



Multisystem Inflammatory Syndrome in Children (MIS-C) Associated with COVID-19

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COVID-19 Situation Report

United States

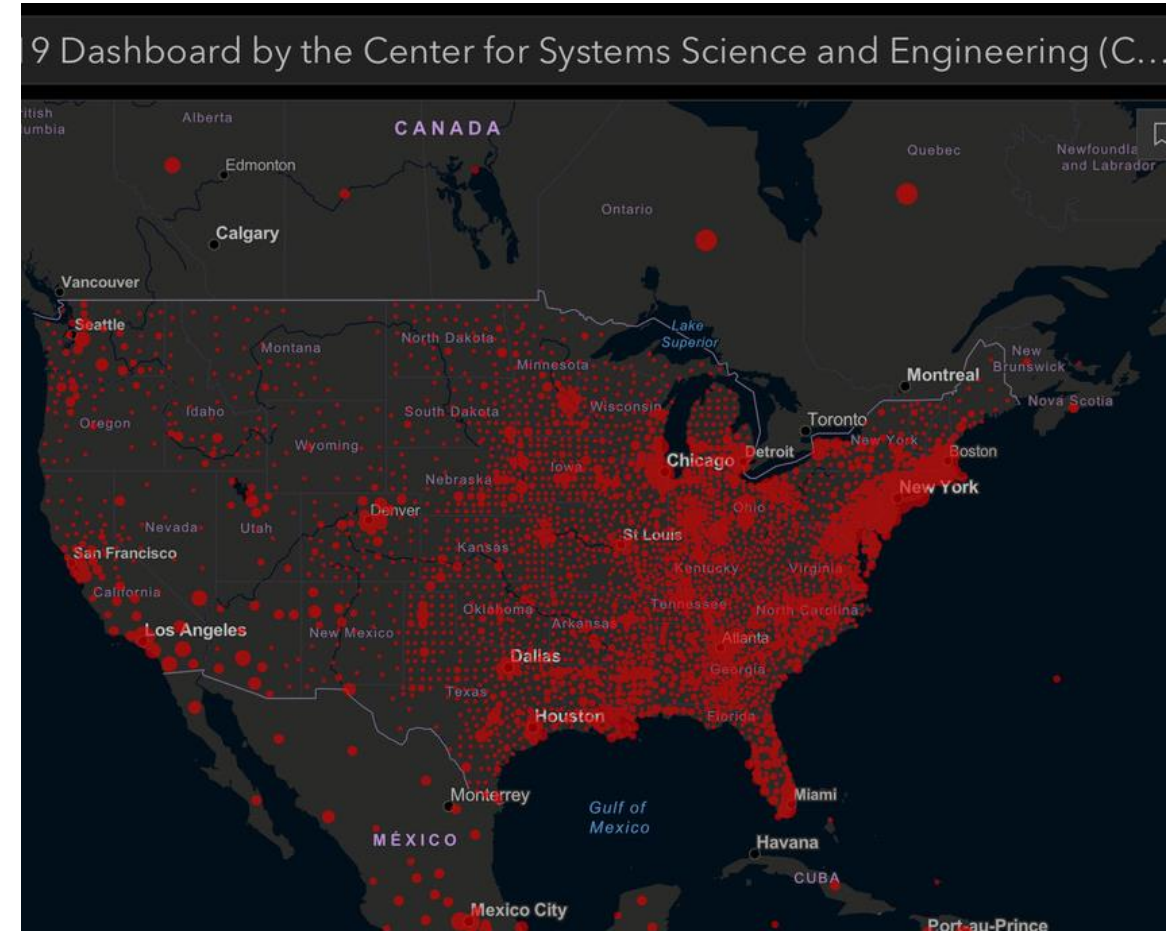
- >1.7 million cases
- 100 K deaths

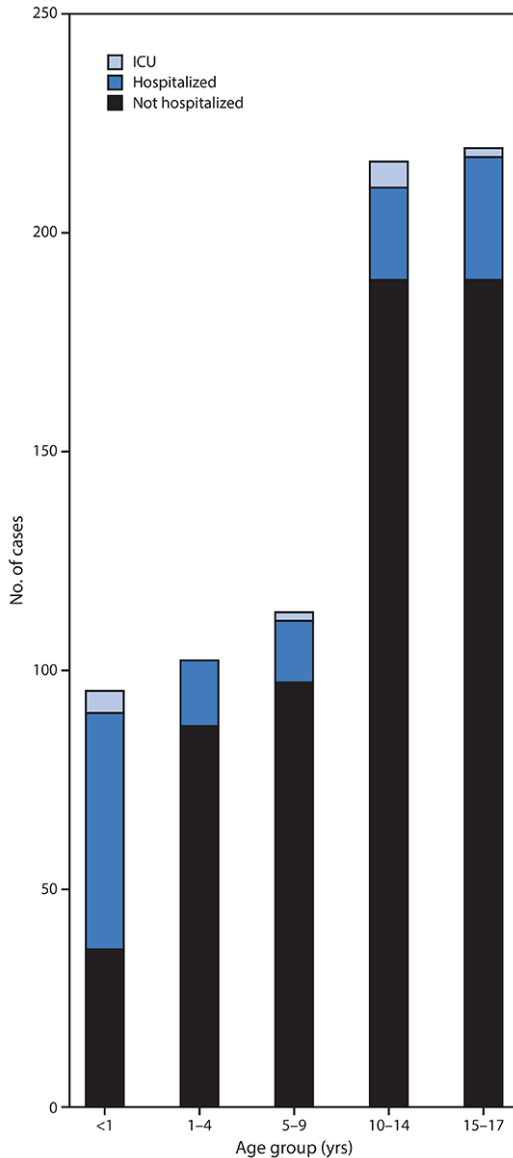
Canada

- 88,201 cases
- 6,753 deaths

Children

< 1-5% of all cases





Coronavirus Disease 2019 in Children — United States, February 12–April 2, 2020

US: Serious COVID-19 Disease in Children rare < 2% required ICU
3 deaths/2500 cases

China: Critical illness in children is rare: - 1.8% of infants - 0.3% of children 1-18yrs

COVID-19 In Children Multisystem Inflammatory Syndrome or Children (MIS-C) Never Assume...

Health

Coronavirus is mysteriously sparing kids and killing the elderly. Understanding why may help defeat the virus.



Two girls in Syria wear masks as a preventive measure. Children have been mysteriously afflicted by the virus worldwide. (Zolt Southerland/NPR/Getty Images)

By William Wan and Joel Schachtel

March 22, 2020 at 7:00 a.m. PDF

HEALTH

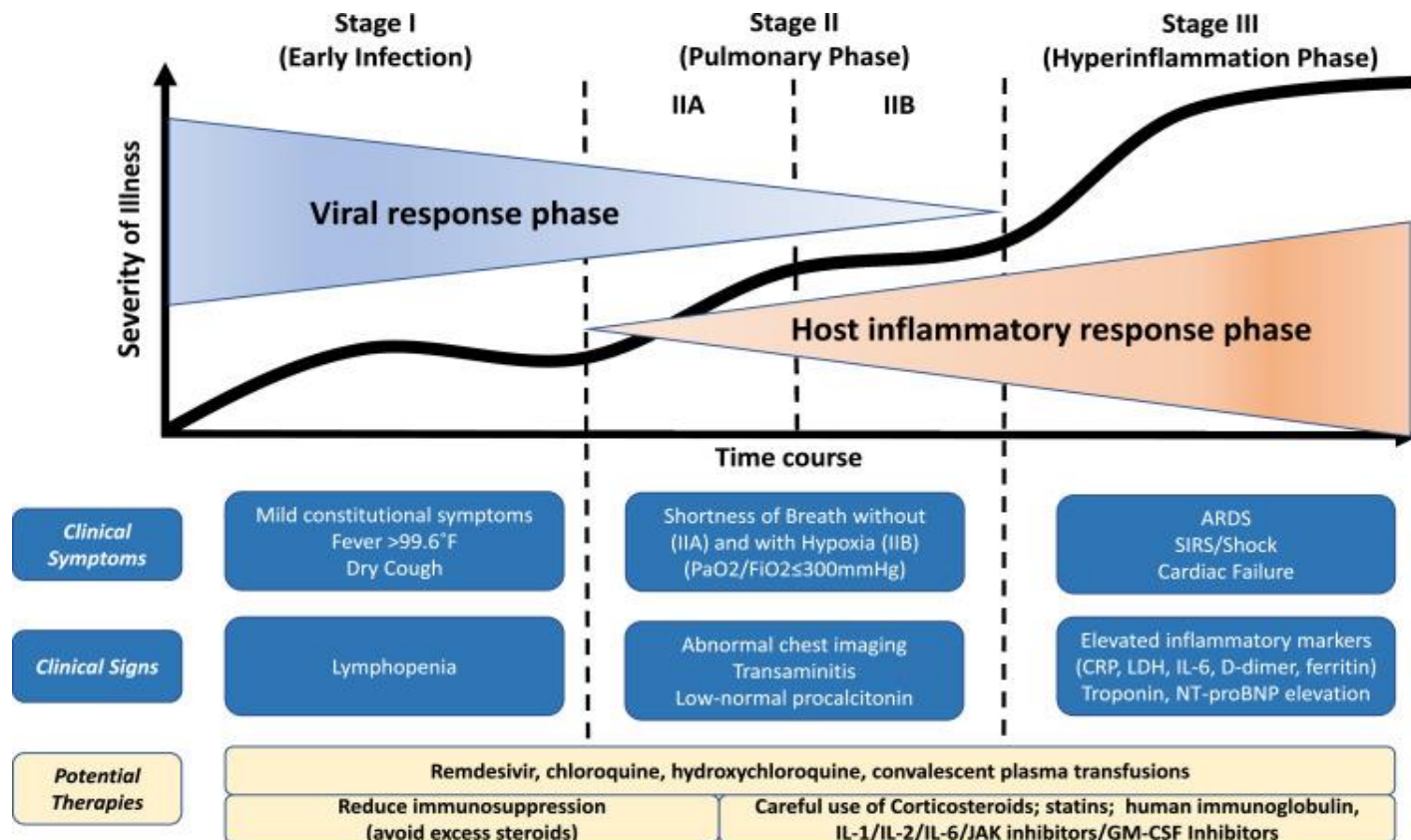
Kids Aren't Spared From the Coronavirus. A New Inflammatory Condition in Children is on the Rise.

Fevers, rashes, nausea and other less-visible symptoms point to the mysterious Multisystem Inflammatory Syndrome apparently related to the coronavirus.

By Leslie Roberts | May 22, 2020 11:36 AM



COVID-19 is a Pathological Inflammatory Disease



- ▶ Stage I (Viral Phase): Mild symptoms fever, cough, diarrhea, headache, elevated inflammatory markers
- ▶ Stage II (Pulmonary Phase) SOB with and without hypoxia
- ▶ Stage III (Hyperinflammation Phase) Systemic inflammation, ARDS, SIRS/Shock, Cardiac Failure

SARS-COV-2 related multisystem inflammation

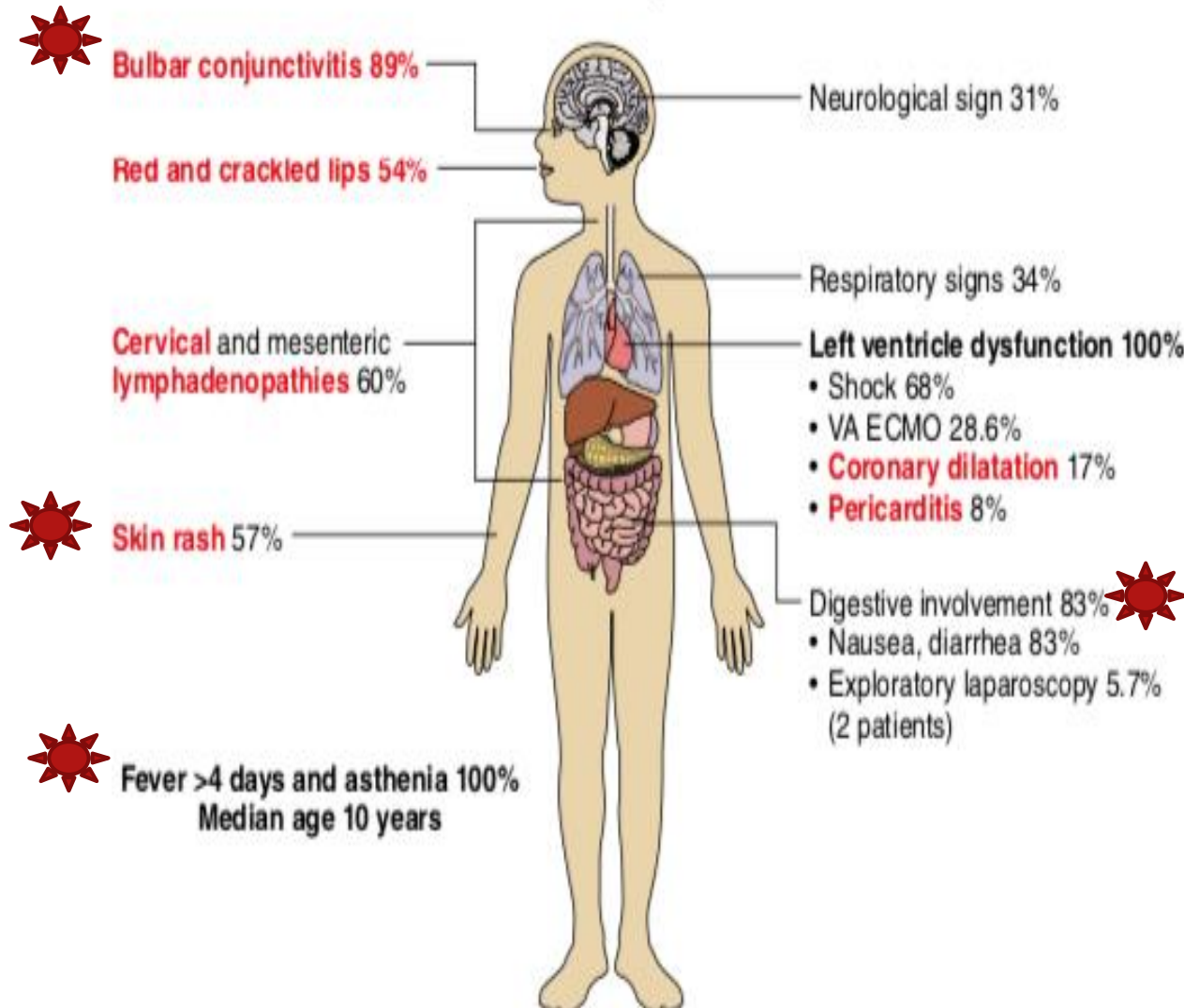


Photo: AHA <https://www.ahajournals.org/doi/pdf/10.1161/CIRCULATIONAHA.120.048360>

March 25th UK Pediatricians report a series of unusual cases

April 24th NHS UK Alert issued

April 27th UK Pediatric Intensive Care Society (8 cases)

May 4th NYC Health Dept Advisory (15 cases)

May 12th Canadian Advisory

May 14th CDC Advisory & Case Definition

May 19th CDC COCA Webinar

May 26th NYC Health Dept Dashboards (170 cases)

May 27th Children's HealthCare Canada (19 cases)

Hallmark Signs and Symptoms

- ▶ ++++ PERSISTENT FEVER (measured or by report) > 24 hours
- ▶ +++ GI SYMPTOMS severe abdominal pain, vomiting, diarrhea
- ▶ +/- rash
- ▶ ++ Hypoxemia/Dyspnea
- ▶ ++ Vasodilated Shock
- ▶ +/- Hx COVID exposure/test
- ▶ Previously WELL children

Pedi Pearl: Children have ability compensate then rapid decompensation



Image Source <https://bit.ly/2zqcFlx>

Serious COVID-19 disease is RARE <1-2 % of children
MIS-C is even more
With **VERY** Broad Spectrum of Presentation

Diagnostic Criteria for Kawasaki Disease

Diagnosis requires ≥ 5 days of fever plus ≥ 4 of following 5 criteria:



MIS-C/Kawasaki/Toxic Shock Syndromes

All Involve Dis-regulation of Immune Response to Infection

Similar Skin Findings and Multi-organ Disease

Shock $>$ MIS-C

Insufficient MIS-C data to predict who develops

Unknown if KD/TSS related or new novel syndrome

MIS-C Rash

The image is from Damien Bonnet, M.D., Ph.D., Necker Hospital-Université, Paris, who was involved in a Circulation study published on MIS-C May 14. Image copyright Damien Bonnet, courtesy of the American Heart Association.



Photo: AHA <https://bit.ly/3d3IJ4k>

What CDC wants parents to know

Contact your child's doctor, nurse, or clinic right away if your child is showing **symptoms of MIS-C**:

- ▶ Fever
- ▶ Abdominal pain
- ▶ Vomiting
- ▶ Diarrhea
- ▶ Neck pain
- ▶ Rash
- ▶ Bloodshot eyes
- ▶ Feeling extra tired

Seek emergency care right away if your child is showing any of these **emergency warning signs of MIS-C** or other concerning signs:

- ▶ Trouble breathing
- ▶ Pain or pressure in the chest that does not go away
- ▶ New confusion
- ▶ Inability to wake or stay awake
- ▶ Bluish lips or face
- ▶ Severe abdominal pain

Early Recognition, Triage to Pediatric Center = Best Outcomes

- ▶ Parents
- ▶ Prehospital Providers
- ▶ Pediatricians
- ▶ Emergency Departments



- ▶ Early consult, triage and referral with Pediatric Specialists and Centers
- ▶ Multi-Disciplinary Pediatric Treatment Matters in MIS-C
 - ▶ Cardiology, Critical Care, Infectious Disease, Rheumatology
- ▶ Even very sick children respond well to appropriate treatment

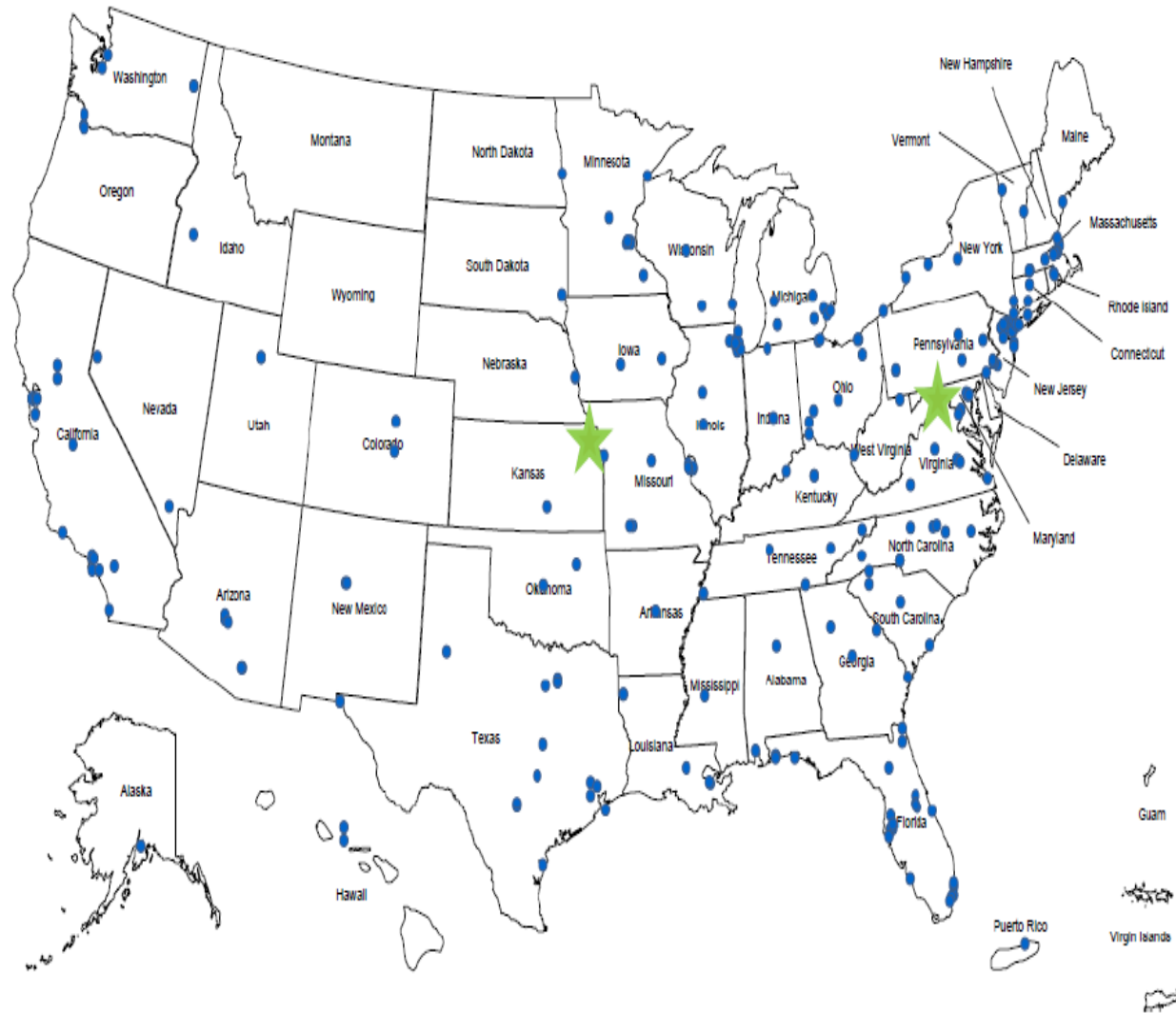
Recommendations EMS Preparation for MIS-C Child

- ▶ Discuss with EMS medical director and pediatric regional specialists.
- ▶ Preplan and practice with destination facilities.
- ▶ Readiness en-route (age, roles)
- ▶ Assume PUI and adhere to PPE
- ▶ Right Equipment (Airway, BP, Vascular access)
- ▶ Assess for vasoactive shock: (HR, BP, ALOC)
 - ▶ 10/kg fluid bolus REASSESS
 - ▶ Inotropes may be needed



Photo: <https://bit.ly/2Zz2prP>

The Nation's Children's Hospitals are Regional Resources



**MOST PEDIATRIC
TERTIARY CENTERS
ARE > 50 MILES
AWAY**

Day to Day

Children,
Hospitals &
EMS

Low Frequency
High Risk

US Hospitals & EMS	Pediatric Contact
Non-children's hospitals ED	> 80% of all children in ED's
75% Hospital see	< 20 children/day
50% Hospitals see	< 10 children/day
Remote Hospitals see	< 2 children/day
Percent of total ED volume	18-27%
Pedi ED volume admitted	<10% (90% treat and release)
Average Length of Stay	3.5 days (children's hospital)
911 Calls and Transports	< 5-10% of all calls
EMS Pediatric MCI Plan	13% report plan



PEARS®

Vital Signs in Children

Normal Heart Rates (per Minute) by Age*

Age	Awake Rate	Mean	Sleeping Rate
Newborn to 3 months	85 to 205	140	80 to 160
3 months to 2 years	100 to 190	130	75 to 160
2 years to 10 years	60 to 140	80	60 to 90
>10 years	60 to 100	75	50 to 90

Normal Respiratory Rates by Age*

Age	Breaths per Minute
Infant (<1 year)	30 to 60
Toddler (1 to 3 years)	24 to 40
Preschooler (4 to 5 years)	22 to 34
School-age child (6 to 12 years)	18 to 30
Adolescent (13 to 18 years)	12 to 16

Normal Blood Pressures by Age¹

Age	Systolic Blood Pressure (mm Hg)		Diastolic Blood Pressure (mm Hg)	
	Female	Male	Female	Male
Neonate (1 day)	60 to 76	60 to 74	31 to 45	30 to 44
Neonate (4 days)	67 to 83	68 to 84	37 to 53	35 to 53
Infant (1 month)	73 to 91	74 to 94	38 to 56	37 to 55
Infant (3 months)	78 to 100	81 to 103	44 to 64	45 to 65
Infant (6 months)	82 to 102	87 to 105	46 to 66	48 to 68
Infant (1 year)	86 to 104	85 to 103	49 to 58	37 to 56
Child (2 years)	88 to 105	89 to 106	45 to 63	42 to 61
Child (7 years)	96 to 113	97 to 115	57 to 75	57 to 76
Adolescent (15 years)	110 to 127	113 to 131	65 to 83	64 to 83

Threshold by Age of Systolic Blood Pressure Indicating Hypotension

Age	Systolic Blood Pressure
Term neonates (0 to 28 days)	Less than 60 mm Hg
Infants (1 to 12 months)	Less than 70 mm Hg
Children 1 to 10 years (5th blood pressure percentile)	Less than 70 + (age in years × 2) mm Hg
Children >10 years	Less than 90 mm Hg

Back to Basics... Hypotension in Children

A Late Sign of Decompensation In Children

- ▶ Know age specific norms
- ▶ Full set of vitals
- ▶ Perfusion (CRT, quality of pulses)
- ▶ Oxygen
- ▶ Infant and Pediatric BP cuffs
- ▶ Prepared for rapid vascular access
- ▶ Prepared for CPR



Think: could this child have SEPSIS?
If in doubt, consult a senior clinician.



SEPSIS ALLIANCE[®]

Suspect Sepsis. Save Lives.

Sepsis Alliance and NAEMT Publish Results of Survey on Pediatric Sepsis

Sepsis: Pediatric First Response training module & companion video, visit <https://www.sepsis.org/training/module/sepsis-pediatric-first-response/>.

Pediatric Early Warning Score Card

	3	2	1	0	Score *
Behavior	<ul style="list-style-type: none"> Lethargic, confused, or Reduced pain response 	<ul style="list-style-type: none"> Irritable or agitated and not consolable 	<ul style="list-style-type: none"> Sleeping or Irritable and consolable 	<ul style="list-style-type: none"> Playing Appropriate for patient 	
Cardiovascular	<ul style="list-style-type: none"> Grey or CRT ≥ 5 or Tachycardia 30 above or Bradycardia for age 	<ul style="list-style-type: none"> CRT 4 seconds or Tachycardia of 20 above normal parameters 	<ul style="list-style-type: none"> Pale or CRT 3 seconds 	<ul style="list-style-type: none"> Pink, CRT 1-2 seconds 	
Respiratory	<ul style="list-style-type: none"> 5 below normal with retractions and/or $\geq 50\%$ FiO2 	<ul style="list-style-type: none"> >20 above normal Using accessory muscles or 40%-49% FiO2 or ≥ 3 LPM 	<ul style="list-style-type: none"> >10 above normal Using accessory muscles or 24-40% FiO2 or ≥ 2 LPM Any initiation of O2 	<ul style="list-style-type: none"> WNL for age No retractions 	
* Add 2 points for frequent interventions (suction, positioning, O2 changes) or multiple IV attempts.					
TOTAL					

** Parental concern should be an automatic call to the Rapid Response Team.

Score ≥ 7 Assmt. every 30 mins. • Score 6 Assmt. every 1 hour. • Score 5 Assmt. every 1-2 hours. • Score 0-4 Assmt. every 4 hours.

Pediatric Early Warning Score (PEWS)

[HTTPS://PEDIATRICS.AAPPUBLICATIONS.ORG/CONTENT/132/4/E841](https://pediatrics.aappublications.org/content/132/4/e841)



Children
Speak with
their Bodies

Project ECHO: COVID-19 Clinical Rounds Top Pediatric Recommendation



HHS/ASPR COVID-19 Clinical Rounds Email List Sign Up

- Critical Care - Tuesdays 12:00-1:00 pm ET
- Emergency Department - Thursdays 12:00-1:00 pm ET
- EMS - Mondays 12:00 - 1:00 pm ET

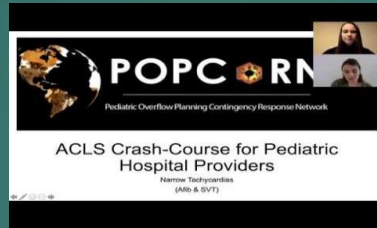
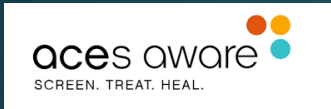
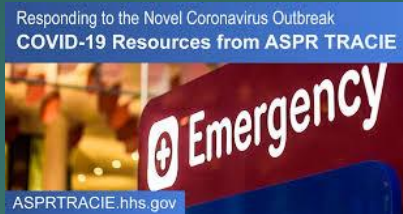
<https://unm.us15.list-manage.com/subscribe?u=0a75704ef6816d86a64d5a1b1&id=b5ee6dff13>

A large group of runners participating in a marathon, with 'marathonKIDS' and 'WHOLE FOODS' signs visible in the background. The image is overlaid with a semi-transparent blue filter. A solid red rectangle is located in the top right corner.

Pandemics are a Team Sport

EMS is an Essential Part of That Team

Webinars, online education, podcasts, blogs, social media, zoom simulation & mobile apps



RESOURCES & TOOLS

Coronavirus (COVID-19)



EMSC-II COVID & Disaster Readiness Website

<https://emscimprovement.center/domains/preparedness/covid-19-coronavirus/>

Questions