

# Behandlung Kinder Covid 19 Kinderspital

update 05.01.2020

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## COVID19 bei Kindern

### Klinische Symptome/ Zeichen

Allein oder in Kombination:

#### Häufig

- Asymptomatisch
- Fieber
- Husten
- Pharyngitis

#### Seltene Symptome

- Durchfall
- Rhinorrhoe
- Giemen
- Kopfschmerzen, Myalgien
- Olfaktorische/Gustatorische Dysfunktion
- Kutane Läsionen: makulopapulös, urtikariell, transiente livedo reticularis

### Laborbefunde

CRP, PCT normal oder nur leicht erhöht

Leukopenie, Lymphopenie, Thrombozytopenie nicht typisch

Selten leicht erhöht: ASAT, ALAT; Gerinnungsstörung nur in sehr schweren Fällen

### Bildgebung

Rx-Thorax und CT mit unspezifischen meist bilateralen Veränderungen, kein Pleuraerguss, keine hiläre Lymphadenopathie

### Allgemein

BGA, weitere Laborbestimmungen, und Bildgebung analog zu Kindern mit Pneumonie.

Nicht jedes hospitalisierte Kind mit COVID19 benötigt ein Rx-Thorax.

## BEHANDLUNGSGRUNDSÄTZE

Grundsätzlich supportive Behandlung.

**Antipyrese:** Primär keine Antipyrese, wenn Trinkverhalten und Allgemeinzustand es erlaubt. Falls notwendig:

1. Wahl Paracetamol. 2. Wahl Ibuprofen = nicht kontraindiziert (keine Evidenz) 3. Wahl Metamizol.

Weiterführung der **enteralen Ernährung**, bei nicht-Toleranz IV-Flüssigkeit analog Pneumonie

**O<sub>2</sub>-Gabe** primär mit Nasenbrille (Low-Flow) bei einer SO<sub>2</sub> <90%: FiO<sub>2</sub>100% mit Flow so tief als möglich. Dies wird für die meisten Kinder mit COVID19 ausreichend sein. Einsatz High-Flow restriktiv, da durch High-Flow vermehrte Aerosolbildung in Umgebung generiert werden.

**Bronchodilatoren** sollen nicht primär bei jedem COVID19-Patienten eingesetzt werden, da die Bronchokonstriktion eher ein seltenes Problem zu sein scheint. Bei entsprechender obstruktiver Klinik versuchsweiser Einsatz analog RSV-Infektion.

**Antibiotika** nur bei Verdacht auf bakterielle Koinfektion (in ca 10-20% der Fälle). An Koinfektion denken bei fehlender Besserung nach 3 Tagen (zB persistierender O<sub>2</sub>-Bedarf), radiologischen Infiltraten, hohem CRP/PCT. Antibiotische Behandlung gemäss den bestehenden Pneumonie-Guidelines.

### Spezifische Therapie:

- **gibt es keine**
- **Anti-inflammatorische/ Antivirale Behandlung** (nach Päd-Infektiologie ggfl. auch Päd. Rheumatologie Konsilium)

## Pediatric inflammatory multisystem syndrome [PIMS]

**Konsilium:** Multidisziplinär:

Päd. Infektiologie, Päd. Rheumatologie, Päd. Kardiologie, Päd. IPS, Päd. Pneumologie

[LINK zu CH-Guideline \(WIKI\)](#)

### Klinik und Labor

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#### Clinical manifestations of COVID-19-associated multisystem inflammatory syndrome in children and adolescents

	Frequency* (%)
<b>Presenting symptoms</b>	
▪ Persistent fevers (median duration 4 to 6 days)	100
▪ Gastrointestinal symptoms (abdominal pain, vomiting, diarrhea)	60 to 100
▪ Rash	45 to 76
▪ Conjunctivitis	30 to 81
▪ Mucous membrane involvement	27 to 76
▪ Neurocognitive symptoms (headache, lethargy, confusion)	29 to 58
▪ Respiratory symptoms (tachypnea, labored breathing)	21 to 65
▪ Sore throat	10 to 16
▪ Myalgias	8 to 17
▪ Swollen hands/feet	9 to 16
▪ Lymphadenopathy	6 to 16
<b>Clinical findings</b>	
▪ Shock	32 to 76
▪ Criteria for complete Kawasaki disease met	22 to 64
▪ Myocardial dysfunction (by echocardiogram or elevated troponin/BNP)	51 to 90
▪ Arrhythmia	12
▪ Acute respiratory failure requiring noninvasive or invasive ventilation	28 to 52
▪ Acute kidney injury	8 to 52
▪ Serositis (small pleural, pericardial, and ascitic effusions)	24 to 57
▪ Hepatitis or hepatomegaly	5 to 21
▪ Encephalopathy, seizures, coma, or meningoenzephalitis	6 to 7

<b>Laboratory findings</b>	
▪ Abnormal blood cell counts	
▪ Lymphocytopenia	80 to 95
▪ Neutrophilia	68 to 90
▪ Mild anemia	70
▪ Thrombocytopenia	31 to 80
▪ Elevated inflammatory markers	
▪ C-reactive protein	90 to 100
▪ Erythrocyte sedimentation rate	75 to 80
▪ D-dimer	67 to 100
▪ Fibrinogen	80 to 100
▪ Ferritin	55 to 76
▪ Procalcitonin	80 to 95
▪ Interleukin-6	80 to 100
▪ Elevated cardiac markers	
▪ Troponin	50 to 90
▪ BNP or NT-pro-BNP	73 to 90
▪ Hypoalbuminemia	48 to 95
▪ Mildly elevated liver enzymes	62 to 70
▪ Elevated lactate dehydrogenase	10 to 60
▪ Hypertriglyceridemia	70

Imaging findings	
<ul style="list-style-type: none"> <li>Echocardiogram</li> </ul>	
<ul style="list-style-type: none"> <li>Depressed LV function</li> </ul>	31 to 58
<ul style="list-style-type: none"> <li>Coronary artery dilation/aneurysm</li> </ul>	8 to 38
<ul style="list-style-type: none"> <li>Other findings can include mitral regurgitation and pericardial effusion</li> </ul>	--
<ul style="list-style-type: none"> <li>Chest radiograph</li> </ul>	
<ul style="list-style-type: none"> <li>Normal in many patients</li> </ul>	--
<ul style="list-style-type: none"> <li>Abnormal findings included small pleural effusions, patchy consolidations, focal consolidation, and atelectasis</li> </ul>	--
<ul style="list-style-type: none"> <li>Chest CT</li> </ul>	
<ul style="list-style-type: none"> <li>Findings generally similar to those on chest radiograph</li> </ul>	--
<ul style="list-style-type: none"> <li>A few patients had nodular ground-glass opacification</li> </ul>	--
<ul style="list-style-type: none"> <li>Abdominal imaging (ultrasound and/or CT)</li> </ul>	
<ul style="list-style-type: none"> <li>Findings are nonspecific, including free fluid, ascites, bowel and mesenteric inflammation, including terminal ileitis, mesenteric adenopathy/adenitis, and pericholecystic edema</li> </ul>	--

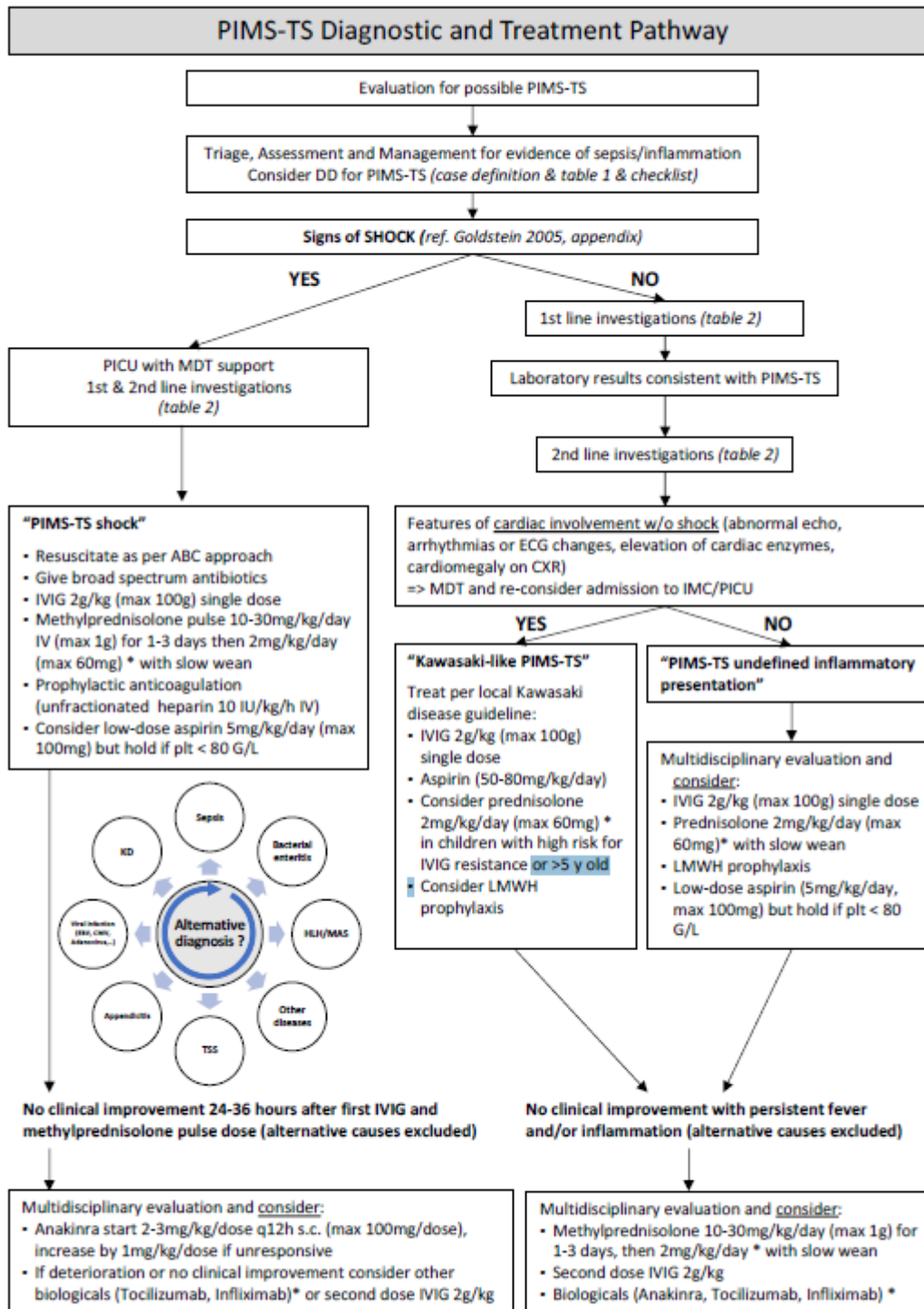
## Diagnosis

1. In Switzerland, the following case definition should be used:

Adapted RCPCH - case definition<sup>21,22</sup>

- Patient aged <18 years of age. Persistent fever + inflammation (elevated CRP and neutrophils, or lymphopaenia) + single or multiorgan dysfunction (shock, cardiac, respiratory, renal, gastrointestinal, neurological) + additional features (see **Table 1**). This may include children fulfilling full or partial criteria for Kawasaki disease (KD).
- Exclusion of any other probable cause, such as bacterial sepsis, staphylococcal/streptococcal shock syndromes, and viral infections associated with myocarditis. Waiting for these results should not delay seeking expert advice.
- Positive for current or recent SARS-CoV-2 infection by PCR, serology, or antigen test; or COVID-19 exposure within 4 weeks prior to the onset of symptoms. Waiting for these results should not delay seeking expert advice.

**Figure 1: PIMS-TS Diagnostic and therapeutic algorithm.**



\* Refer to the treatment Table 3 for more details

MDT: Immunology, infectious diseases, respiratory medicine, rheumatology, cardiology, intensive care, general paediatrics, haematology (surgery, radiology, neurology); consider expert opinion from another center

**Table 1. List of diagnostic criteria for PIMS-TS.** Patients must be below 18 years and meet at least one criterion for each group, including i) presence of fever, ii) organ involvement, iii) laboratory evidence of inflammation, iv) microbiologically proven or putative COVID-19 contact, and v) exclusion of other causes.

<b>Clinical features</b>		
<b>General</b>	<b>Criteria</b>	
Required	Fever	O
<b>Organ systems</b>	<b>Single or multi-organ involvement</b>	
Gastrointestinal	Abdominal pain, diarrhoea, vomiting	O
	Abnormal liver function tests	O
	Colitis, ileitis, ascites	O
Cardiovascular	Hypotension, shock, oliguria	O
	Myocardial dysfunction, pericardial effusion	O
	Coronary artery dilatation	O
Respiratory	Cough, sore throat	O
	Oxygen requirement	O
	Patchy infiltrates, pleural effusion	O
Dermatologic	Conjunctivitis, periorbital swelling/redness	O
	Mucus membrane changes	O
	Rash	O
	Lymphadenopathy	O
	Swollen hands and feet	O
Neurologic	Headache, confusion, irritability, reduced level of consciousness	O
	Syncope	O
<b>Abnormal laboratory findings indicating inflammation (any combination)</b>		
Inflammatory markers	Elevated CRP / fibrinogen / D-Dimers / ferritin, hypoalbuminaemia, lymphopaenia, neutrophilia	O
Cardiac markers	Elevated Troponin / NT-pro-BNP	O
<b>COVID-19 contact</b>	<b>Either confirmed or putative</b>	<b>O</b>
Confirmed	Positive for current or recent SARS-CoV-2 infection by PCR, serology, or antigen test	O
Putative	COVID-19 exposure within the 4 weeks prior to the onset of symptoms	O
<b>No alternative plausible diagnosis (microbial or inflammatory)</b>		<b>O</b>

**Table 2. Recommendations for diagnostic work-up in children evaluated for PIMS-TS.**  
 Note: where possible, PIMS-TS patients should be enrolled in observational or interventional studies, which may include additional diagnostics.

<p><b>Initial investigations in case of suspected PIMS-TS</b>          (according to disease severity)</p>	<p>Full blood count (FBC)          C-reactive protein (CRP)          Blood gas, lactate, glucose          Urea, creatinine, electrolytes (U&amp;E)          Liver function tests (LFTs)          Coagulation: INR, aPTT, Fibrinogen          Blood cultures (always before starting antibiotics)          Urine microscopy and culture          NPA: respiratory panel, SARS-CoV-2 PCR          Urine          Lumbar puncture if clinically indicated</p>
<p><b>Second line investigations:</b>          (in addition to initial bloods)</p> <p>Desirable measures which should NOT delay seeking expert opinion or treatment</p>	<p>Erythrocyte sedimentation rate (ESR)          Ferritin          D-dimers          Troponin          NT-pro-BNP          LDH          CK          Albumin          Triglycerides</p> <p>Store serum and EDTA blood (before administration of IVIG)          EBV/CMV/Adeno-/Enterovirus blood PCR          SARS-CoV-2 serology</p> <p>12-lead ECG and echokardiography          Chest radiograph          Abdominal ultrasound (if gastrointestinal symptoms)</p> <p>IL-10, IL-6, sCD25*          * consider full HLH screen if suggestive features present (e.g. splenomegaly, fibrinogen normal or low; ferritin &gt;2000):          Perforin-, SAP- and XIAP-expression, NK cell degranulation and consider HLH-directed therapy (MDT)</p>
<p><b>Follow up investigations:</b></p>	<p><i>Unstable patient (deteriorating or in PICU):</i>          12-24 hourly: FBC, CRP, U&amp;E, LFTs, coagulation, ferritin;          parameters that need to be repeated guided by clinical progress such as Troponin and NT-pro-BNP, echocardiography (in consultation with cardiology)</p> <p><i>Stable patient with ongoing pyrexia:</i>          24-48 hourly: FBC, CRP U&amp;E, LFTs, ferritin          *as above          Echocardiography 48 hourly (in consultation with cardiology)</p> <p><i>Child improving +/- defervescence:</i>          48 hourly bloods or pre-discharge bloods: FBC, CRP, U&amp;E, LFTS</p>