WISCONSIN
Emergency Medical
Services for Children

Children's Health
Alliance of Wisconsin

Approach to Acute Respiratory Distress in Children

Prehospital Emergency Care Coordinator Quarterly Meeting

November 8, 2023

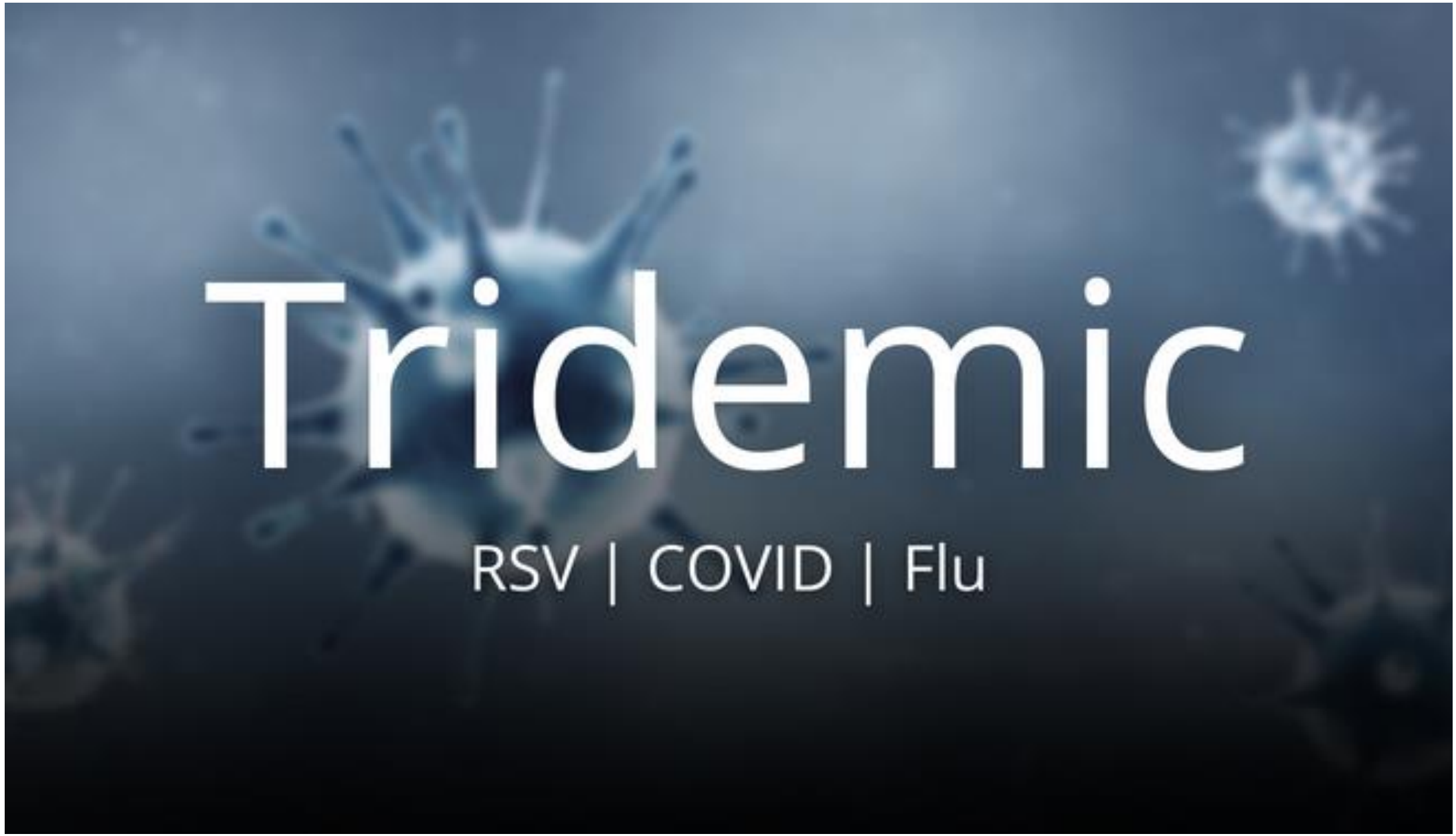
Michael Kim, MD

Disclosure

Advancing Healthier Wisconsin Grant

Objectives

- Understand the pediatric resp surge
- Know the initial care for child with respiratory distress
- Consider destination dilemma and effects on EMS services
- Entertain solutions


Tridemic
RSV | COVID | Flu

HEALTH ›

Rising RSV cases threaten to overwhelm hospitals in our area, nationwide

CBS NEWS NEW YORK

BY JOHN DIAS

UPDATED ON: DECEMBER 5, 2022 / 12:24 PM / CBS NEW YORK

Pediatric ER doctor gives glimpse into front lines of RSV surge: 'No space anywhere'

Packed emergency rooms, long wait times, no beds. One doctor recounts how the surge in respiratory viruses like RSV is overwhelming children's hospitals.

Daily Briefing

'Crisis mode': RSV surge overwhelming pediatric hospitals

HEALTH

Children's hospitals grapple with a nationwide surge in RSV infections

October 24, 2022 · 5:00 AM ET

RSV virus outbreak: Children's hospitals overwhelmed by sick kids. **Published** October 22, 2022 **Updated** October 24, 2022 U.S. FOX 5 NY

In the 2022-2023 season, the overall rate of RSV-associated hospitalizations was 50.5 per 100,000 people.

Reset Filters

Season | Age Group | Race/Ethnicity | Sex | Site

View

Monthly Rates

Weekly Rates

Cumulative Rates

Filters

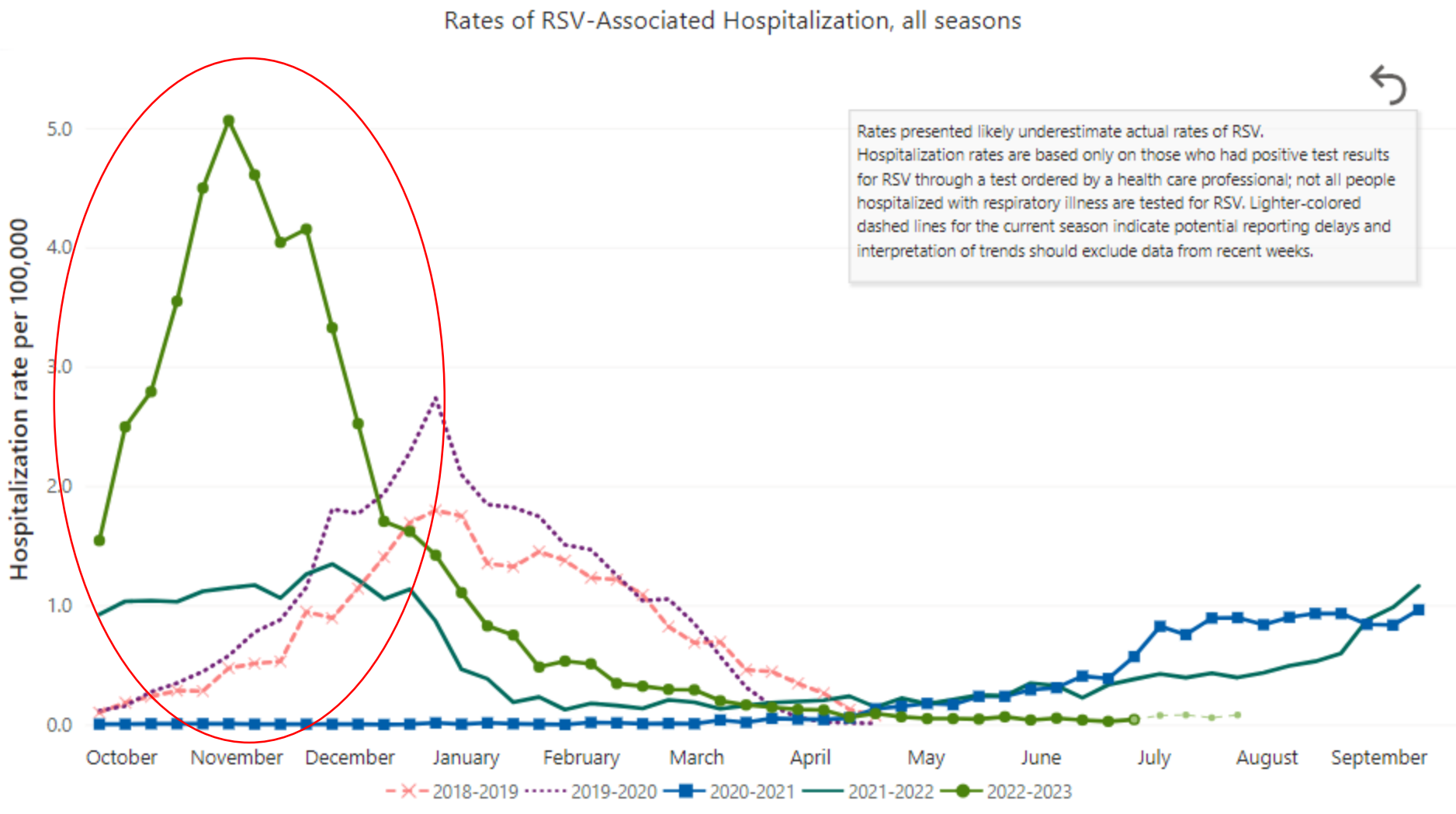
Season: All

Site: RSV-NET

Age Group: All

Race/Ethnicity: All

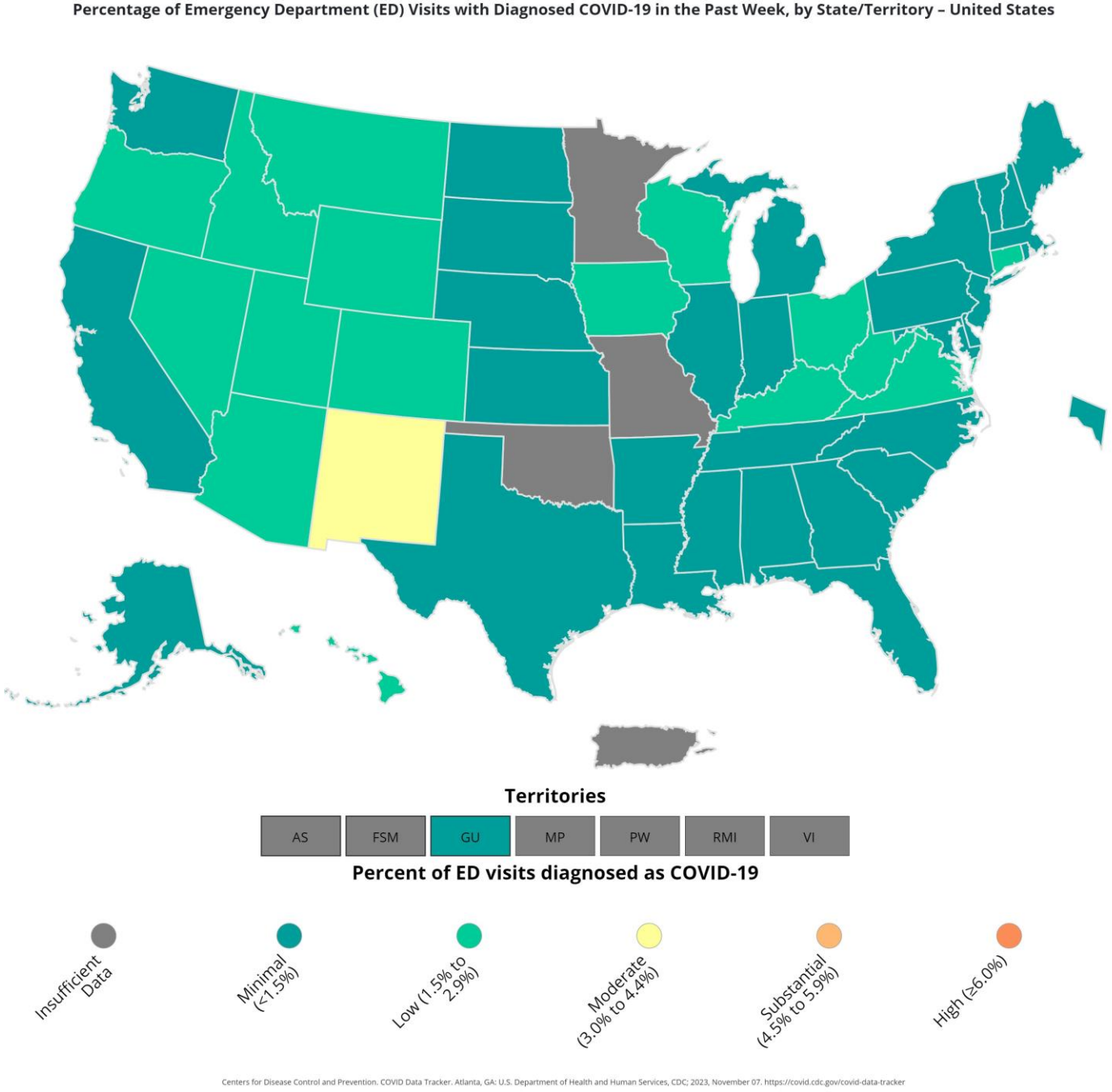
Sex: All



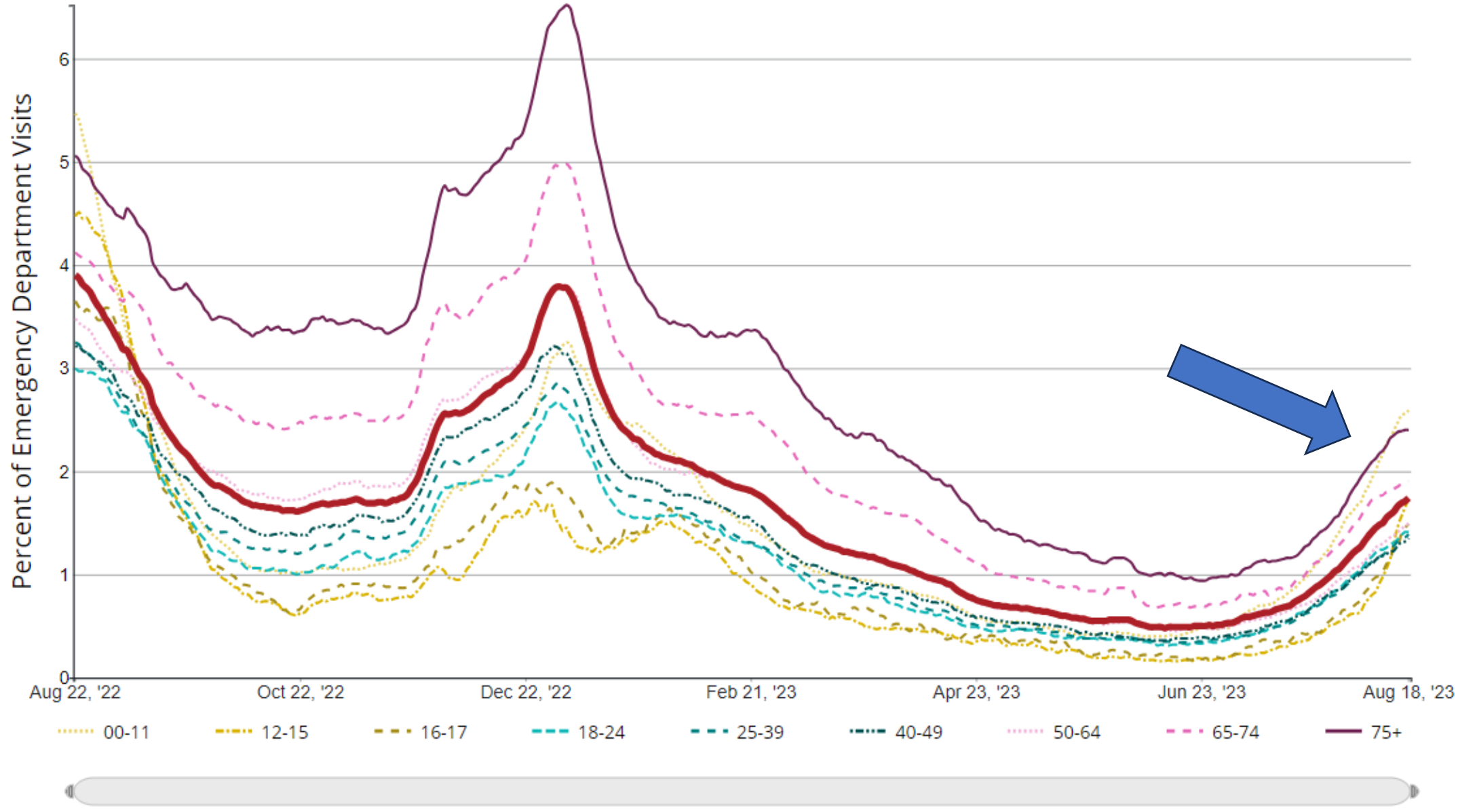
Download Data

Data last updated: 08/16/2023 | **Accessibility:** Hover over graph area to display options such as show data as table and copy visual.
Note: AI/AN, American Indian or Alaska Native; A/PI, Asian and Pacific Islander.

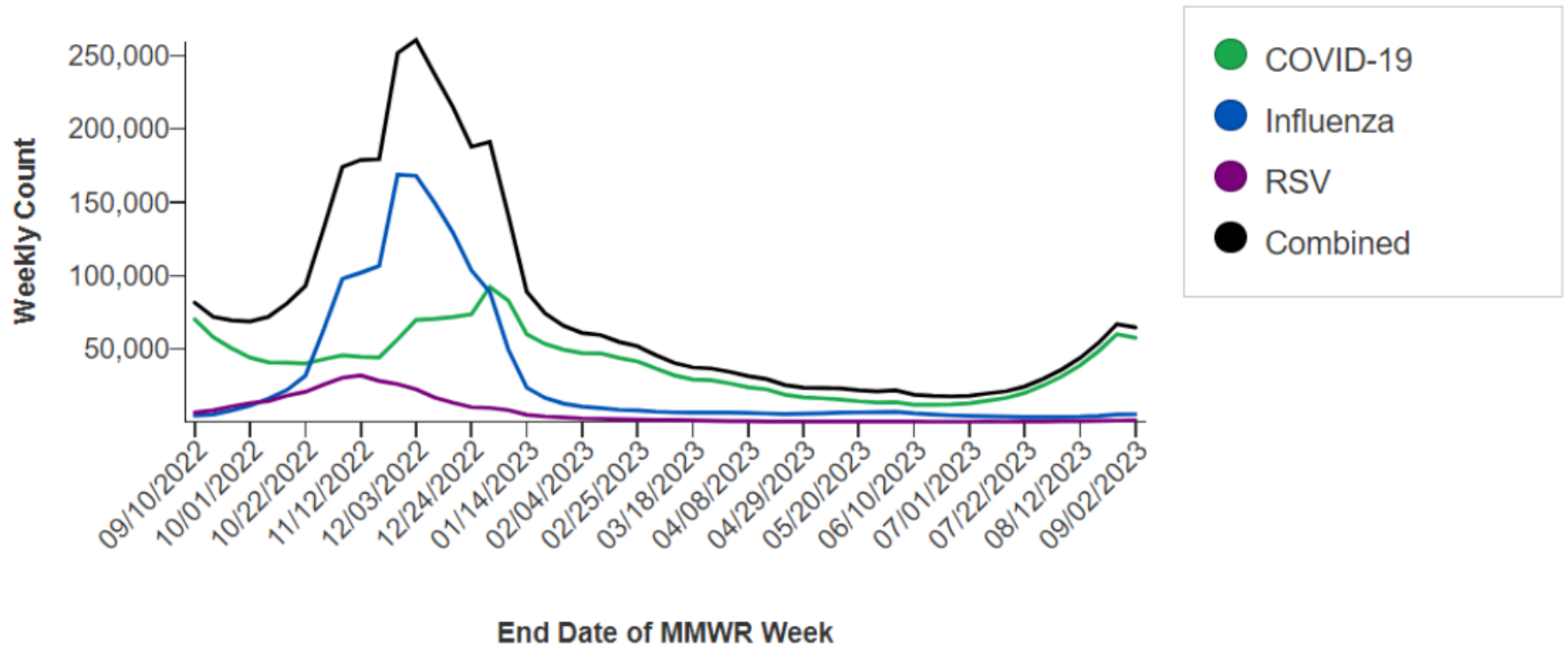
COVID 19


Percentage of Emergency Department (ED) Visits with Diagnosed COVID-19 in the Past Week, by State/Territory – United States
Territories
AS
FSM
GU
MP
PW
RMI
VI
Percent of ED visits diagnosed as COVID-19
Insufficient Data
Minimal (<1.5%)
Low (1.5% to 2.9%)
Moderate (3.0% to 4.4%)
Substantial (4.5% to 5.9%)
High (≥6.0%)
Centers for Disease Control and Prevention. COVID Data Tracker. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2023, November 07. https://covid.cdc.gov/covid-data-tracker

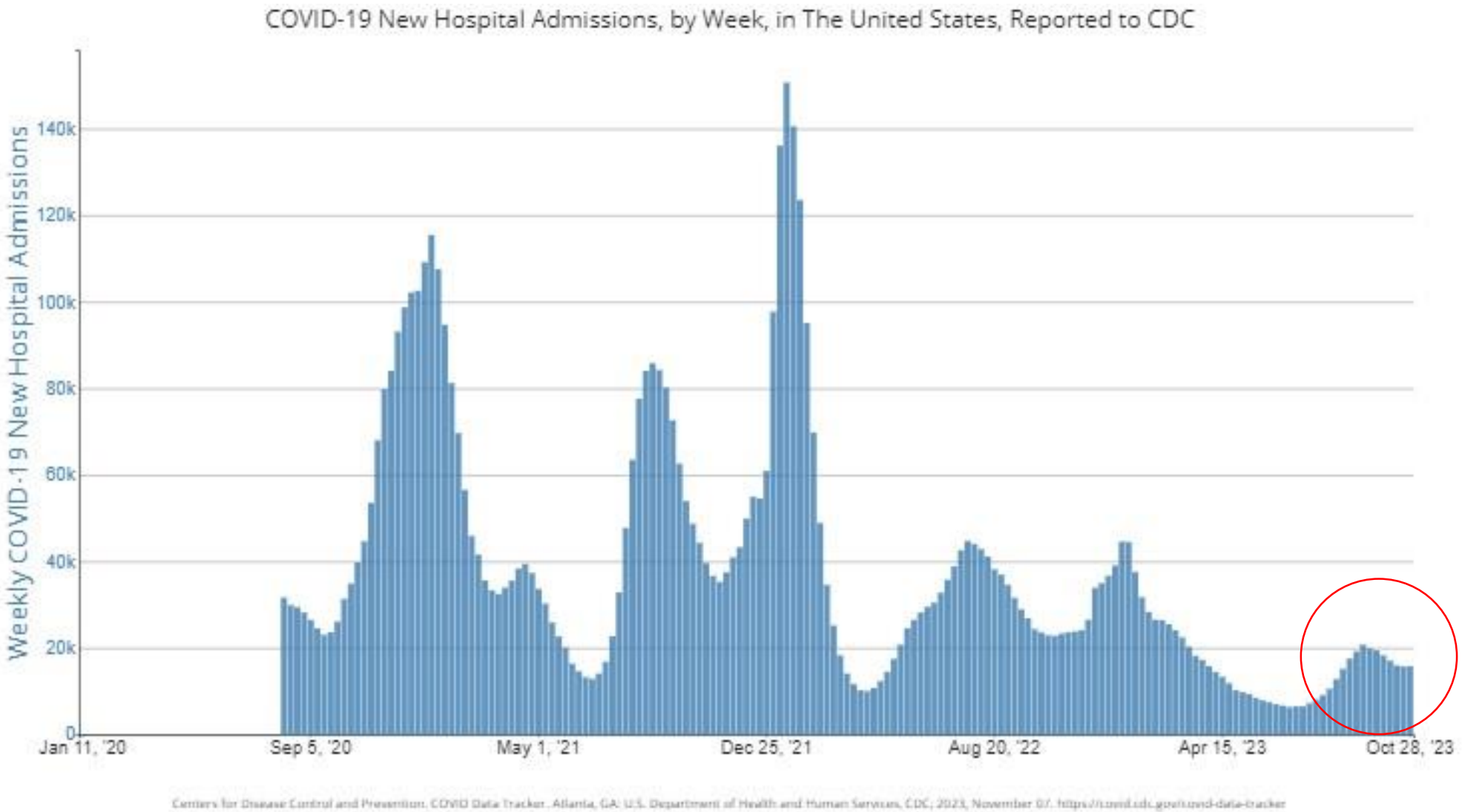
Percentage of Emergency Department Visits with Diagnosed COVID-19 in United States, by Age Group



CDC Integrated Respiratory Virus Activity Dashboard

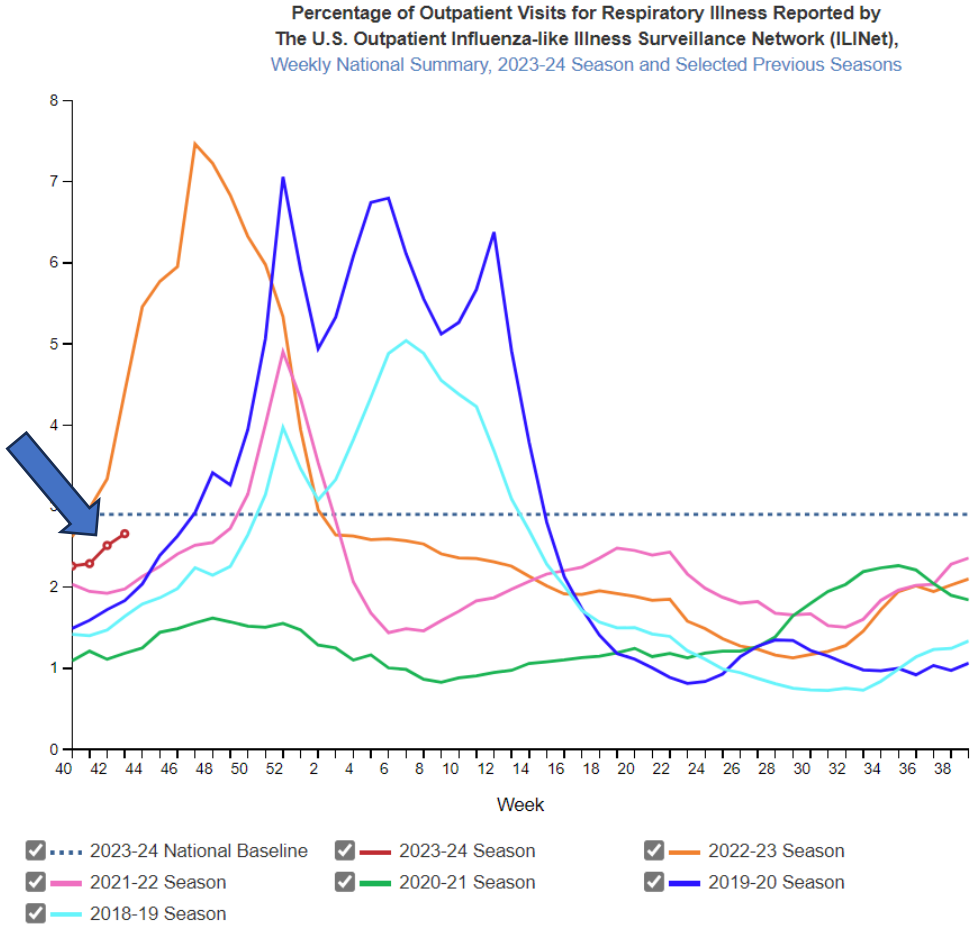


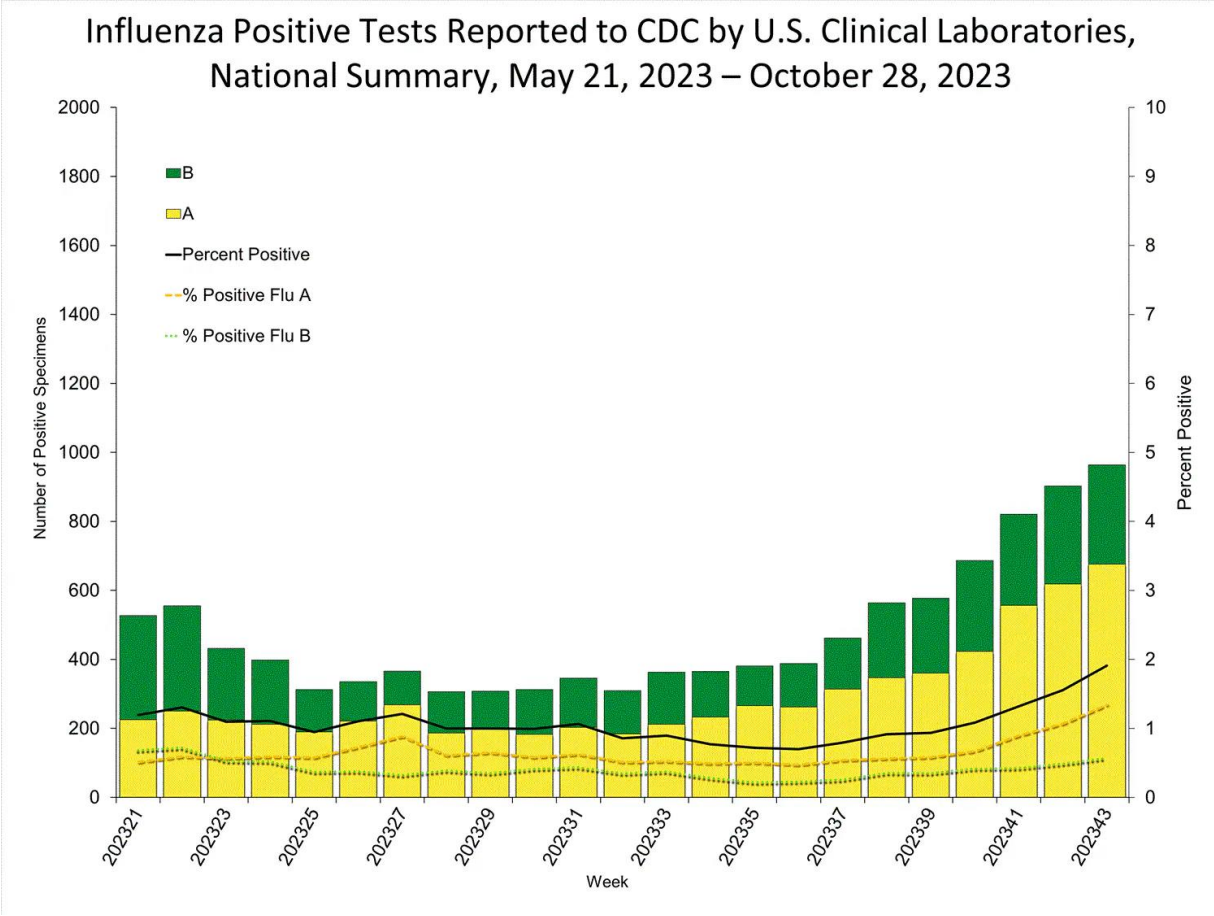
https://www.cdc.gov/respiratory-viruses/index.html



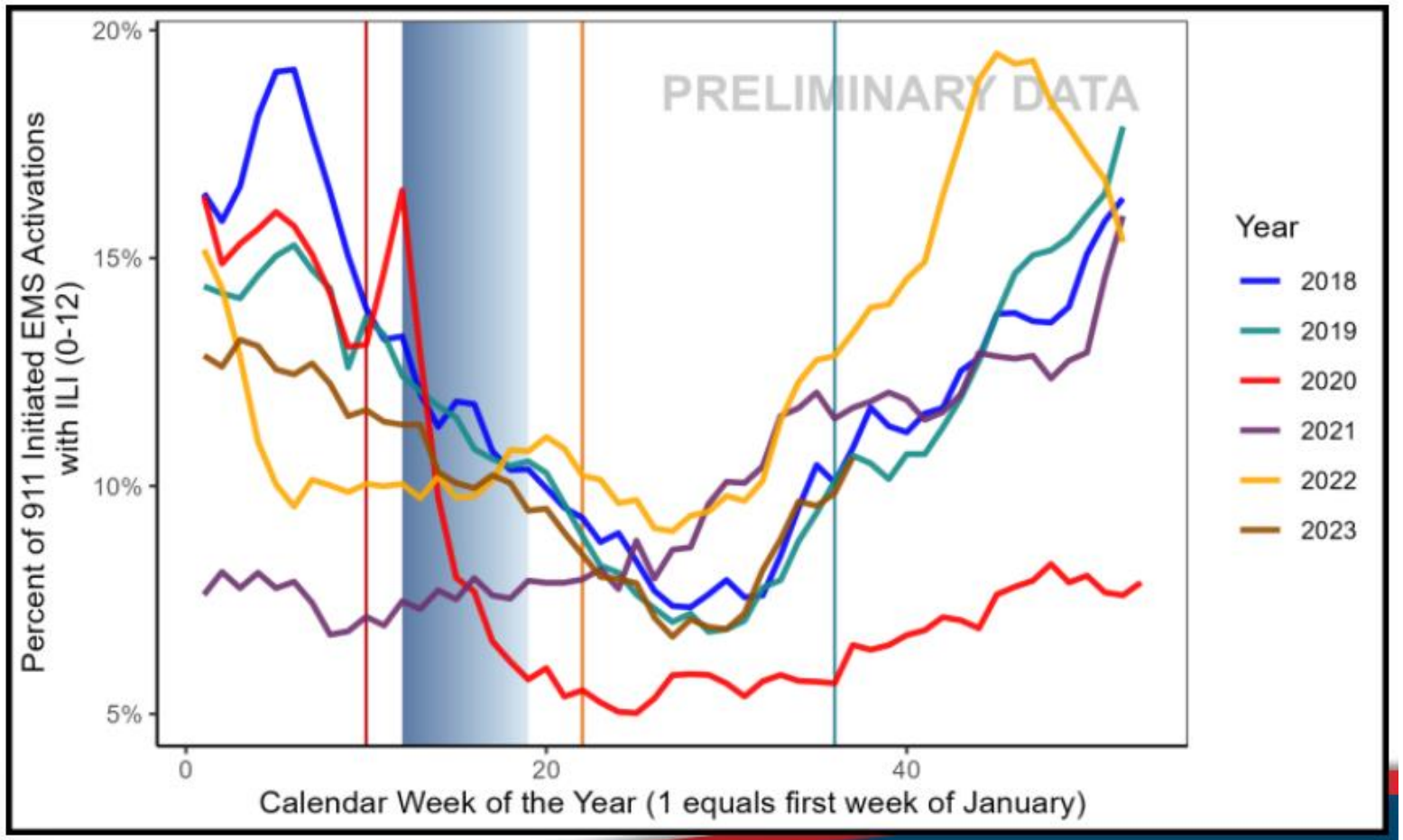
Centers for Disease Control and Prevention. COVID Data Tracker. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2023, November 07. https://covid.cdc.gov/covid-data-tracker

Influenza


Percentage of Outpatient Visits for Respiratory Illness Reported by
The U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet),
Weekly National Summary, 2023-24 Season and Selected Previous Seasons
Week
2023-24 National Baseline
2023-24 Season
2022-23 Season
2021-22 Season
2020-21 Season
2019-20 Season
2018-19 Season


Influenza Positive Tests Reported to CDC by U.S. Clinical Laboratories,
National Summary, May 21, 2023 – October 28, 2023
B
A
Percent Positive
% Positive Flu A
% Positive Flu B
Number of Positive Specimens
Percent Positive
Week

Rate of Pediatric ILI Activations



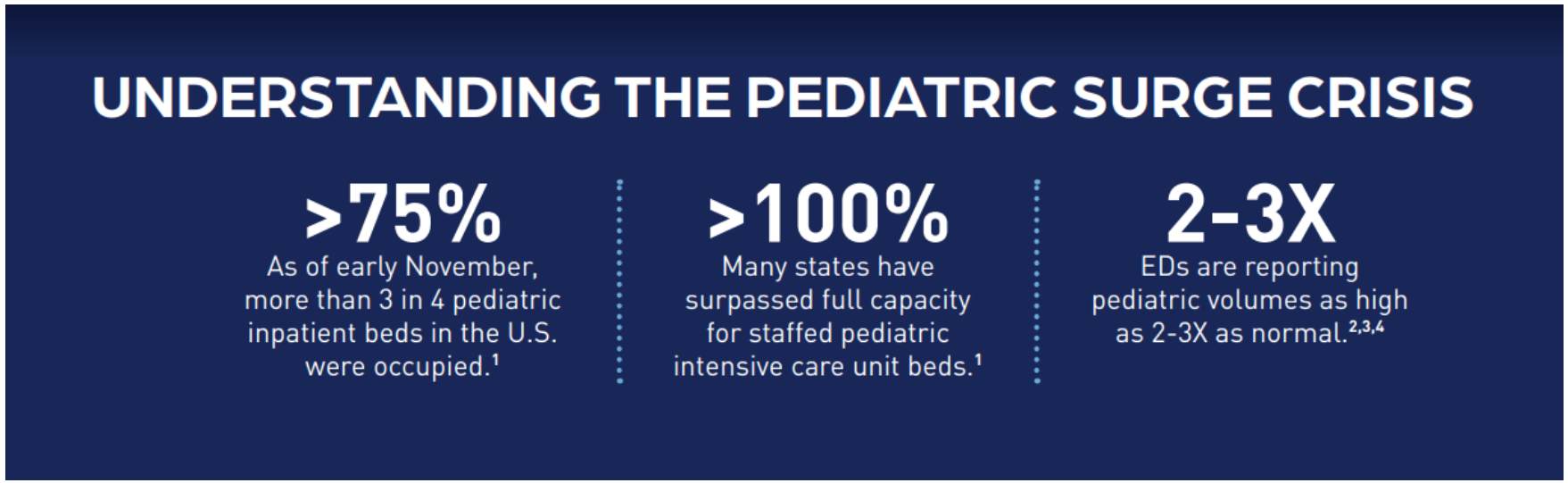
ILI inclusion criteria for patients age 0 – 12 years.

Outlook by CDC

- Infectious disease experts and scenario models provide evidence that this season is likely to bring a moderate **COVID-19** wave, causing around as many hospitalizations at the peak as occurred at last winter's peak.
- There is widespread, population-level protective immunity to COVID-19 from prior infections and/or vaccinations, making it unlikely that COVID-19 will cause very large waves of severe disease or hospitalization, according to modeling by the COVID-19 Scenario Modeling Hub.
- COVID-19 could peak earlier than last season, however, because of limited summer activity compared to past years.

- Experts anticipate that the **influenza** season will fall in the typical range of severity. However, even typical seasons vary widely in the number of illnesses, hospitalizations, and deaths.
- Experts do not believe that the COVID-19 pandemic—and associated interventions and behavior changes—will continue to have a major impact on influenza transmission, following reduced influenza activity in 2020-2021 and an early peak for the 2022-2023 season.

- Experts anticipate that **RSV** is likely to return to normal season patterns following a severe season last year.
- Last year's season likely elevated population immunity to typical levels, which had previously been lower because of reduced RSV circulation early in the COVID-19 pandemic.
- There are also new RSV prevention tools available, which could potentially decrease hospital burden. These include vaccines for those aged 60 years and older and an immunization for infants.



https://pedspandemicnetwork.org/news/pediatric-surge/

Systemic Challenges

#1: Low pediatric reimbursement + high costs = shrinking services

2X

as many **children 18 and under are on Medicaid** vs. adults ages 19-64. Meanwhile, Medicaid reimburses at 22% less than Medicare.[5,6]

+

+11%

Hospital expenses were 11% higher in 2021 than in 2019.[7]

=

-19%

Pediatric inpatient units have decreased by more than 19% over 10 years; rural areas have seen a decrease of 26%.[8]

#2: Staff stress & shortages, exacerbated by the COVID-19 pandemic

35%

More than 1 in 3 clinicians report at least **one symptom of burnout**.[9]

+

23%

of hospitals report a **critical staffing shortage**.[10]

#3: Gaps in everyday readiness for children's emergencies

69/100

was the **median score on a national assessment** of how ready emergency departments (EDs) are for pediatric patients.[11]

BUT

4X

Low pediatric readiness in EDs is associated with a **four-fold increase in mortality rate**.[12]

&

90%

of American families **do not have an ED closest to them** that is considered pediatric ready.[13]

Challenges faced by community EDs

- Pediatric readiness
  - Expertise: MD, RN, RT
  - Guideline
  - Equipment
- Staffing
- Beds

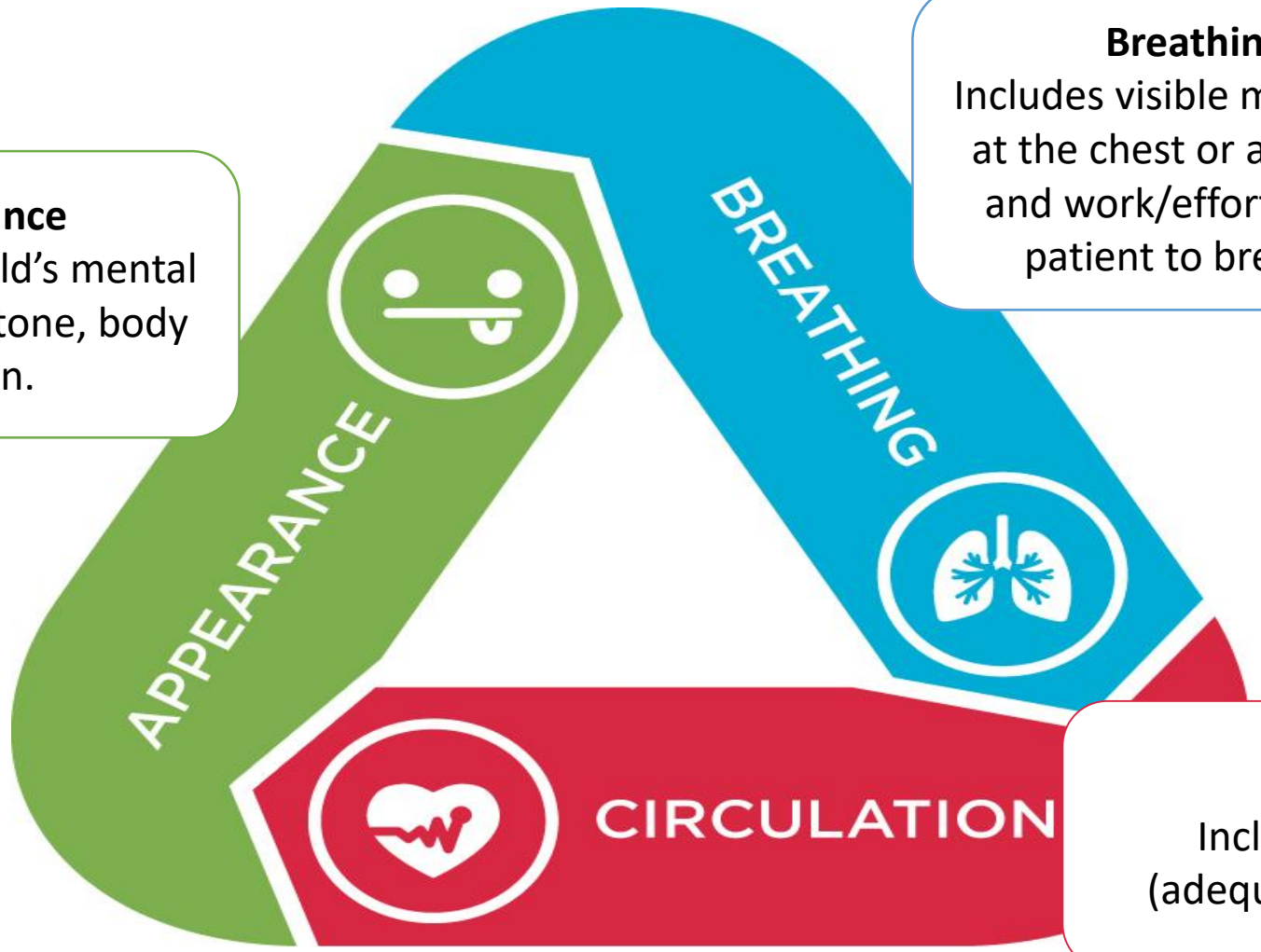
Undifferentiated case

- 2 YO with respiratory distress with some nasal congestion.
- P 130, R 52, Sat 92%
- Agitated child with upper airway noise with some wheezing and retractions
- Key differentiating factors
  - Medical history and medication
  - Age
  - Acute or gradual onset
  - Barky cough or wheeze

Pediatric Assessment Triangle

Appearance
Includes the child's mental status, muscle tone, body position.

Breathing
Includes visible movement at the chest or abdomen and work/effort for the patient to breathe.



Circulation
Includes skin color (adequacy of perfusion)

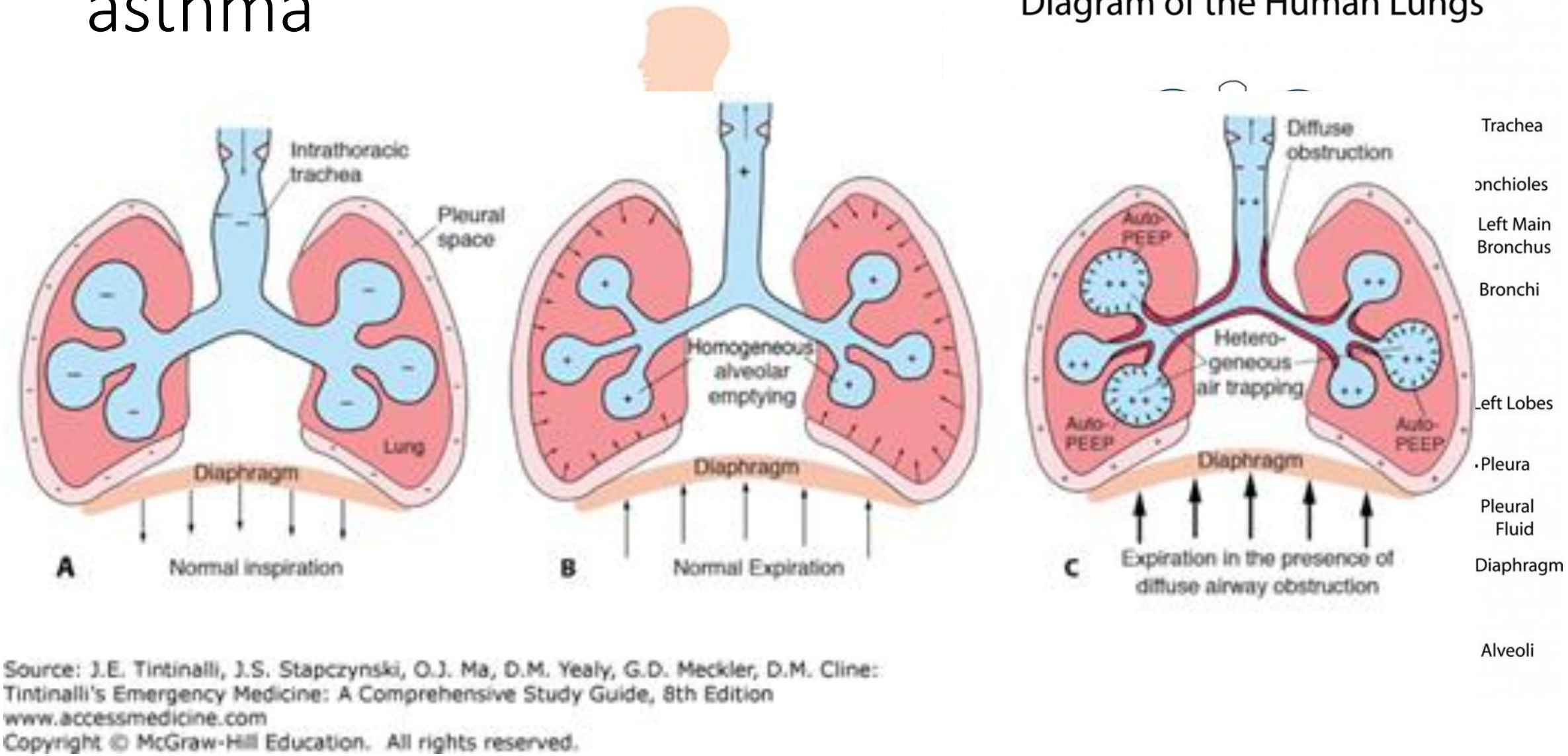
Asthma or Bronchiolitis or Croup?

	Asthma	Bronchiolitis	Croup
Age			
Etiology			
Pathophysiology			
Anatomy			
Clinical findings			
Treatment			

Case: S.A

- Patient is a 7 year old child with h/o asthma now has cough and breathing difficulties for last 24 hours. Despite albuterol MDI use every 4 hours, patient is continuing to have dyspnea. For last hour, patient has been agitated with occasional lethargy.
- VS: P 144, RR 32, BP 112/76, Pox 90%
- Exam: patient is anxious appearing, in moderate respiratory distress, and is pink in a leaning forward position. There is moderate to severe nasal flaring, retractions sitting in tripodding. There is minimal wheezing on auscultation.

asthma



Source: J.E. Tintinalli, J.S. Stapczynski, O.J. Ma, D.M. Yealy, G.D. Meckler, D.M. Cline: Tintinalli's Emergency Medicine: A Comprehensive Study Guide, 8th Edition
www.accessmedicine.com

Did you know?

Early intermittent wheezers vs. late persistent wheezers

Risk factors include: family hx, race, onset of wheeze, atopy, maternal smoking

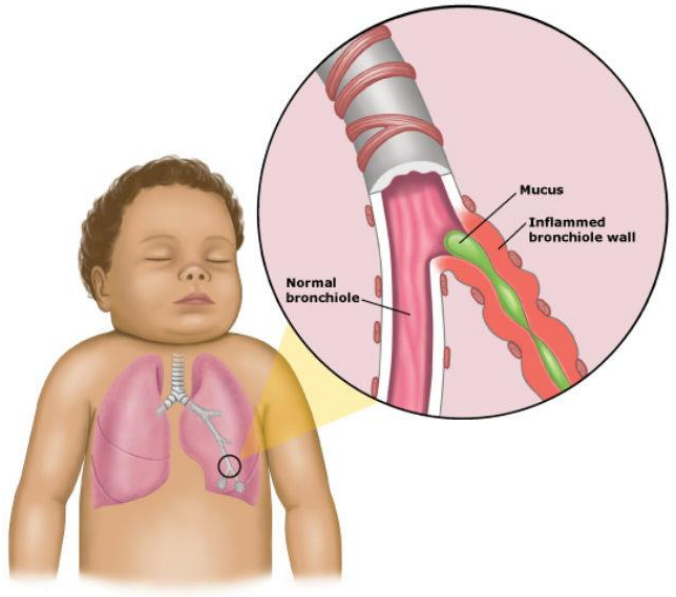
Triggers include: URI, allergens, inhalants, temperature, activity, hormones, medications, emotion

Intervention per Asthma protocol

- Albuterol and / or atrovent
- Steroid: dexamethasone, solumedrol (IV), prednisone
- Oxygen
- IV fluids if needed
- Magnesium Sulfate (25-75 mg/kg max 2.5 gm)
- NPPV
- Airway

10 mo girl in respiratory distress

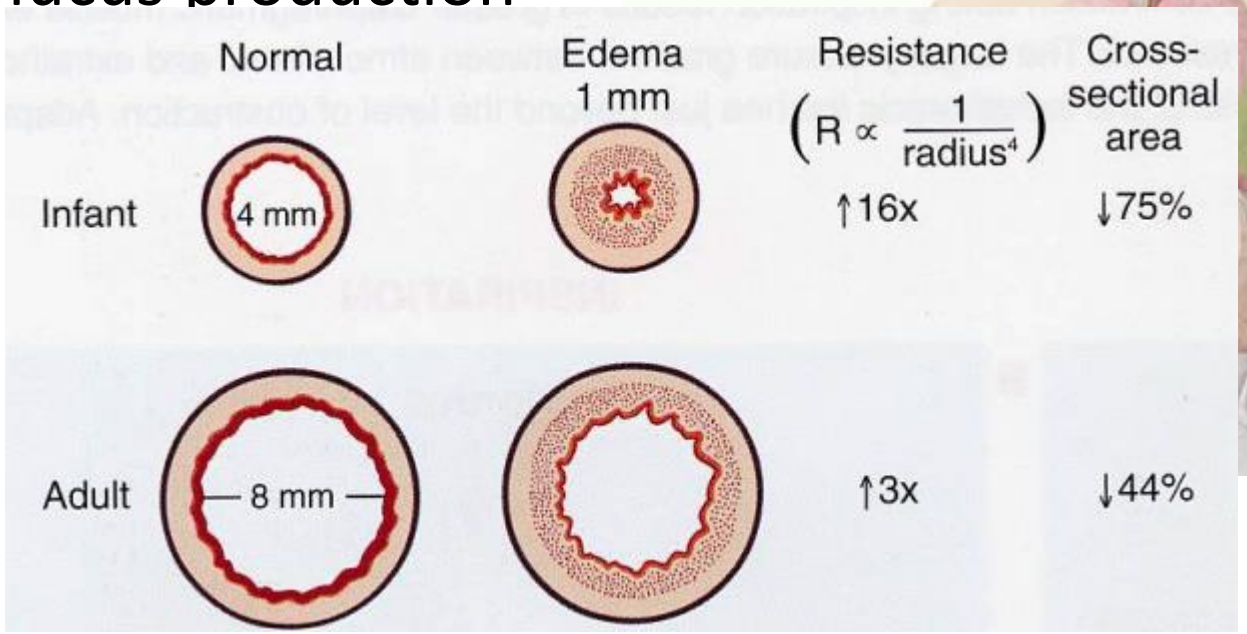
- 3 days of cold & worsening
- Lethargic, grunting with severe retractions, cyanotic
- P178, R64, BP-, POX 81%
- Lethargic, moderate resp distress and pale
- NC Oxygen 4 L/min with Pox 89%
- Poor aeration with CRT >3 sec
- VBG: pH 7.25, PCO2 48,BE -7
- CXR with hazy interstitial viral infection pattern

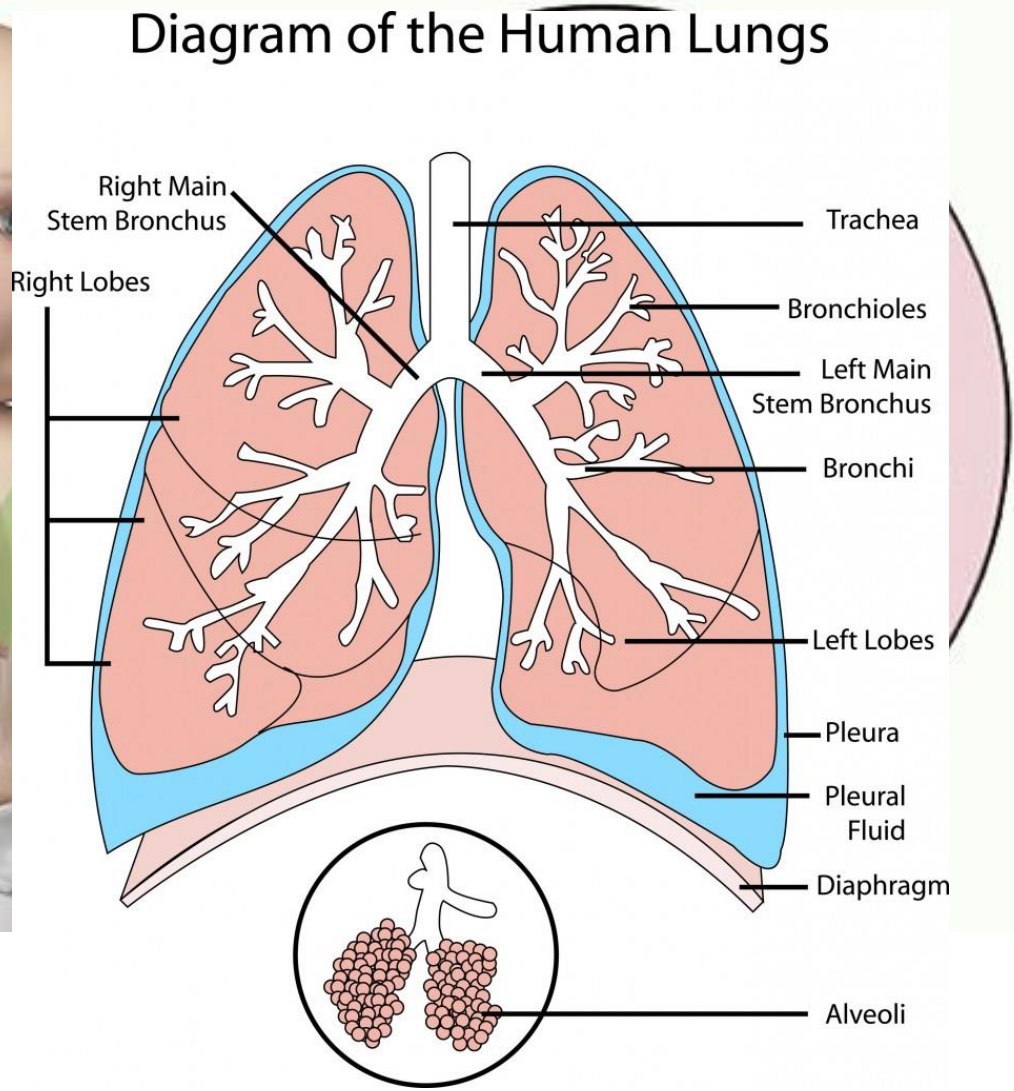


- Suction
- IVF
- Albuterol with minimal improvement

Bronchiolitis pathophysiology

- Viral infection
- Bronchioles
- Inflammation
- Mucus production

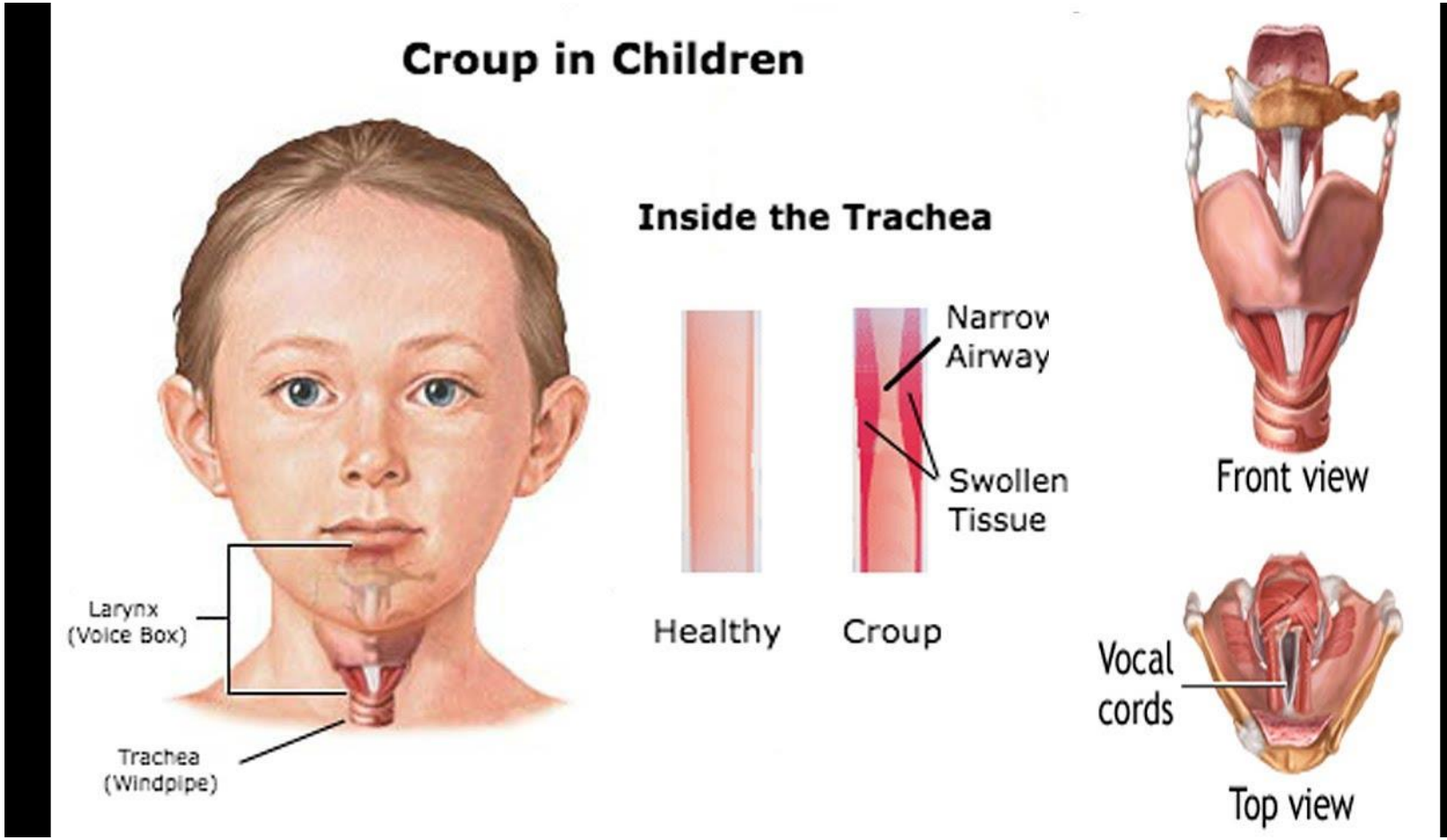


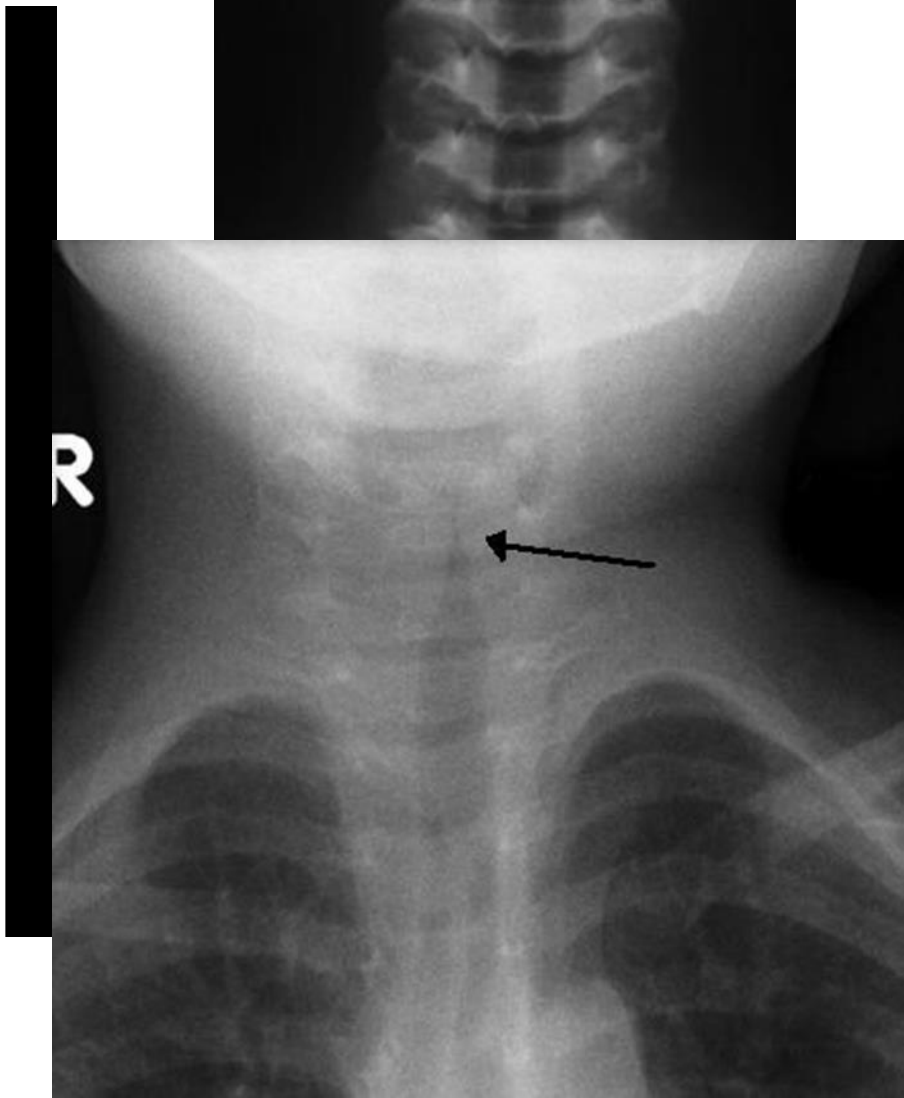


3 yo boy with dyspnea

- Acute onset of noisy breathing and barky cough
- Had URI for last 2 days with fever
- Alert and anxious, audible stridor with retractions, pink
- P 174, R 34, Pox 92%

Croup


Croup in Children
Larynx
(Voice Box)
Trachea
(Windpipe)
Inside the Trachea
Narrow
Airway
Swollen
Tissue
Healthy
Croup
Front view
Vocal
cords
Top view


R

Interventions

Racemic Epinephrine

Dexamethasone

“Cool air”

Supportive care

Differentiating resp conditions: Helpful historical information

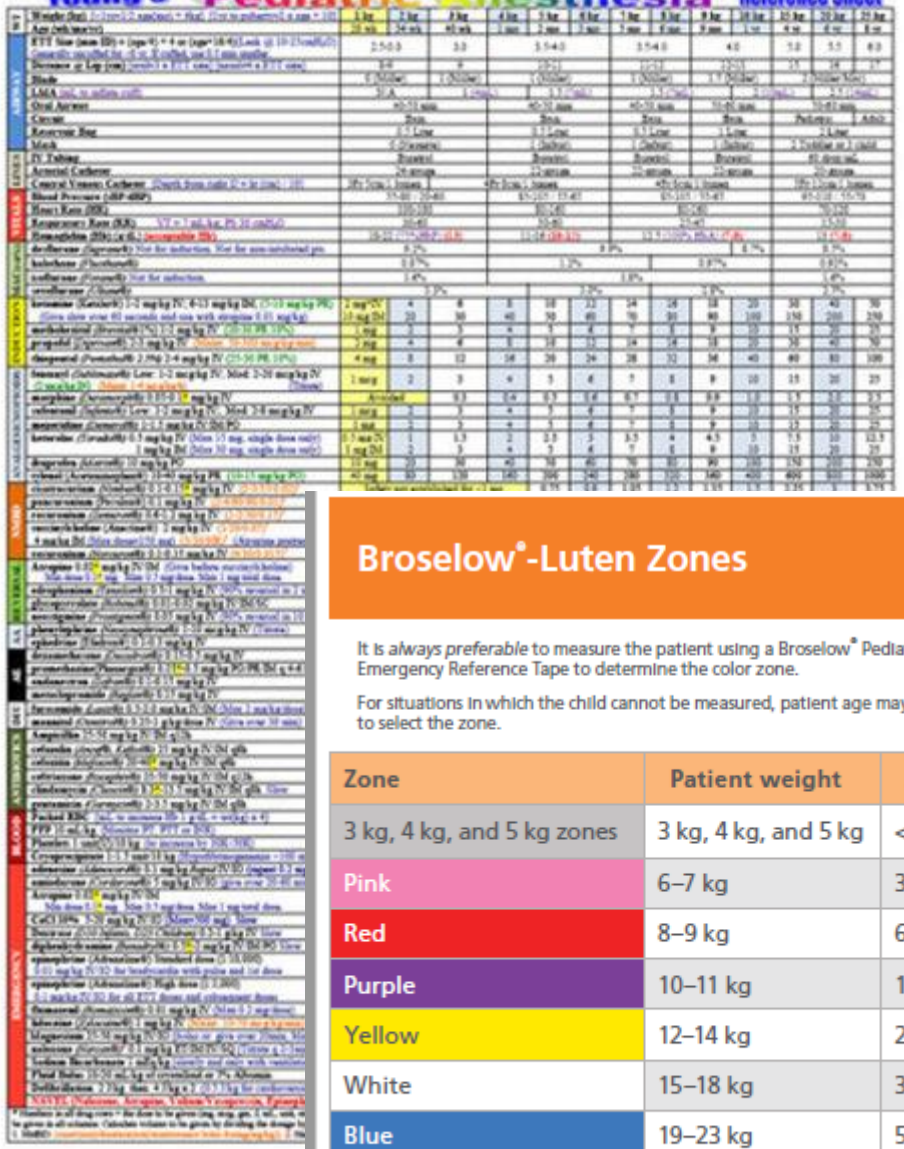
- Age
- Previous resp conditions
- Onset: sudden or gradual and choking
- Current symptoms: coughing, wheezing or barking
- Prodromal symptoms: runny nose or fever
- Possible triggers
- Meds and Tx given at home

Classic signs of respiratory distress and exam findings

- Visual inspection (without shirt)
- Degree of distress
- Position of comfort
- VS with Pulse Oximeter
- Upper airway sounds
- Lung exam
- Other systems

Weight, Normal Vital Signs and Equipment Estimates

AGE	Weight (kg)	Heart Rate	Respiratory Rate	BP – Systolic (mm Hg)	Laryngoscope Blade	ETT (cuffed)	LMA	King
Preterm	<3	120-160	40-60	40-60	1 straight only	2.5-3.0 (uncuffed)	1	0
Newborn	3	100-165	40-60	60-80	1 straight only	3.0	1	0
1 month	6	120-180	40-60	65-95	1 straight only	3.0	1	0
6 months	8	110-185	25-40	65-105	1 straight only	3.0	1.5	1
12 months	10	110-170	20-30	70-110	1 straight only	3.5	2	1
2 years	12	90-150	20-30	70-110	2 straight only	4.0	2	2
3 years	14	75-135	20-30	80-110	2 straight or curved	4.0	2	2
4 years	16	75-135	20-30	80-110	2 straight or curved	4.5	2	2
5 years	18	65-135	20-30	80-110	2 straight or curved	4.5	2	2
6 years	20	60-130	12-25	90-115	2 straight or curved	5.0	2.5	2.5
8 years	26	60-120	12-25	90-115	3 straight or curved	6.0	2.5	2.5
10 years	32	60-120	12-25	95-120	3 straight or curved	6.5	3	2.5
12 years	42	60-120	12-25	95-120	3 straight or curved	6.5	3	3
14 years	50	60-120	12-18	100-130	3 straight or curved	6.5	4	4



BLUE

SEIZURE		ICP	
Lorazepam (2 mg/mL)	2 mg (1 mL)	3% Saline	42-105 mL
(4 mg/mL)	2 mg (0.5 mL)	Mannitol 20% (0.2 g/mL)	21 g (105 mL)
Diazepam IV (5 mg/mL)	4.2 mg (0.84 mL)	25% (0.25 g/mL)	21 g (84 mL)
Phenobarbital (65 mg/mL)	420 mg (6.5 mL)	Furosemide (10 mg/mL)	21 mg (2.1 mL)
(130 mg/mL)	420 mg (3.2 mL)	**FLUIDS**	
Phenytoin (50 mg/mL)	420 mg (8.4 mL)	Fluid Bolus	
Fosphenytoin (50 mg PE/mL)	420 mg PE (8.4 mL)	Crystalloid (NS or LR)	420 mL
Levetiracetam (100 mg/mL)	1050 mg (10.5 mL)	Colloid/blood	210 mL
OVERDOSE/HYPOGLYCEMIA		Maintenance	
$D_{25}W$ (0.25 g/mL)	10.5 g (42 mL)	D5 1/2 NS + 20 mEq KCL/L	63 mL/hr
$D_{50}W$* (0.5 g/mL)	10.5 g (21 mL)	**PAIN**	
Naloxone (1 mg/mL)	2 mg (2 mL)	Fentanyl (50 mcg/mL)	21 mcg (0.42 mL)
(0.4 mg/mL)	2 mg (5 mL)	Morphine (2 mg/mL)	2.1 mg (1.1 mL)
Flumazenil (0.1 mg/mL)	0.2 mg (2 mL)	(4 mg/mL)	2.1 mg (0.53 mL)
Charcoal (25 g/120 mL)	21 g (100mL)		
Glucagon (1 mg/mL)	1 mg (1 mL)		

* Dilute $D_{50}W$ 1:1 with preservative free sterile water

EQUIPMENT		EQUIPMENT	
*E.T. Tube	5.5 Uncuffed/*5.0 Cuffed	Oxygen Mask	Pediatric NRB
E.T. Insertion Length	15.5-16.5 cm	*$ETCO_2$	Adult
Stylet	10 French	*Urinary Catheter	10-12 French
Suction Catheter	10 French	*Chest Tube	20-28 French
Laryngoscope	2 Straight or Curved	NG Tube	10-14 French
BVM	Child	Vascular Access	18-20 Ga
Oral Airway	70 mm	Intraosseous (IO)	15 Ga
*Nasopharyngeal Airway	24 French	BP Cuff	Child
*LMA	2-2.5	*May not be included in Organizer System(s).	

Broselow®-Luten Zones

It is *always preferable* to measure the patient using a Broselow® Pediatric Emergency Reference Tape to determine the color zone.

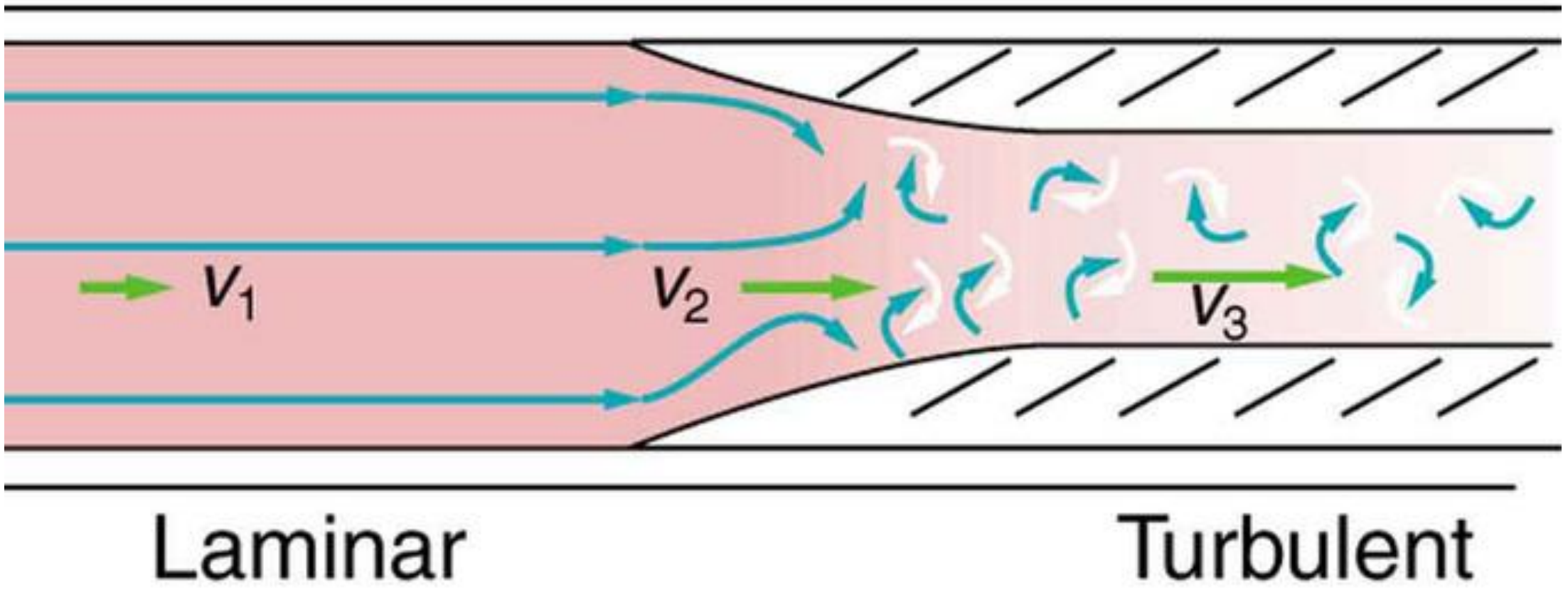
For situations in which the child cannot be measured, patient age may be used to select the zone.

Zone	Patient weight	Age
3 kg, 4 kg, and 5 kg zones	3 kg, 4 kg, and 5 kg	< 3 mos
Pink	6–7 kg	3–5 mos
Red	8–9 kg	6–11 mos
Purple	10–11 kg	12–24 mos
Yellow	12–14 kg	2 yrs
White	15–18 kg	3–4 yrs
Blue	19–23 kg	5–6 yrs
Orange	24–29 kg	7–9 yrs
Green	30–36 kg	10–11 yrs

Equipment

“Don’t worry. He is not wheezing!”

Sound

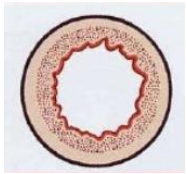


IMPORTANT

Air Entry

Wheeze

Beath sound

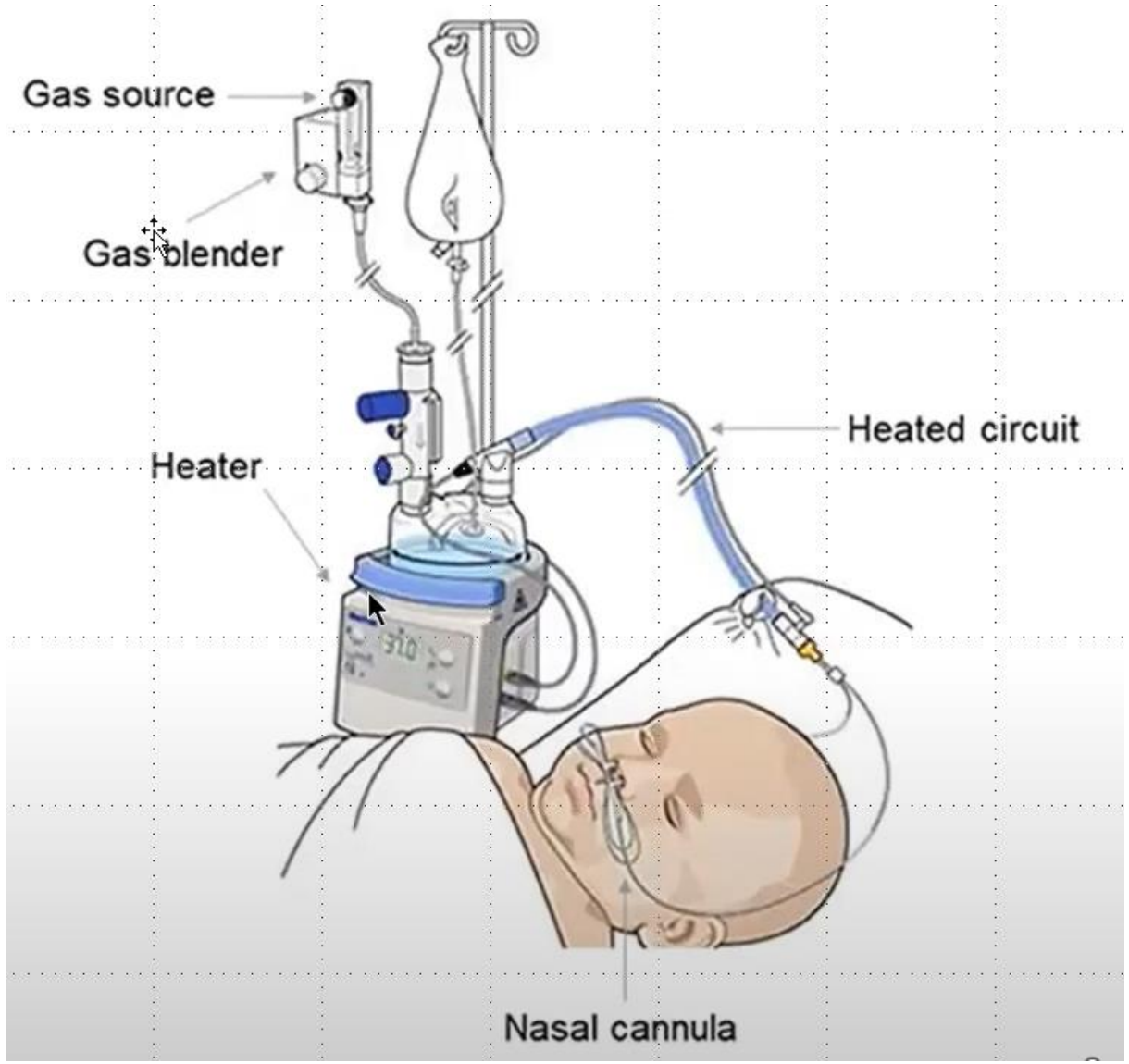


Asthma or Bronchiolitis or Croup?

	Asthma	Bronchiolitis	Croup
Age	> 2 YO	< 2 YO	6 mo – 3 YO
Etiology	Allergen	Viral infection	Viral or Spasmodic
Pathophysiology	Spasm, mucus, inflammation	Inflammation, mucus production	Soft tissue inflammation & edema
Problem location	Large airways: Bronchus	Small airways: Bronchioles	Subglottic region
Clinical findings	Cough, wheeze	Fever, Rhinorrhea, cough, multiphonic lung sounds	Nasal congestion, fever, barky cough, stridor
Treatment	Bronchodilator, steroids, Mg, Epi	Suction, O2, Bronchodilator, Steroid, IVF, supportive	Racemic Epi, Dexamethasone

HFNC

- Humidity
- Adjustable flow: ½ to 30 L/min
- Adjust O2



High Flow Nasal Cannula:

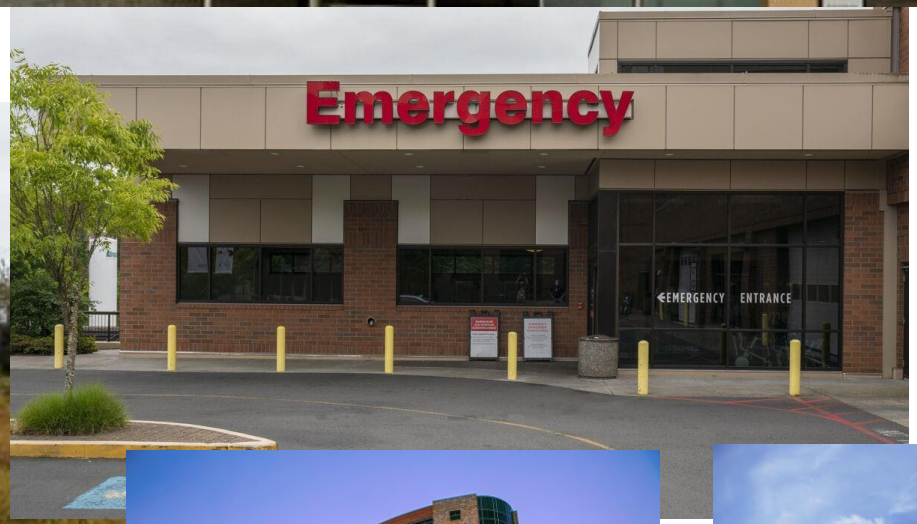
Initial flow is set is often 2L/kg

- Infant = greater than 2 lpm
- Child = greater than 3 lpm
- Teen = greater than 6 lpm

- FiO2 range is 21-100%
- Flow Range is 0.5-30 depending on the size of the cannula

Where to???


EMANUEL MEDICAL CENTER
ADULT EMERGENCY
ADULT EMERGENCY


Emergency
EMERGENCY ENTRANCE


EMERGENCY
ROOM


AMERICAN FAMILY CHILDRENS HOSPITAL

HEALTH ›

Rising RSV cases threaten to overwhelm hospitals in our area, nationwide

CBS NEWS NEW YORK

BY JOHN DIAS

UPDATED ON: DECEMBER 5, 2022 / 12:24 PM / CBS NEW YORK

Pediatric ER doctor gives glimpse into front lines of RSV surge: 'No space anywhere'

Packed emergency rooms, long wait times, no beds. One doctor recounts how the surge in respiratory viruses like RSV is overwhelming children's hospitals.

Daily Briefing

'Crisis mode': RSV surge overwhelming pediatric hospitals

HEALTH

Children's hospitals grapple with a nationwide surge in RSV infections

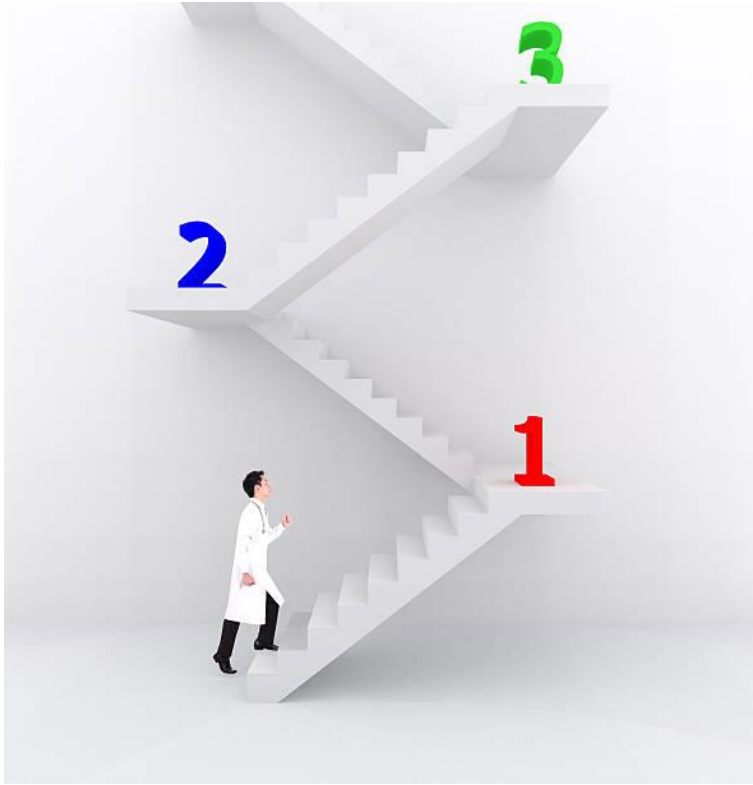
October 24, 2022 · 5:00 AM ET

Capacity dilemma and effects on EMS

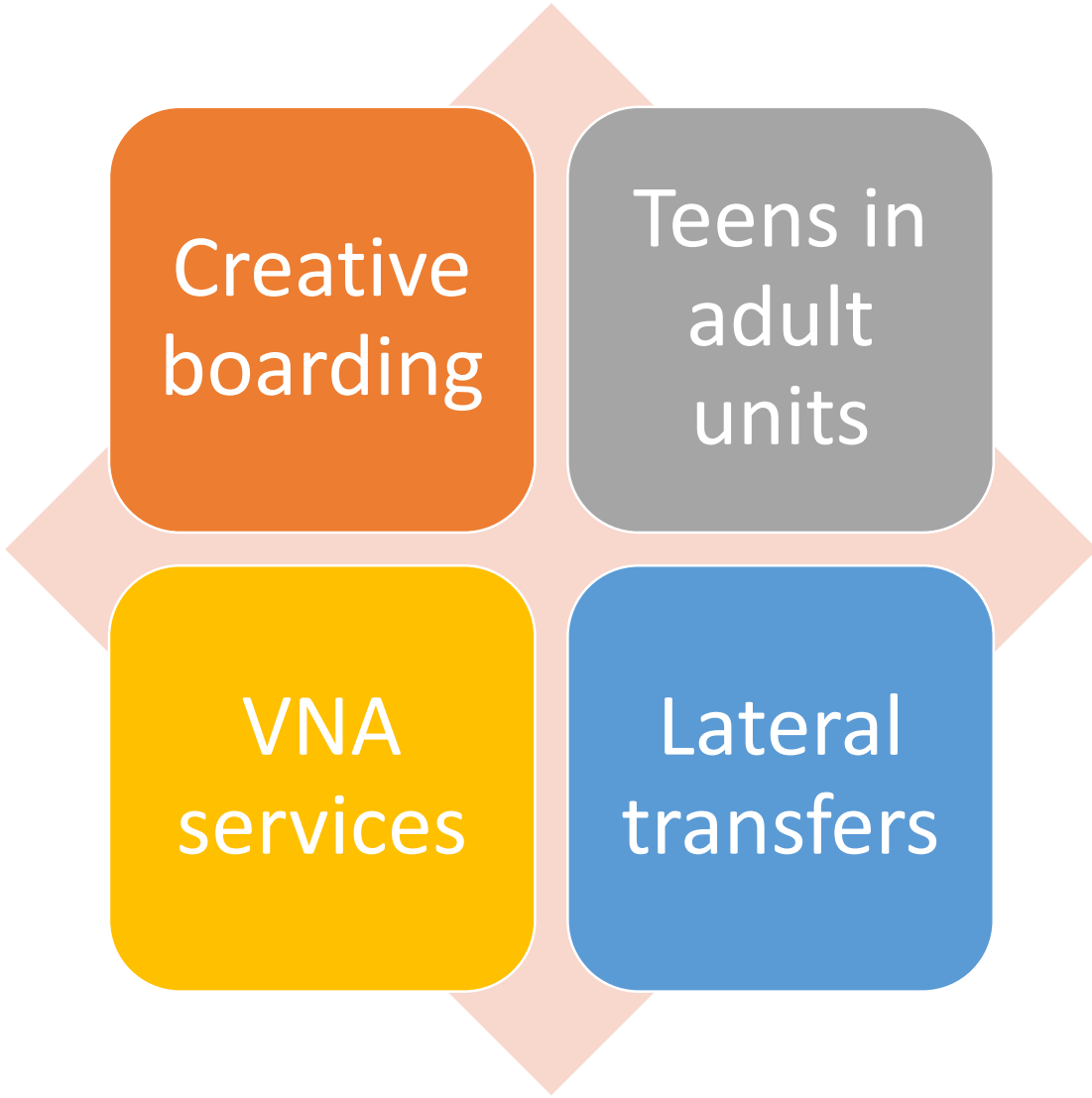
Escalation of care in ED

- Keep monitoring
- NC
- HFNC
- Heliox
- NIPPV
- Intubation

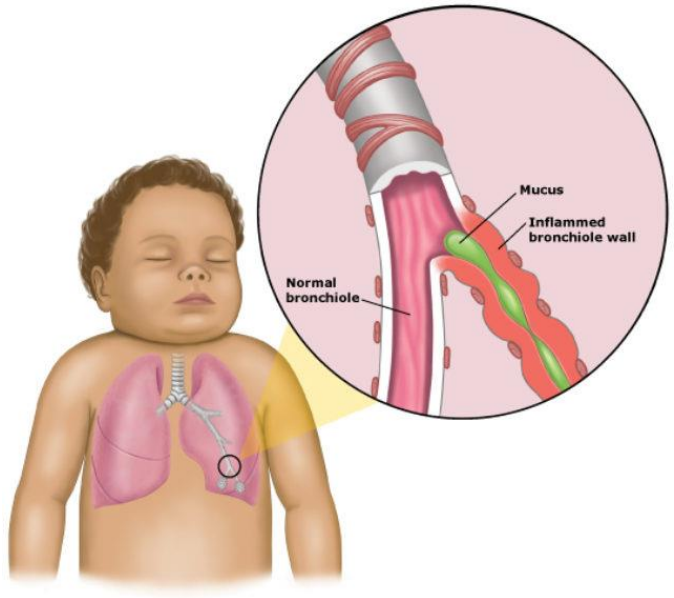
- O2
- Alb
- Ipratropium
- Steroid
- Epi
- Magnesium
- Terbutaline



ED capacity


Creative boarding
Teens in adult units
VNA services
Lateral transfers

10 mo girl in respiratory distress



- 3 days of cold & worsening
- Lethargic, grunting with severe retractions, cyanotic
- P178, R64, BP-, POX 81%
- Lethargic, moderate resp distress and pale
- NC Oxygen 4 L/min with Pox 89%
- Poor aeration with CRT >3 sec
- VBG: pH 7.25, PCO2 48,BE -7
- CXR with hazy interstitial viral infection pattern

- Suction
- IVF
- Albuterol with minimal improvement

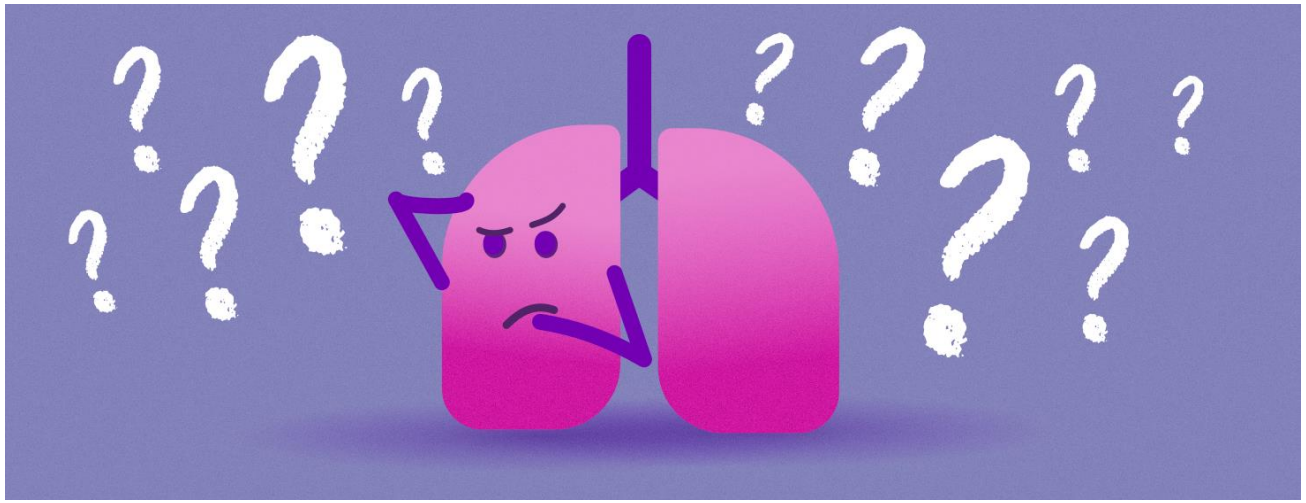
- No bed available
- PICU consult
- Stayed in community ED for 3 days

Call to action

- Do your part and educate
  - Vaccination
  - Minimize potential exposures
  - Monitor and manage ill providers
  - Standard precautions and respiratory hygiene
  - Adhere to infection control measures
- Enhancing community care availability and expertise
- Pediatric readiness for EMS and EDs
- Increased coordination: WI Pediatric Medical Surge Plan
  - https://www.dhs.wisconsin.gov/publications/p03207.pdf
- Maximize staffing resources
- Flexible age limits

Complex teamwork

- Dept Public Health
- PCP
- EMS
- ED and hospital personnel
- Nursing
- RT
- Receiving hospital
- Family
- Hospital leadership



- https://www.rdhrs.org/surge-in-pediatric-patients-with-acute-respiratory-infections-resources-and-tools/
- https://bpb-us-e2.wpmucdn.com/sites.pedspandemicnetwork.org/dist/c/12/files/2023/04/pediatric-surge-recommendations-resources.pdf