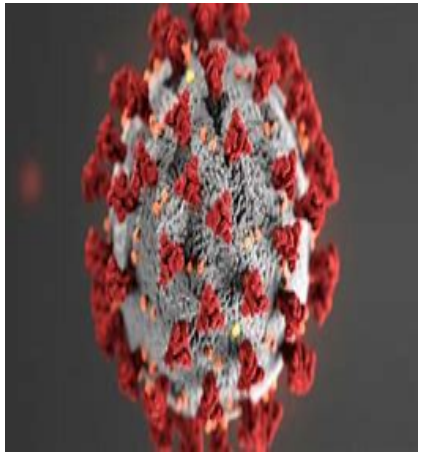

The Kids Will be Alright…Right?

A Primer and Update on Pediatric SARS-CoV2 Exposure

Rajit K Basu, MD MS FCCM

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Director of Research, Critical Care Medicine

@BasuND22

FORCE COLLABORATIVE

3.12.21

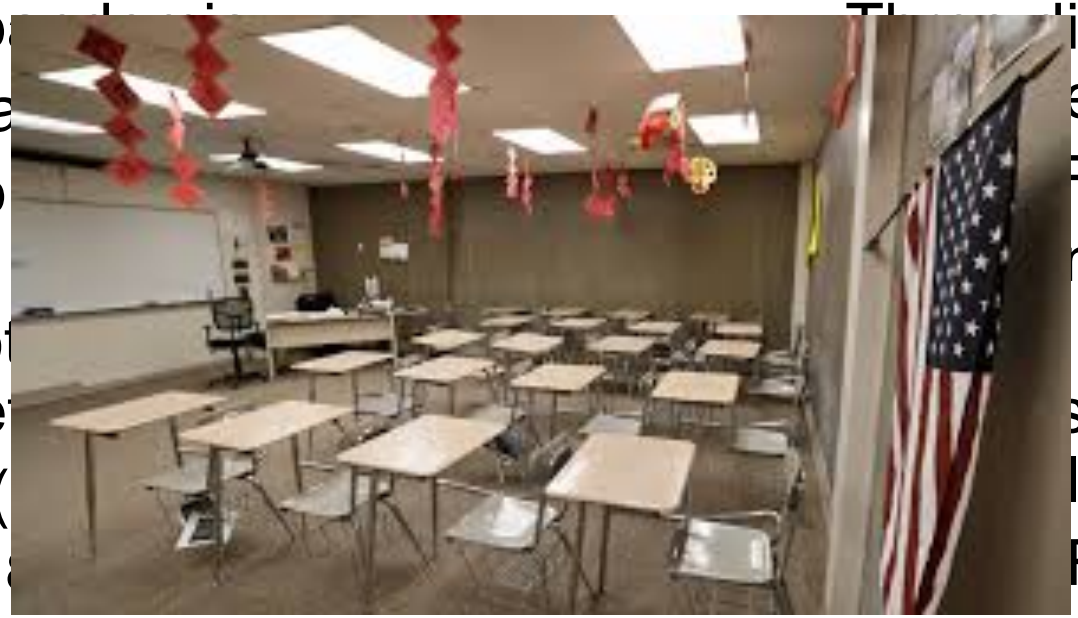
Disclosures

- BioPorto Diagnostics
- Baxter Acute Therapies Institute
- bioMerieux
- Potrero Medical
- BD Medical
- CHF Solutions

Acknowledgements

the choice of topic today was intentional

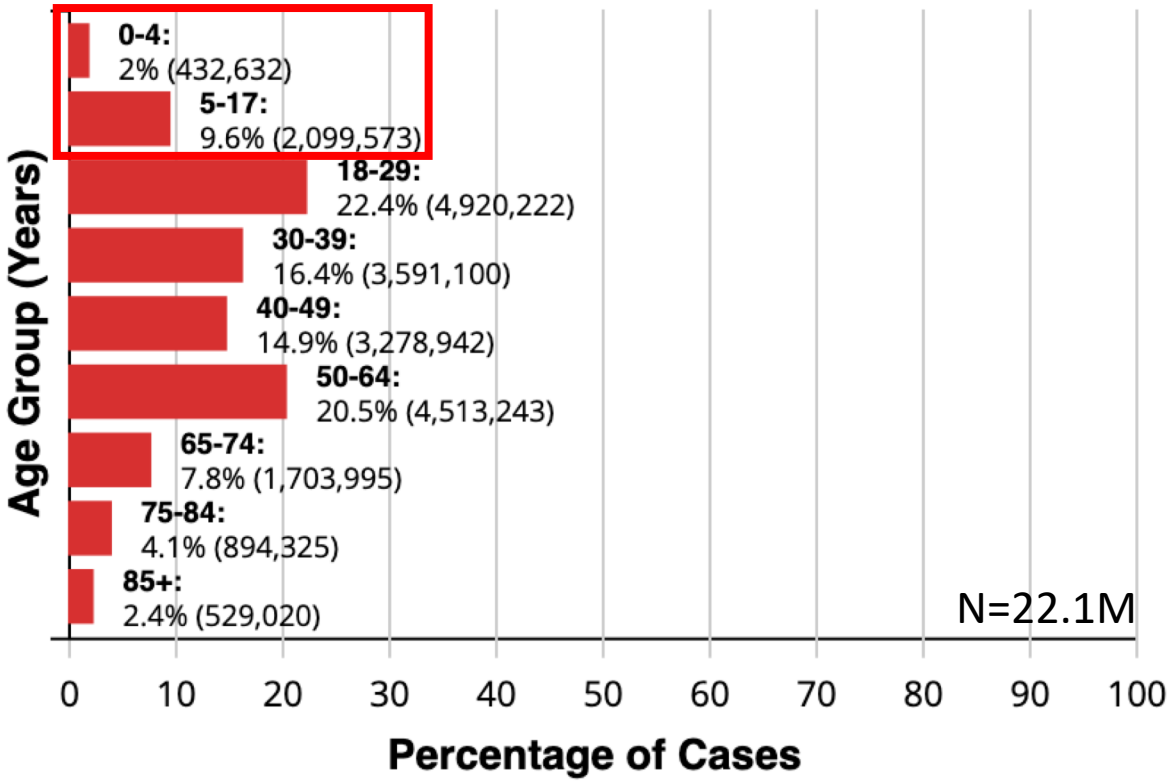
- March 11, 2020
  - WHO declares p
  - NBA cancels sea
  - President Trump
    nation
  - Congress cannot
    coronavirus relief
  - COVID Figures (
    - Cases (1267/11
    - Deaths (38/4300)

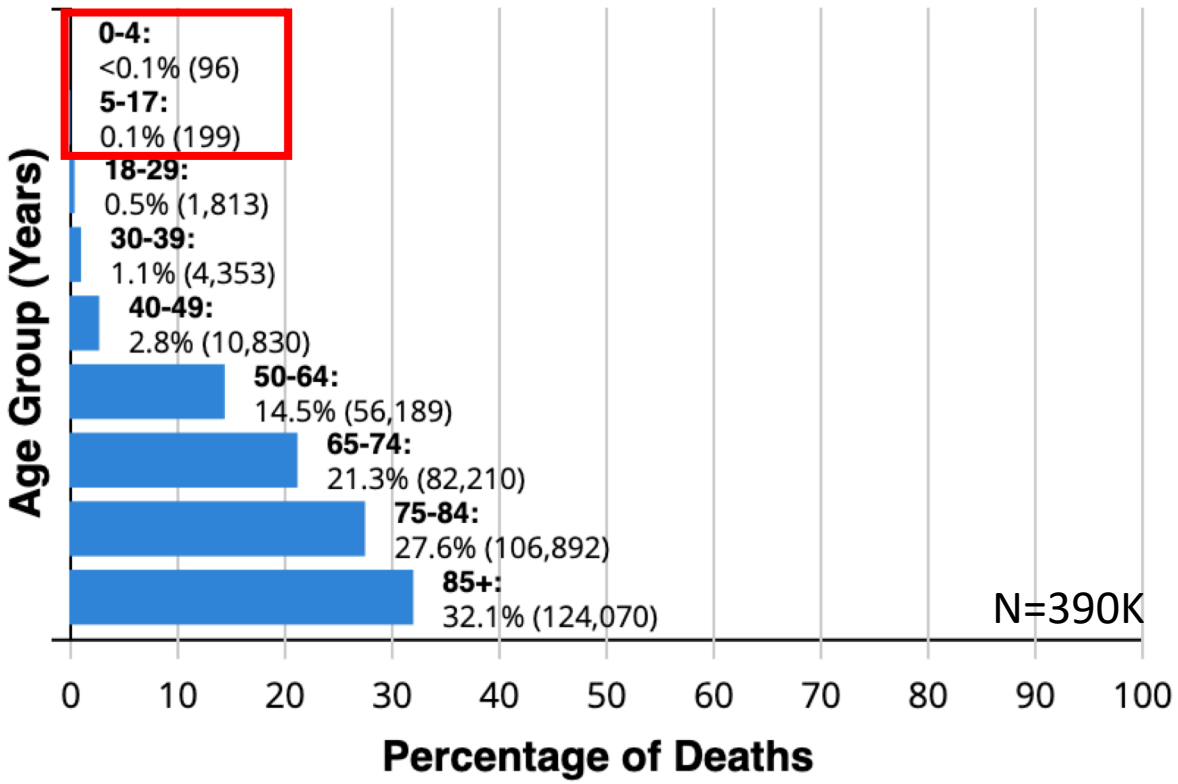


- March 11, 2021
  - Three different vaccines
    e
  - FL to complete seasons
  - nt Biden addresses
  - ss passes coronavirus
    l
  - Figures (US/World)
    - Cases (29.3M/118M)
    - Deaths (530K/2.63M)

Acknowledgements

for the children we have lost





CDC.gov: 3.12.21 – 8:30am

Acknowledgements

- CHOA Teams, Nurses, Staff, Physicians
- Special thanks to the ED / PICU / CICU teams

Children's Healthcare of Atlanta

Emory University School of Medicine

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will the kids be alright? - a prospectus

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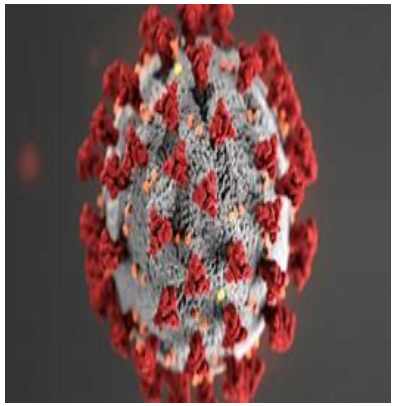

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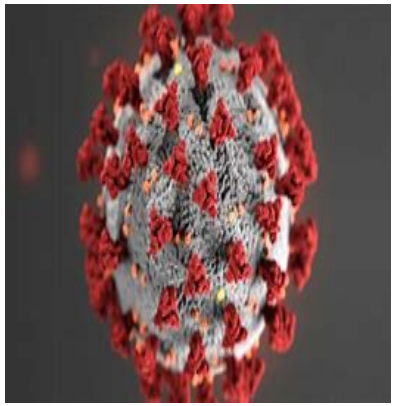


Viral factors

SARS-like bat CoVs

Intermediate host(s)?
Domestic animals?

Bat	ACE2	binding
Swine	ACE2	binding
Civet	ACE2	binding
Mouse	ACE2	no binding

SARS-CoV-2

S protein, attaching to host receptor ACE2, including two subunits S1 and S2:
- S1 determines the virus host range and cellular tropism by RBD
- S2 mediates virus-cell membrane fusion by HR1 and HR2

M Protein, responsible for the transmembrane transport of nutrients, the bud release and the formation of envelope

(+)ssRNA

N Protein

E Protein

N, E Protein and several accessory proteins, interfered with host immune response or unknown function

Other unknown molecules facilitated membrane invagination (co-factors)?

16 non-structure proteins:
nsp1-nsp16

Host factors

SARS-COV-2 receptor: Human angiotensin converting enzyme 2 **(hACE2)**

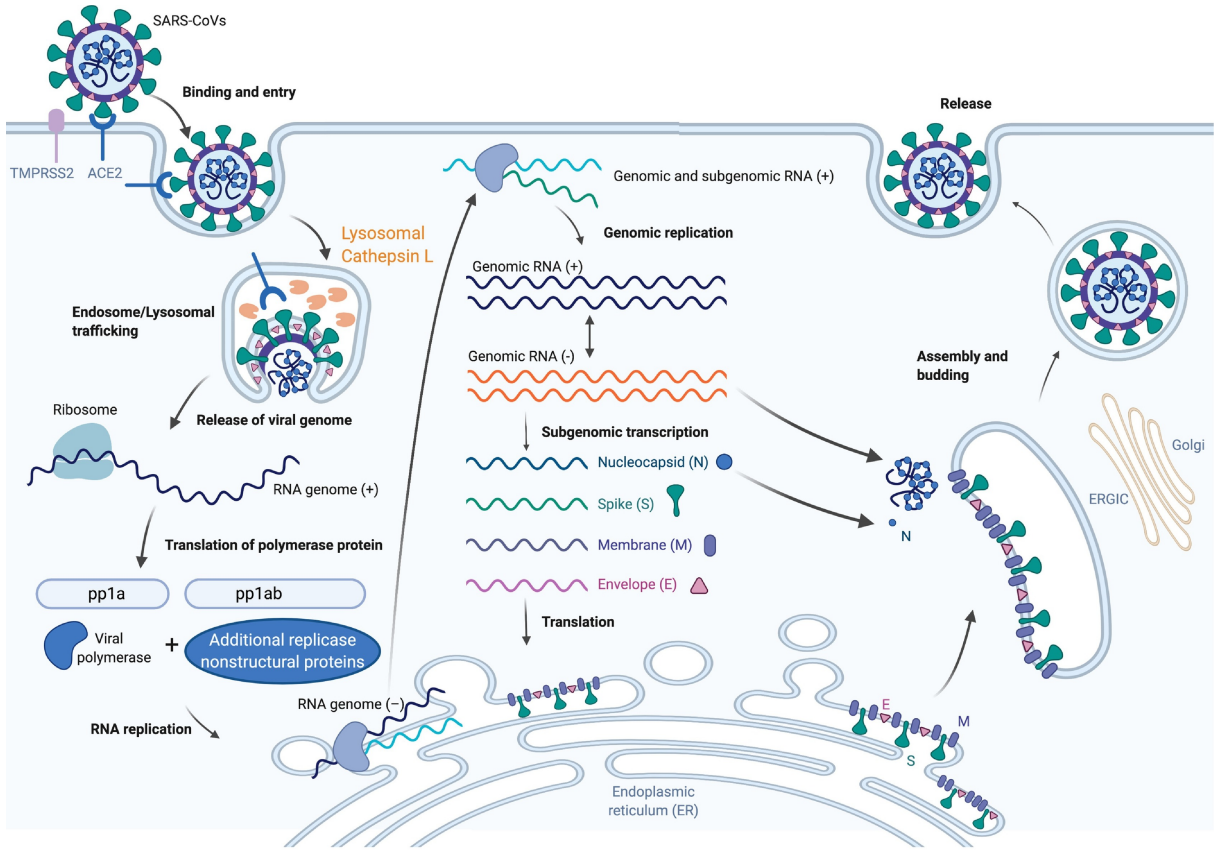
Underlying health conditions that increase susceptibility:
- Hypertension
- Chronic obstructive pulmonary disease
- Diabetes
- Cardiovascular disease

Individuals who are more susceptible to severe disease:
- Elderly (>65 years of age)
- People with underlying diseases

Severe complications:
- Respiratory distress syndrome
- Septic shock
- Metabolic acidosis hard to correct
- Coagulation dysfunction
- Multiple organs failure

Cytopathic effect (CPE) and cytokine storm or sustained inflammatory responses, hypoxia, septic shock, etc. may be related to the critical conditions of SARS-CoV-2 infected patients

Transmission/Communication of Virus across Hosts
SARS-CoV2 Spike Protein → Infiltration into Endothelium
Intracellular viral transcription
Pro-inflammatory messaging
Induction of host response – dysregulated immunity
End-organ effects

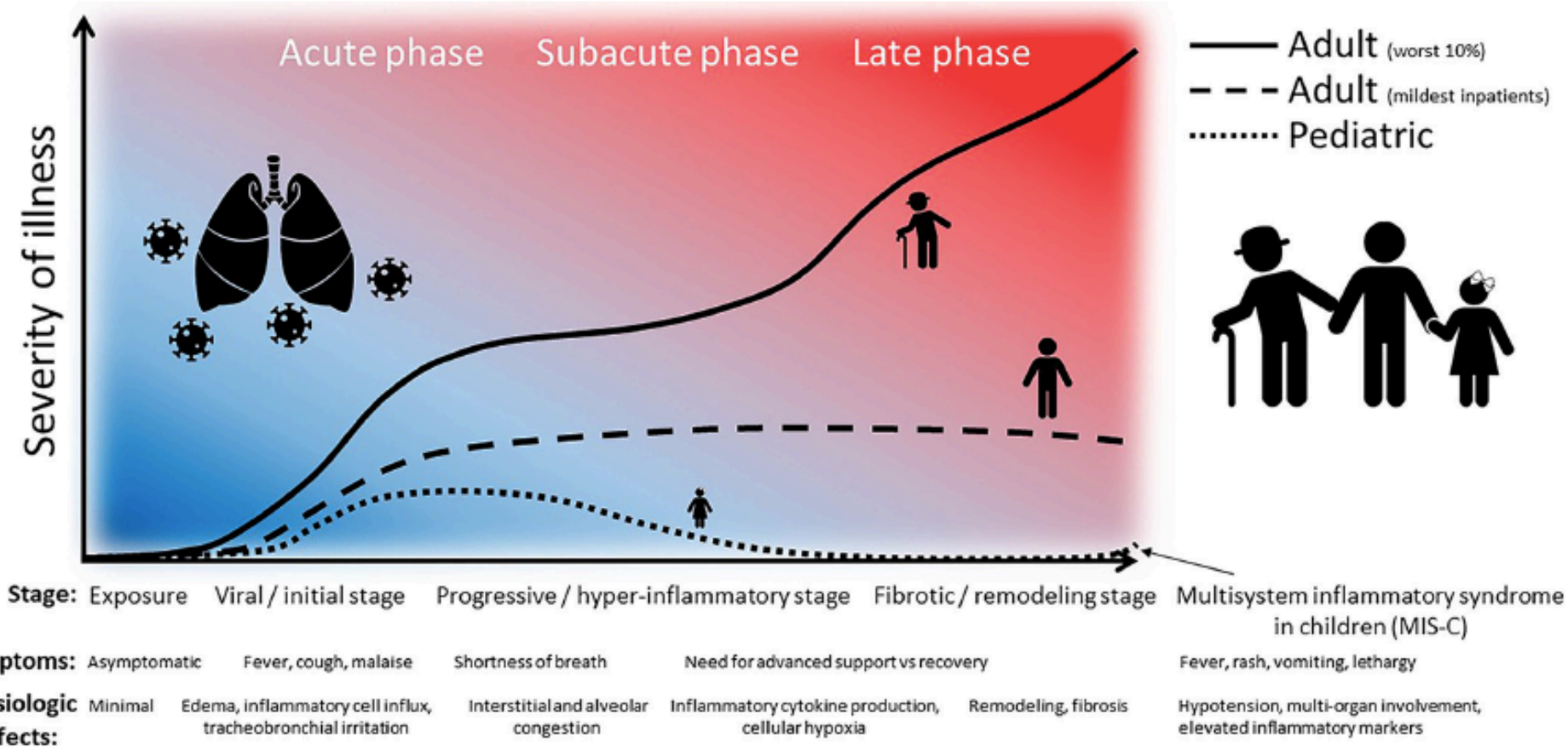


Understanding the age divide in COVID-19: why are children overwhelmingly spared?

K. Lingappan,[1] H. Karmouty-Quintana,[2] J. Davies,[1] B. Akkanti,[3] and M. T. Harting[4]

[1]Division of Neonatology, Department of Pediatrics, Baylor College of Medicine, Houston, Texas; [2]Department of Biochemistry and Molecular Biology, McGovern Medical School, The University of Texas Health Science Center at Houston, Houston, Texas; [3]Divisions of Pulmonary, Critical Care, Sleep Medicine, McGovern Medical School, The University of Texas Health Science Center at Houston, Houston, Texas; and [4]Department of Pediatric Surgery, McGovern Medical School, The University of Texas Health Science Center at Houston, Houston, Texas

Submitted 26 April 2020; acc



The Pathophysiology of SARS-CoV2
Are Children Unique?

The Indian Journal of Pediatrics
https://doi.org/10.1007/s12098-020-03322-y

REVIEW ARTICLE

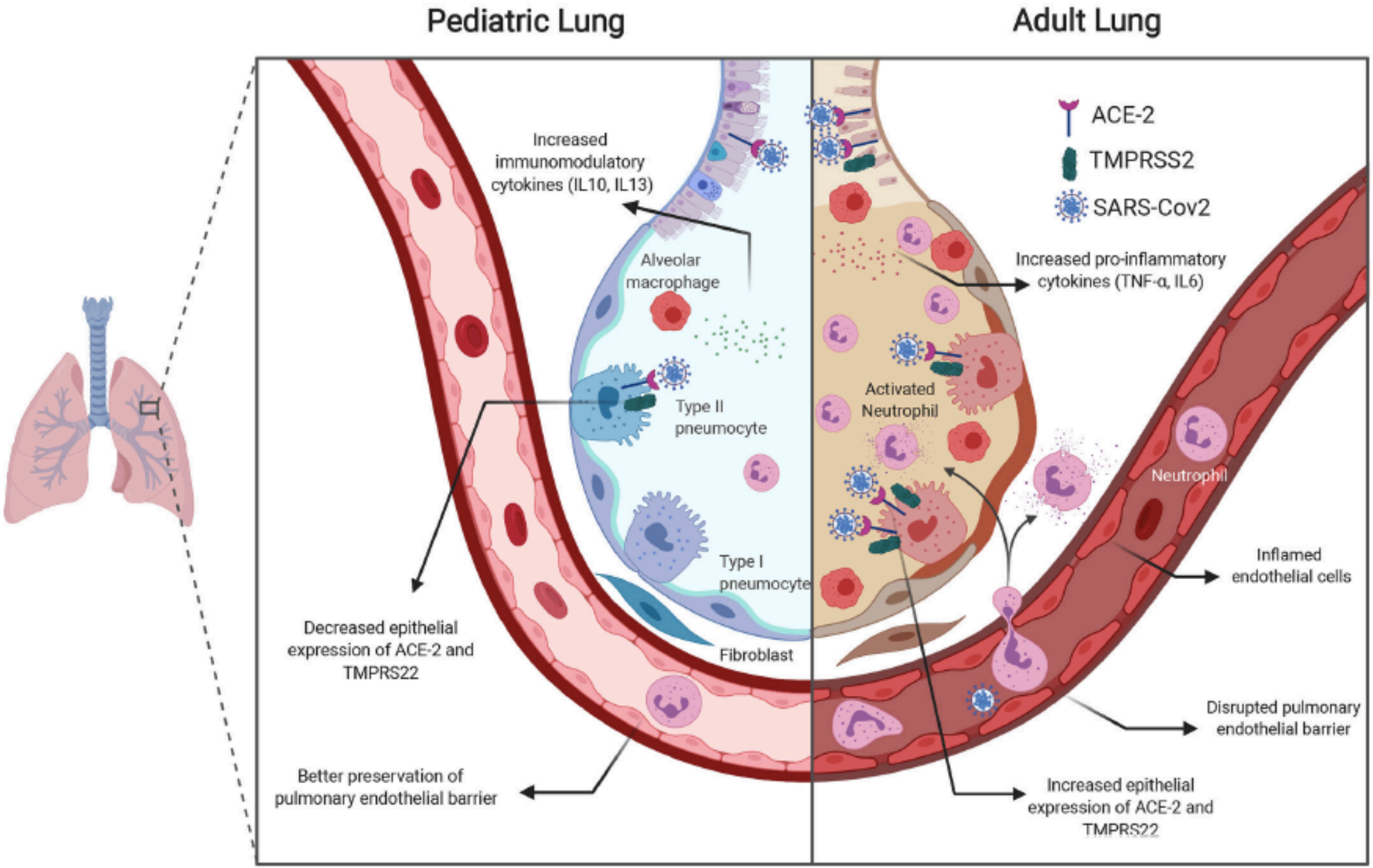
Check for updates

Pathophysiology of COVID-19: Why Children Fare Better than Adults?

Nitin Dhochak[1] · Tanu Singhal[2] · S. K. Kabra[1] · Rakesh [illegible][1]

Table 2 Potential factors protecting children against severe SARS-CoV-2 infection

Potential protective factor	Mechanisms
Prevention of virus exposure	Early isolation and movement restriction
	-Closing schools and day-care centers in epidemics
Appropriate infection handling	Trained immunity (strong innate response) due to
	-Live vaccines (BCG, live virus vaccines)
	-Frequent virus infections
	High ACE-2 expression metabolizing angiotensin-2
	Lack of immune-senescence
	Good lung regeneration capacity
Absence of high-risk factors	Absence of ageing related co-morbidities.
	Less degree of obesity, smoking
High-risk group	
1. Infants (< 1 y)	
2. Children with pre-existing illnesses (neurological disorders, chronic lung diseases including asthma, un-corrected heart diseases, and genetic disorders)	


Pediatric Lung
Adult Lung
ACE-2
TMPRSS2
SARS-Cov2
Increased immunomodulatory cytokines (IL10, IL13)
Alveolar macrophage
Type II pneumocyte
Type I pneumocyte
Fibroblast
Decreased epithelial expression of ACE-2 and TMPRS22
Better preservation of pulmonary endothelial barrier
Increased pro-inflammatory cytokines (TNF-α, IL6)
Activated Neutrophil
Neutrophil
Inflamed endothelial cells
Disrupted pulmonary endothelial barrier
Increased epithelial expression of ACE-2 and TMPRS22

Reduced development of COVID-19 in children reveals molecular checkpoints gating pathogenesis illuminating potential therapeutics

Jonathan Baruch Steinman[a], Fok Moon Lum[b,c], Peggy Pui-Kay Ho[b,c], Naftali K
and Lawrence Steinman[b,c,1]

Five Clues Why Children Have Reduced Susceptibility to COVID-19

Adults | **Children**

But does the differential biology mean that kids do not get sick?

That the kids will be…alright?

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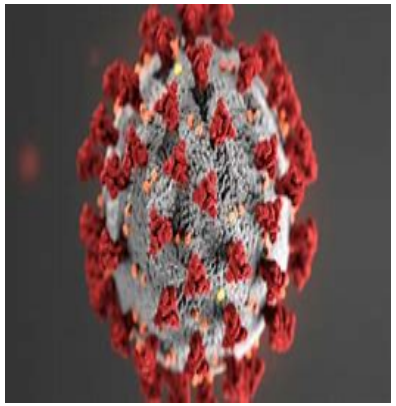

3.12.21
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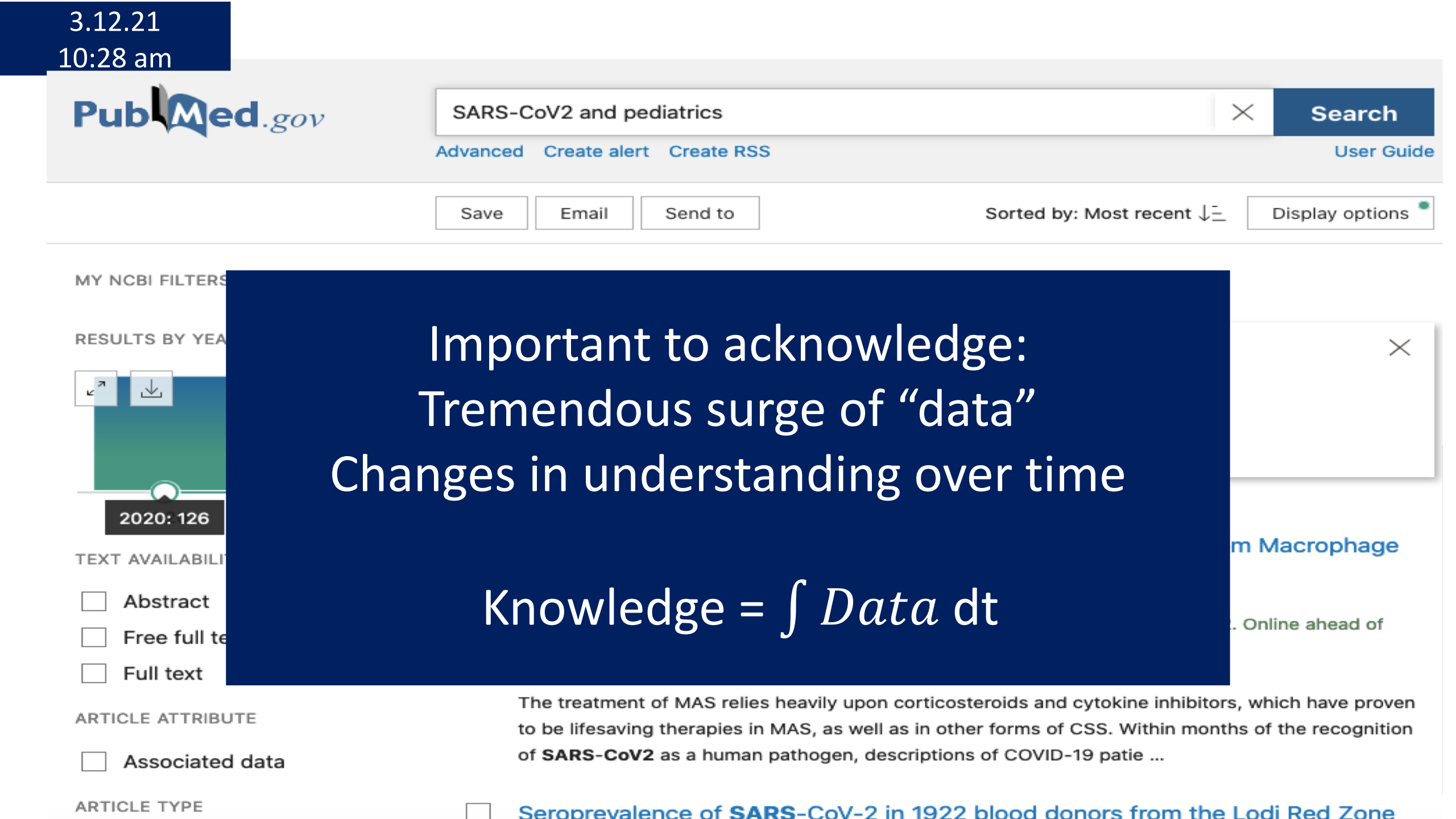


Clinical and epidemiological features of 36 children with coronavirus disease 2019 (COVID-19) in Zhejiang, China: an observational cohort study

Haiyan Qiu, Junhua Wu*, Liang Hong, Yunling Luo, Qifa Song, Dong Chen*

1st Report – Zhejiang (China)
Published in JUNE
N=36
Compared to SARS and H1N1
COVID in kids is "mild"

	Children with COVID-19 (n=36)	Adults with COVID-19 (n=175)[17]	Children with SARS (n=44)[10]	Children with H1N1 influenza (n=167)[19]
Age, years	8·3 (3·5)	45 (14)	12·2 (4·1)	4·1 (3·5)
Fever	13 (36%)	150 (86%)	44 (100%)	153 (92%)
Cough	7 (19%)	109 (62%)	28 (64%)	138 (83%)
Pharyngeal congestion or sore throat	1 (3%)	8 (5%)	6 (14%)	159 (95%)
Dyspnoea	1 (3%)	23 (13%)	4 (9%)	12 (7%)
Asymptomatic*	10 (28%)	<5%	0	<5%
Pneumonia	19 (53%)	166 (95%)	40/62 (65%)†	18 (11%)
Comorbidities or complications (except pneumonia and bronchitis)	0	10 (6%)	5 (11%)	7 (4%)
Mild and moderate cases	36 (100%)	136 (77%)	35 (79%)	135 (81%)
Severe cases	0	39 (23%)	9 (21%)	32 (19%)
Leucopenia	7 (19%)	44 (25%)	15 (34%)	65 (39%)
Lymphopenia	11 (31%)	61 (35%)	34 (77%)	NA
Myocardial enzymes elevated	11 (31%)	39 (22%)	3 (7%)	18 (11%)
Liver enzymes elevated	2 (6%)	32 (18%)	21 (48%)	12 (7%)
Elevated C-reactive protein	1 (3%)	86 (49%)	NA	42 (25%)
Antiviral therapy	14 (39%)	170 (97%)	42 (96%)	167 (100%)

Data are n (%) or mean (SD). COVID-19=coronavirus disease 2019. SARS=severe acute respiratory syndrome. NA=not available. *No pneumonia, no upper respiratory symptoms, and no fever. †The prevalence of abnormal radiographic presentations in children with SARS was obtained from reference 18.

Table 3: **Comparison of prevalence of clinical features between children with COVID-19, adults with COVID-19, children with H1N1 influenza, and children with SARS**

	Total (n=36)	Mild cases (n=17)	Moderate cases (n=19)	p value*
(Continued from previous page)				
Treatment				
Oxygen inhalation	6 (17%)	1 (6%)	5 (26%)	..
Interferon alfa	36 (100%)	17 (100%)	19 (100%)	..
Lopinavir–ritonavir	14 (39%)	2 (12%)	12 (63%)	..
Time taken to become SARS-CoV-2 PCR-negative, days (SD, range)	10 (2, 7–22)	9 (2, 7–12)	11 (2, 8–22)	0·0050
Duration of fever after admission, days (SD, range)†	3 (2, 2–5)	2 (2, 2–4)	3 (2, 2–5)	0·14
Duration of hospitalisation, days (SD, range)	14 (3, 10–20)	12 (3, 10–16)	15 (4, 12–20)	0·017

Data are n (%) or mean (SD), unless otherwise indicated. COVID-19=coronavirus disease 2019. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. *p values indicate the difference between paediatric patients with mild clinical type (asymptomatic or upper respiratory infection) and those with moderate clinical type with pneumonia. †Data for 13 patients.

Table 1: **Epidemiological and clinical features of paediatric patients with COVID-19 stratified by two clinical types**

Lancet June 2020 (Jan-Mar 2020 Data)

Epidemiology of COVID-19 Among Children in China

Yuanyuan Dong, MD,[a,b,*] Xi Mo, PhD,[a,*] Yabin Hu, MD,[a] Xin Qi, PhD,[c] Fan Jiang, MD, PhD,[a] Zhongyi Jiang, MD,[a,b] Shilu Tong, MD, PhD[a,d,e]

Broader Epidemiology from China
N=2133
Asymptomatic <10%
Critical < 2%
Most with mild-moderate

TABLE 2 Different Severity of Illness by Age Group

Age Group, y[a]	Asymptomatic, *n* (%)	Mild, *n* (%)	Moderate, *n* (%)	Severe, *n* (%)	Critical, *n* (%)	Total, *n*
<1	7 (1.9)	204 (54.2)	125 (33.2)	33 (8.8)	7 (1.9)	376
1–5	15 (3.1)	245 (49.9)	195 (39.7)	34 (6.9)	2 (0.4)	491
6–10	30 (5.8)	277 (53.3)	191 (36.7)	22 (4.2)	0 (0.0)	520
11–15	27 (6.5)	198 (48.1)	170 (41.3)	14 (3.4)	3 (0.7)	412
>15	15 (4.5)	164 (49.1)	145 (43.4)	9 (2.7)	1 (0.3)	334
Total	94 (4.4)	1088 (51.0)	826 (38.7)	112 (5.3)	13 (0.6)	2133

See also Supplemental Table 3.

[a] Two cases had missing values.

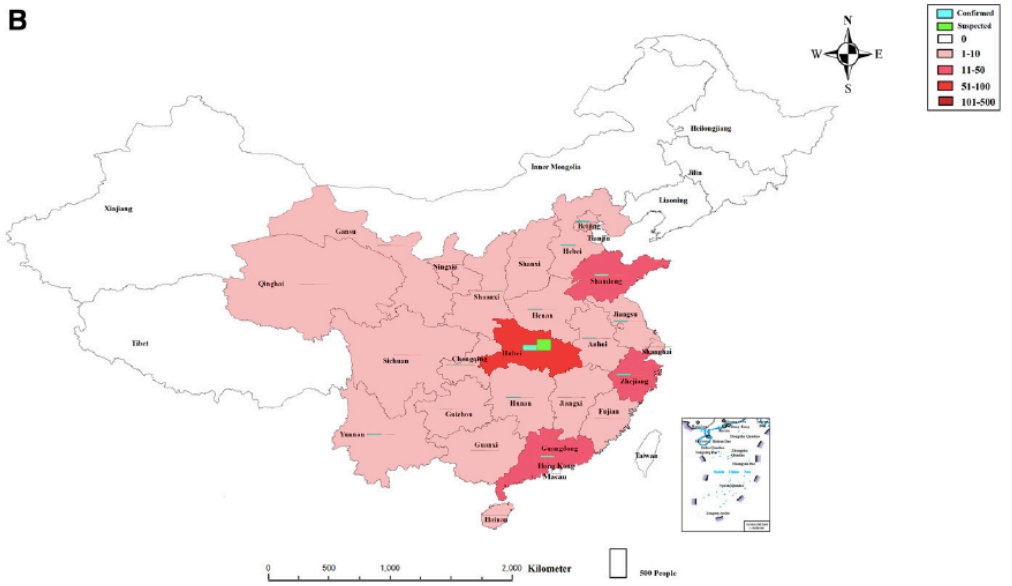


FIGURE 5

Like a petri dish of spread….

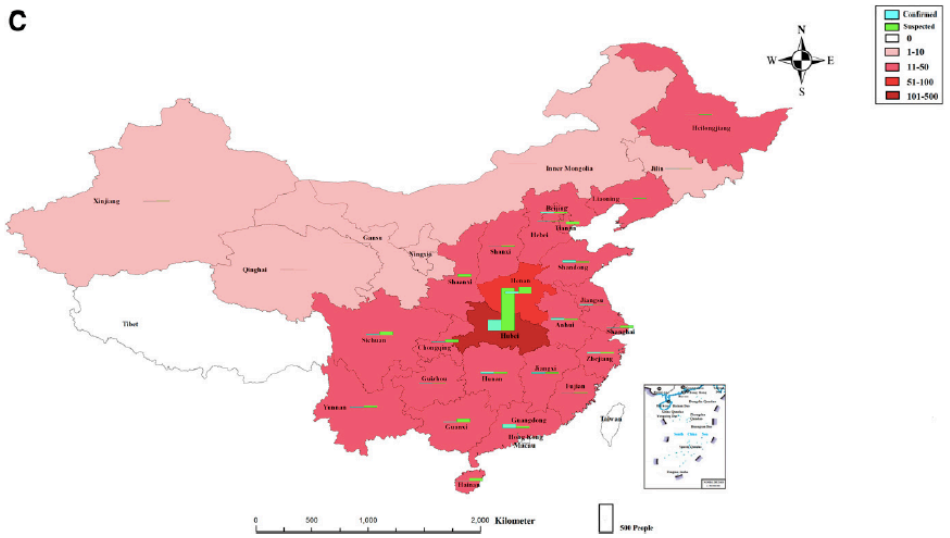


FIGURE 5
Continued.

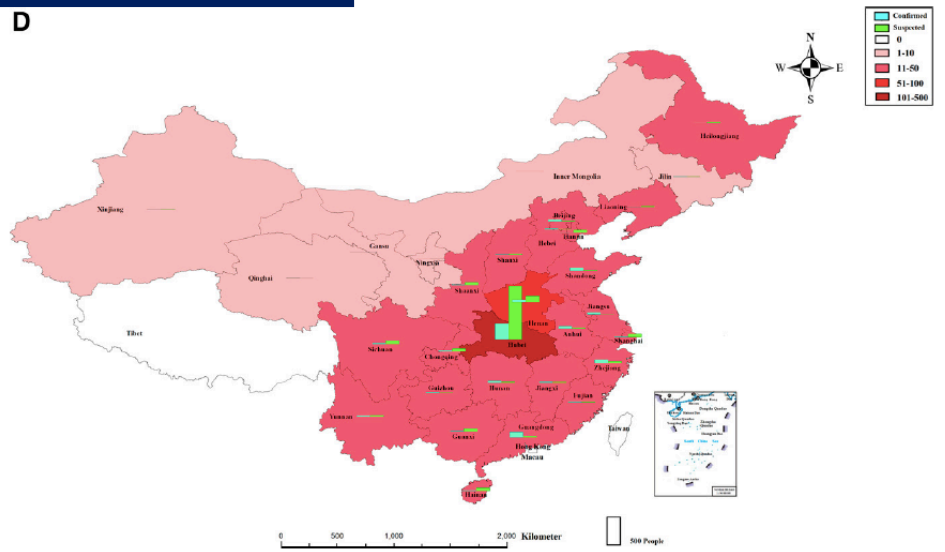


FIGURE 5
Continued.

SARS-CoV-2 (COVID-19): What Do We Know About Children? A Systematic Review

Nisha S. Mehta,[1] Oliver T. Mytton,[2] Edward W. S. Mullins,[3,4] Tom A. Fowler,[5] Catherine L. Falconer,[6] Orla B. Murphy,[1] Claudia Langenberg,[7,8,9] Wikum J. P. Jayatunga,[1,10] Danielle H. Eddy,[8] and Jonathan S. Nguyen-Van-Tam[1,10]

[1]Department of Health and Social Care (England), London, United Kingdom, [2]University of Cambridge, Cambridge, United Kingdom, [3]Imperial College London, London, United Kingdom, [4]Obstetrics and Gynecology, Queen Charlotte's and Chelsea Hospital, London, United Kingdom, [5]Genomics England, London, United Kingdom, [6]Somerset County Council, Taunton, United Kingdom, [7]MRC Epidemiology Unit, University of Cambridge, Cambridge, United Kingdom, [8]Public Health England, London, United Kingdom, [9]The Francis Crick Institute, London, United Kingdom, and [10]University of Nottingham School of Medicine, Nottingham, United Kingdom

Background. Few pediatric cases of coronavirus disease 2019 (COVID-19) have been reported and we know little about the epidemiology in children, although more is known about other coronaviruses. We aimed to understand the infection rate, clinical presentation, clinical outcomes, and transmission dynamics for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), in order to inform clinical and public health measures.

Methods. We undertook a rapid systematic review and narrative synthesis of all literature relating to SARS-CoV-2 in pediatric populations. The search terms also included SARS-CoV and MERS-CoV. We searched 3 databases and the COVID-19 resource centers of 11 major journals and publishers. English abstracts of Chinese-language papers were included. Data were extracted and narrative syntheses conducted.

Results. Twenty-four studies relating to COVID-19 were included in the review. Children appear to be less affected by COVID-19 than adults by observed rate of cases in large epidemiological studies. Limited data on attack rate indicate that children are just as susceptible to infection. Data on clinical outcomes are scarce but include several reports of asymptomatic infection and a milder course of disease in young children, although radiological abnormalities are noted. Severe cases are not reported in detail and there are few data relating to transmission.

Conclusions. Children appear to have a low observed case rate of COVID-19 but may have rates similar to adults of infection with SARS-CoV-2. This discrepancy may be because children are asymptomatic or too mildly infected to draw medical attention and be tested and counted in observed cases of COVID-19.

Keywords. coronavirus; SARS-CoV-2; COVID-19; children; infection.

Early UK Systematic Review
Low Case Rate
Mild Symptomatology in Children

no data on
of children
hile under-
actor in the
liovascular
conditions
a [7, 19].

Transmission

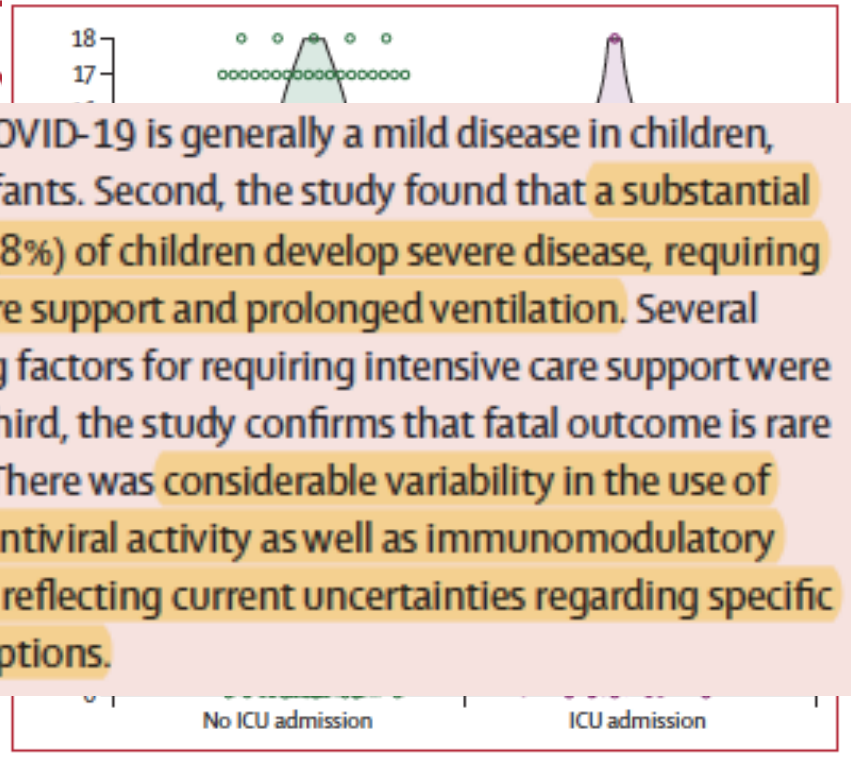
There is limited evidence relating to transmission of SARS-CoV-2 by children. Many of the childhood cases are from familial clusters, with the children tending to be identified through contact tracing of adult cases [6, 9, 21, 22]. While people interviewed by the WHO-China Joint Mission could not recall episodes of a child infecting an adult

vere cases (7.6%) [18]. Rarely, pediatric deaths have also been reported [19]. We found no detailed studies of transmission of SARS-CoV-2 from children. Many of the childhood cases are from familial clusters with children identified through contact tracing of adult cases [20, 21]. There is only 1 case describing likely transmission from a 3-month-old infant to her parents after they looked after the unwell infant without personal protective measures [12]. Of note is the high frequency of chest radiographic abnormality described in both mild and asymptomatic infections in children. Longitudinal data will be required to understand the duration, persistence, and functional deficit related to these findings.

We detected only a weak signal that children with comorbidities are at increased risk or are overrepresented

	Entire cohort (n=582)	Not admitted to ICU (n=534)	Admitted to ICU (n=48)	p value	Odds ratio (95%CI)
Age, years	5·0 (0·5–12·0)	5·5 (0·6–12·0)	4·0 (0·3–11·0)	0·20	0·9 (0·9–1·0)
<2	230 (40%)	207 (39%)	23 (48%)	..	1·4 (0·8–2·6)
2–5	62 (11%)	60 (11%)	2 (4%)	..	0·3 (0·1–1·4)
5–10	94 (16%)	86 (16%)	8 (17%)	..	1·0 (0·4–2·3)
>10	196 (34%)	181 (34%)	15 (31%)	..	0·8 (0·4–1·6)
Age <1 month	40 (7%)	33 (6%)	7 (15%)	0·027	2·5 (1·0–6·2)
Sex					
Female	271 (47%)	256 (48%)	15 (31%)	..	1 (ref)
Male	311 (53%)	278 (52%)	33 (69%)	0·026	2·2 (1·0–3·8)
Pre-existing medical conditions					
Any	145 (25%)	120 (22%)	25 (52%)	<0·0001	3·7 (2·0–6·8)
Chromosomal abnormality	10 (2%)	8 (1%)	2 (4%)	0·19	2·8 (0·5–13·8)
Chronic kidney disease	9 (2%)	7 (1%)	2 (4%)	0·16	3·2 (0·6–16·2)
Chronic pulmonary disease	29 (5%)	23 (4%)	6 (13%)	0·012	3·1 (1·2–8·2)
Congenital heart disease	25 (4%)	20 (4%)	5 (10%)	0·029	2·9 (1·0–8·4)
Malignancy	27 (5%)	22 (4%)	5 (10%)	0·047	2·7 (0·9–7·5)
Neurological disorders	26 (4%)	21 (4%)	5 (10%)	0·037	2·8 (1·0–7·9)
Other	35 (6%)	29 (5%)	6 (13%)	0·048	2·4 (0·9–6·3)
Immunosuppressive therapy*	29 (5%)	26 (5%)	3 (6%)	0·72	1·3 (0·3–4·4)
Known immunodeficiency	3 (1%)	3 (1%)	0	1·00	..

show that COVID-19 is generally a mild disease in children, including infants. Second, the study found that a substantial proportion (8%) of children develop severe disease, requiring intensive care support and prolonged ventilation. Several predisposing factors for requiring intensive care support were identified. Third, the study confirms that fatal outcome is rare in children. There was considerable variability in the use of drugs with antiviral activity as well as immunomodulatory medication, reflecting current uncertainties regarding specific treatment options.



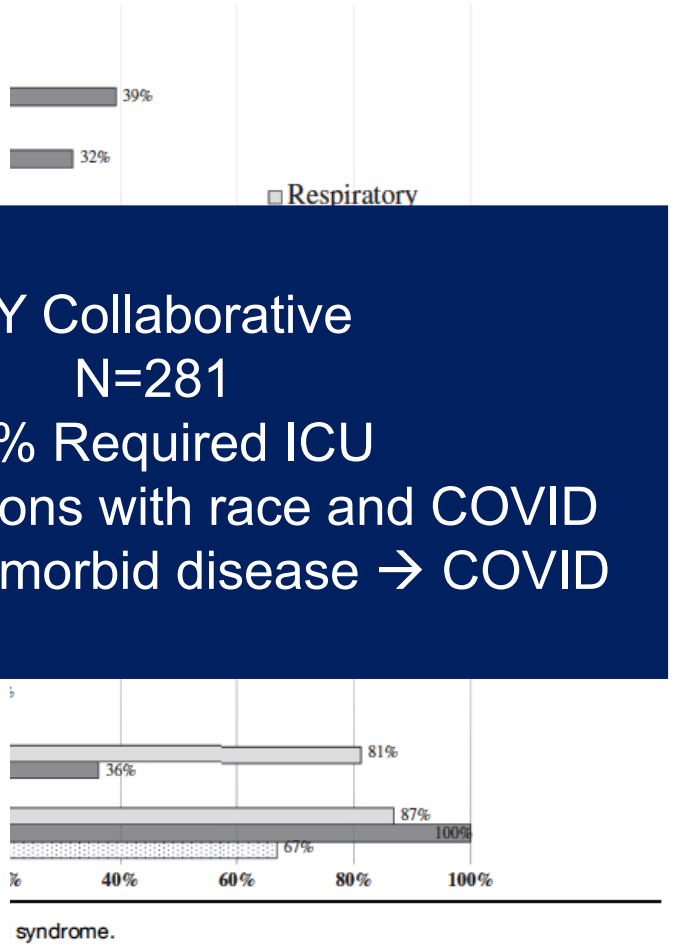
Multinational European Study
N=582
8% Required ICU
“Uncertainties”
“Early … more data urgently needed”

128 (22%)	113 (21%)	15 (31%)	0·10	1·6 (0·8–3·2)
70/255 (28%)	64/236 (27%)	6/19 (32%)	0·67	1·2 (0·4–3·4)

Severe Acute Respiratory Syndrome Coronavirus 2 Clinical Syndromes and Predictors of Disease Severity in Hospitalized Children and Youth

Table VII. Clinical characteristics during hospital admission

Clinical measures	Total, N = 281		Clinical subgroups: Respiratory, N = 143		MIS-C, N = 69		Other, N = 69		*P* value
Maximum respiratory support									
Ambient air	169/281	(60.1%)	60/143	(42.0%)	43/69	(62.3%)	66/69	(95.7%)	<.001
Noninvasive respiratory support									
Low-flow nasal cannula	42/281	(14.9%)	29/143	(20.3%)	11/69	(15.9%)	2/69	(2.9%)	.001
High-flow nasal cannula	24/281	(8.5%)	16/143	(11.2%)	8/69	(11.6%)	0/69	(0.0%)	.004
Noninvasive positive-pressure ventilation	8/281	(2.8%)	5/143	(3.5%)	3/69	(4.3%)	0/69	(0.0%)	.24
Invasive mechanical ventilation	29/281	(10.3%)	25/143	(17.5%)	3/69	(4.3%)	1/		
Medical therapy									
Hydroxychloroquine	50/281	(17.8%)	49/143	(34.3%)	0/69	(0.0%)	1/		
Remdesivir	31/281	(11.0%)	26/143	(18.2%)	5/69	(7.2%)	0/		
Methylprednisolone	72/281	(25.6%)	39/143	(27.3%)	32/69	(46.4%)	1/		
Interleukin inhibitor	23/281	(8.2%)	10/143	(7.0%)	13/69	(18.8%)	0/		
Azithromycin	38/281	(13.5%)	34/143	(23.8%)	4/69	(5.8%)	0/		
Convalescent plasma	4/281	(1.4%)	3/143	(2.1%)	1/69	(1.4%)	0/		
Intravenous immunoglobulin	47/281	(16.7%)	3/143	(2.1%)	41/69	(59.4%)	3/		
Empiric antibiotics (excluding azithromycin)	178/281	(63.3%)	93/143	(65.0%)	47/69	(68.1%)	38/		
Anticoagulant therapy	98/281	(34.9%)	55/143	(38.5%)	41/69	(59.4%)	2/		
Complications									
Acute respiratory distress syndrome*	27/281	(9.6%)	24/143	(16.8%)	3/69	(4.3%)	0/		
Acute kidney injury*	37/281	(13.2%)	15/143	(10.5%)	17/69	(24.6%)	5/		
Carditis*	20/281	(7.1%)	3/143	(2.1%)	17/69	(24.6%)	0/		
Shock*	26/281	(9.3%)	2/143	(1.4%)	24/69	(34.8%)	0/69	(0.0%)	<.001
Thrombotic event*	12/281	(4.3%)	11/143	(7.7%)	1/69	(1.4%)	0/69	(0.0%)	.014
Bacteremia	12/281	(4.3%)	10/143	(7.0%)	2/69	(2.9%)	0/69	(0.0%)	.050
Urinary tract infection	10/281	(3.6%)	9/143	(6.3%)	0/69	(0.0%)	1/69	(1.4%)	.037
Outcomes									
Discharged home	267/281	(95.0%)	133/143	(93.0%)	66/69	(95.7%)	68/69	(98.6%)	.21
Hospital length of stay, median d (IQR)†	4	(2-8)	5	(2-10)	6	(3-8)	2	(2-4)	<.001
Required ICU stay	114/281	(40.6%)	64/143	(44.8%)	44/69	(63.8%)	6/69	(8.7%)	<.001
ICU length of stay, median d (IQR)‡	5	(2-10)	6	(2-17)	4	(2-7)	2	(1-3)	<.001



syndrome.

NY Collaborative
N=281
41% Required ICU
No associations with race and COVID
Kids with co-morbid disease → COVID

European Journal of Pediatrics (2021) 180:689–697
https://doi.org/10.1007/s00431-020-03801-6

REVIEW

COVID-19 Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in children and adolescents: a systematic review of critically unwell children and the association with underlying comorbidities

Nia Williams[1] · Trisha Radia[1] · Katharine Harman[2] · Pankaj Agrawal[1] · James Cook[2] · Atul Gu

Cardiovascular	
Cardiovascular including congenital heart disease and cardiomyopathy	10/48 (21%)
Hypertension	1/48 (2%)
Mucopolysacharidosis with cardiac failure	1/48 (2%)
Neurological	
Epilepsy, neurodegenerative disorders and cerebral palsy	5/48 (10%)
Respiratory	
Asthma or reactive airway disease	5/48 (10%)
Recurrent chest infections	1/48 (2%)
OSA	1/48 (2%)
Immunosuppressed/Oncology/Haematology	
Allogeneic hematopoietic stem cell transplantation	1/48 (2%)
Leukaemia on maintenance chemotherapy	1/48 (2%)
Immunodeficiency	3/48 (6%)
Sickle cell disease	1/48 (2%)
Metastatic cancer	1/48 (2%)
Nephroblastoma	1/48 (2%)
Genetic syndromes	
Genetic syndrome unspecified	2/48 (4%)
T21	2/48 (4%)
18q deletion	1/48 (2%)
Endocrine	
Diabetes	2/48 (4%)
Obesity	7/48 (15%)
Other	
Prematurity	2/48 (4%)
Intussusception	1 (2%)
Hydronephrosis	1 (2%)
No comorbidity	12 (25%)

European Registry

Kids with co-morbid disease
+ COVID = Mortality

Table 3 Demographics of patients who d

First author	Number who died	Age				
CDC	3	–	–	–	–	–
Chao	1	11 y	M	Black	Metastatic cancer	Family chose to withdraw care after a period of invasive mechanical ventilation
Climent	1	5 m	M	–	Mucopolysaccharidosis with heart failure	Was on ACE inhibitor prior to admission
Craver	1	17 y	M	African American	Nil	Eosinophilic myocarditis on post mortem examination
Dong	1	14 y	M	–	–	–
Lu	1	10 m	–	–	Intussusception	
Oualha	5	16 y	F		Nil	
		16 y	M	–	Nil	Sphenoidal sinusitis with cavernous sinus thrombosis. Blood culture positive for Fusobacterium necrophorum and Strep. constellatus. Left middle cerebral artery stroke.
		6 y	F	–	Nil	Myocarditis and septic shock. Blood culture and CSF-positive for Staph aureus. Underwent ECMO and suffered massive brain haemorrhage.
		4 y	M	–	Chemotherapy for acute lymphoblastic leukaemia	ARDS and multiorgan failure
		17 y	F	–	Epilepsy and major neonatal encephalopathy	Not intubated due to mutual decision to withdraw care
Shekerdemian	2	12 y	–	–	Had comorbidities but no details given	Multiorgan failure
		17 y	–	–	Had comorbidities but no details given	Multiorgan failure
Wang	1	8 y	M	–	ALL in remission	
Zachariah	1	–	–	–	–	–

Racial and/or Ethnic and Socioeconomic Disparities of SARS-CoV-2 Infection Among Children

Monika K. Goyal, MD, MSCE,[a,b] Joelle N. Simpson, MD, MPH,[a,b] Meleah D. Boyle, MPH,[a] Gia M. Badolato, MPH,[a] Meghan Delaney, DO, MPH,[a,b,c] Robert McCarter, ScD,[a,b] Denice Cora-Bramble, MD, MBA[a,b]

OBJECTIVES: To evaluate racial and/or ethnic and socioeconomic differences in rates of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection among children.

METHODS: We performed a cross-sectional study of children tested for SARS-CoV-2 at an exclusively pediatric drive-through and walk-up SARS-CoV-2 testing site from March 21, 2020, to April 28, 2020. We performed bivariable and multivariable logistic regression to measure the association of patient race and/or ethnicity and estimated median family income (based on census block group estimates) with (1) SARS-CoV-2 infection and (2) reported exposure to SARS-CoV-2.

RESULTS: Of 1000 children tested for SARS-CoV-2 infection, 20.7% tested positive for SARS-CoV-2. In comparison with non-Hispanic white children (7.3%), minority children had higher rates of infection (non-Hispanic Black: 30.0%, adjusted odds ratio [aOR] 2.3 [95% confidence interval (CI) 1.2–4.4]; Hispanic: 46.4%, aOR 6.3 [95% CI 3.3–11.9]). In comparison with children in the highest median family income quartile (8.7%), infection rates were higher among children in quartile 3 (23.7%; aOR 2.6 [95% CI 1.4–4.9]), quartile 2 (27.1%; aOR 2.3 [95% CI 1.2–4.3]), and quartile 1 (37.7%; aOR 2.4 [95% CI 1.3–4.6]). Rates of reported exposure to SARS-CoV-2 also differed by race and/or ethnicity and socioeconomic status.

CONCLUSIONS: In this large cohort of children tested for SARS-CoV-2 through a community-based testing site, racial and/or ethnic minorities and socioeconomically disadvantaged children carry the highest burden of infection. Understanding and addressing the causes of these differences are needed to mitigate disparities and limit the spread of infection.

TABLE 3 Racial and/or Ethnic and Socioeconomic Factors Associated With Reported SARS-CoV-2 Exposure

Demographic Characteristic	OR (95% CI)	aOR (95% CI)[a]
Race and/or ethnicity		
NH white	Reference	Reference
NH Black	2.2 (1.1–4.4)	2.3 (1.0–5.1)
Hispanic	2.2 (1.1–4.5)	1.9 (0.8–4.4)
Other	2.0 (1.0–4.5)	2.5 (1.1–5.8)
MFI (quartiles)		
Quartile 4: $157 679–>$250 000	Reference	Reference
Quartile 3: $107 321–$157 308	2.0 (1.0–4.1)	1.9 (0.9–4.1)
Quartile 2: $70 341–$107 292	2.6 (1.3–5.1)	2.4 (1.1–5.2)
Quartile 1: $11 667–$70 300	2.5 (1.3–4.9)	2.1 (0.9–4.6)

[a] Models were adjusted for age, sex, race and/or ethnicity, and MFI.

SARS-CoV-2 testing and positivity by MFI.
patients positive for SARS-CoV-2 and MFI

DC-Washington Area
N=1000

Racial and Socioeconomic disparities DO exist with which kids are +

Characteristics and outcomes of neonatal SARS-CoV-2 infection in the UK: a prospective national cohort study using active surveillance

Chris Gale, Maria A Quigley, Anna Placzek, Marian Knight, Shamez Ladhani, Elizabeth S Draper, Don Sharkey, Cora Doherty, Helen Mactier, Jennifer J Kurinczuk

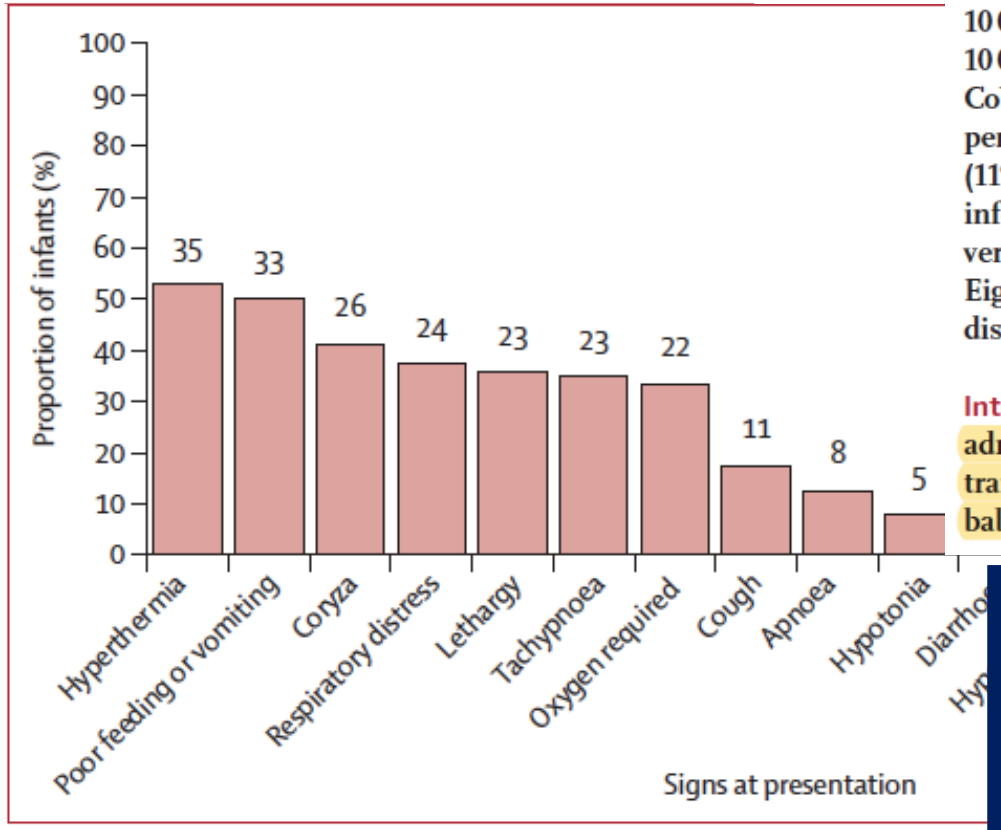


Figure 3: **Clinical signs at presentation (n=66)**
The number of patients in each category is shown above each bar. Percentage
Missing data: n=1 for apnoea, hypoglycaemia, rash, seizures, and none; n=2 f
and respiratory distress; and n=3 for coryza, cough, and hypotonia.

Findings We identified 66 babies with confirmed SARS-CoV-2 infection (incidence 5·6 [95% CI 4·3–7·1] per 10 000 livebirths), of whom 28 (42%) had severe neonatal SARS-CoV-2 infection (incidence 2·4 [1·6–3·4] per 10 000 livebirths). 16 (24%) of these babies were born preterm. 36 (55%) babies were from white ethnic groups (SARS-CoV-2 infection incidence 4·6 [3·2–6·4] per 10 000 livebirths), 14 (21%) were from Asian ethnic groups (15·2 [8·3–25·5] per 10 000 livebirths), eight (12%) were from Black ethnic groups (18·0 [7·8–35·5] per 10 000 livebirths), and seven (11%) were from mixed or other ethnic groups (5·6 [2·2–11·5] per 10 000 livebirths). 17 (26%) babies with confirmed infection were born to mothers with known perinatal SARS-CoV-2 infection, two (3%) were considered to have possible vertically acquired infection (SARS-CoV-2-positive sample within 12 h of birth where the mother was also positive). Eight (12%) babies had suspected nosocomially acquired infection. As of July 28, 2020, 58 (88%) babies had been discharged home, seven (11%) were still admitted, and one (2%) had died of a cause unrelated to SARS-CoV-2 infection.

Interpretation Neonatal SARS-CoV-2 infection is uncommon in babies admitted to hospital. Infection with neonatal admission following birth to a mother with perinatal SARS-CoV-2 infection was unlikely, and possible vertical transmission rare, supporting international guidance to avoid separation of mother and baby. The high proportion of babies from Black, Asian, or minority ethnic groups requires investigation.

Early UK Neonatal Registry
N=66 (positive cases)

Maternal – neonatal spread “uncommon”
“High proportion of Black/Asian/minority ethnic groups requires investigation”

Research paper

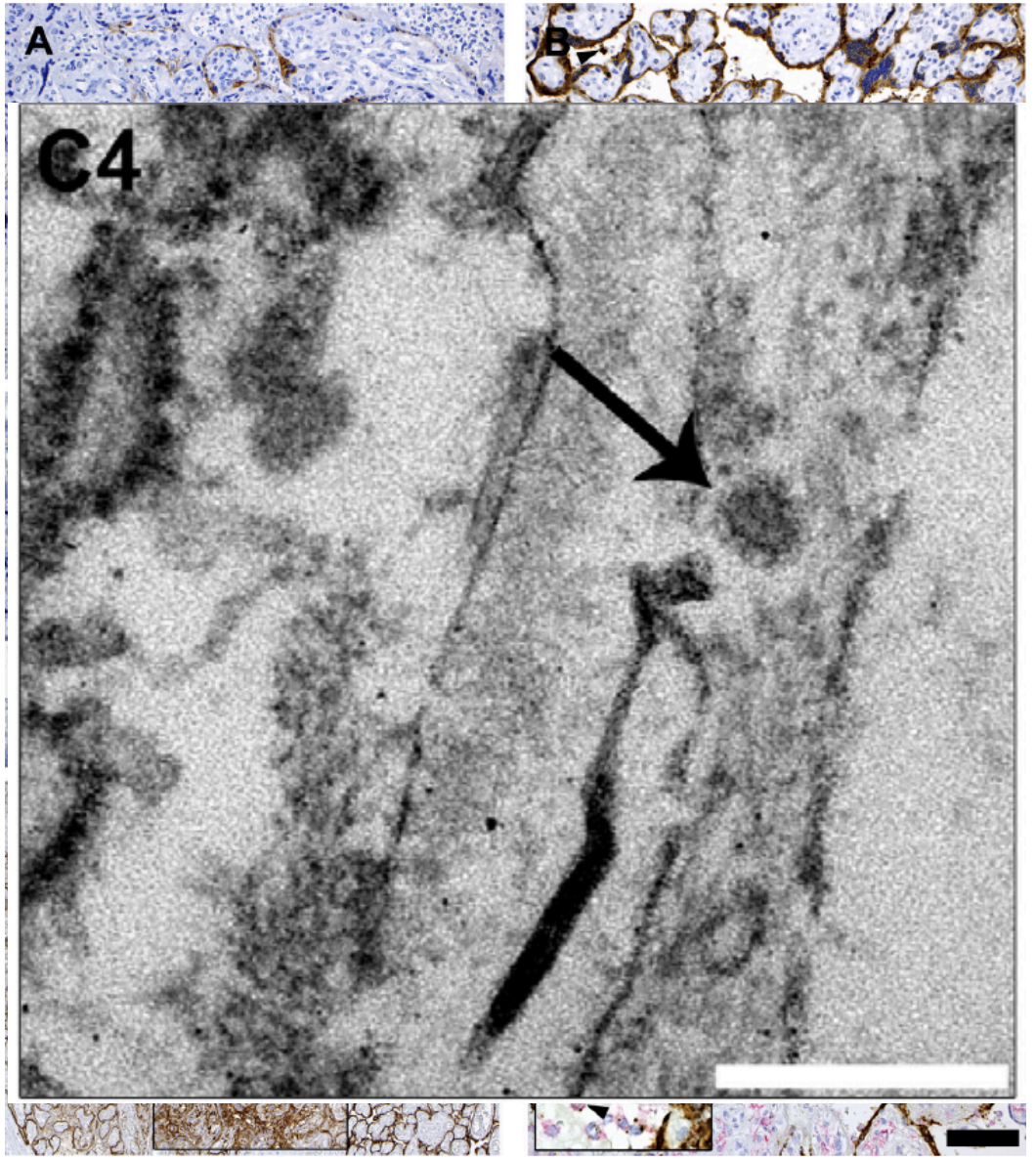
SARS-CoV2 vertical transmission with adverse effects on the newborn revealed through integrated immunohistochemical, electron microscopy and molecular analyses of Placenta

Fabio Facchetti[a,*,#], Mattia Bugatti[a,#], Emma Drera[a], Claudio Tripodo[b], Enrico Sartori[c], Valeria Cancila[b], Marta Papaccio[c], Roberta Castellani[c], Stefano Casola[d], Maria Beatrice Boniotti[e], Patrizia Cavadini[e], Antonio Lavazza[e,#]

[a] Pathology Unit, Department of Molecular and Translational Medicine, University of Brescia, 25123, Brescia, Italy
[b] Tumor Immunology Unit, Department of Health Sciences, University of Palermo School of Medicine, 90134, Palermo, Italy
[c] Department of Obstetrics and Gynaecology, University of Brescia, 25123, Brescia, Italy
[d] The FIRC Institute of Molecular Oncology (IFOM), 20139, Milan, Italy
[e] Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (I.Z.S.L.E.R.), 25124 Brescia, Italy

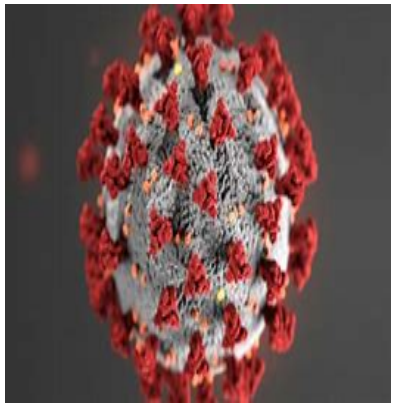
Italian Immunohistochemical study
Post-partum placental analysis

Viral infiltration in the placental endothelium



Pensa.
will the kids be alright? - a prospectus

- Adults are Not Kids: The Unique Pathology of Pediatric SARS-CoV2
- Time Equals Data: The Trajectory of the Epidemiology
- Kids Are Often Not Alright: Organ Damage in SARS-CoV2
- The Pediatric COVID-19: Multi-inflammatory Syndrome in Children
- Stop the Blame! : Asymptomatic Carrier and Transmission
- The Future: The choir needs to preach



JAMA Pediatrics | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Characteristics and Outcomes of Children With Coronavirus Disease 2019 (COVID-19) Infection Admitted to US and Canadian Pediatric Intensive Care Units

Lara S. Shekerdemian, MD, MHA; Nabihah R. Mahmood, MD; Katie K. Wolfe, MD; Becky J. Riggs, MD; Catherine E. Ross, MD; Christine A. McKiernan, MD; Sabrina M. Heidemann, MD; Lawrence C. Kleinman, MD, MPH; Anita I. Sen, MD; Mark W. Hall, MD; Margaret A. Priestley, MD; John K. McGuire, MD; Konstantinos Boukas, MD; Matthew P. Sharron, MD; Jeffrey P. Burns, MD, MPH; for the International COVID-19 PICU Collaborative

RESULTS Of the 48 children with COVID-19 admitted to participating PICUs, 25 (52%) were male, and the median (range) age was 13 (4.2-16.6) years. Forty patients (83%) had significant preexisting comorbidities; 35 (73%) presented with respiratory symptoms and 18 (38%) required invasive ventilation. Eleven patients (23%) had failure of 2 or more organ systems. Extracorporeal membrane oxygenation was required for 1 patient (2%). Targeted therapies were used in 28 patients (61%), with hydroxychloroquine being the most commonly used agent either alone (11 patients) or in combination (10 patients). At the completion of the follow-up period, 2 patients (4%) had died and 15 (31%) were still hospitalized, with 3 still requiring ventilatory support and 1 receiving extracorporeal membrane oxygenation. The median (range) PICU and hospital lengths of stay for those who had been discharged were 5 (3-9) days and 7 (4-13) days, respectively.

JAMA 2020

Pediatric Critical Care and COVID-19

Sebastián González-Dambrauskas, MD,[a,b] Pablo Vásquez-Hoyos, MD, MSc,[a,c,d] Anna Camporesi, MD,[e] Franco Díaz-Rubio, MD,[f] Byron Enrique Piñeres-Olave, MD,[g] Jaime Fernández-Sarmiento, MD,[h] Shira Gertz, MD, FAAP,[i] Ilana Harwayne-Gidansky, MD, FAAP, CHSE,[j] Pietro Pietroboni, MD,[k] Steven L. Shein, MD,[l] Javier Urbano, MD, PhD,[m] Adriana Wegner, MD,[n] Eliana Zemanate, MD,[o] Todd Karsies, MD, MPH,[p] CRITICAL CORONAVIRUS AND KIDS EPIDEMIOLOGY CAKE STUDY

TABLE 1 Demographics, Presenting Symptoms, and Selected Laboratory Findings

Characteristic	Result
Days of symptoms preadmission, median (IQR)	3.5 (2–5.8)
	3.5 (2–6.8)
	5 (29)
	1 (6)
	2 (12)
	2 (12)
	2 (12)
	8 (47)
	13 (76)
	9 (53)
	6 (35)
	6 (35)
	6 (35)
	5 (29)
	9 (53)
	7 (41)
	6 (35)
	13 (76)
	12 (71)
	8 (47)
Elevated D-dimer	9 (53)
Ferritin >200 ng/mL	7 (41)
Troponin I >1 ng/mL	4 (25)

TABLE 2 ICU Therapies and Medications

Treatment	
Respiratory support[a]	
None	
HFNC	
NIV	
IMV	
Vasoactive infusion	
Respiratory adjuncts[b]	
Medications	
Antibiotics	
Remdesivir	
Lopinavir and/or ritonavir	
Corticosteroids	
Tocilizumab	
Hydroxychloroquine	
Diagnosis and/or complication	
Pneumonia	
ARDS[c]	
Myocarditis	
Cardiac arrest	
AKI	
Outcome	
Died	
MV duration, d, median (IQR)	
ICU LOS, d, median (IQR)	
Hospital LOS, d, median (IQR)	13 (6.8–15)

Multinational
"CAKE" Study

ICU Related Features and Support of Pediatric COVID
Looks like septic shock

Factors Associated With Severe SARS-CoV-2 Infection

Naïm Ouldali, MD, PhD,[a,b,c,d] David Dawei Yang, MD,[e] Fouad Madhi, MD,[d,f] Michael Levy, MD, PhD,[g] Jean Gaschignard, MD,PhD,[a] Irina Craiu, MD,[h] Tamazoust Guiddir, MD,[h] Cyril Schweitzer, MD, PhD,[i] Arnaud Wiedemann, MD, PhD,[i] Mathie Lorrot, MD, PhD,[j] Anne-Sophie Romain, MD,[j] Aurélie Garraffo, MD,[k] Hervé Haas, MD,[l] Sébastien Rouget, MD,[m] Loïc de Pontual, MD, Camille Aupiais, MD, PhD,[n,o] Alain Martinot, MD, PhD,[p] Julie Toubiana, MD, PhD,[q] Laurent Dupic, MD,[r] Philippe Mi Manon Passard, MD,[t] Alexandre Belot, MD, PhD,[u] Corinne Levy, MD,[b,d] Stephane Béchet, MSc,[b] Camille Jung, MD,[v] Mayssa Sarakbi, MD,[w] Sarah Ducrocq, MD,[x] Nevena Danekova, MD,[y] Imen Jhaouat, MD,[z] Olivier Vignaud, MD,[aa] Nathalie Garrec, MD,[bb] Elisabeth Caron, MD,[cc] Robert Cohen, MD,[b,d,dd] Vincent Gajdos, MD, PhD,[ee,ff] François Angoulvant, MD, PhD,[d,e,o] on behalf of the investigator group of the PANDOR study

French “PANDOR” Study
N=250

Older age, obesity, co-morbid conditions → PICU and Severe COVID

TABLE 3 Factors Associated With Severe Form of SARS-CoV-2 Infection

	Severe Forms (n = 23)	Nonsevere Form (n = 283)	Univariate Analysis		Multivariate Analysis	
	n/N (%)	n/N (%)	OR (95% CI)	P	OR (95% CI)	P
Age >10 y	12/23 (52)	56/283 (20)	4.4 (1.9–10.8)	<.0001	3.4 (1.1–10.3)	.034
Male sex	10/23 (43)	165/281 (59)	0.5 (0.2–1.3)	.16	—	—
Comorbidities	15/23 (65)	72/283 (25)	5.5 (2.3–14.2)	<.0001	2.9 (0.9–9.9)	.075[a]
Asthma	2/23 (9)	18/283 (6)	1.4 (0.2–5.3)	.68	—	—
Other chronic respiratory diseases	2/23 (9)	5/283 (2)	5.3 (0.7–26.3)	.055	—	—
[illegible]nancy	4/23 (17)	13/283 (5)	4.4 (1.1–13.8)	.017	—	—
	0/23 (0)	4/283 (1)	0.0 (NA–10^53)	.99	—	—
	1/23 (4)	6/283 (2)	2.1 (0.1–13.1)	.50	—	—
	1/23 (4)	5/283 (2)	2.5 (0.1–16.6)	.41	—	—
	4/23 (17)	13/283 (5)	4.4 (1.1–13.8)	.017	—	—
	1/21 (5)	18/227 (8)	0.6 (0.0–3.1)	.61	—	—
	18/22 (82)	215/275 (79)	1.3 (0.4–4.5)	.69	—	—
	12/23 (52)	127/278 (46)	1.3 (0.6–3.1)	.55	—	—
	6/23 (26)	136/275 (49)	0.4 (0.1–0.9)	.037	—	—
[illegible]es	12/22 (55)	55/270 (20)	4.7 (1.9–11.7)	.0007	—	—
	8/19 (42)	17/271 (6)	10.9 (3.8–30.7)	.0001	8.9 (2.6–29.7)	.0004
	1/16 (6)	25/160 (16)	0.6 (0.3–1.0)	.064	—	—
	7/22 (32)	79/277 (29)	1.2 (0.4–2.9)	.74	—	—
	4/22 (18)	20/277 (7)	2.9 (0.8–8.6)	.08	—	—
	10/23 (43)	14/227 (6)	11.7 (4.3–31.7)	.0001	6.6 (1.4–27.5)	.012
	5/13 (38)	6/118 (5)	11.7 (2.8–48.0)	.0005	—	—
	12/23 (52)	70/230 (30)	2.3 (1.0–5.6)	.055	—	—
Lymphocytes <1.5 G/L	8/20 (40)	39/212 (18)	3.0 (1.1–7.6)	.027	—	—
Neutrophils >10 G/L	7/20 (35)	15/212 (7)	7.1 (2.4–20.2)	.0003	—	—
Platelets <150 G/L	8/21 (38)	11/216 (5)	11.5 (3.9–33.7)	.0001	—	—

Association with severity was assessed for children with pattern 1 and 2 (n = 335) because outcomes from those with pattern 3 were not related to SARS-CoV-2 infection. Severity was defined as need for either ventilatory or hemodynamic support during hospitalization, or death. Variables significant at P ≤ .20 on univariate analyses were included in the stepwise selection.—, variables not included in the final multivariate model.

[a] Multivariate analysis showed comorbidities due to the clinical relevance of this variable, even if not significant.

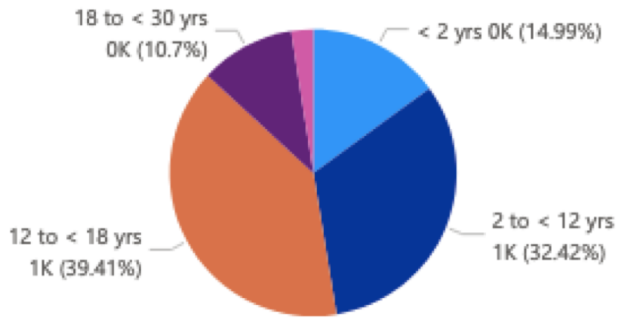
flammatory multisystem syndrome

COVID-19 Data: North American Pediatric ICUs

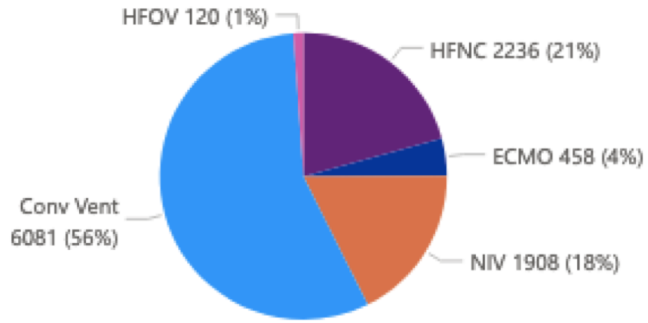
www.myvps.org

3149	95	35K	988	18K	185
COVID-19 Positive	Confirmed Deaths	Tested*	MIS-C Diagnosed	PICU Days	Sites Submitted Data*

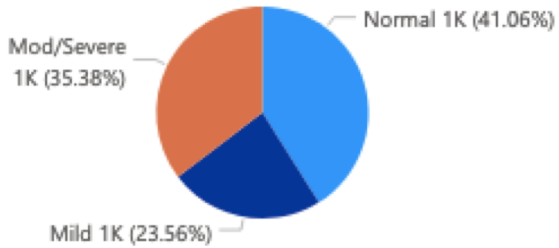
Age Distribution



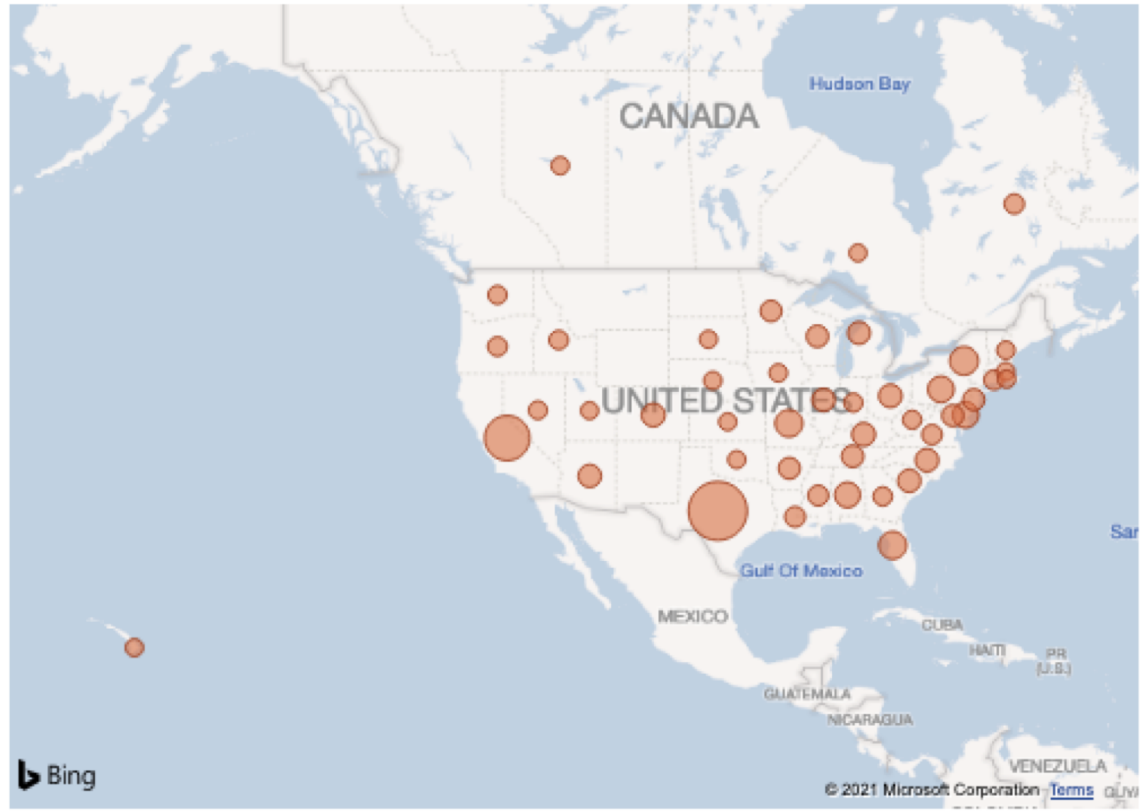
Therapies Used (as Cumulative PICU Days) *



Comorbidity of Patients



COVID-19 Confirmed Patients BY STATE / PROVINCE



Timeline Dashboard

Clinical Summary I Dashboard

Clinical Summary II Dashboard

State

All

3/14/2020 3/10/2021

COVID-19 BY STATE / PROVINCE

State	Positive	Deaths
TX	589	16
CA	393	12
NY	158	6
FL	143	4
MO	141	5
DE	124	5
PA	123	4
Total	**3149**	**95**

North American PICUs can submit data for this dashboard by contacting covid@myvps.org. Data submission is voluntary. Do not submit PHI; no PHI will be displayed on the dashboard. Please refer to the FAQ section for supportive details behind each component including update frequency. The dashboard and data are for information purposes only, not suitable for research publication. The veracity of the data has not been confirmed by VPS.

Last Updated
(UTC Timezone)
3/11/2021 11:51:55 PM

*FAQ

Severe COVID-19 Infection and Pediatric Comorbidities: A Systematic Review and Meta-Analysis

Boyan K. Tsankov[a,b,d,e], Joannie M. Allaire[a,b,d], Michael A. Irvine[d], Alison A. Lopez[a,c,d], Laura J. Sauvé[a,c,d], Bruce A. Vallance[a,b,d], Kevan Jacobson[a,b,d,f,*]

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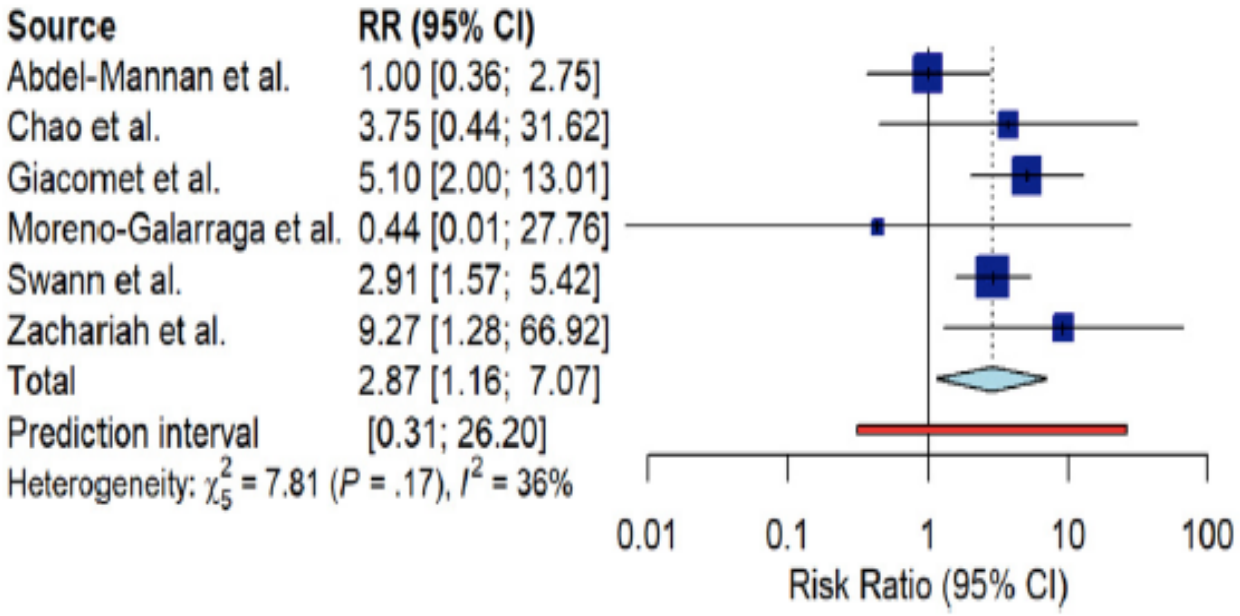
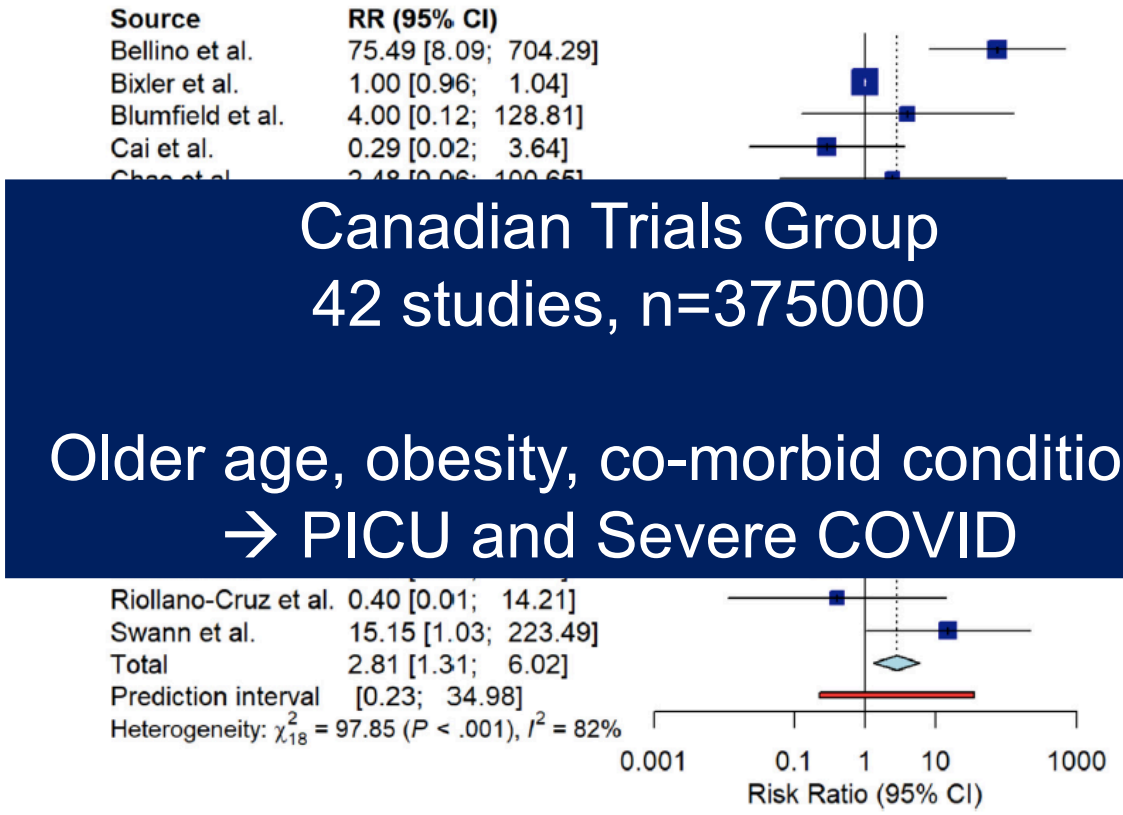




Canadian Trials Group
42 studies, n=375000

Older age, obesity, co-morbid conditions
→ PICU and Severe COVID

Fig. 4. Pooled estimate of the relative risk of COVID-19-associated mortality among pediatric patients with comorbidities.

Clinical Manifestations and Outcomes of Critically Ill Children and Adolescents with Coronavirus Disease 2019 in New York City

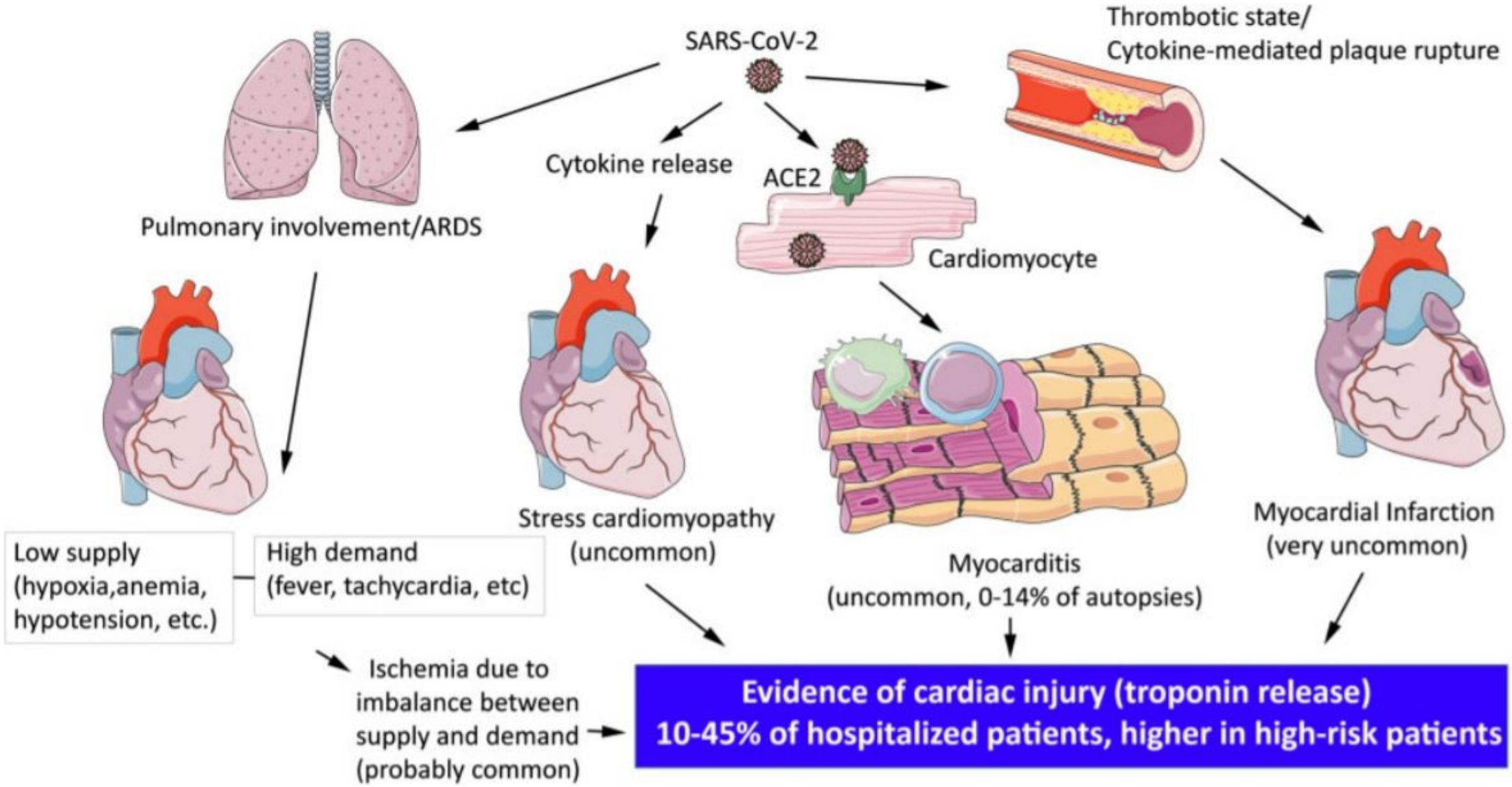
Kim R. Derespina, MD[1,*], Shubhi Kaushik, MBBS[2,*], Anna Plichta, MD[1], Edward E. Conway, Jr., MD, MS[3], Asher Bercow, MD[3], Jaeun Choi, PhD[4], Ruth Eisenberg, MS[4], Jennifer Gillen, MD[2], Anita I. Sen, MD[5], Claire M. Hennigan, MD[6], Lillian M. Zerihun, BS[7], Sule Doymaz, MD[8], Michael A. Keenaghan, MD[9,10], Stephanie Jarrin, MD[9,11], Franscene Oulds, MD[12], Manoj Gupta, MBBS[12,13], Louisdon Pierre, MD[14], Melissa Grageda, MD[15], H. Michael Ushay, MD, PhD[1], Vinay M. Nadkarni, MD[16], Michael S. D. Agus, MD[17], and Shivanand S. Medar, MD[1,13,*]

Conclusions Critically ill children with COVID-19 predominantly are adolescents, have comorbidities, and require some form of respiratory support. The presence of ARDS is significantly associated with prolonged PICU and hospital stay. *(J Pediatr 2020;226:55-63)*.

Table IV. Multivariable Cox proportional hazards model of outcome: time to PICU discharge (N = 70)

Variables	AHR (95% CI)	*P* value
ARDS (reference = no)	0.08 (0.03-0.21)	<.0001
Black/Latino (reference = white)	1.78 (0.71-4.48)	.2210
Other race (reference = white)	0.91 (0.33-2.51)	.8539
Any comorbidity (reference = no)	1.29 (0.68-2.45)	.4377

Cardiac Injury with SARS-CoV-2 / COVID-19



Slide Courtesy of S. Basu

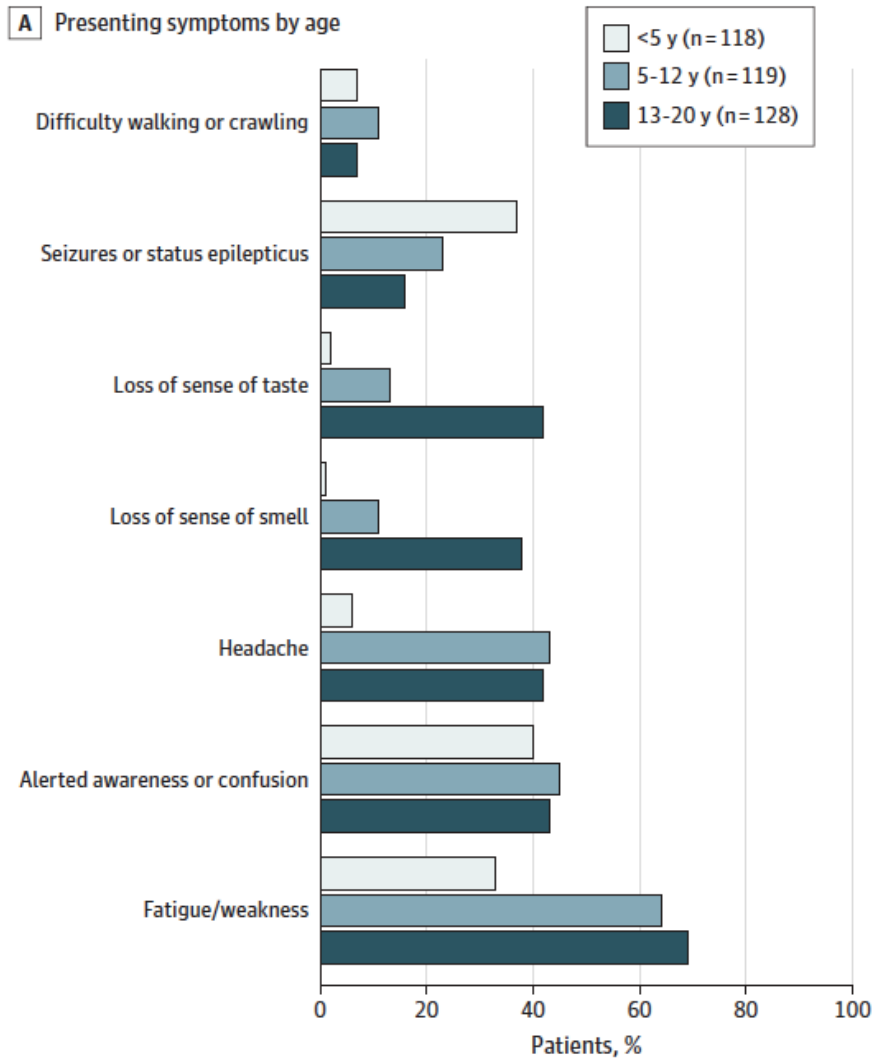
JAMA Neurology | Original Investigation

Neurologic Involvement in Children and Adolescents Hospitalized in the United States for COVID-19 or Multisystem Inflammatory Syndrome

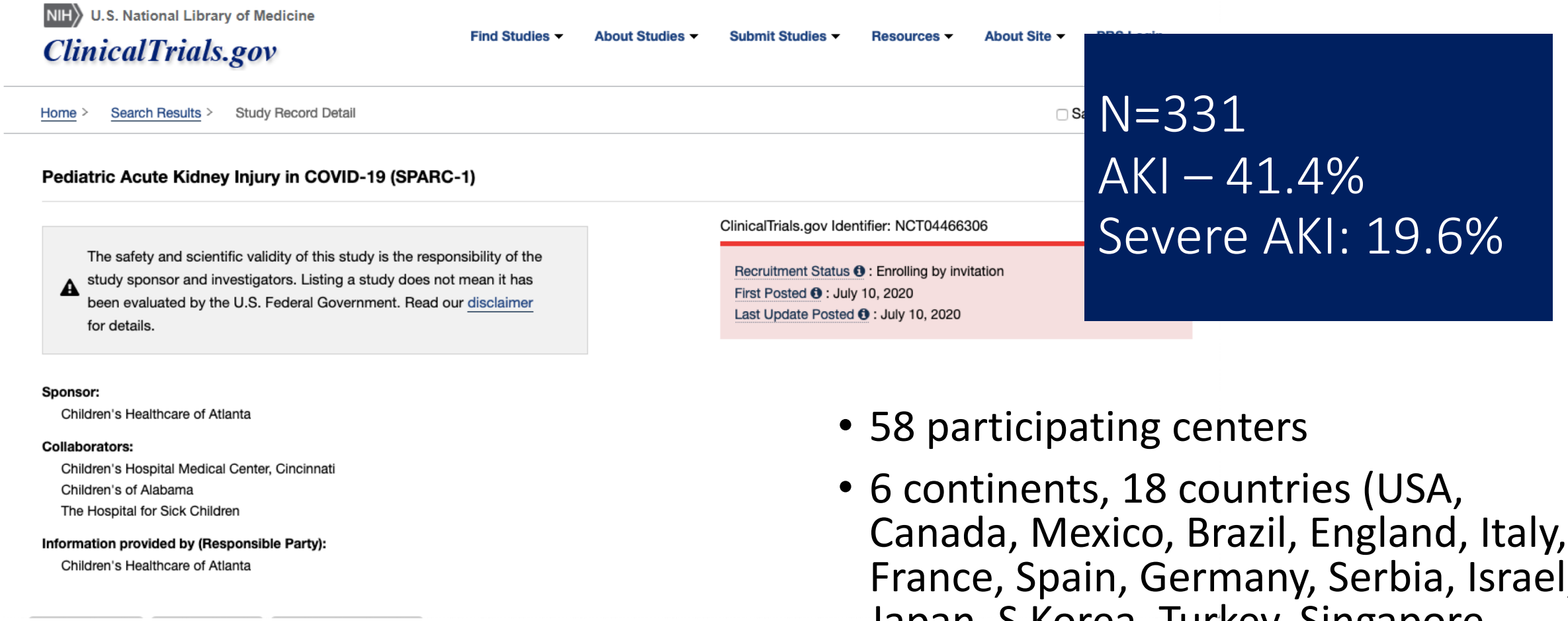
Kerri L. LaRovere, MD; Becky J. Riggs, MD; Tina Y. Poussaint, MD; Cameron C. Young; Margaret M. Newhams, MPH; Mia Maamari, MD; Tracie C. Walker, MD; Aalok R. Singh, MD; Heda Dapul, MD; Charlotte V. Hobbs, MD; Gwenn E. McLaughlin, MD; Mary Beth F. Son, MD; Aline B. Maddux, MD; Katharine N. Clouser, MD; Courtney M. Rowan, MD; John K. McGuire, MD; Julie C. Fitzgerald, MD, PhD; Shira J. Gertz, MD; Steven L. Shein, MD; Alvaro Coronado Munoz, MD; Neal J. Thomas, MD; Katherine Irby, MD; Emily R. Levy, MD; Mary A. Staat, MD; Mark W. Tenforde, MD, PhD; Leora R. Feldstein, PhD; Natasha B. Halasa, MD, MPH; John S. Giuliano Jr, MD; Mark W. Hall, MD; Michele Kong, MD; Christopher L. Carroll, MD; Jennifer E. Schuster, MD; Sule Doymaz, MD; Laura L. Loftis, MD; Keiko M. Tarquinio, MD; Christopher J. Babbitt, MD; Ryan A. Nofziger, MD; Lawrence C. Kleinman, MD, MPH; Michael A. Keenaghan, MD; Natalie Z. Cvijanovich, MD; Philip C. Spinella, MD; Janet R. Hume, MD, PhD; Kari Wellnitz, MD; Elizabeth H. Mack, MD; Kelly N. Michelson, MD; Heidi R. Flori, MD; Manish M. Patel, MD; Adrienne G. Randolph, MD; for the Overcoming COVID-19 Investigators

Table 1. Characteristics and Outcomes of 1695 Patients (Age <21 Years) Hospitalized for COVID-19–Related Illness by Reported Neurologic Involvement (continued)

Clinical characteristics	No. (%)			P value
		Neurological involvement		
	All patients (N = 1695)	Yes (n = 365)	No (n = 1330)	
Outcomes				
ICU	836 (49)	227 (62)	609 (46)	<.001
ECMO	32 (2)	16 (4)	18 (1)	<.001
Mechanical ventilation	225 (13)	103 (28)	122 (9)	<.001
Length of stay, median (IQR), d				
ICU	4 (2-7)	4 (2-9)	4 (2-6)	.02
Hospital	5 (2-9)	5 (2-11)	5 (2-8)	.004
Died	22 (1)	14 (4)	8 (1)	<.001
Survived, new neurological deficit	22 (1)	20 (5)	2 (0.2)	.02
Discharged to rehabilitation	25 (1)	13 (4)	12 (1)	<.001



SPARC: SARS-CoV2 and Pediatric AKI, Registry-Collaborative



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Pediatric Acute Kidney Injury in COVID-19 (SPARC-1)

The safety and scientific validity of this study is the responsibility of the study sponsor and investigators. Listing a study does not mean it has been evaluated by the U.S. Federal Government. Read our disclaimer for details.

ClinicalTrials.gov Identifier: NCT04466306

Recruitment Status : Enrolling by invitation
First Posted : July 10, 2020
Last Update Posted : July 10, 2020

Sponsor:
Children's Healthcare of Atlanta

Collaborators:
Children's Hospital Medical Center, Cincinnati
Children's of Alabama
The Hospital for Sick Children

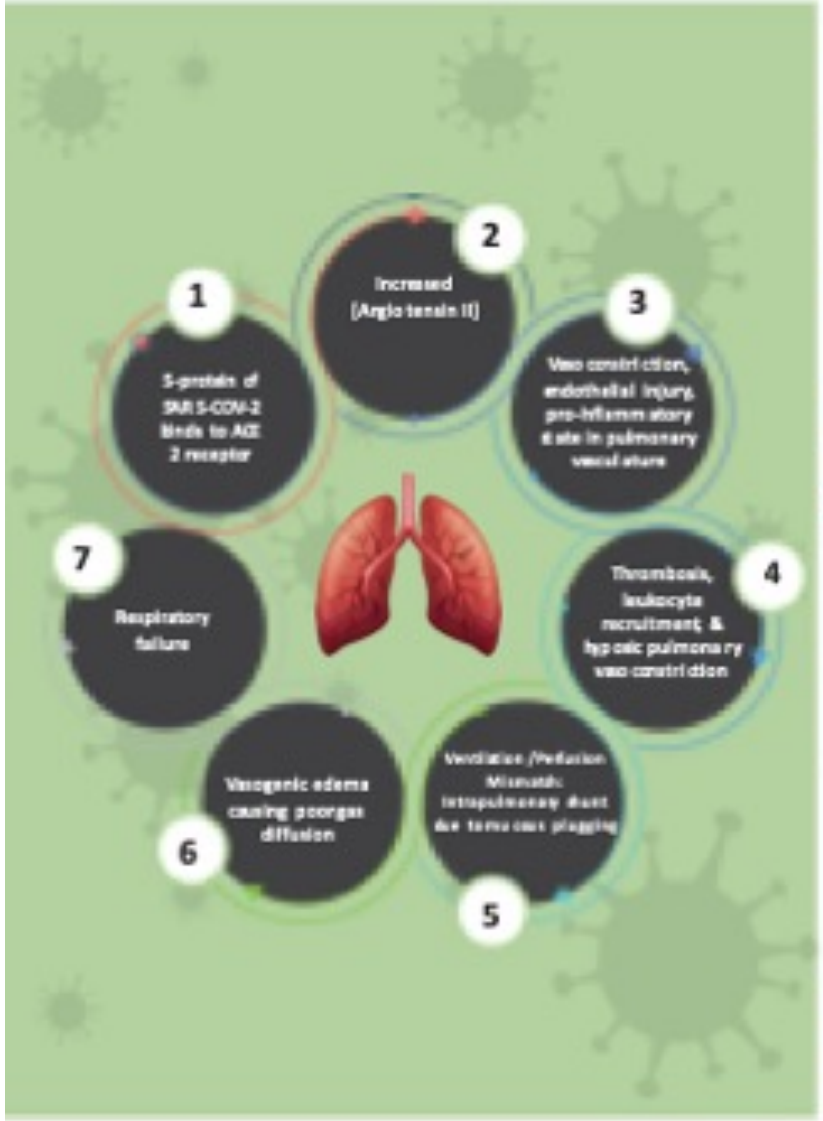
Information provided by (Responsible Party):
Children's Healthcare of Atlanta

N=331
AKI – 41.4%
Severe AKI: 19.6%

- 58 participating centers
- 6 continents, 18 countries (USA, Canada, Mexico, Brazil, England, Italy, France, Spain, Germany, Serbia, Israel, Japan, S Korea, Turkey, Singapore, Taiwan, South Africa, India, Australia)

COVID-19 INFECTION IN PEDIATRICS

COVID PATHOPHYSIOLOGY



COVID ORGAN DYSFUNCTION IN PEDIATRICS

16%-50% may be asymptomatic

Most common symptoms in children: cough and/or fever.

1 in 3 hospitalized with COVID-19 in the US, were admitted to the intensive care unit.

CHILDREN WITH MEDICAL COMPLEXITY (i.e. genetic, neurologic, asthma, sickle cell, immunosuppressed) may be at increased risk for severe illness.

Hospitalization rates are higher in Hispanic and African American populations > White children.

OBESITY
was the most prevalent underlying condition.

SEVERE COVID 19 IN PEDIATRICS

RESPIRATORY FAILURE (MOST COMMON)

44% requiring non-invasive positive pressure.

38% requiring intubation/tracheostomy ventilation (MV) [median duration of MV ~9 days].

Other presentations in PICU setting: vaso-occlusive crises, diabetic ketoacidosis, and circulatory collapse.

MEDICATIONS & MANAGEMENT

Supportive care with particular emphasis on ventilatory, circulatory, and hydrational support.

Important: Respiratory status may change suddenly after one week of symptoms.

DEXAMETHASONE

Dexamethasone may be beneficial in critically ill children (decreased mortality in critically ill adult patients, RECOVERY trial).

Dosing:
PO or IV 0.15 mg/kg (maximum dose 6 mg) daily up to 10 days.

REMDESIVIR

Approved by US Food and Drug Administration for the treatment of children requiring hospitalization for COVID-19 (≥ 12 years age, ≥40 kg); emergency authorization for ≥3.5 kg

MECHANISM:
Inhibits RNA polymerase, decreasing COVID-19 mRNA production.

DOSING:

<40 kg: IV 5 mg/kg/dose x 1 day, IV 2.5 mg/kg/dose q24hr x total of 10 days.	>40 kg: IV 200 mg/dose x 1 day, IV 100 mg/dose q24hr x total of 10 days.

MONITOR:

Hepatic function (hold if LFTs are 5x > upper limit of normal)	Renal function (hold if estimated CrCl Clearance < 30mL [Cockroft-Gault formula])

Empiric antibiotics as indicated for presumed bacterial coinfections.

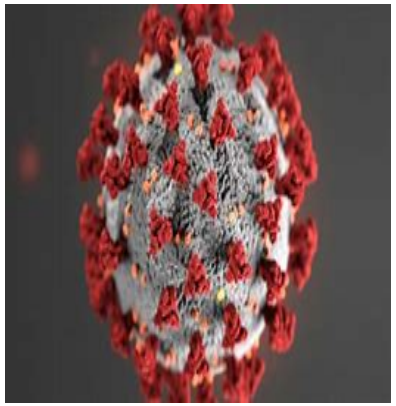
ON THE HORIZON, ADJUNCTIVE THERAPIES:

- Baricitinib (in combination with remdesivir) in patients ≥ 2 years of age requiring oxygen.
- Tocilizumab (IL-6 inhibitor)
- Convalescent plasma
- Vitamin A

Damania et al, Curr Opin Peds 2021

Pensa.
will the kids be alright? - a prospectus

- Adults are Not Kids: The Unique Pathology of Pediatric SARS-CoV2
- Time Equals Data: The Trajectory of the Epidemiology
- Kids Are Often Not Alright: Organ Damage in SARS-CoV2
- The Pediatric COVID-19: Multi-inflammatory Syndrome in Children
- Stop the Blame! : Asymptomatic Carrier and Transmission
- The Future: The choir needs to preach



MULTISYSTEM INFLAMMATORY SYNDROME IN CHILDREN (MIS-C)

MIS-C PATHOPHYSIOLOGY

Pathophysiology not well understood.

Pathophysiology is similar to Kawasaki Disease, Macrophage Activation Syndrome, and Cytokine Release Syndrome.

MIS-C RELATED ORGAN DYSFUNCTION

Median age: 8-11 years old.

>70% of children are previously healthy

Hospitalization rates are higher in Hispanic and African American populations > White children.

Obesity & asthma are the most prevalent underlying condition.

Severe MIS-C in Pediatrics:

Phenotypic overlap with Kawasaki disease differentiated by:

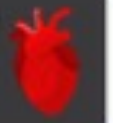
Gastrointestinal symptoms

Myocardial dysfunction

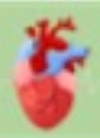
Shock 32-76%

Myocardial dysfunction 51-90%

- LV EF <55%



Arrythmia



Acute respiratory failure 28-52%

Serial laboratory markers and echocardiographic study are crucial

MEDICATIONS AND MANAGEMENT

Epinephrine when there is LV dysfunction with addition of milrinone.

Intravenous immunoglobulin (IVIG) – especially with cardiac dysfunction

- 2 g/kg over 8-12 hrs
- maximum 100 grams

Aspirin (especially if coronary involvement)

Glucocorticoids

Empiric broad-spectrum antibiotics (Ceftriaxone & Vancomycin) for suspected bacterial co-infection.

VTE prophylaxis

Adjunctive therapies:

- IL-1 inhibitors (anakinra)

- IL-6 inhibitors (tocilizumab)

Damania et al, Curr Opin Peds 2021

JAMA | Original Investigation

Characteristics and Outcomes of US Children and Adolescents With Multisystem Inflammatory Syndrome in Children (MIS-C) Compared With Severe Acute COVID-19

Leora R. Feldstein, PhD; Mark W. Tenforde, MD; Kevin G. Friedman, MD; Margaret Newhams, MPH; Erica Billig Rose, PhD; Heda Dapul, MD; Vijaya L. Soma, MD; Aline B. Maddux, MD; Peter M. Mourani, MD; Cindy Bowens, MD; Mia Maamari, MD; Mark W. Hall, MD; Becky J. Riggs, MD; John S. Giuliano Jr, MD; Aalok R. Singh, MD; Simon Li, MD; Michele Kong, MD; Jennifer E. Schuster, MD; Gwenn E. McLaughlin, MD; Stephanie P. Schwartz, MD; Tracie C. Walker, MD; Laura L. Loftis, MD; Charlotte V. Hobbs, MD; Natasha B. Halasa, MD; Sule Doymaz, MD; Christopher J. Babbitt, MD; Janet R. Hume, MD; Shira J. Gertz, MD; Katherine Irby, MD; Katharine N. Clouser, MD; Natalie Z. Cvijanovich, MD; Tamara T. Bradford, MD; Lincoln S. Smith, MD; Sabrina M. Heidemann, MD; Sheemon P. Zackai, MD; Kari Wellnitz, MD; Ryan A. Nofziger, MD; Steven M. Horwitz, MD; Ryan W. Carroll, MD; Courtney M. Rowan, MD; Keiko M. Tarquinio, MD; Elizabeth H. Mack, MD; Julie C. Fitzgerald, MD; Bria M. Coates, MD; Ashley M. Jackson, MPH; Cameron C. Young; Mary Beth F. Son, MD; Manish M. Patel, MD; Jane W. Newburger, MD; Adrienne G. Randolph, MD; for the Overcoming COVID-19 Investigators

Box 1. Centers for Disease Control and Prevention Case-Definition for MIS-C[a]

- Age <21 y
- Fever ≥38.0 °C for ≥24 h or report of subjective fever lasting ≥24 h
- Laboratory evidence of inflammation[b]
- Evidence of clinically severe illness requiring hospitalization with multisystem (≥2) organ involvement (cardiac, kidney, respiratory, hematologic, gastrointestinal, dermatologic, or neurological)
- No alternative plausible diagnoses
- Positive for current or recent SARS-CoV-2 infection by RT-PCR, antibody, or antigen test; or exposure to a suspected or confirmed COVID-19 case within the 4 wk prior to the onset of symptoms[c]

Abbreviations: COVID-19, coronavirus disease 2019; MIS-C, multisystem inflammatory syndrome in children; RT-PCR, reverse transcriptase–polymerase chain reaction; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

Key Points

Question How do the characteristics and outcomes of children and adolescents with multisystem inflammatory syndrome in children (MIS-C) compare with severe coronavirus disease 2019 (COVID-19)?

Findings In this case series that included 539 patients with MIS-C and 577 [illegible] more li[illegible] old, be[illegible] mucoc[illegible]

Meani[illegible] presen[illegible] patient[illegible]

Box 2. Case-Definition for Severe Acute COVID-19[a,b]

- Admitted to the hospital with symptoms suspected to be related to COVID-19
- Evidence of infection with SARS-CoV-2 based on a positive RT-PCR test result during current illness
- Severe organ system involvement including at least 1 of the following:

Respiratory
- Receipt of mechanical ventilation or any type of supplemental oxygen (or increased support for patients receiving respiratory support at baseline)
- Severe bronchospasm requiring continuous bronchodilators
- Pulmonary infiltrates on chest radiograph
- Lower respiratory infection

Gastrointestinal
- Appendicitis
- Pancreatitis
- Hepatitis or hepatomegaly
- Gallbladder hydrops or edema
- Other complications as determined by site clinicians ileitis, colitis, or mesenteric adenitis

Hematologic
- Absolute lymphocyte count <1 ×10^3 cells/μL
- Absolute neutrophil count <0.5 ×10^3 cells/μL exclud therapy patients[3]
- Severe anemia[d]

Table 1. Baseline Characteristics of Patients With MIS-C and Severe Acute COVID-19 and Initial Laboratory Values Within 48 Hours of Admission[a,b,c]

Characteristic	Study cohort from the Overcoming COVID-19 registry (N = 1116)	
	MIS-C (n = 539)	Severe acute COVID-19 (n = 577)
Age, median (IQR), y	8.9 (4.7-13.2)	11.7 (1.2-16.6)
Sex, No. (%)		
Male	312 (57.7)	307 (53.2)
Female	227 (42.1)	270 (47.8)
Race/ethnicity, No. (%)[d]		
No.	421	529
White, non-Hispanic (n = 174)	66 (13.3)	108 (19.0)
Black, non-Hispanic (n = 310)	181 (34.7)	129 (22.7)
Hispanic or Latino (n = 455)	193 (35.9)	262 (45.5)
Other, non-Hispanic (n = 67)	27 (5.5)	40 (7.1)
Underlying medical conditions, No. (%)		
At least 1 underlying condition[e]	167 (30.9)	358 (62.1)
Obesity[f]	176 (36.2)	176 (41.8)
Respiratory	72 (13.4)	151 (26.2)
Other[g]	52 (9.6)	223 (38.6)
Neurological/neuromuscular	30 (5.6)	104 (18.0)
Cardiovascular	17 (3.2)	57 (9.8)

Table 2. Clinical Course of Patients With MIS-C and Severe Acute COVID-19[a,b]

Characteristic	Study cohort from the Overcoming COVID-19 registry (n = 1116) No. (%) MIS-C (n = 539 [48%])	Severe acute COVID-19 (n = 577 [52%])	Difference (95% CI)[c]
Treatments			
Intravenous immunoglobulin	415 (77.0)	24 (4.2)	72.8 (68.9 to 76.7)
Systemic steroids	374 (69.4)	141 (24.4)	45.0 (39.7 to 50.2)

Table 2. Clinical Course of Patients With MIS-C and Severe Acute COVID-19[a,b] (continued)

Characteristic	Study cohort from the Overcoming COVID-19 registry (n = 1116) No. (%) MIS-C (n = 539 [48%])	Severe acute COVID-19 (n = 577 [52%])	Difference (95% CI)[c]
Critical care interventions			
Any respiratory support	303 (56.2)	292 (50.6)	5.6 (−0.2 to 11.5)
Noninvasive positive pressure ventilation	192 (35.6)	188 (32.6)	0.7 (−3.2 to 7.3)
Invasive mechanical ventilation	95 (17.6)	84 (14.6)	3.0 (1.2 to 7.4)
Vasopressor use	244 (45.3)	50 (8.7)	36.6 (31.8 to 41.4)
Extracorporeal membrane oxygenation	18 (3.3)	8 (1.4)	1.9 (0.2 to 3.7)
Clinical outcomes			
Length of admission, d (n = 1083)[f]			
No.	523	560	
Median (IQR)	7.0 (5.0 to 11.0)	3.0 (2.0 to 8.0)	
Intensive care unit admission[g]	398 (73.8)	253 (43.8)	30.0 (24.5 to 35.5)
Length of ICU stay, d (n = 639)			
No.	388	251	
Median (IQR)	4.0 (2.0 to 7.0)	4.0 (2.0 to 8.0)	
Died	10 (1.9)	8 (1.4)	0.5 (−2.0 to 1.0)
Gastrointestinal	50 (9.3)	41 (7.1)	2.2 (−5.2 to 1.2)
Severe organ involvement subcategories[d]			
Severe cardiorespiratory involvement	302 (56.0)	51 (8.8)	47.2 (42.4 to 52.0)
Severe respiratory without cardiovascular involvement	130 (24.1)	408 (70.7)	−46.6 (−51.8 to −41.4)
Severe cardiovascular without respiratory involvement	57 (10.6)	17 (2.9)	7.7 (4.7 to 10.6)
Mucocutaneous without severe cardiorespiratory involvement	38 (7.1)	13 (2.3)	4.8 (2.3 to 7.3)
Hematologic, neurologic, or gastrointestinal severe involvement only	12 (2.2)	88 (15.3)	−13.1 (−16.2 to −9.8)

Figure 2. Multivariable Analyses of MIS-C vs COVID-19

B Comparison of clinical phenotypes and laboratory values[a]

	No./total No. (%)				
	MIS-C (n = 539)	Severe acute COVID-19 (n = 577)	Absolute risk difference, % (95% CI)[b]	Adjusted risk ratio (95% CI)[c]	*P* value
Clinical group by complication					
Respiratory without cardiovascular	130/539 (24.1)	408/577 (70.7)	-46.6 (-51.8 to -41.4)	1 [Reference]	
Cardiorespiratory	302/539 (56.0)	51/577 (8.8)	47.2 (42.4 to 52.0)	2.99 (2.55 to 3.50)	<.001
Cardiovascular without respiratory	57/539 (10.6)	17/577 (2.9)	7.7 (4.7 to 10.6)	2.49 (2.05 to 3.02)	<.001
Mucocutaneous without respiratory or cardiovascular	38/539 (7.1)	13/577 (2.3)	4.8 (2.3 to 7.3)	2.29 (1.84 to 2.85)	<.001
Other without respiratory, cardiovascular, or mucocutaneous	12/539 (2.2)	88/577 (15.3)	-13.1 (-16.2 to -9.8)	0.43 (0.25 to 0.74)	.002
Laboratory value within first 48 h					
Neutrophil to lymphocyte ratio >5	321/515 (62.3)	154/464 (33.2)	29.1 (23.2 to 35.1)	1.59 (1.40 to 1.80)	<.001
Platelets <150 × 10^3/μL	212/523 (40.5)	84/486 (17.3)	23.2 (17.9 to 28.6)	1.58 (1.43 to 1.75)	<.001
C-reactive protein level >100 mg/L	325/491 (66.2)	67/285 (23.5)	42.7 (36.2 to 49.1)	1.70 (1.51 to 1.92)	<.001

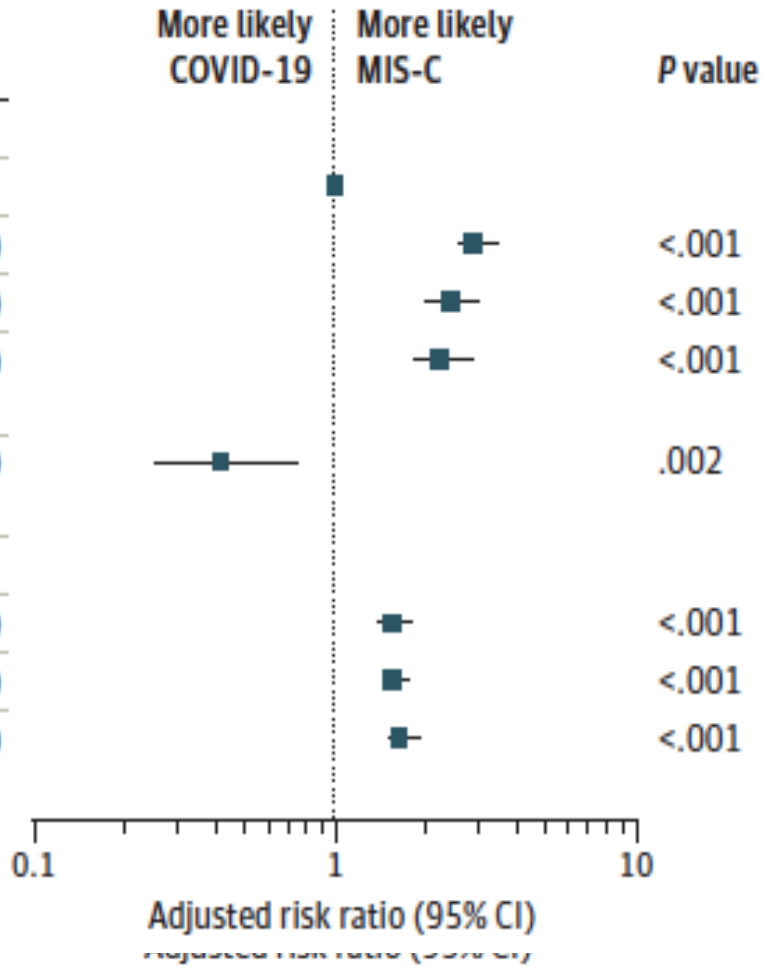
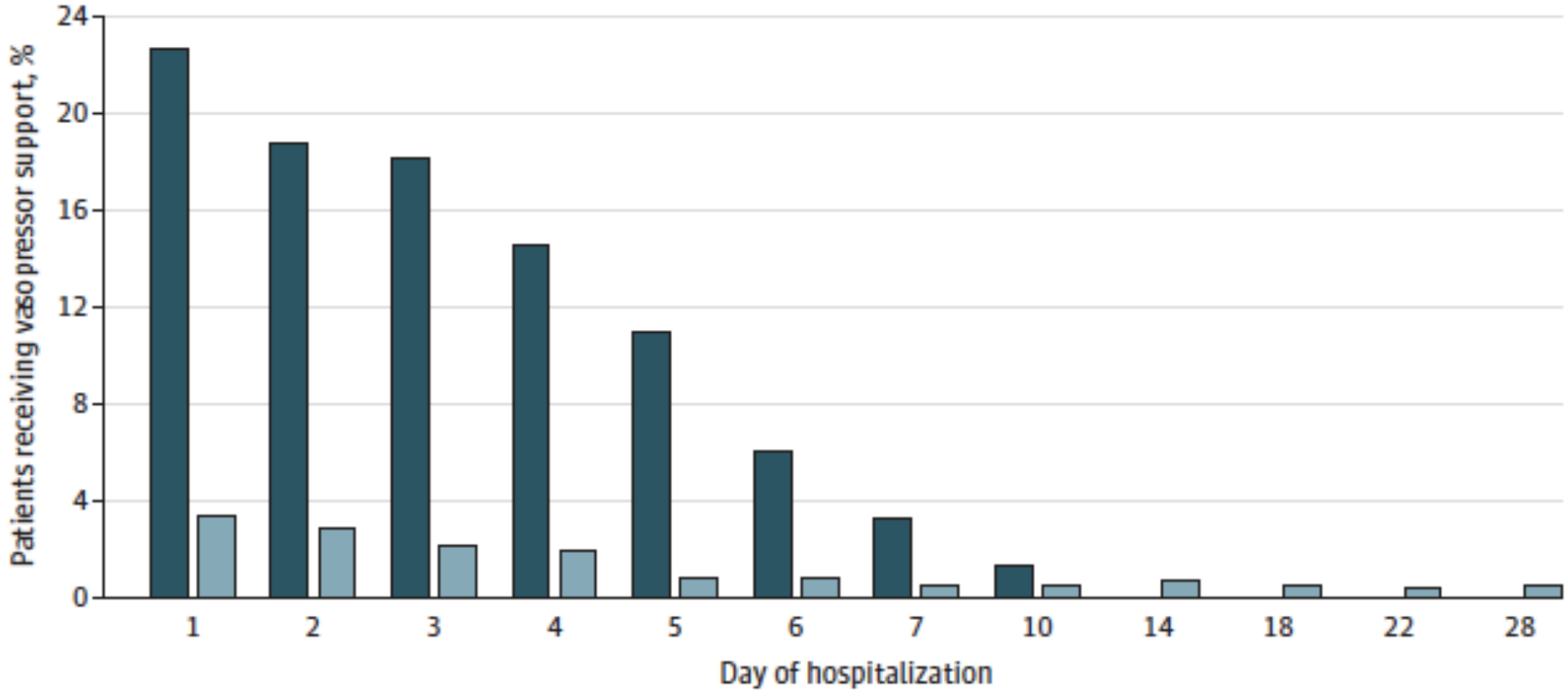


Figure 3. Clinical Outcomes by Day of Hospitalization for Patients With MIS-C and Severe COVID-19

B Vasopressor support and death



Hospitalized patients												
MIS-C	528	509	494	436	399	345	285	146	83	48	37	24
Severe COVID-19	565	430	322	279	239	205	174	119	75	52	45	37
Receiving vasopressors												
MIS-C	120	99	96	77	58	32	17	7	0	0	0	0
Severe COVID-19	19	16	12	11	5	5	3	3	4	3	2	3
Cumulative deaths												
MIS-C	0	1	2	3	4	5	5	6	7	8	8	8
Severe COVID-19	0	3	3	3	3	3	3	4	4	4	4	4

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- Adults are Not Kids: The Unique Pathology of Pediatric SARS-CoV2
- Time Equals Data: The Trajectory of the Epidemiology
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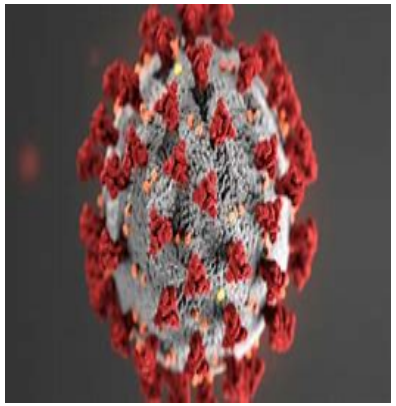

EDITORIAL

Symptomatic and Asymptomatic Viral Shedding in Pediatric Patients Infected With Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Under the Surface

Roberta L. DeBiasi, MD, MS; Meghan Delaney, DO, MPH

Despite the value of the study by Han et al,[13] there are limitations that leave important remaining knowledge gaps that are ripe for investigation. The first limitation is due to qualitative molecular detection methods, which are the standard clinical approach for testing of nasopharyngeal swab specimens. Qualitative positive or negative findings for molecular detection of virus may not necessarily correlate with infectivity. Sensitive molecular detection methods may detect viable, infective virus but also nonviable or fragments of RNA with no capability for transmission. Additionally, even if vi-

The authors' inclusion of asymptomatic patients in the study and has rarely been addressed in the erestingly, this study aligns with adult of adults may remain asymptomatic [14] The true burden of unrecognized

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[7%]) were
nt with on-
pt that in-
either with
or without symptoms and continue on with their usual activities, which may contribute to viral circulation within their community.

LETTER

OPEN ACCESS

Dynamic surveillance of SARS-CoV-2 shedding and neutralizing antibody in children with COVID-19

Pengcheng Liu [a*], Jiehao Cai [b*], Ran Jia [a*], Shuai Xia [c], Xiangshi Wang [b], Lingfeng Cao [a], Mei Zeng [b] and Jin Xu [a]

[a]Department of Clinical Laboratory, Children's Hospital of Fudan University, Shanghai, People's Republic of China; [b]Department of Infectious Diseases, Children's Hospital of Fudan University, Shanghai, People's Republic of China; [c]Key Laboratory of Medical Molecular Virology (MOE/NHC/CAMS), School of Basic Medical Sciences, Fudan University, Shanghai, People's Republic of China

ABSTRACT

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged in China and quickly spread globally. In this study, we investigated the characteristics of viral shedding from different sites and the neutralizing antibody (NAb) response during the acute and convalescent phases of nine children with COVID-19. SARS-CoV-2 was detected in their nasopharyngeal swabs (9/9, 100%), stool samples (8/9, 89%), and oropharyngeal swabs (3/9, 33%) but was not detected in their serum and urine samples. The median duration of viral shedding detected in nasopharyngeal swabs, oropharyngeal swabs, and stools was 13, 4, and 43 days respectively, and the maximum duration of viral shedding detected from stools was 46 days after discharge. In children, nasopharyngeal swabs appear to be a more sensitive specimen type for the diagnosis of COVID-19 compared with oropharyngeal swabs. Three of eight patients produced NAbs in the acute phase, and NAbs were detected in all eight patients with convalescent sera. The results of this study provide valuable information for the diagnosis and surveillance of COVID-19 and development of SARS-CoV-2 vaccines for use in children.

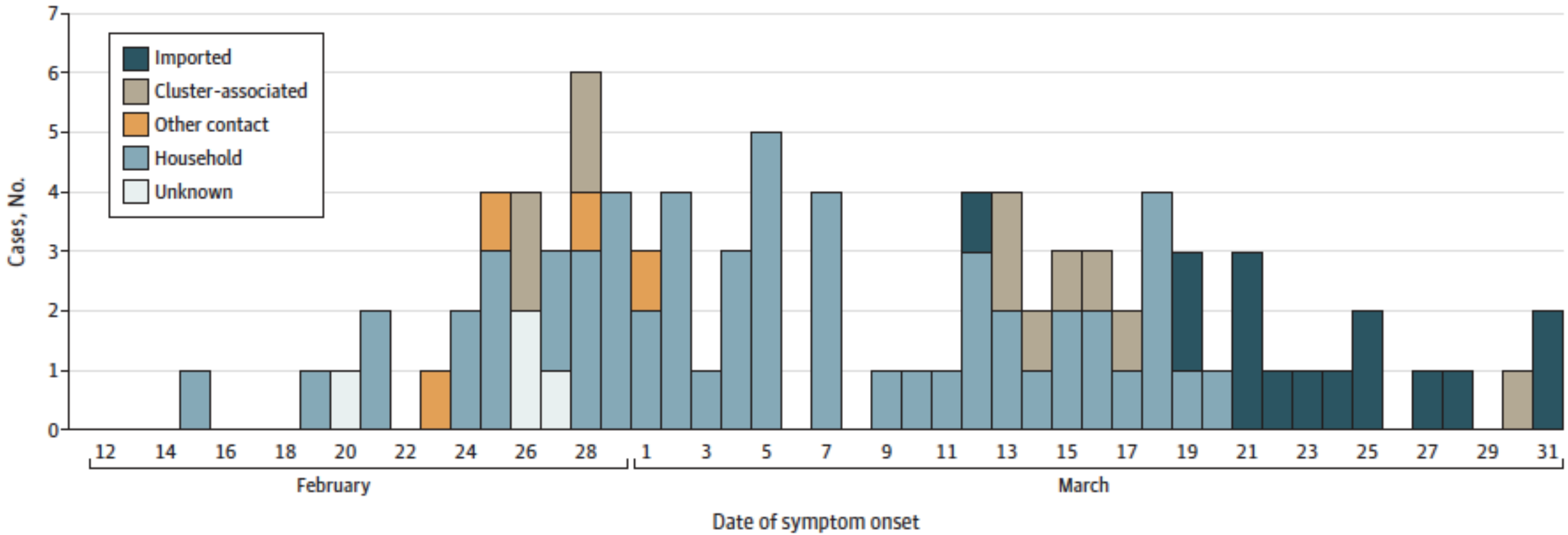
JAMA Pediatrics | Original Investigation

Clinical Characteristics and Viral RNA Detection in Children With Coronavirus Disease 2019 in the Republic of Korea

Mi Seon Han, MD, PhD; Eun Hwa Choi, MD, PhD; Sung Hee Chang, MD; Byoung-Lo Jin, MD; Eun Joo Lee, MD; Baek Nam Kim, MD; Min Kyoung Kim, MD; Kihyun Doo, MD; Ju Hee Seo, MD, PhD; Yae-Jean Kim, MD, PhD;

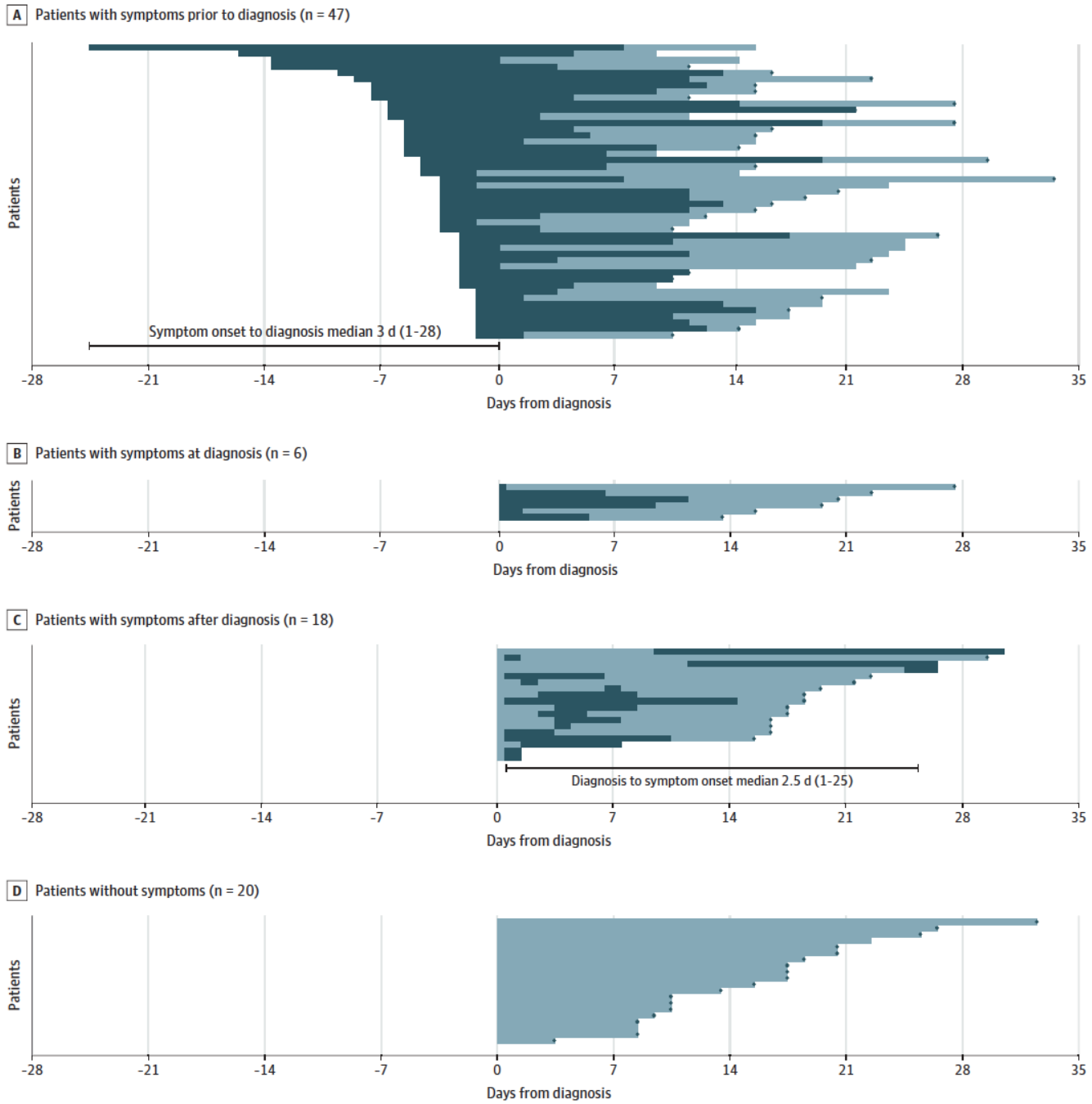
Key Points

Figure 1. Epidemic Curve of Children With Coronavirus Disease 2019 in Korea From February 14 to March 31, 2020



Other contacts indicates close contact with a kindergarten teacher, care helper at a rehabilitation center, or with other individual with a confirmed case without a social relationship.

Figure 2. Time Course From Time of Diagnosis to End of Isolation in Children With Coronavirus Disease 2019



Comparison of onset of symptoms and duration with test positivity

Majority of kids are symptomatic at diagnosis or shortly thereafter

Review Article

Prolonged viral shedding in feces of pediatric patients with coronavirus disease 2019

Yu-Han Xing [a,1], Wei Ni [b,1], Qin Wu [b], Wen-Jie Li [b], Guo-Ju Li [b], Wen-Di Wang [b], Jian-Ning Tong [b], Xiu-Feng Song [b], Gary Wing-Kin Wong [a,**], Quan-Sheng Xing [b,*]

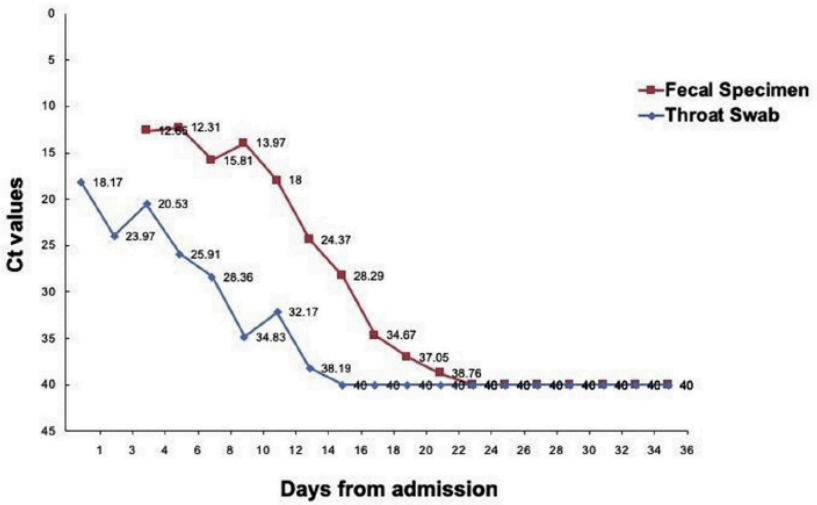


Figure 4. Chronological changes in RT—PCR testing results after hospital admission.

Abstract *Objective:* To determine the dynamic changes of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) RNA in respiratory and fecal specimens in children with coronavirus disease 2019 (COVID-19).

Methods: From January 17, 2020 to February 23, 2020, three paediatric cases of COVID-19 were reported in Qingdao, Shandong Province, China. Epidemiological, clinical, laboratory, and radiological characteristics and treatment data were collected. Patients were followed up to March 10, 2020, and dynamic profiles of nucleic acid testing results in throat swabs and fecal specimens were closely monitored.

Results: Clearance of SARS-CoV-2 in respiratory tract occurred within two weeks after abatement of fever, whereas viral RNA remained detectable in stools of pediatric patients for longer than 4 weeks. Two children had fecal SARS-CoV-2 undetectable 20 days after throat swabs showing negative, while that of another child lagged behind for 8 days.

Conclusions: SARS-CoV-2 may exist in children's gastrointestinal tract for a longer time than respiratory system. Persistent shedding of SARS-CoV-2 in stools of infected children raises the possibility that the virus might be transmitted through contaminated fomites. Massive efforts should be made at all levels to prevent spreading of the infection among children after reopening of kindergartens and schools.

Viral loads in throat and anal swabs in children infected with SARS-CoV-2

Chunhui Yuan [a*], Hongmin Zhu [b*], Yuan Yang [c*], Xiaonan Cai [c], Feiyan Xiang [c], Huan Wu [a], Cong Yao [d], Yun Xiang [a] and Han Xiao [c]

[a]Department of Laboratory Medicine, Wuhan Children's Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, People's Republic of China; [b]Department of Neurology, Wuhan Children's Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, People's Republic of China; [c]Institute of Maternal and Child Health, Wuhan Children's Hospital, Tongji Medic[illegible] han Childr[illegible]

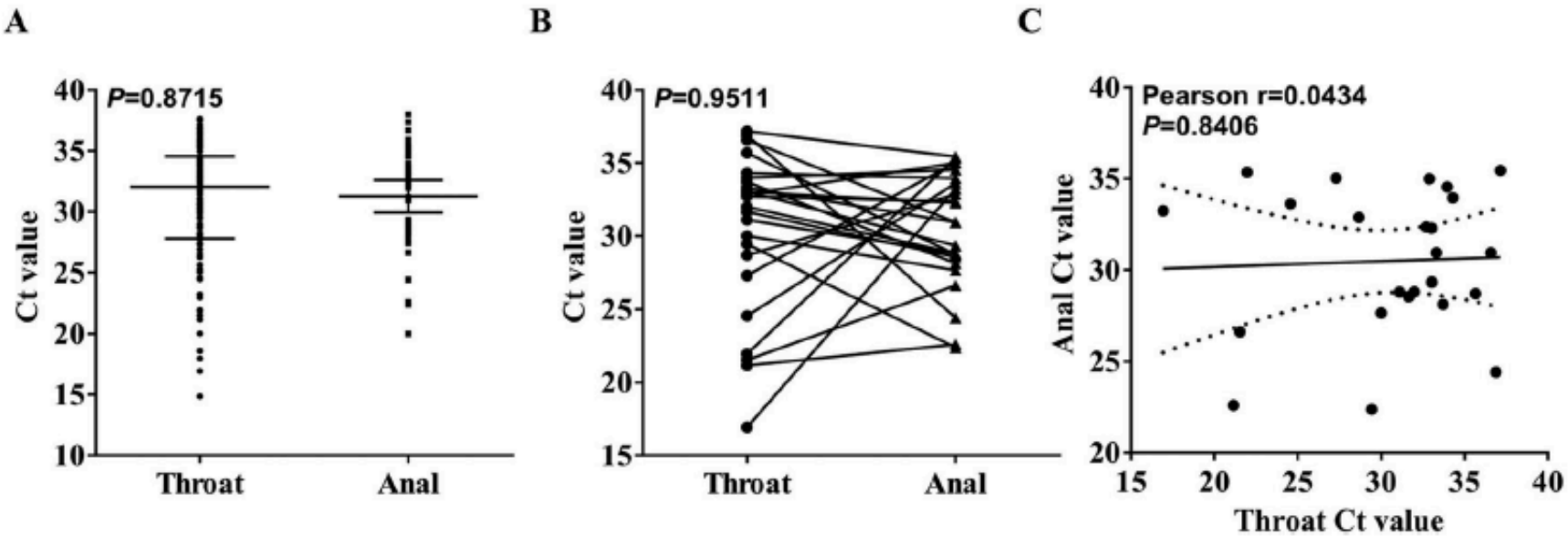


Figure 1. The difference and correlation of Ct value between throat and anal swabs-testing. (A) The difference between Ct value obtained by RT-PCR-testing on throat swabs (200 cases) and anal swabs (41 cases). (B) The difference between Ct value obtained by RT-PCR-testing on paired throat swabs and anal swabs in 24 cases. The data were normally distributed and a paired *t*-test was used to compare statistical differences. (C) The pearson correlation between Ct value obtained by RT-PCR-testing on paired throat swabs and anal swabs in 24 cases.

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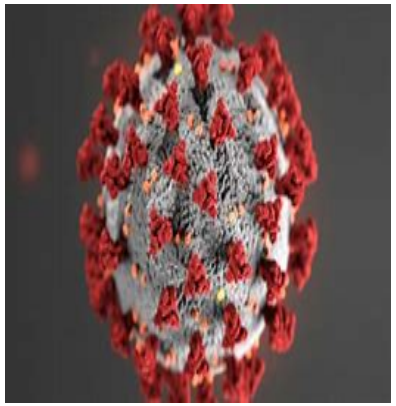
- Adults are Not Kids: The Unique Pathology of Pediatric SARS-CoV2
- Time Equals Data: The Trajectory of the Epidemiology
- Kids Are Often Not Alright: Organ Damage in SARS-CoV2
- The Pediatric COVID-19: Multi-inflammatory Syndrome in Children
- Stop the Blame! : Asymptomatic Carrier and Transmission
- The Future: The choir needs to preach



The Future

Addressing the Knowledge Gap

- In the absence of a pediatric vaccine…
- Are we prepared to continue working in our own pandemic?

- Significance is compounded by:
  - Less spotlight
  - Less industry sponsorship (remember H1N1?)
  - Growing “ease” and sentiment of “I’m over it”

Received: 12 December 2020 | Revised: 20 December 2020 | Accepted: 21 December 2020

DOI: 10.1111/apa.15731

ACTA PÆDIATRICA
NURTURING THE CHILD
WILEY

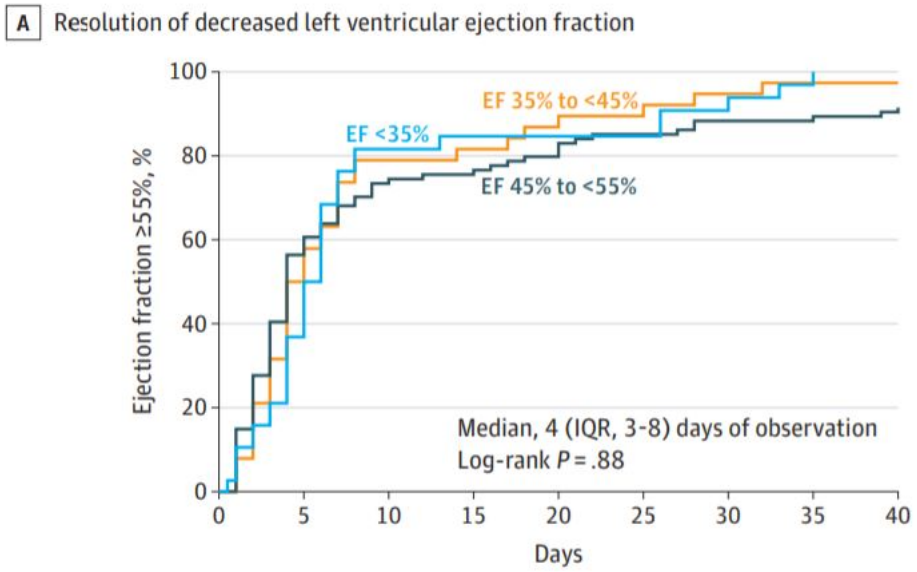
EDITORIAL

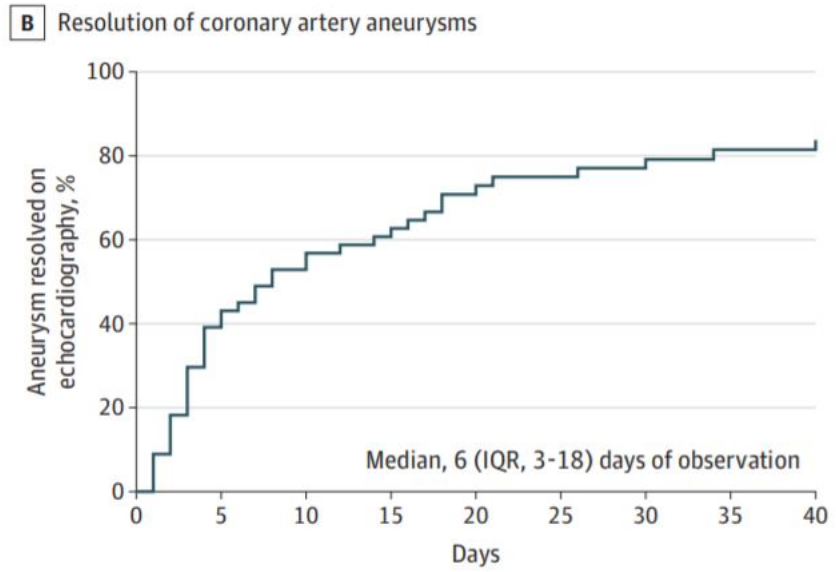
More research is needed on the long-term effects of COVID-19 on children and adolescents

Significance is compounded by:

Less spotlight
Less industry sponsorship (remember H1N1?)
Growing “ease” and sentiment of “I’m over it”

Cardiovascular Outcomes in MIS-C





LV systolic dysfunction	~ 91%
Coronary aneurysms	~ 79%

Outpatient pediatric cardiology follow-up:

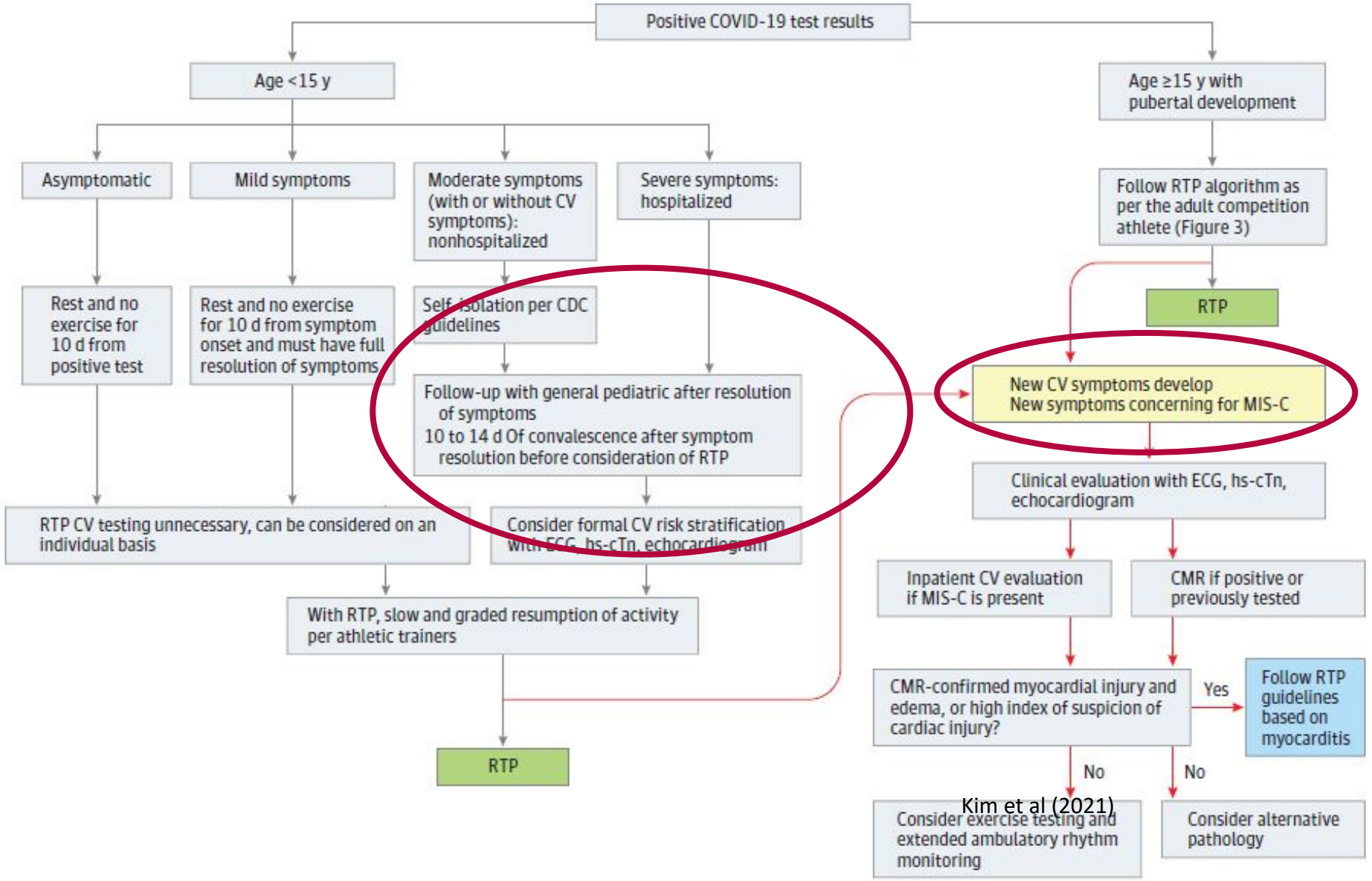
1-2 weeks following hospital discharge then 4-6 weeks following initial visit

Further follow-up & management based on clinical status and echocardiogram findings

Table 2. Life-threatening COVID-19–Related Neurologic Conditions and Deaths in 43 Patients (Age <21 Years) Hospitalized for COVID-19

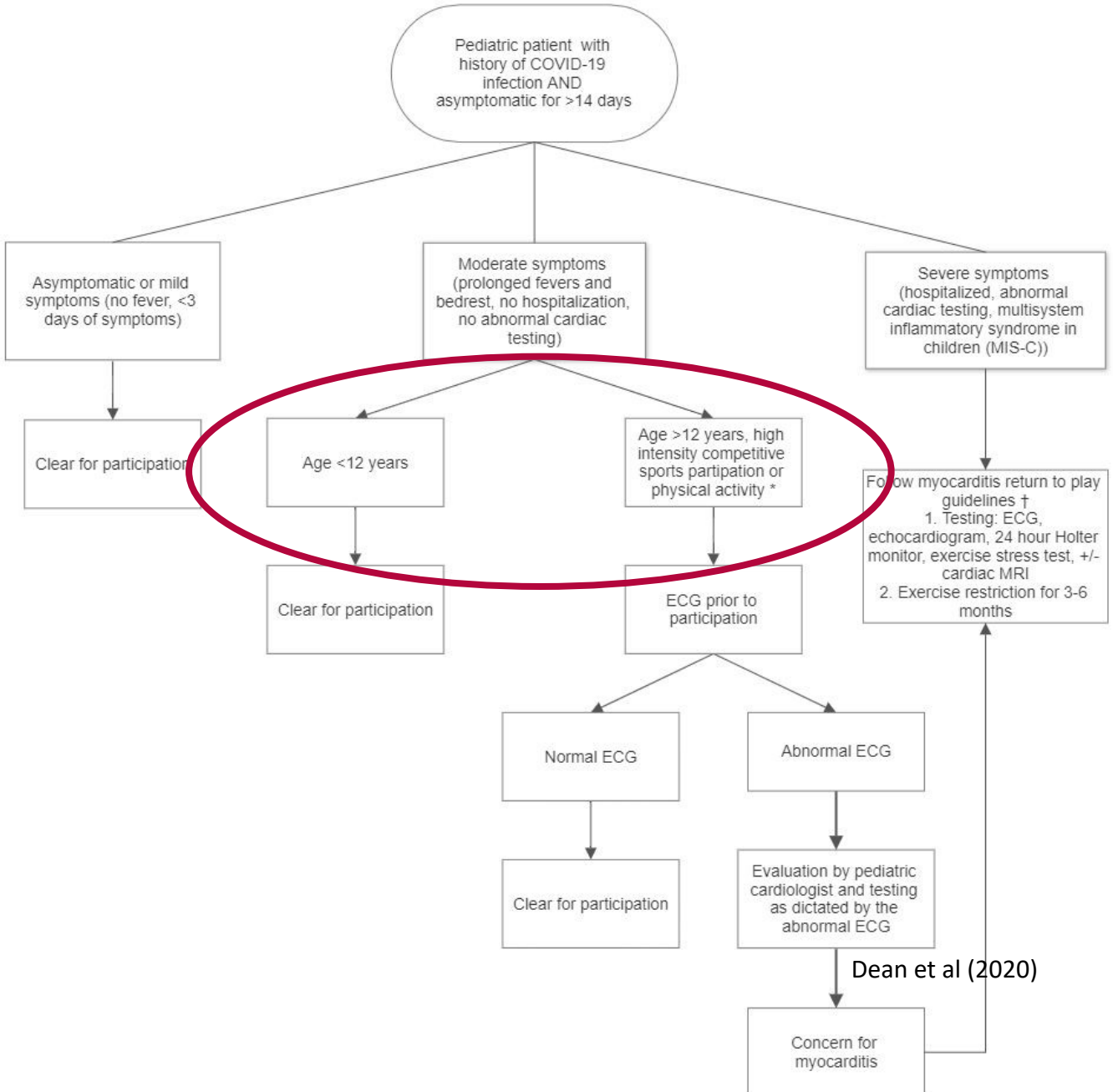
Variable	Life-threatening COVID-19-related neurologic conditions, No. (%)					
	Overall	Severe encephalopathy	Ischemic or hemorrhagic stroke	Acute CNS infection or ADEM	Acute fulminant cerebral edema	Guillain-Barré syndrome
No.	43	15	12	8	4	4
Age, median (IQR), y[a]	12 (7-15)	1 Infant	1 Preschooler	1 Infant	1 Infant	2 School aged
		1 Toddler	5 School-aged	1 Toddler	1 Preschooler	2 Adolescents
		2 Preschoolers	5 Adolescents	2 Preschoolers	2 School-aged	NA
		5 School-aged	1 Young adult	1 School-aged	NA	NA
		6 Adolescents	NA	3 Adolescents	NA	NA
Male	27 (63)	11 (73)	6 (50)	4 (50)	2 (50)	4 (100)
RT-PCR or antibody results						
Positive RT-PCR result only	19 (44)	7 (47)	7 (58)	2 (25)	3 (75)	0
Positive antibody result only	11 (26)	3 (20)	3 (25)	3 (38)	0	2 (50)
Positive RT-PCR and antibody results	13 (30)	5 (33)	2 (17)	3 (38)	1 (25)	2 (50)
MIS-C diagnosis	20 (47)	8 (53)	3 (25)	6 (75)	2 (50)	1 (25)
No major underlying conditions	34 (79)	11 (73)	8 (67)	8 (100)	4 (100)	3 (75)
Underlying neurologic disorder	3 (7)	1 (7)	2 (17)	0	0	0
Death	11 (26)	4 (27)	4 (33)	0	3 (75)	0
Discharged alive, new CNS deficit	17 (40)	2 (13)	7 (58)	5 (63)	0	3 (75)

Can the kids play?



Kim et al (2021)

Return to Play After COVID-19 Infection in Pediatric Patients



Dean et al (2020)

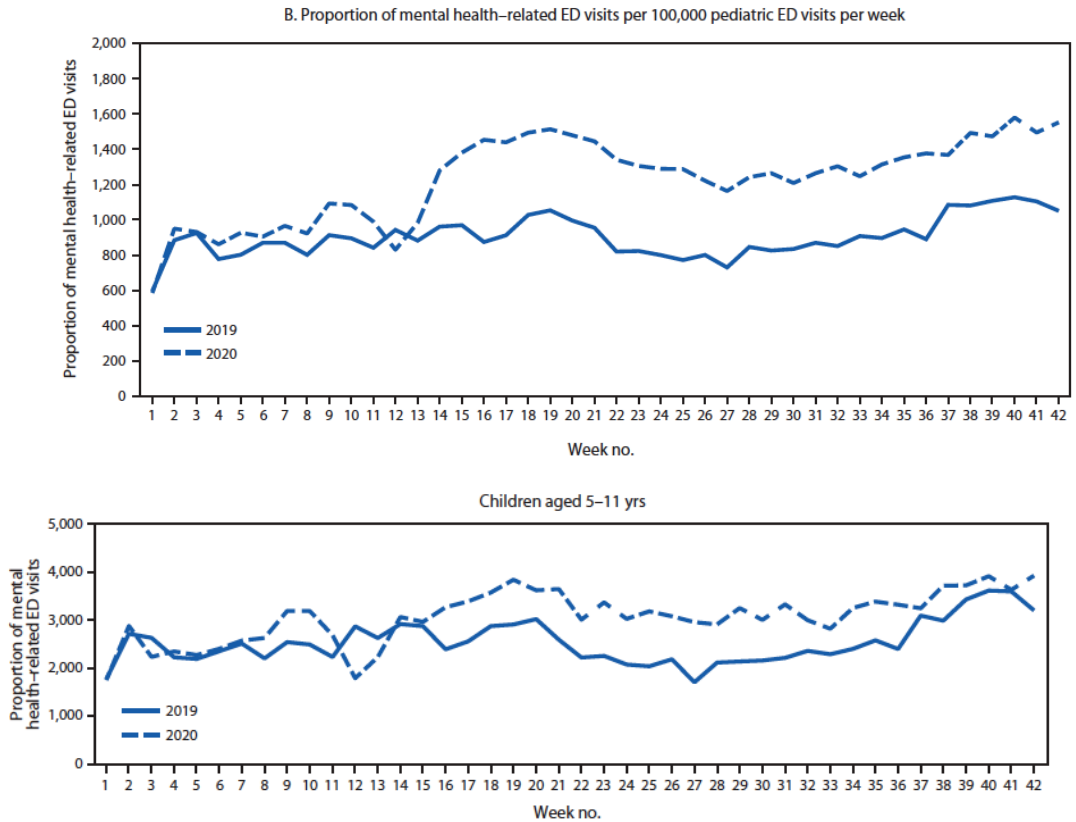
Mental Health for Children

What is the residual effect of a pandemic?

- What are the long-lasting effects of:
  - Being quarantined
  - Wearing masks
  - Not being in school
  - The virus??
- On Children…
- On Adults…

Mental Health–Related Emergency Department Visits Among Children Aged <18 Years During the COVID-19 Pandemic — United States, January 1–October 17, 2020

Rebecca T. Leeb, PhD[1]; Rebecca H. Bitsko, PhD[1]; Lakshmi Radhakrishnan, MPH[2]; Pedro Martinez, MPH[3]; Rashid Njai, PhD[4]; Kristin M. Holland, PhD[5]



Summary

What is already known about this topic?

Emergency departments (EDs) are often the first point of care for children's mental health emergencies. U.S. ED visits for persons of all ages declined during the early COVID-19 pandemic (March–April 2020).

What is added by this report?

Beginning in April 2020, the proportion of children's mental health–related ED visits among all pediatric ED visits increased and remained elevated through October. Compared with 2019, the proportion of mental health–related visits for children aged 5–11 and 12–17 years increased approximately 24%. and 31%, respectively.

What are the implications for public health practice?

Monitoring indicators of children's mental health, promoting coping and resilience, and expanding access to services to support children's mental health are critical during the COVID-19 pandemic.

PEDIA
OFFICIAL JOURNAL OF THE AMERICA

Article

Well-being of Parer vey

Stephen W. Patrick, Laura E. Her
Pediatrics October 2020, 146 (4) e202

Abstract

BACKGROUND: As the coronavirus disease pandemic spread across the United States and protective measures to mitigate its impact were enacted, parents and children experienced widespread disruptions in daily life. Our objective with this national survey was to determine how the pandemic and mitigation efforts affected the physical and emotional well-being of parents and children in the United States through early June 2020.

METHODS: In June 2020, we conducted a national survey of parents with children age <18 to measure changes in health status, insurance status, food security, use of public food assistance resources, child care, and use of health care services since the pandemic began.

RESULTS: Since March 2020, 27% of parents reported worsening mental health for themselves, and 14% reported worsening behavioral health for their children. The proportion of families with moderate or severe food insecurity increased from 6% before March 2020 to 8% after, employer-sponsored insurance coverage of children decreased from 63% to 60%, and 24% of parents reported a loss of regular child care. Worsening mental health for parents occurred alongside worsening behavioral health for children in nearly 1 in 10 families, among whom 48% reported loss of regular child care, 16% reported change in insurance status, and 11% reported worsening food security.

CONCLUSIONS: The coronavirus disease pandemic has had a substantial tandem impact on parents and children in the United States. As policy makers consider additional measures to mitigate the health and economic effects of the pandemic, they should consider the unique needs of families with children.

NEWS RELEASES

Tuesday, March 2, 2021

NIH effort seeks to understand MIS-C, range of SARS-CoV-2 effects on children

The National Institutes of Health has launched a new research effort to understand how SARS-CoV-2, the virus that causes COVID-19, affects children, who account for roughly 13% of the total cases of COVID-19 in the United States. The effort is called the Collaboration to Assess Risk and Identify Long-term Outcomes for Children with COVID (CARING for Children with COVID). This research program is developing and funding studies to investigate why some children are at greater risk for SARS-CoV-2 infection than others, why symptoms vary among children who are infected, and how to identify children at risk for severe illness from SARS-CoV-2 infection. Research on the latter question is focused particularly on multisystem inflammatory syndrome in children (MIS-C), a life-threatening condition marked by severe inflammation of one or more parts of the body, including the heart, lungs, kidneys, brain, skin, eyes and gastrointestinal organs.

Institute/Center

Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD)

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nhlbi_news@nhlbi.nih.gov
301-496-5449

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Emory + Children's COVID-19 Dashboard

COVID FORCE Team

Leadership: Stacy Heilman, PhD & Ann Chahroudi, MD, PhD
Committee meets to discuss new project submissions and guide investigators to new collaborators/existing IRB's to capitalize on expertise and conserve resources.

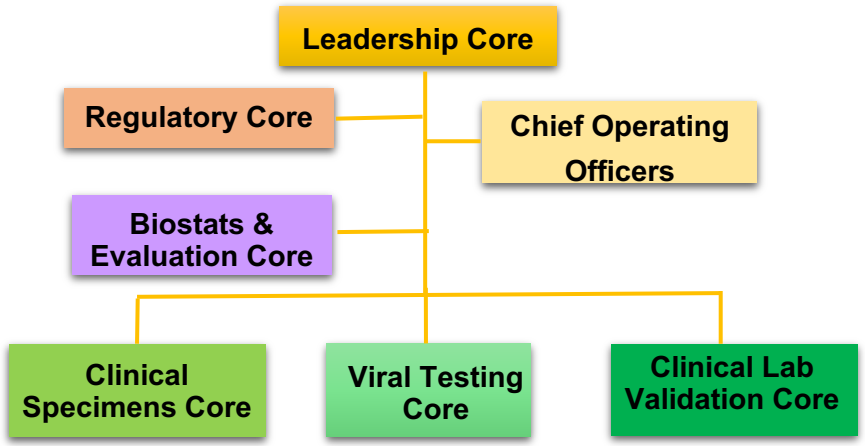
New COVID Seminar Series

Co-sponsored by CCIV and CCTR and ACME-POCT
(see slide 6)

Virtual seminar series to highlight COVID research at Emory & Children's. Each seminar will be 1 hour with up to three talks per seminar. Speakers are invited to share their research in a 10-15 minute talk. Click here **to submit your interest and availability/nominate someone to present.**

RADx Test Validation Core Organization

Wilbur Lam, MD, PhD, and Greg Martin, MD, received a **$31 million** NIH supplement to lead the national effort in testing validation through the Atlanta Center for Microsystems Engineered Point-of-Care Technologies (ACME POCT).



Children's Provider and Staff Vaccination Status

- 8,031 COVID-19 vaccines to employees and physicians.
- Both Pfizer and Moderna vaccines are being administered

RADx Testing Update:

Test Site:	Go-Live Date:	Updates:	Enrolled: *(as of 12/7*
Satellite Boulevard Drive-Thru	6/22/20	• 8 devices tested • 1000th patient enrolled in August • Interim results look promising • Egleston ED has begun enrolling for the UMass study so far contributing 5 patients	3242
Egleston ED	7/13/20		125
Scottish Rite	7/16/20		31
Total Enrolled:			3398

We enrolled our first participants at Atlanta Public Schools on 3/4/21 alongside the adult team and the RADx Tech Program will continue working into 2022

Investigators, Studies, Publications, Awards & Proposals At-a-Glance

60 **PIs** with COVID-19 projects underway or in development within DOP/Children's Healthcare of Atlanta *(see slide 3)*
- **-19 of these PIs** are leading more than one project
- **-PIs represent 22** different Divisions/Specialties

95 **Studies** from all phases (early development to IRB-approved clinical trials) being tracked by COVID FORCE

72 **COVID-19 Publications** *(see slides 6-14)*

70 **Proposals submitted by DOP faculty as PI or MPI** totaling $100M and received $54M in **awards** *(see slides 15-19)*

19 **Proposals submitted by DOP Faculty as co-investigators** totaling $48M & received $12M in **awards** *(see slides 20-21)*

17 **Intramural awards** for DOP Faculty *(see slides 22-23)*

Data as of 3/8/21

COVID-Related Research

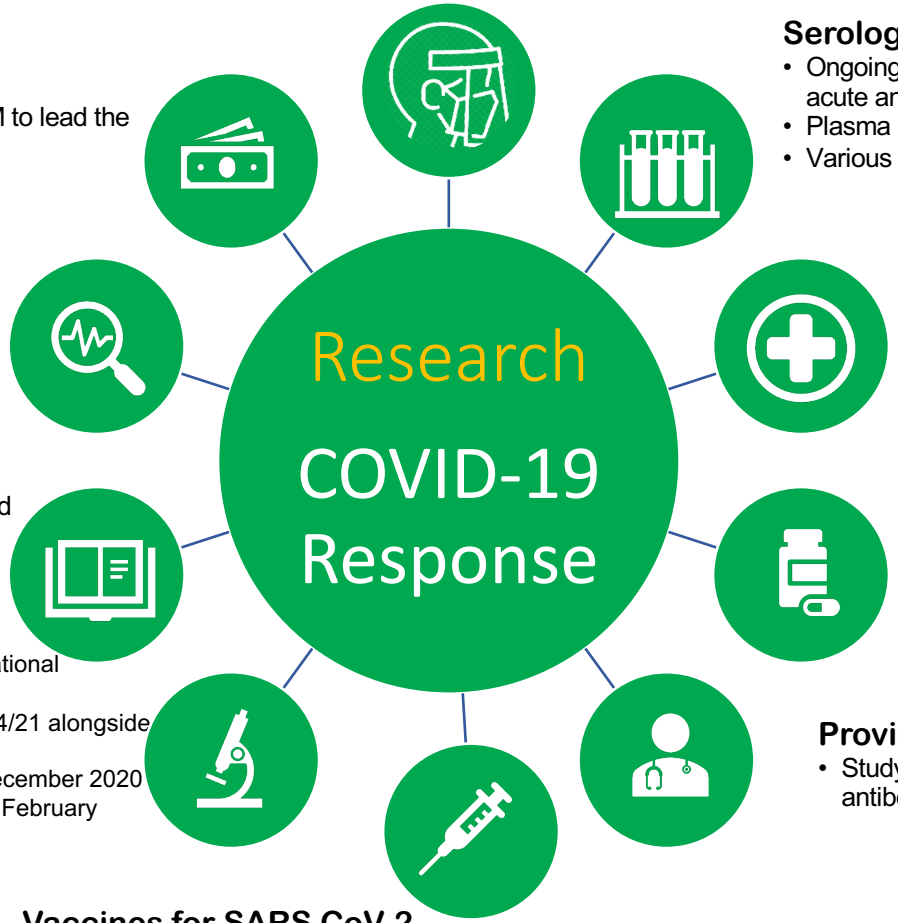
3D Printed PPE
- Over 1 million face shields donated to protect healthcare workers nationwide
- Current capacity 160K face shield per week
- $2M Aflac, Inc. gift

COVID-19 Research Grants
- 19 grants awarded to date totaling $54M
- $31 million NIH with additional supplement of $18.2M to lead the national effort in testing validation (RADx)

COVID-19 Research Proposals
- 70 proposals submitted totaling $100M in funding
- A total of 60 PIs with COVID-19 projects already underway or in development

COVID-19 Publications
- 72 Publications
- Evan Anderson's Vaccine study featured in New England Journal of Medicine

RADx Testing & Test Core
- Dr. Mimi Le new Technical Director of Children's Clinical Translational Discovery Core (CTDC)
- We enrolled our first participants at Atlanta Public Schools on 3/4/21 alongside the adult team
- The adult team enrolled over 1,000 participants by the end of December 2020
- The peds team enrolled close to 3400 participants by the end of February 2021
- 34 devices tested



Serology and Neutralizing Assays
- Ongoing immunological studies of innate and adaptive immune responses in acute and convalescent patients
- Plasma infusion therapy
- Various diagnostic development projects

Multisystem Inflammatory Disease
- 566 patients with symptomatic disease due to SARS-CoV2 seeking care
- 130 hospitalized
- MIS-c in 22 patients (majority are PCR-, serology positive)
- MIS-C serology manuscript was formally accepted to *Pediatrics* Journal

Drug Discovery
- Designed a large randomized controlled study of remdesivir versus baricitinib plus remdesivir (ACCT).
- FDA authorizes EUA for baricitinib/remdesiver combo use for COVID-19 treatment in hospitalized adults and pediatric patients

Provider Immune Response
- Study aims to determine prevalence of antibodies to COVID-19 in healthcare workers

Vaccines for SARS CoV-2
- Moderna – Emory participated in all three phases and enrolled 700 in Phase 3 showing vaccine as 94.5% effective
- Janssen – Emory recently began enrollment for this first Phase 3 single dose trial
- 8,031 employees, clinical staff and physicians vaccinated.
- Both Pfizer and Moderna vaccines are being administered

As of 3/8/21

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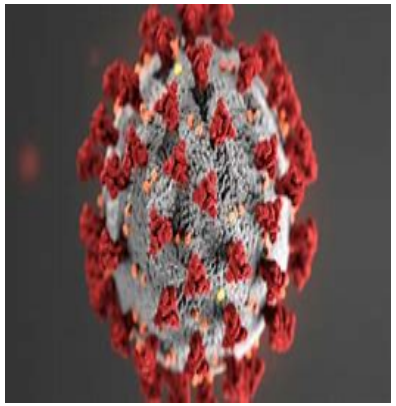
will the kids be alright? - a prospectus

- Adults are Not Kids: The Unique Pathology of Pediatric SARS-CoV2
- Time Equals Data: The Trajectory of the Epidemiology
- Kids Are Often Not Alright: Organ Damage in SARS-CoV2
- ory Syndrome in Children
- nd Transmission

<u>Conjecturae.</u>

1. *Kids have unique pathophysiology*
2. *Data has shifted considerably, pediatric SARS-CoV2 exposure deserves respect!*
3. *Organ dysfunction can be significant in children*
4. *MIS-C…the pediatric shockwave*
5. *Kids should not be blamed!*
6. *The kids WILL be alright – but it's up to us*



Final Acknowledgements

- All the other people that could have given this talk
- Special thanks to the COVID FORCE