <strong>Present:</strong> Pediatric patient who has underlying comorbid medical conditions placing the patient at higher risk for disease progression. Examples include asthma, cystic fibrosis, congenital heart disease, malignancy, prematurity-related chronic lung disease (also known as bronchopulmonary dysplasia), chronic infections (eg, tuberculosis or HIV), and/or immunosuppressed state.</td>
</tr>
<tr>
<td>- <strong>Absent:</strong> Pediatric patient who does not have comorbid medical disease increasing risk for COVID-19 disease progression</td>
</tr>
<tr>
<td><strong>Travel history</strong></td>
</tr>
<tr>
<td>- <strong>Present:</strong> Pediatric patient who has recently traveled in a location with known high prevalence of COVID-19 infection</td>
</tr>
<tr>
<td>- <strong>Absent:</strong> Pediatric patient with no recent travel to a location with COVID-19 prevalence</td>
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<tr>
<td><strong>Constrained-resource environment</strong></td>
</tr>
<tr>
<td>- An environment where COVID-19 laboratory testing is unavailable or will take a substantial amount of time to result, and rapid triage decisions based on COVID-19 status are necessary so as not to overwhelm a health system with limited resources (limited staff, hospital beds, ventilators, and/or personal protective equipment).</td>
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</table>
Situation 1: Mild Clinical Features of COVID-19 in Pediatric Patients

- outpatient mild clinical symptoms such as fever, cough, and/or rhinorrhea
- COVID-19 testing with RT-PCR should be the first step in screening evaluation
- If is not readily available, these pediatric patients can be stratified into a suspected COVID-19 positive group in endemic areas with known community spread and suspected negative group in locations with low disease prevalence
- imaging is not recommended for the majority of patients in the mild group at the time of presentation regardless of RT-PCR results.
- for patients with a positive COVID-19 status (either by laboratory diagnosis or presumed positive status based on local disease prevalence) who have underlying comorbidities (ie, asthma, cystic fibrosis, congenital heart disease, malignancy, bronchopulmonary dysplasia, chronic infections [eg, tuberculosis or HIV], and/or an immunosuppressed state) placing them at risk for disease progression, chest imaging is recommended to serve as a baseline as well as to evaluate for alternative diagnoses possibly related to a comorbid condition (eg, pulmonary edema in congenital heart disease)
- Even in pediatric patients with an elevated risk for progression, chest CT is not recommended at the time of presentation for diagnosis of COVID-19 but may be considered in cases of clinical progression, inadequate clinical improvement, or when an alternative diagnosis (such as a concern for pulmonary embolism) necessitates further evaluation
Situation 2: Moderate-to-Severe Clinical Features of COVID-19 in Pediatric Patients in a Without Resource-Constrained Environment

- suspected COVID-19 + present with clinical signs of a more serious respiratory compromise, including moderate-to-severe dyspnea or hypoxemia, or symptoms such as chest pain, tachycardia, hypotension, or altered mentation that may indicate cardiovascular compromise and/or pending shock.
- COVID-19 testing with RT-PCR is the initial screening test recommended
- If testing or timely results are not readily available, these patients can be further classified into presumed positive or presumed negative COVID-19 status based on local disease prevalence.
- Regardless of the COVID-19 status, chest radiography is recommended for initial evaluation of the pediatric patient presenting with moderate-to-severe features to establish an imaging baseline and evaluate for an alternative diagnosis. Chest CT may also be considered in this group if the outcome will impact clinical decision making (ie, imaging findings would affect how closely a patient is clinically followed and possibly followed with imaging to assess for change or potential complication.
- One important note for the moderate-to-severe group is that in pediatric patients initially categorized into the negative COVID-19 group (either by RT-PCR test results or by low community prevalence) who are found to have imaging manifestations commonly seen in COVID-19, repeat laboratory COVID-19 testing (or initial testing if grouped based on community prevalence) is recommended.
Situation 3: Moderate-to-Severe Clinical Features of COVID-19 in Pediatric Patients in a Resource-Constrained Environment

- describes a plan for COVID-19 screening in an environment where laboratory testing is unavailable or a lengthy turnaround time for results would preclude rapid triage decisions, potentially overwhelming a health system with limited resources (limited hospital beds, ventilators, personal protective equipment, etc)
- imaging may be used as an initial step to evaluate for findings suggestive of COVID-19 (presumed positive) versus findings suggestive of an alternative diagnosis. Given the limited sensitivity of chest radiography, chest CT, specifically tailored to a low-dose technique for pediatric patients closely following the as-low-as-reasonably-achievable (ALARA) principle, may be considered for the assessment of this group either initially or following unrevealing chest radiography results
- If no alternative diagnosis is identified and imaging findings are nonspecific but extensive enough to be worrisome, the hospital will then have to make triage decisions related to concerns for COVID-19 based on overall clinical picture, local disease prevalence, and known resource limitation
Sequential Imaging in Moderate-to-Severe Pediatric COVID-19

- Similar to recommendations for the adult population, daily routine chest radiographic examinations are not indicated for clinically stable, intubated pediatric intensive care unit patients with COVID-19.
- One large study with over 1,500 pediatric patients showed no significant difference in average pediatric intensive care unit length of stay, hospital length of stay, or days on ventilator support and absence of reported adverse outcomes between patients with a standing order for daily chest radiography versus patients with chest radiography ordered for a specific clinical indication.
- A chest CT in this group may be considered, especially if not pursued at the time of initial presentation, in pediatric patients who are not responding appropriately to supportive care or demonstrate clinical deterioration.
- Given the increased radiation dose, chest CT is only recommended if it would directly impact clinical decision making in pediatric patients given their increased sensitivity to radiation compared with adults.
Post-Recovery Follow-up Chest Imaging in Pediatric COVID-19 Patients

- The decision to pursue posttreatment follow-up chest imaging should be based both on the severity of disease (mild vs moderate-to-severe) and the presence (or absence) of clinical symptoms (ie, dyspnea, decreased exercise tolerance, etc) at the time of follow-up.

- For asymptomatic pediatric patients who had a mild disease course, no long-term imaging follow-up is recommended.

- Even pediatric patients with a mild disease course may develop long-standing pulmonary injury and thus a follow-up standard two-view (posteroanterior and lateral) chest radiography should be considered in symptomatic patients with prior mild COVID-19 infection. Follow-up imaging in this group can evaluate for evidence of pulmonary scarring/fibrosis and also evaluate for other potentially treatable causes for the patients’ symptoms.

- In pediatric patients with a moderate-to-severe COVID-19 infection, a follow-up standard two-view chest radiography is recommended for symptomatic pediatric patients for the same reasons as described earlier for symptomatic mild cases and may be considered in asymptomatic pediatric patients depending on the level of clinical concern for long-term lung injury.
Abdominal US findings

- underwent abdominal US because of gastrointestinal symptoms
- abdominal pain, diarrhea, and vomiting, or for the assessment of hepatosplenomegaly and renovascular complications
- Findings included
  - anechoic free fluid (53%)
  - localized inflammatory change within the right iliac fossa (47%), (combination of echogenic expanded mesenteric fat (37%), and multiple mildly enlarged lymph nodes (47%) (more than three nodes in a localized region; short-axis diameter range, 8–15 mm). The pathophysiology of mesenteric lymphadenitis is thought to be either direct microbial infiltration of nodes via the bowel wall, or a secondary reactive lymphoid hyperplasia
  - In addition, bowel wall thickening (>= 2mm) occurred (21%) and involved the terminal ileum and cecum

again likely due to lymphoid-rich tissue here. This is an uncommon but recognized finding in Kawasaki disease, A proposed cause of the gastrointestinal symptoms is bowel wall ischemia secondary to vasculitis
also postulate that cardiac dysfunction and/or shock could contribute to the ileal and cecal wall abnormality seen a imaging, the ileocolic artery being the lowest and most distant branch of the superior mesenteric artery
A normal appendix was seen in three of the four children in whom acute appendicitis was suspected.

- Increased periportal echogenicity (16%), pericholecystic edema and mild gallbladder wall thickening (16%) and gallbladder sludge (16%);
- Mild hepatomegaly and borderline enlarged spleen, and subcortical, hypoechoic splenic lesions (infarction), a recognized finding in inflammatory vasculitis and Kawasaki disease, hypothesized to be secondary to splenic artery inflammation
- Apart from one patient in the pediatric intensive care unit with renal impairment who showed echogenic kidneys, all renal images were normal. and renal Doppler US may also detect renal infarction.
7-year-old boy with multisystem inflammatory syndrome in children (MIS-C) and abdominal pain.
Image depicts an enlarged mesenteric lymph node within the right iliac fossa (arrow), with associated hyperechoic mesenteric fat. The appendix is normal in diameter (arrowhead).
(b) US scan in a 15-year-old boy with MIS-C. There are multiple mesenteric lymph nodes within the right iliac fossa, and the short-axis diameter of the largest lymph node was 13 mm (calipers). Image also shows associated hyperechoic mesenteric fat (arrow).
(c) US scan in a 9-year-old boy with MIS-C. Image shows loops of thickened small bowel (between white arrows) with associated hyperechoic mesenteric fat (black arrows).
(d) High-frequency US scan in a 16-year-old boy with severe right iliac fossa pain shows marked cecal wall thickening (arrows).
14 year old girl with multisystem inflammatory syndrome in children (MIS-C) who presented with abdominal pain, shock, and multi-organ involvement including renal dysfunction. There is gallbladder wall thickening (black arrow) and pericholecystic fluid. Increased periportal echogenicity was noted (white arrow) throughout, and diffusely increased echogenicity of the renal parenchyma (*).

(b)US scan in a 15-year-old boy with MIS-C. Image shows a well-defined subcapsular hypoechoic splenic lesion (arrow) that is believed to be an infarct as the clinical course did not conform with this being a splenic abscess, the main other differential diagnosis for this appearance.
Abdominal CT findings

- A normal appendix was identified on all
- (60%) showed mesenteric fat stranding and lymphadenopathy within the right iliac fossa
- marked distal ileal and cecal bowel wall thickening
- free fluid; two of these four children also had periportal and pericholecystic edema, all likely due to systemic inflammation, hypoalbuminemia, serositis, fluid overload, and/or cardiac failure
- splenic infarct
15-year-old boy who presented with abdominal pain and clinical features of sepsis and subsequently diagnosed with multisystem inflammatory syndrome in children. (a) Coronal image of the abdomen demonstrates gallbladder wall edema (white arrow). There is extensive thickening of the cecal wall thickening (arrowhead) and free fluid within the pelvis (black arrow). (b) Axial slice through the lower abdomen shows the cecal wall thickening (arrow) with multiple adjacent mesenteric nodes (arrowhead) and surrounding fat-stranding. (c) Coronal image through the left upper quadrant shows a focal subcapsular, hypoattenuating region within the spleen in keeping with a splenic infarct (arrow).
THANK YOU