Approach to Acute Respiratory Distress in Children

ED Pediatric Emergency Care Coordinator Quarterly Meeting

August 23, 2023

Michael Kim, MD

Disclosure

- Advancing Healthier Wisconsin Grant

Objectives

- Understand the respiratory surge in children
- Recognition, evaluation and management of respiratory distress in children
- Interventions if delayed transport
- Preparation for the pediatric respiratory surge

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

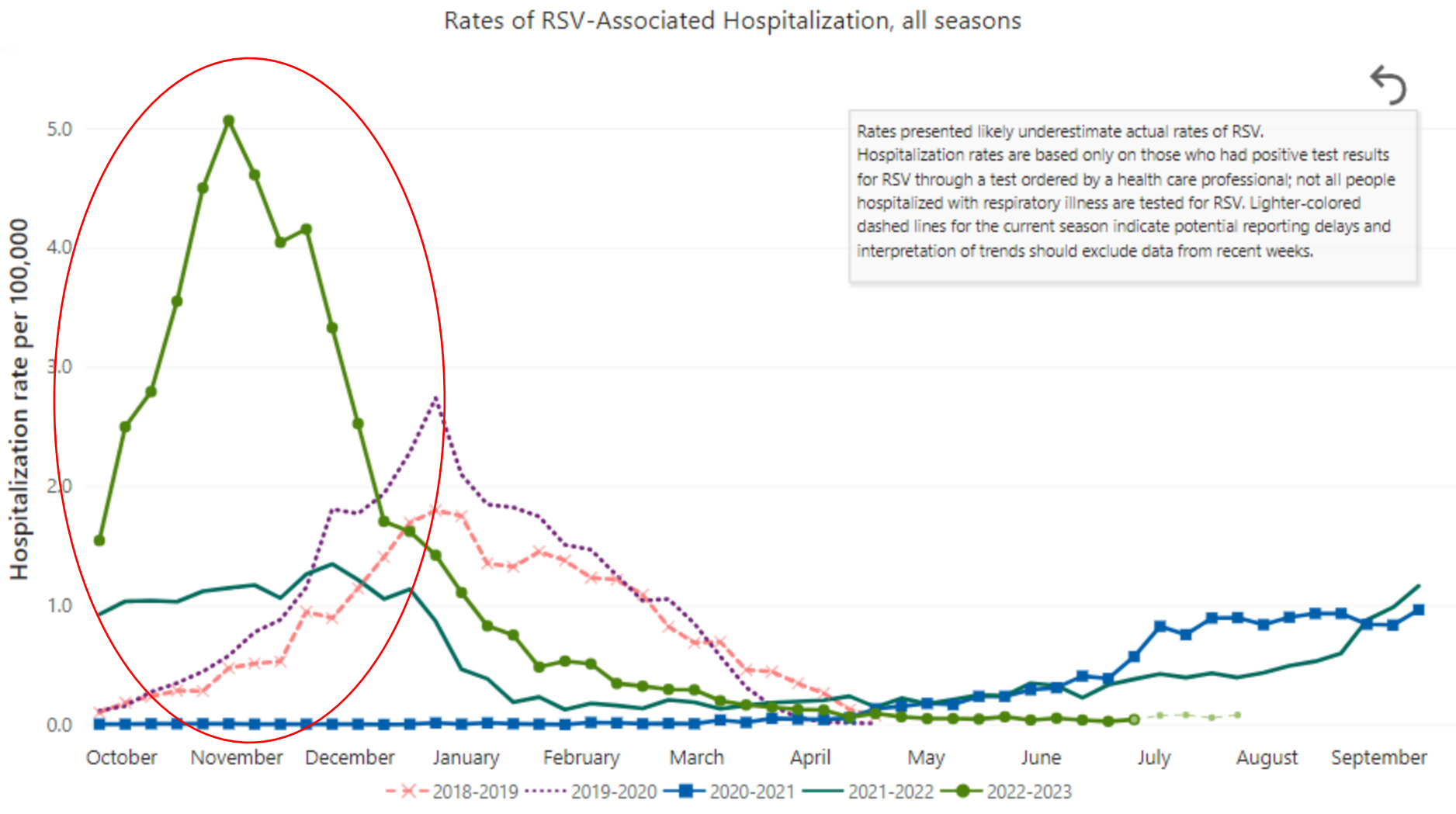
Season: All

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.

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

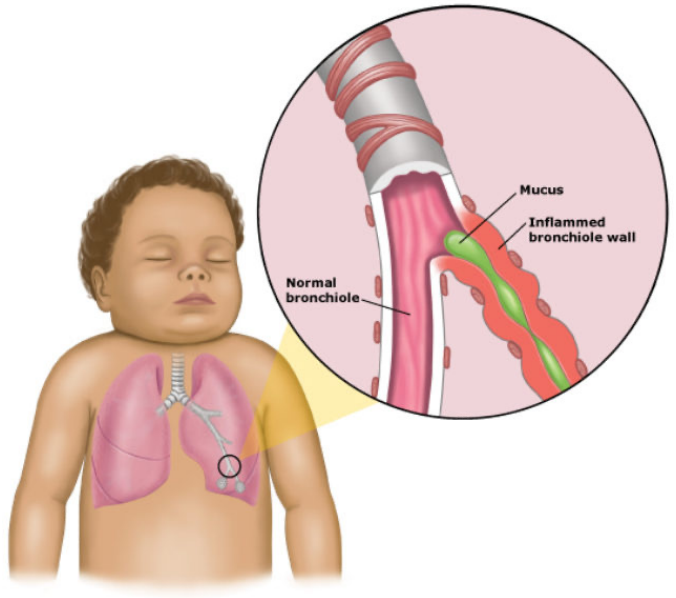
'Crisis mode': RSV surge overwhelming pediatric hospitals

HEALTH

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

October 24, 2022 · 5:00 AM ET

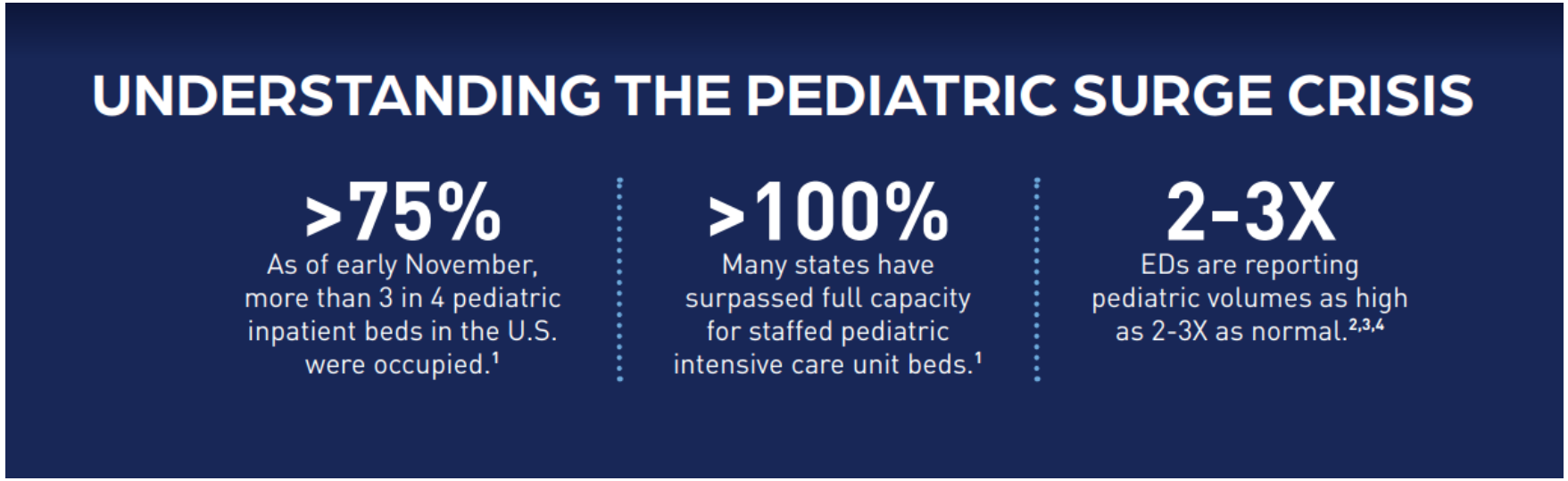
10 mo girl in respiratory distress



- 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



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]

Public Health Challenges

#4: The growing pediatric mental health crisis

+280%
The suicide rate in children ages 5-12 **increased 280% from 1999-2018**.[14]

+

68%
of U.S. counties are designated as **mental health professional shortage areas.**[15]

=

+6-10%
Pediatric **utilization of EDs for mental health** has been increasing 6% to 10% *per year*.[16]

#5: A tidal wave of respiratory illnesses

+68%
From October to December, the number of children with **COVID-19 at hospital admission** increased 68%.[17]

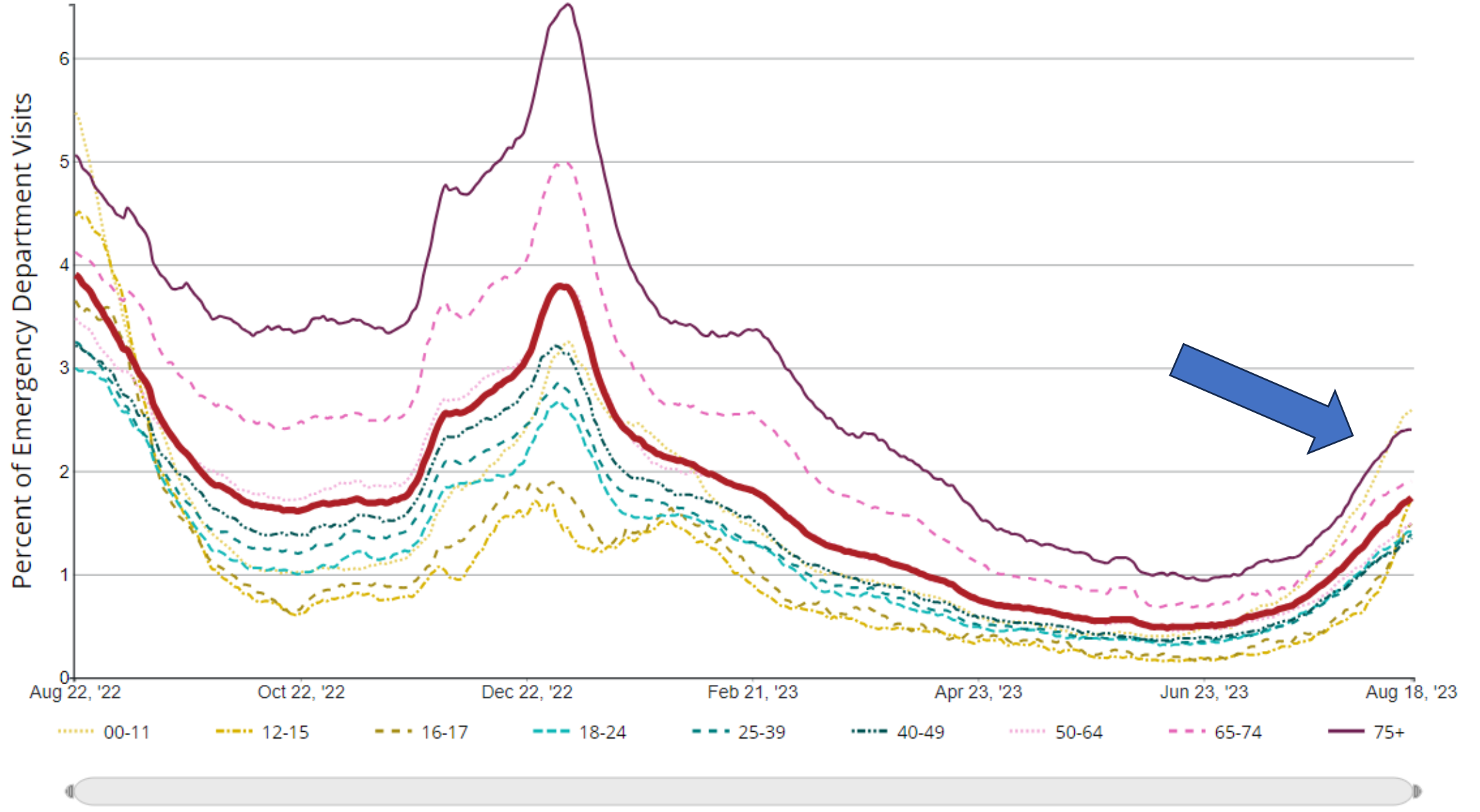
+

+14%
Flu hospitalization of young children reached nearly 14% in November 2022, the highest point for that period since 2009.[18]

+

+300%
RSV hospitalization among children in November 2022 was more than quadruple the rate a year earlier.[19]

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



Challenges faced by community EDs

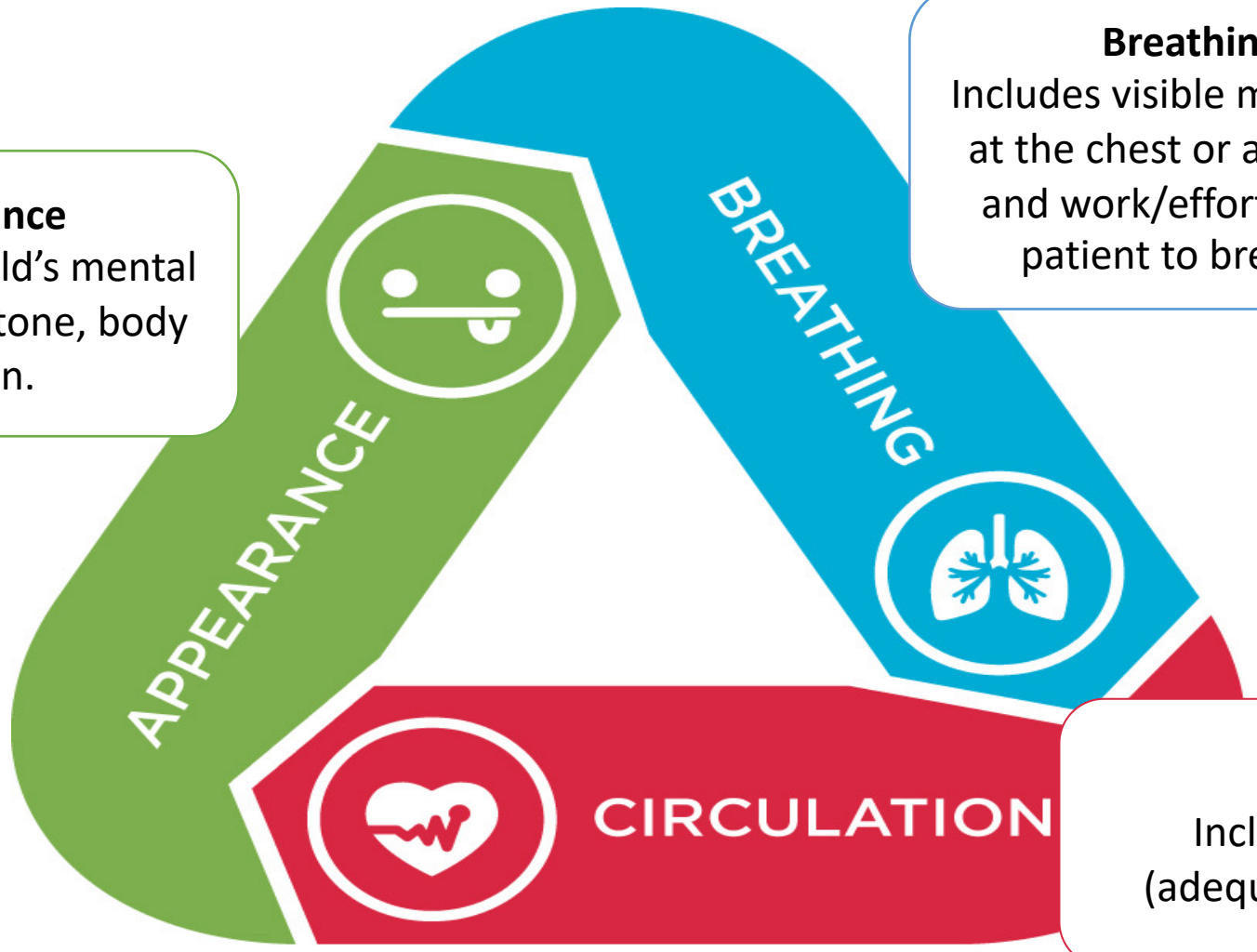
- Pediatric readiness
  - Expertise: MD, RN, RT
  - Guideline
  - Equipment
- Staffing
- Beds

Brief overview of assessment and management of pediatric respiratory emergencies

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)

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

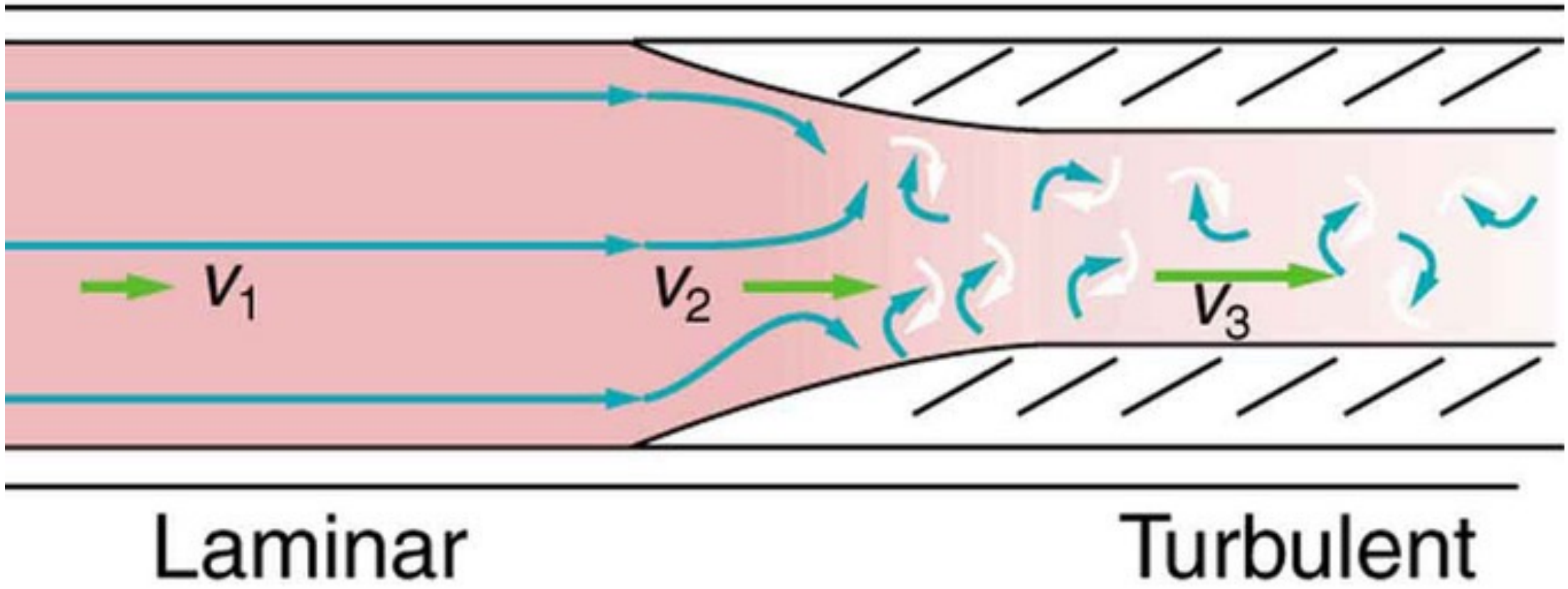
- Visual inspection
- Degree of distress
- Position of comfort
- VS with Pulse Oximeter
- Upper airway sounds
- Lung exam
- Other systems

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

“Don’t worry. He is not wheezing!”

Sound

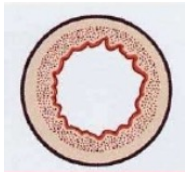


IMPORTANT

Air Entry

Wheeze

Beath sound



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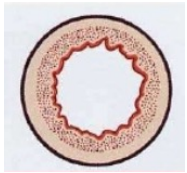

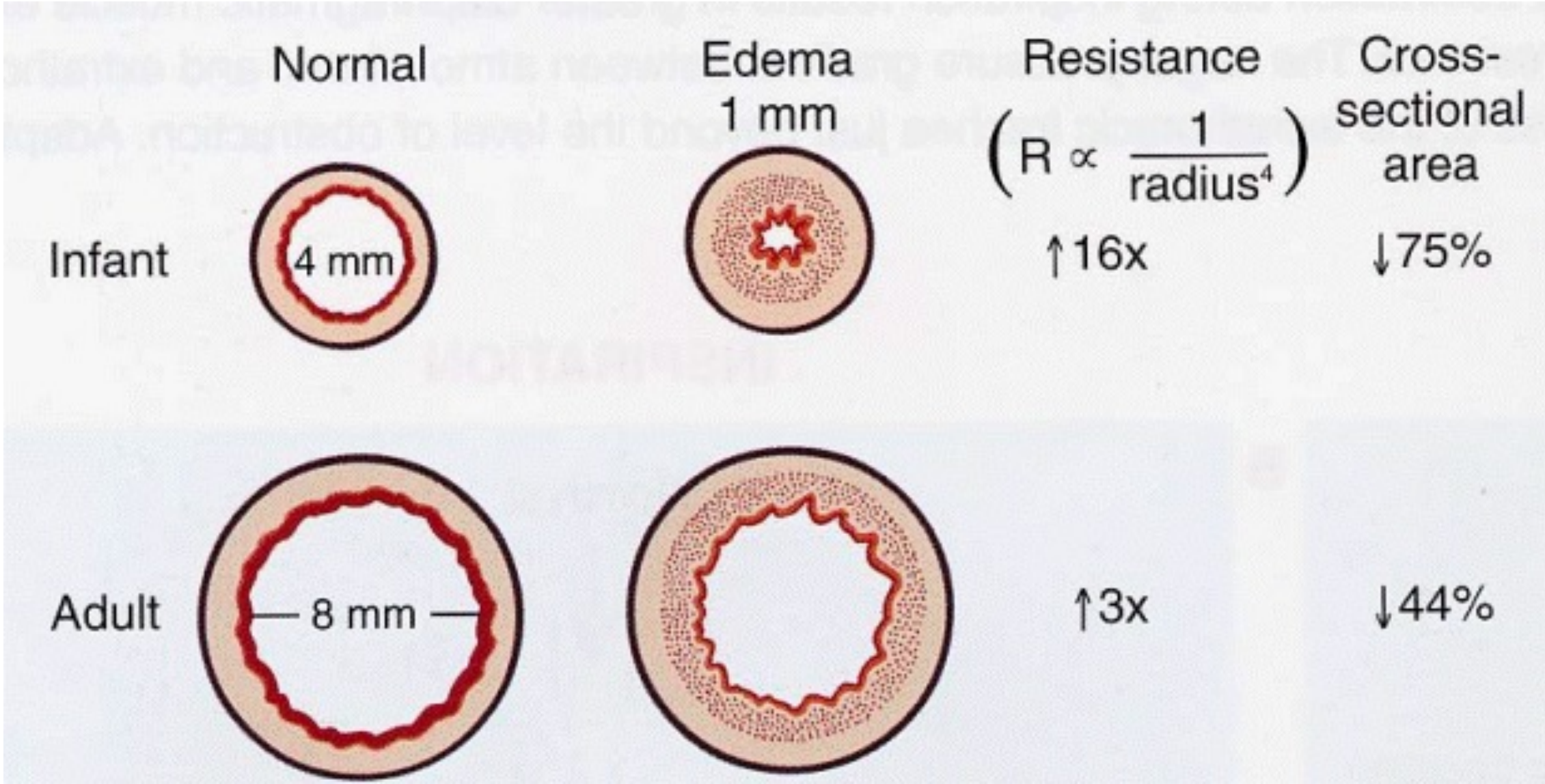
Normal
Edema
1 mm
Resistance
$\left(R \propto \frac{1}{\text{radius}^4}\right)$
Cross-sectional area
Infant
4 mm
↑16x
↓75%
Adult
8 mm
↑3x
↓44%

Asthma or Bronchiolitis or Croup?

	Asthma	Bronchiolitis	Croup
Age			
Etiology			
Pathophysiology			
Problem location			
Clinical findings			
Treatment			

Asthma or Bronchiolitis or Croup?

	Asthma	Bronchiolitis	Croup
Age	> 2 YO	< 2 YO	6 mo – 3 YO
Etiology			
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Problem location			
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Problem location			
Clinical findings			
Treatment			

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Treatment			

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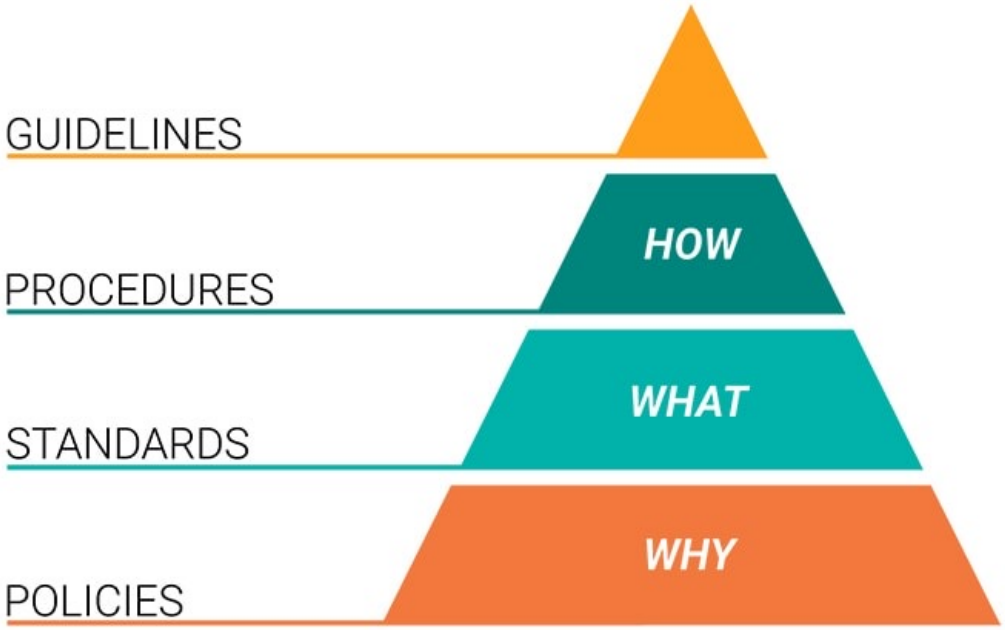
Super Tx	Terbutaline, BiPAP, Aminophylline, ETT	HFNC, CPAP, ETT	Heliox, ETT

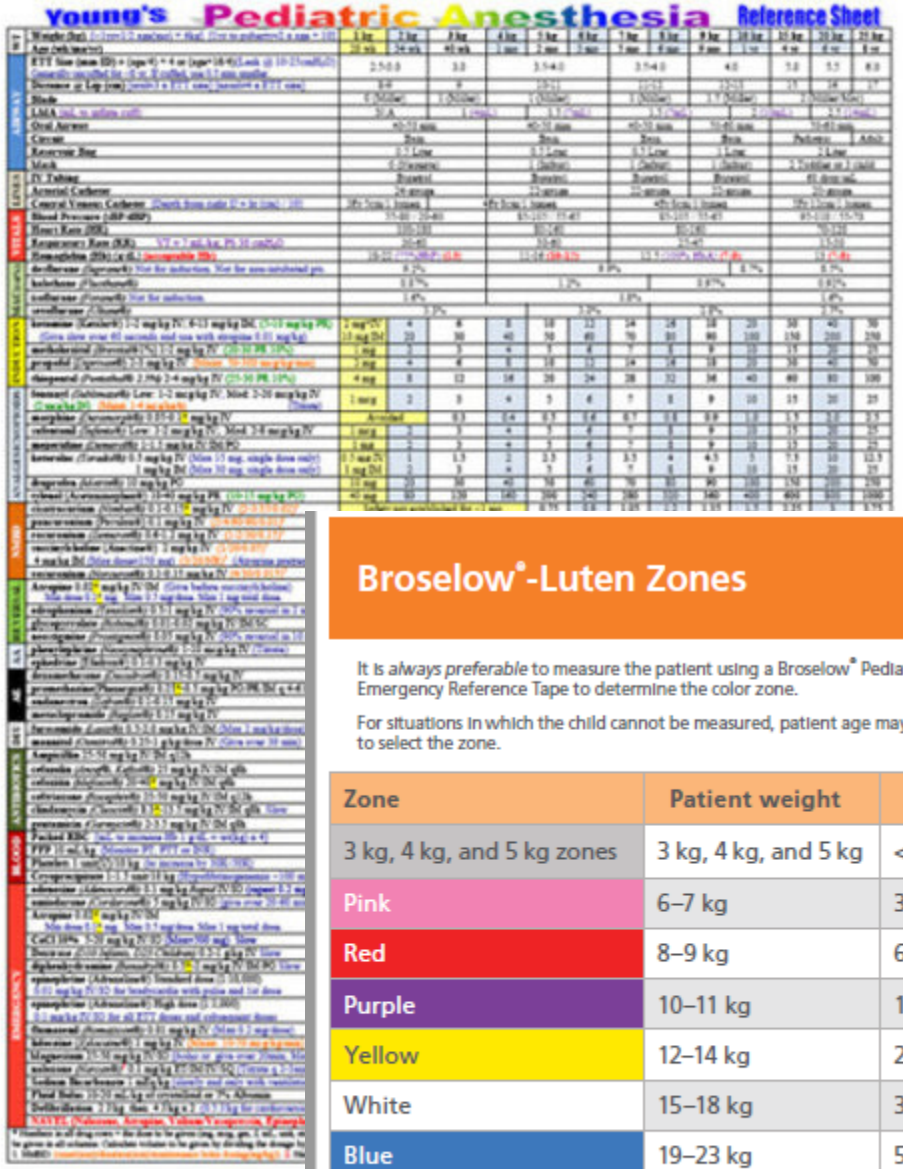
Policies, procedures, guidelines, & references



Vital signs

- Methods and equipment
- VS reference table
- Abnormal VS alert

	Infant (0-12 months)	Toddler (1-2 years)	Preschool (3-5 years)	School (6-11 years)	Adolescent (12-18 years)
Pulse	110-165	100-140	80-125	70-110	60-100
Respiratory Rate	30-60	35-45	20-30	16-25	12-20
Systolic Blood Pressure	70-100	85-105	90-110	95-115	100-120
Temperature (Celsius)	36-38	36-38	36-38	36-38	36-38
Temperature (Fahrenheit)	96.8-100.4	96.8-101	96.8-101	96.8-101	96.8-102
Pulse Oximeter	>95%	>95%	>95%	>95%	>95%



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

Children's Hospital of Wisconsin

EDTC PATHWAY

Asthma
Clinical Practice Pathway

Box 1. *Eligibility criteria include:*
1. Age ≥2 years (children 1-2 years are eligible if discussed with MD/PA/NP)
2. Prior diagnosis of asthma or RAD without other significant comorbidities (tracheostomy, cardiac disease)
3. Acute symptoms of an exacerbation (wheezing, difficulty breathing, significant cough)

Box 2. *Asthma assessment components*
1. Respiratory rate, oxygen saturation
2. PASS Score
3. Peak flow (If older than 5 years and able to complete)

Is patient eligible for asthma clinical pathway? **(Box 1)**

NO → Patient off clinical pathway

YES

Nurse or RCP begins asthma assessment **See Box 2**

Box 3. *Adjunct Therapies*
1. Epinephrine 1:1000, 0.01 mL/kg SC (max 0.3mL)
2. Heliox 70/30 (If no oxygen requirement)
3. Terbutaline 2mcg/kg IV bolus, then 0.1mcg/kg/min infusion
4. Aminophylline 5-7 mg/kg IV load over 20-30 minutes. Maintenance dosing: https://connect.chw.org/Search?keywords=aminophylline&context=intranet
5. CPAP/BiPAP for impending or actual respiratory failure.

PASS 0-2

Patient roomed if available. If not, initial treatment below provided in triage.

Initial Treatment

EDTC PASS 0-2 Order Set
1. Supplemental oxygen as needed to maintain SpO_2 ≥92%
2. Administer Short-acting β-agonist (SABA) per protocol or by provider order
3. Consider additional SABA via inhaler with spacer and teaching
4. Provider to order albuterol q20 minutes x2 for PASS ≥2
5. Add ipratropium bromide (Atrovent®) 0.5 mg if recent albuterol treatments given at home or via EMS
6. Administer oral steroids for patients requiring more than one SABA treatment: Decadron 0.6mg/kg (Max 16 mg). **(Strongly consider for any patient with significant asthma history or prolonged symptoms.)**

Reassess PASS **within 15 minutes**

PASS <2

Likely Discharge
1. Complete teaching
2. Encourage PMD follow-up within 5-7 days
3. Further treatment per MD discretion

PASS ≥2

1. Administer up to two additional SABA and ipratropium treatments (treatments 2 & 3) **every 20 minutes for PASS ≥2**
2. Reassess PASS **within 15 minutes** of each treatment

PASS 2-3

EDTC Asthma Ongoing Care Order Set
1. Consider continuous albuterol
2. Consider IV Magnesium

Consider Admission (Page 2)

PASS 3-6

Patient immediately roomed in main ED and attending notified.

Initial Treatment

EDTC PASS 3-6 Order Set
1. Supplemental oxygen as needed to maintain SpO_2 ≥92%
2. Administer continuous albuterol and ipratropium bromide
3. Oral corticosteroids: Decadron 0.6mg/kg (Max 16 mg). *Consider methylprednisolone IV at 2mg/kg for vomiting or inability to tolerate PO* (max dose 60-80 mg).
4. Assess PASS **every 15 minutes**
5. For PASS ≥5 strongly consider early IV magnesium sulfate or other adjunct treatments **(Box 3)**

PASS <2

Possible Discharge
1. Observe 30-60minutes post treatment
2. Further treatment per MD discretion

PASS ≥2

EDTC Asthma Ongoing Care Order Set
1. Continuous albuterol
2. IV magnesium sulfate (if not already given)
3. Further adjunctive treatment per MD discretion **(Box 3)**

Consider Admission (Page 2)

This information is intended as a guideline for the management of children with Asthma. Management of the actual patient may require a more individualized approach.

Children's Hospital of Wisconsin

EDTC PATHWAY

Asthma
Admission Algorithm

Patients at increased risk of needed admission:
1. Combined PASS and total number of β-agonists treatments administered >5
   a. Continuous albuterol considered equivalent to 3 treatments

- ✓ Received treatment in CHW ED for at least 2 hours
- ✓ Received at least 6 albuterol treatments (equivalent of 2 hours continuous)
- ✓ Received steroids
- ✓ May receive IV magnesium (should be strongly considered for those not responding to albuterol)

- ➢ PASS Score < 4 or
- ➢ PASS Score is improving*

Floor placement

Patients may require frequent albuterol treatments or continuous albuterol treatments on the floor.

- ➢ PASS Score ≥ 4 and
- ➢ PASS Score is <u>not</u> improving*, or
- ➢ O2 requirement >6L by facemask and >3L by nasal cannula

<u>Escalation in care as clinically indicated</u>:
- ✓ Continuous albuterol
- ✓ IV magnesium if not given
- ✓ IV terbutaline/aminophylline
- ✓ Noninvasive or invasive ventilation

PICU placement

Patients requiring rapid escalation in care may not have 2 hours of treatment at time of bed request.

Croup[1] Clinical Practice Guideline

Children's Wisconsin

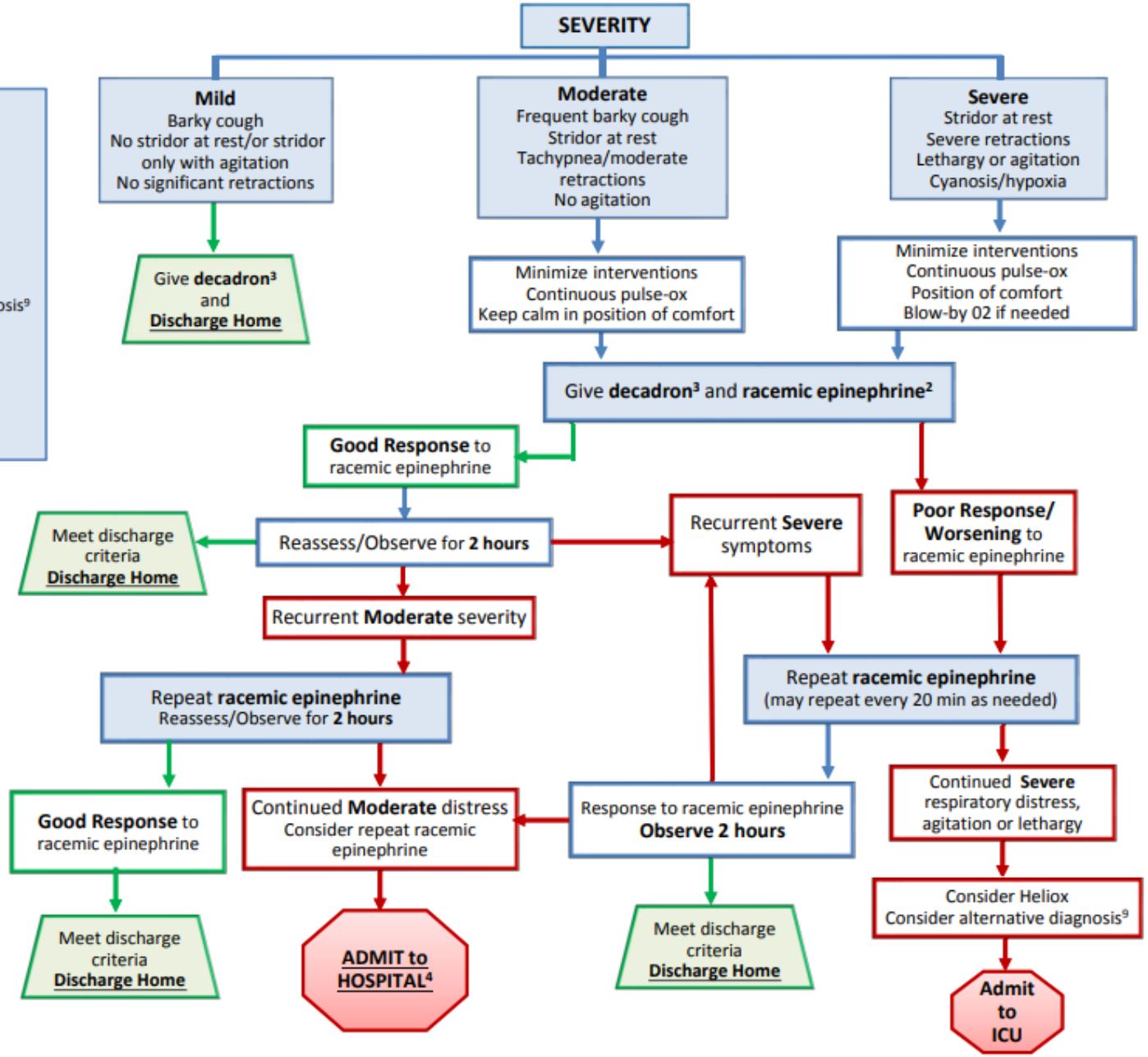
EDTC Guideline

Criteria for use of Guideline:

Inclusion:
- Previously healthy children
- Common age: 6 months–6years
- History & clinical exam consistent with primary diagnosis of croup[1]

Exclusion:
- Toxic appearance
- Symptoms suggestive of alternative diagnosis[9]
- Known upper airway abnormality
- Recent airway instrumentation
- History of chronic/recurrent aspiration
- Neurologic impairment/neuromuscular weakness
- Immunocompromise

EDTC Discharge Criteria:
- Minimal or no stridor at rest
- Able to tolerate oral intake
- 2 hours post racemic epinephrine



This guideline was developed with the Sections of Hospital Medicine and Emergency Medicine. It is a guideline and is not meant to supplant clinical judgment.

Children's Wisconsin

Acute Care Guideline

Initial acute care management to include:

Continuous pulse ox

Oxygen PRN to maintain saturations >90%

Q4 hour vital signs

Hydration orders (IVF and/or PO) with fluid goals [5]

Diet order (for RR<60)

Call Provider if return of stridor at rest

Criteria for use of Guideline:

* See page 1

Reassess Clinical Status

Observe for return of Stridor?

No

Meet discharge criteria

Discharge Home

Yes

Provider evaluation

If stridor at rest:

Give **racemic epinephrine**[3] treatment and continue observation

Consider repeating steroid[7]

No stridor at rest
or
Good Response to racemic epinephrine

Acute Care Discharge criteria:

- Clinically stable for 8-12 hours
- No or minimal stridor at rest
- No or minimal work of breathing
- No racemic epinephrine given within the last 4-6 hours
- Oxygen saturations ≥ 90% RA
- Able to maintain adequate hydration[6]
- Established outpatient follow-up plan
- Discharge paperwork completed

Consider subspecialty consult if [8]:

Congenital airway anomaly suspected

Recurrent croup

Age <3 months

Foreign body suspected

Severe disease

Alternative diagnosis suspected[9]

Persistent Fevers [6]

Consider fever evaluation if the patient continues to worsen despite proper treatment

Poor Response or **No Improvement**
may (re)dose racemic epinephrine

Worsening Clinical Status

Progressive hypoxia

Increasing respiratory distress

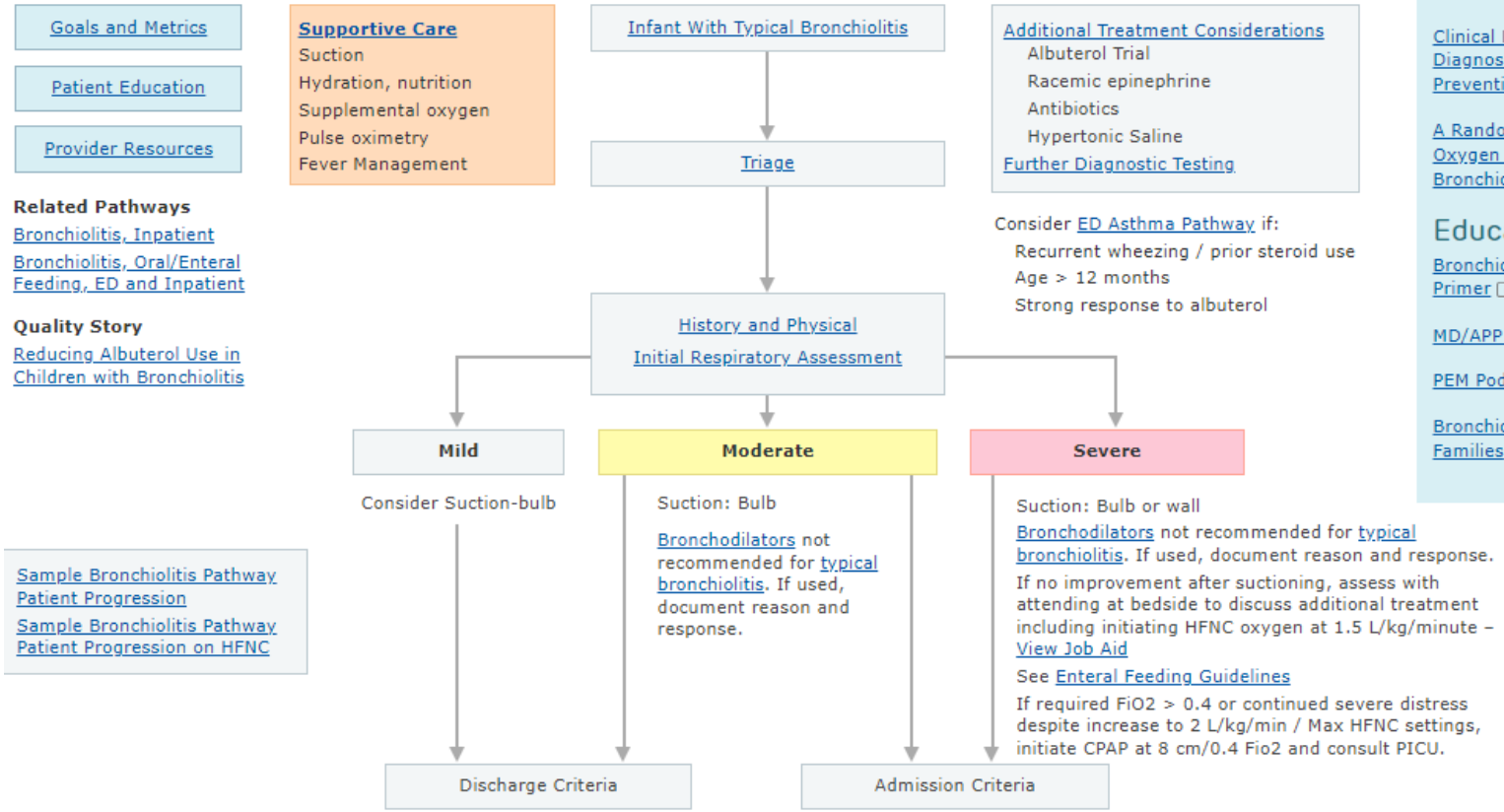
Change in mental status

Consider Heliox

Consider alternative diagnosis [9]

Critical Care Consult
and/or
Transfer to ICU

Emergency Department Clinical Pathway for Evaluation/Treatment of Children with Bronchiolitis



Evidence

Reducing Albuterol Use in Children With Bronchiolitis

Clinical Practice Guideline: The Diagnosis, Management, and Prevention of Bronchiolitis

A Randomized Trial of High-Flow Oxygen Therapy in Infants with Bronchiolitis

Educational Media

Bronchiolitis: A Scenario-Based Primer

MD/APP Learning Module

PEM Podcast: Bronchiolitis

Bronchiolitis Educational Video for Families

https://www.chop.edu/pathways

Equipment

HFNC

Indications

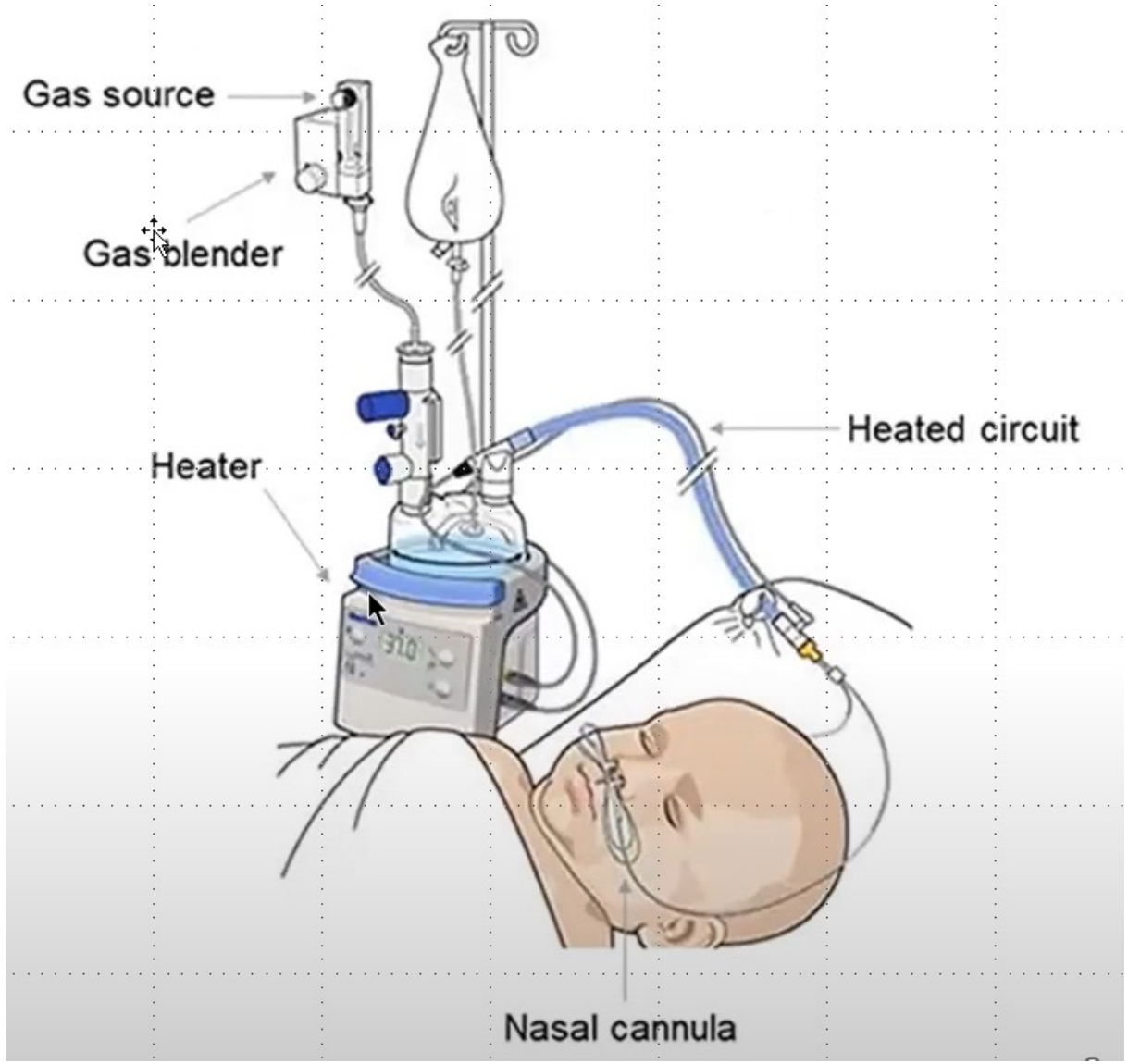
- <2 YO with resp distress
- Not improving on NC in 30 min

Not if

- Apneic or severe distress
- NC is adequate
- Co-morbidities

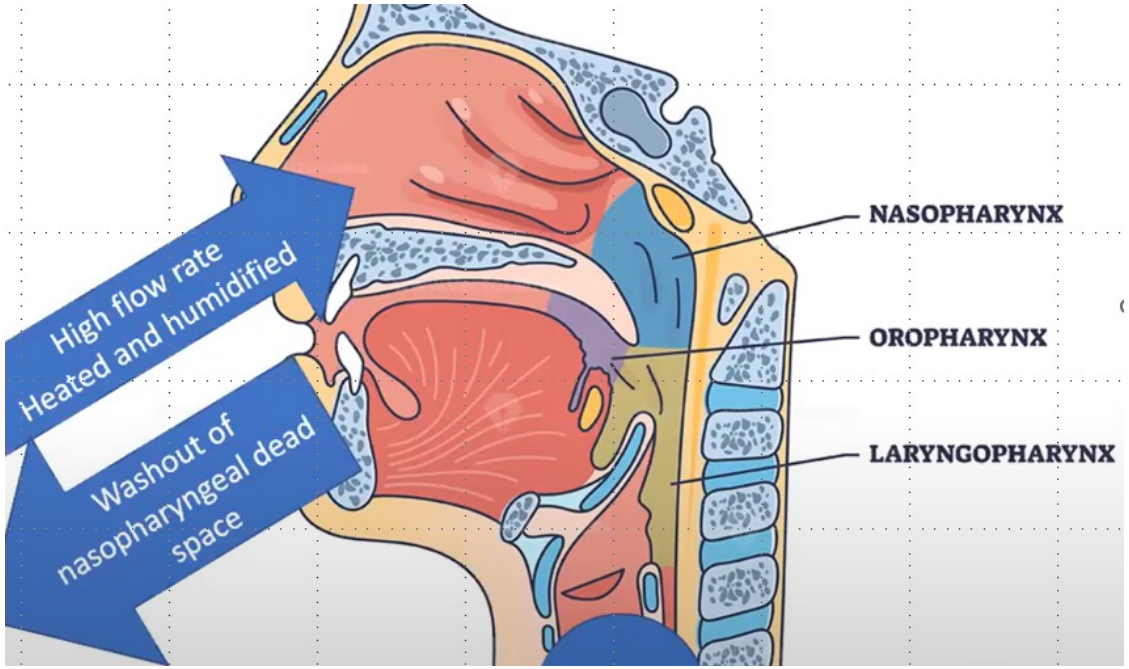
HFNC

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



HFNC mechanism of action

- Improved WOB
- Higher FiO2 delivered
- Decrease UAW resistance
- Less energy used
- Washout of dead space



Flow Rate

Age-Based

Age	HFNC floor maximum (L/min)	HFNC floor minimum (L/min)
44wk PMA - 90 days*	4	3
91 days - 6 months*	6	4
>6 months - 1 year	8	5
>1 year - <2 years	10	5

*Correct for gestational age

Trial HFNC at acute care max flow

Seattle Children's
HOSPITAL · RESEARCH · FOUNDATION

Weight-Based

Initiate HFNC

- Document baseline vitals to monitor effect of therapy & start at max support:
- Order HFNC at dose below:
  - Flow: **2 L/Kg*** with 30L/min maximum at York St. Campus - *maximum may differ at various delivery networks
  - FiO_2: Titrate from 21%-60% (Max 60% at York St ward) to keep ≥ 90%

Yale
NewHaven
Health

HFNC vs CPAP

HFNC	CPAP
Treatment failure ~0.5x low flow	Treatment failure ~0.5x HFNC
Gastric distension, poor feeding	More gastric distension, poorer feeding
More comfortable	Less comfortable
More water in circuit/patient	More skin breakdown
Low risk of pneumothorax	Slightly higher risk of pneumothorax
$$	$$$

Monitoring

- Continuous cardiopulmonary
- VBG, CBG or clinical exam
- Intermittent POX if not continuous Oxygen Tx

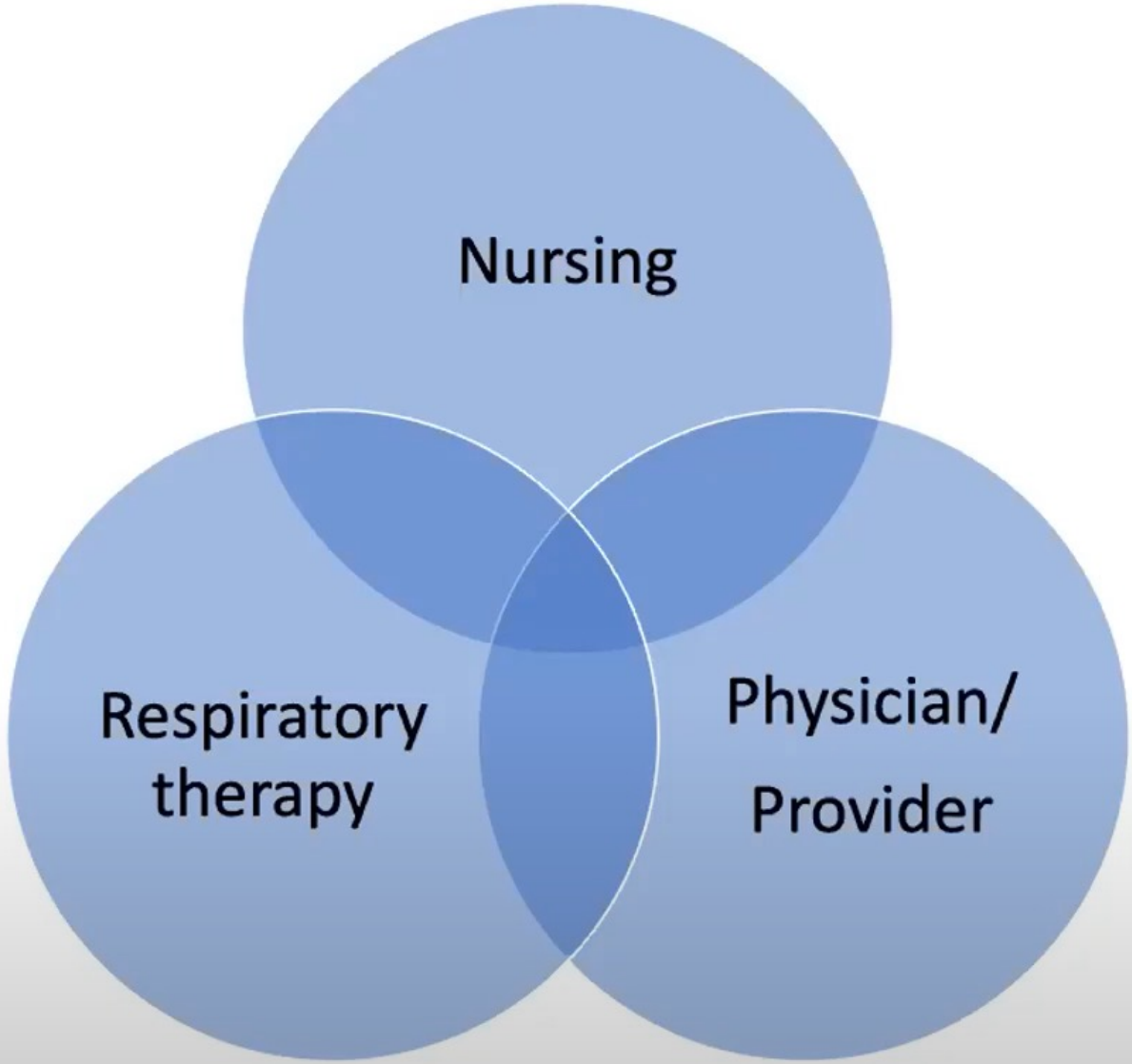
- Reassess every 30 min initially
- Use resp score

- Escalate: 3 L/kg/min up to 30 l/min then PAP or BiPAP
- Wean q 4 hours
- Off HFNC if at 0.5 l/kg/min and O2 of <40%

Staffing

- Nurse ratios
- RT ratios
- Number of HFNC patients
- Experience of providers

- Champions and buy-in



THE JOURNAL OF PEDIATRICS • www.jpeds.com

Efficacy of High-Flow Nasal Cannula vs Standard Oxygen Therapy or Nasal Continuous Positive Airway Pressure in Children with Respiratory Distress: A Meta-Analysis

Jian Luo, MD, PhD[1], Trevor Duke, MD, FRACP[2], Mohammod Jobayer Chisti, MBBS, MMed, PhD[2,3], Elizabeth Kepreotes, PhD[4], Valerie Kalinowski, MD, MHA[5], and Jie Li, MS, RRT-NPS, RRT-ACCS[6]

Objectives To evaluate the efficacy of high-flow nasal cannula (HFNC) oxygen therapy in providing respiratory support of children with acute lower respiratory infection (ALRI), hypoxemia, and respiratory distress.

Study design We performed a meta-analysis of randomized controlled trials that compared HFNC and standard flow oxygen therapy or nasal continuous positive airway pressure (nCPAP) and reported treatment failure as an outcome. Data were synthesized using Mann-Whitney U test.

Results Compared with standard oxygen therapy, HFNC significantly reduced treatment failure (risk ratio [RR] 0.49, 95% CI 0.40-0.60, $P < .001$) in children with mild hypoxemia (arterial pulse oximetry [SpO_2] >90% on room air). HFNC had an increased risk of treatment failure compared with nCPAP in infants age 1-6 months with severe hypoxemia (SpO_2 <90% on room air or SpO_2 >90% on supplemental oxygen) (RR 1.77, 95% CI 1.17-2.67, $P = .007$). No significant differences were found in intubation rates and mortality between HFNC and standard oxygen therapy or nCPAP. HFNC had a lower risk of nasal trauma compared with nCPAP (RR 0.35, 95% CI 0.16-0.77, $P = .009$).

Conclusions Among children <5 years of age with ALRI, respiratory distress, and mild hypoxemia, HFNC reduced the risk of treatment failure when compared with standard oxygen therapy. However, nCPAP was associated with a lower risk of treatment failure than HFNC in infants age 1-6 months with ALRI, moderate-to-severe respiratory distress, and severe hypoxemia. No differences were found in intubation and mortality between HFNC and standard oxygen therapy or nCPAP. *(J Pediatr 2019;215:199-208)*.

Clinical pathways

- CHOP: https://www.chop.edu/clinical-pathway/bronchiolitis-emergent-evaluation-clinical-pathway
- Seattle: https://www.seattlechildrens.org/globalassets/documents/healthcare-professionals/clinical-standard-work/bronchiolitis-pathway.pdf

Nurses: Engage & Educate the Family

- Nasal Suctioning
  - Keep the airway clear
  - FREQUENT
  - Partner with family
  - Before feeding/drinking
- Staying hydrated
  - Empower family
  - Encourage POs, try a syringe
  - Consider NG/OG before IV
  - Urine output
- Monitors
  - What and how pt. is monitored
  - How will you respond to alarms
  - Spot checking vs. continuous monitoring
    - When and why
- Sick vs Distress
  - Engage family from start
  - Explain your evaluation
  - Ask their opinion
  - Trust their instincts

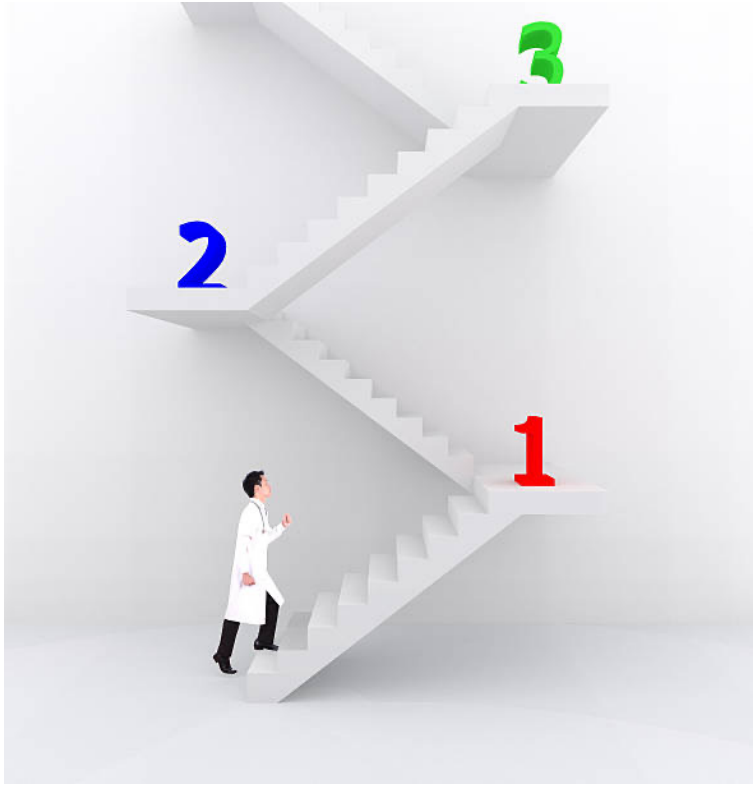
Disposition options

- Discharge home
- Observe prior to DC
- Maximize therapy and re-evaluate
- Transfer

Escalation of care (consult)

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

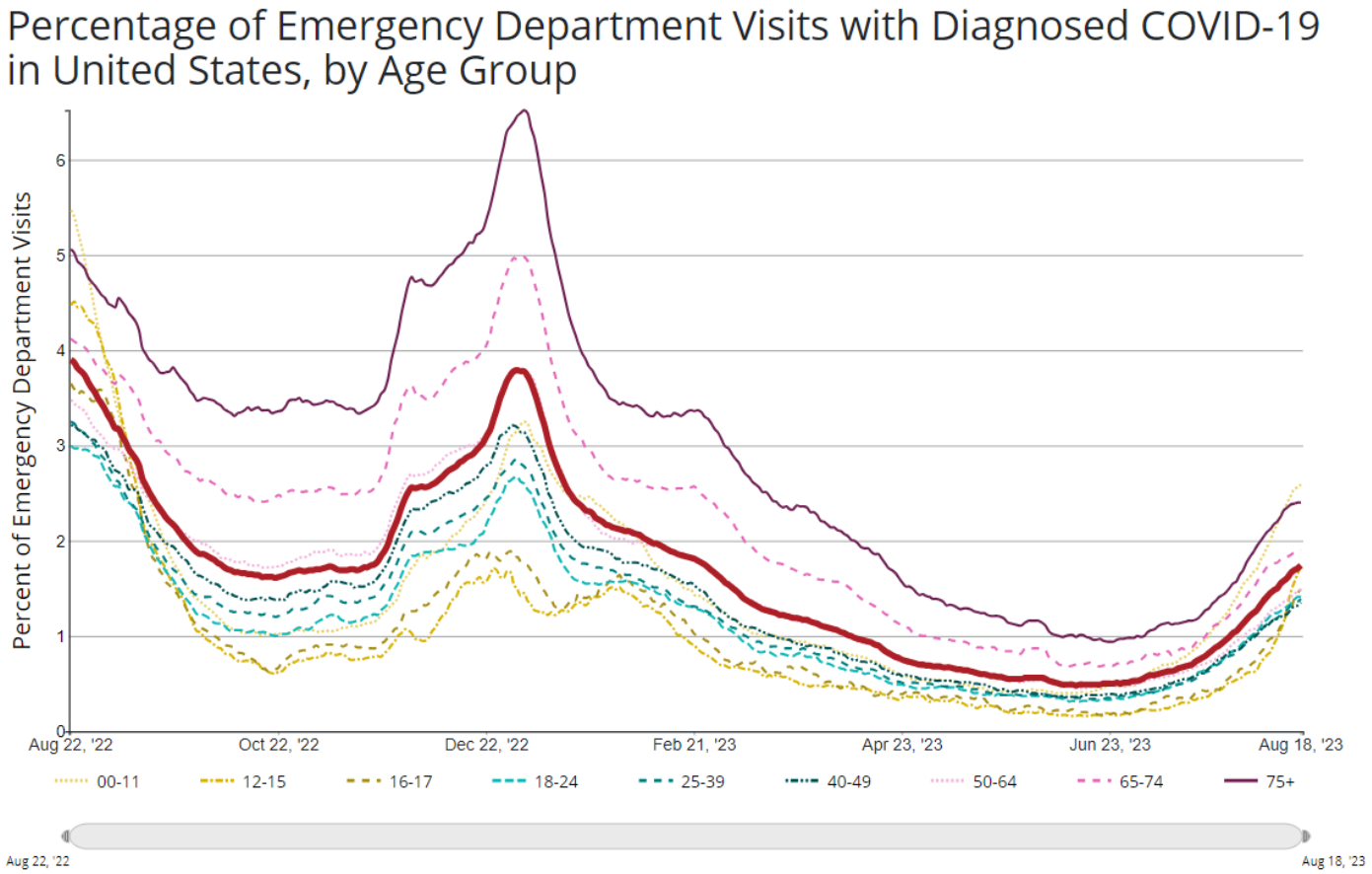
- O2
- Alb
- Ipratropium
- Steroid
- Epi
- Magnesium
- Terbutaline



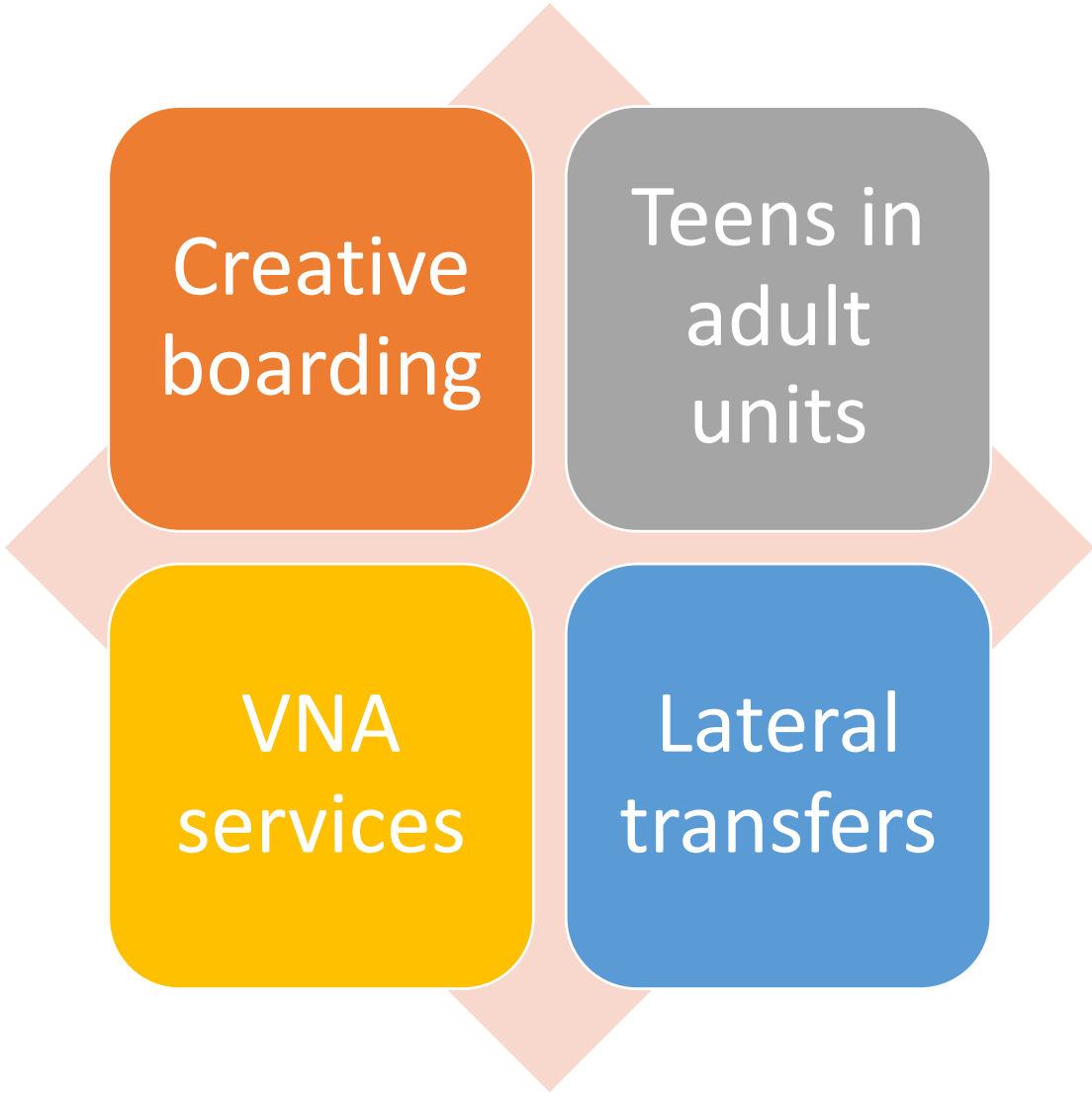
Prior to transfer

- Maximize hydration
- Consider VBG
- Sxn, sxn, sxn
- Consider CXR
- Call early if appropriate
- Method of transfer
- Intensivist consult

Surge Capacity Challenges



Space


Creative boarding
Teens in adult units
VNA services
Lateral transfers

Telemedicine

Telemedicine: Emergency Department

- Emergency Care Connect: peds telemedicine: Foster et al., Acad Pediatr 2020
  - 4 EDs and 1 UCC
  - 1327 Peds contact with 202 telemedicine
    71% remained locally and 25% care plan changes
  - High satisfaction
  - Barriers:
    - lack of familiarity with telemedicine
    - fears of changes in workflow
  - Reduced with strong institutional support and frequent, sustained stakeholder engagement.

Telemedicine in the emergency department: an overview of systematic reviews Sharifi Kia et al. 2022

- 9/18 concluded real-time video conferencing was the best method of delivery
- 8 had cost reduction as an outcome
- 6 studies found technical & infrastructure barriers

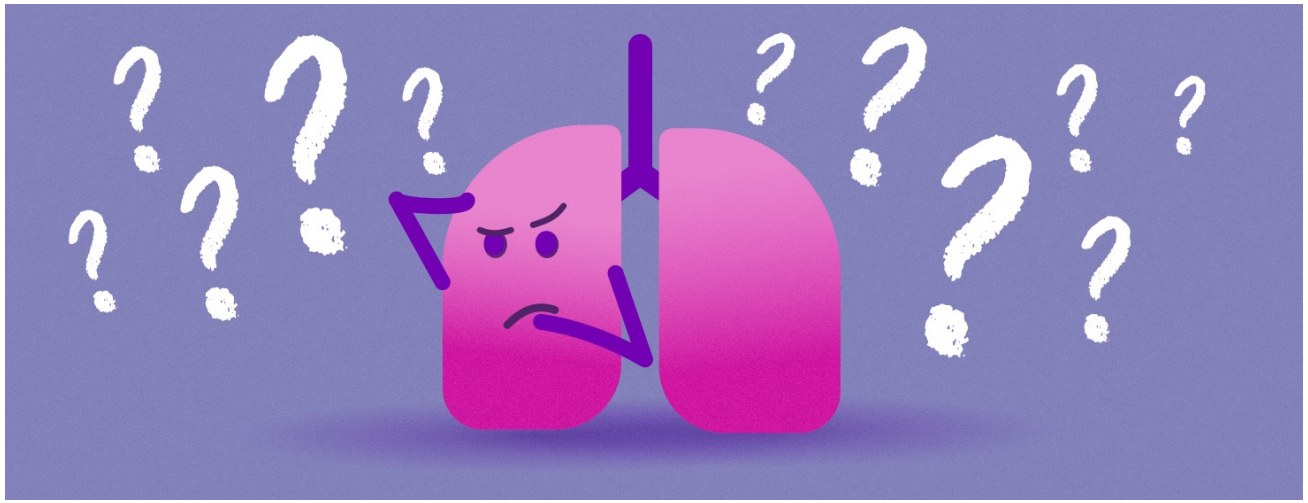
- In conclusion, despite the high potential of telemedicine systems, there is still a need for better quality of evidence in order to confirm their feasibility in the ED.

Complex teamwork

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

Call to action

- Public health
  - Vaccinating the community (RSV, Flu, COVID +)
  - Prophylaxis
  - Spread mitigation
  - Education
- PCP availability
- Enhancing the community ED expertise (reduce transfer)
  - Manage sicker pts locally
  - Early consult: make plan, support care, transfer triage, telemedicine
- Staffing resources
- Flexible age limit (increase IP capacity)



- 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