



**Project Echo for Pediatric Care 2020-2022**  
**Multisystem Inflammatory Syndrome of Children (MIS-C)**  
**July 16, 2020**  
**Dominic O. Co, MD, PhD**

*Provided by the University of Wisconsin–Madison Interprofessional Continuing Education Partnership (ICEP)*

**Intended Audience:**

Pediatric emergency care professionals

**Objectives:**

As a result of this educational regularly scheduled series, learners will be able to:

1. Utilize new skills and guidelines determined to be safe for children when accessing pediatric trauma.
2. Identify proper tools and standardized practices in order to improve the diagnosis and treatment of pediatric patients.
3. Define roles and responsibilities of team members who triage pediatric emergencies in order to identify communication strategies that result in effective patient care.

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**Text TOGSOC  
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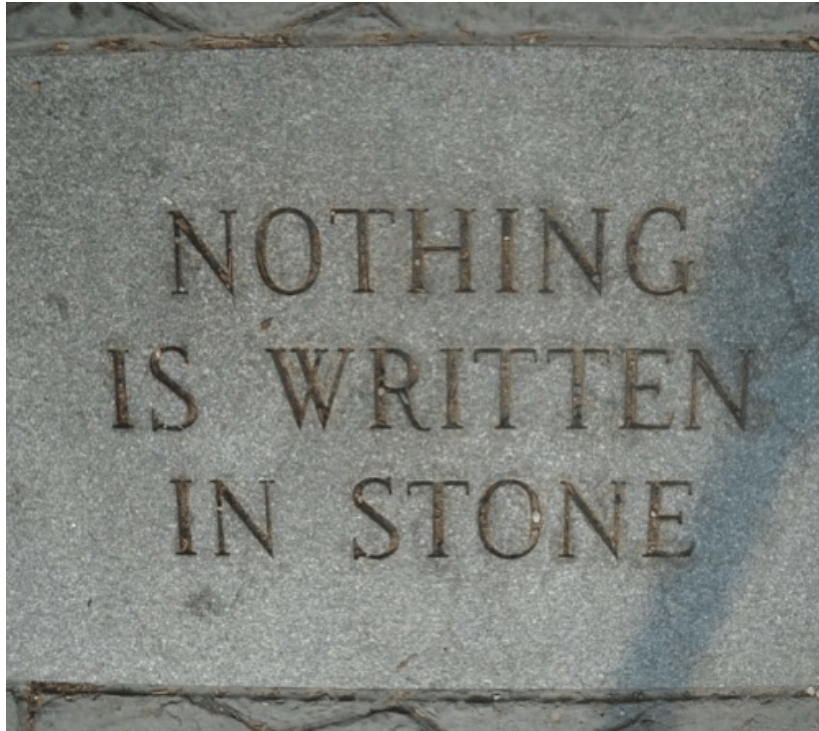


# Multisystem Inflammatory Syndrome in Children (MIS-C)

July 16, 2020  
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Pediatric Rheumatology  
American Family Children's Hospital



# Disclaimer



<https://me.me/i/nothing-is-written-in-stone-1564399> accessed 7/11/2020





## Case

- 7 yo boy develops fever, abdominal pain, vomiting and diarrhea
- Brought to the ER due to progressive vomiting, lack of urine output
- Also has red, cracked lips and slurring of his words
- Transferred to AFCH PICU due to hypotension, elevated lactate
- High troponin and BNP – evidence of cardiac damage and dysfunction
- Does not respond to fluids and needs two pressor drips to maintain his blood pressure



# What is MIS-C?

- Multisystem Inflammatory Syndrome in Children
- Severe inflammatory syndrome presumed to be triggered by SARS-CoV2 infection
- Can cause severe illness requiring ICU admission
- Similar syndrome in Europe referred to as PIMS (Paediatric Inflammatory Multisystem Syndrome)



# MIS-C Case Definition (CDC)

- An individual aged < 21 years presenting with
  - **Fever** > 24 hours (documented or subjective)
  - Elevated **inflammatory** markers (e.g., CRP, ESR, fibrinogen, procalcitonin, d-dimer, ferritin, LDH)
  - Clinically severe illness requiring **hospitalization**
  - **> 2 organ involvement** (cardiac, renal, respiratory, hematologic, gastrointestinal, dermatologic or neurological)
- No alternative plausible diagnoses
- Recent **SARS-CoV-2 infection**: positive 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.
- \* may satisfy full or partial criteria for Kawasaki disease





# Clinical Presentation

- Fever
- **GI symptoms** – abdominal pain, diarrhea, sometimes vomiting (may have elevated AST, ALT)
- **Hypotension**/Systemic Inflammatory Response Syndrome (SIRS)-like picture
  - Elevated troponin and BNP common
- Altered mental status – slurring words, waxing/waning consciousness
- May have renal insufficiency
- Markedly elevated inflammatory markers (see case def.)
- May fulfill criteria for Kawasaki Disease
- COVID19 infection 2-4 weeks prior
  - Children may have mild symptoms or be asymptomatic!
  - Look for recent known COVID19 exposures or sick contacts
  - Test for virus (NP swab for PCR) and SARS-CoV2 IgG



# Mucocutaneous Lymph Node Syndrome (MCLNS, “Kawasaki Disease”)

- Self-limited inflammation of medium-sized vessels, commonly involving coronary arteries
- Most common cause of heart attack in children



# Kawasaki Disease – Diagnostic Criteria

Fever  $\geq$  5 days and 4 out of 5 of following:

- Conjunctivitis – nonpurulent, classically bilateral
- Mucosal changes – strawberry tongue; swollen, cracked lips
- Cervical LN  $>$  1.5cm – typically large, unilateral
- Extremity changes – hand/foot swelling, erythema of palms/soles, periungual desquam (late)
- Rash – any kind, but typically **NOT** vesicular or ulcerated



# Kawasaki Disease



“Strawberry tongue”

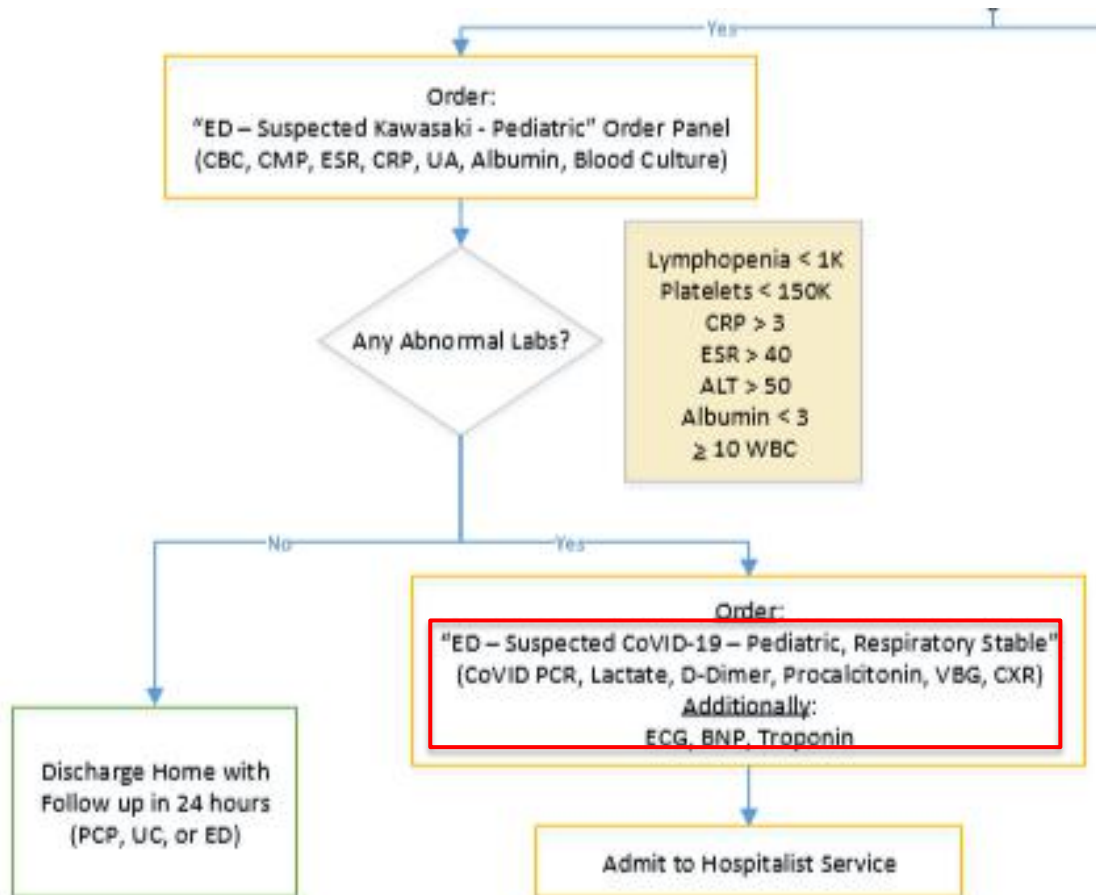


Red, cracked lips



# Other Diagnoses to Consider

- Kawasaki Disease
- Sepsis
- Macrophage activation syndrome
- Toxic Shock Syndrome
- Viral myocarditis
- Appendicitis



Courtesy Nick Kuehnel, AFCH ED





# Initial Workup

- NP Swab for SARS-CoV2, SARS-CoV2 Ab testing
- CBC/Coags: PT/INR, PTT, fibrinogen, D-dimers, vWF Ag
  - Look for signs of DIC
- Inflamm markers: ESR, CRP, ferritin, procalcitonin
- Liver/Kidney function: CMP, LDH
- Cardiac: troponin, BNP
- Blood cultures – other cultures as indicated
- CXR – assess for active lung infection, pulmonary edema
- Echo – assess cardiac function, coronaries



# Treating MIS-C

- Multidisciplinary team: ER/ICU/hospitalist, ID, Cardiology, Rheum, Heme
- Acute management
  - Fluid resuscitation
  - Pressors
- Antibiotics – sepsis until proven otherwise (BCx first)
- Anti-inflammatory therapy
  - IVIG and/or steroids
  - Tocilizumab (anti-IL-6), anakinra (IL-1 inhibitor)
- Aspirin – initially high dose, switch to low dose when afebrile
- DVT prophylaxis?



# Prognosis

- Survival 98% in U.S. series
- Median hospital stay ~ 1 week
- Long term – unknown



# Key Takeaways

- When to consider MIS-C
  - Febrile child with hypotension
  - Febrile child with prominent GI symptoms – watch closely
- What to do?
  - Support blood pressure and respiration
  - Send the evaluation for MIS-C (cardiac, sepsis evaluation)
  - Contact a multidisciplinary team – ID is often the point person
- More information: CDC Clinician Outreach and Communication Activity (“COCA”)
  - <https://emergency.cdc.gov/coca/calls/index.asp> (July 16th, 2020 Webinar about MIS-C)



**Thank You!**  
(for wearing your mask)



<https://jerz.setonhill.edu/blog/2020/03/14/social-distancing-because-the-needs-of-the-many-outweigh-the-needs-of-the-few/> accessed 5/12/2020



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# Kawasaki Disease – other features

- Aseptic meningitis – very fussy!
- Uveitis – manifests as photophobia
- Gallbladder hydrops – RUQ tenderness
- Sterile pyuria – often of urethral origin and cath may miss it
- LFT abnormalities – elevated ALT, hypoalbuminemia
- Arthritis – usually initially large joint oligoarticular followed later by small joint polyarticular
- Can have other artery involvement!!! (e.g. brachial, etc.)