University of Vermont Health

Golisano Children's Hospital

University of Vermont Health

Cough & Effect: Debating What Actually Works

Shane Murley, RRT

Level III RT UVM Health Golisano Children's Hospital

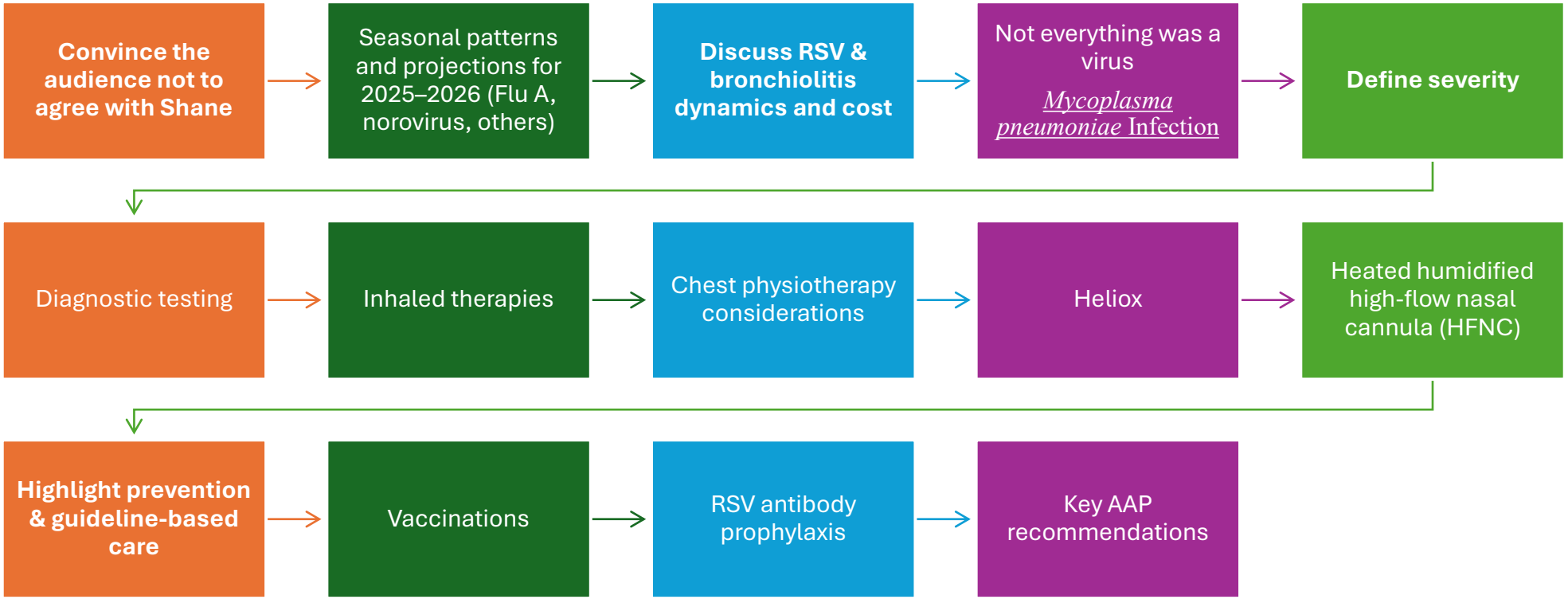
Ryan Kessler RRT

Pediatric Clinical Educator University of Vermont Health

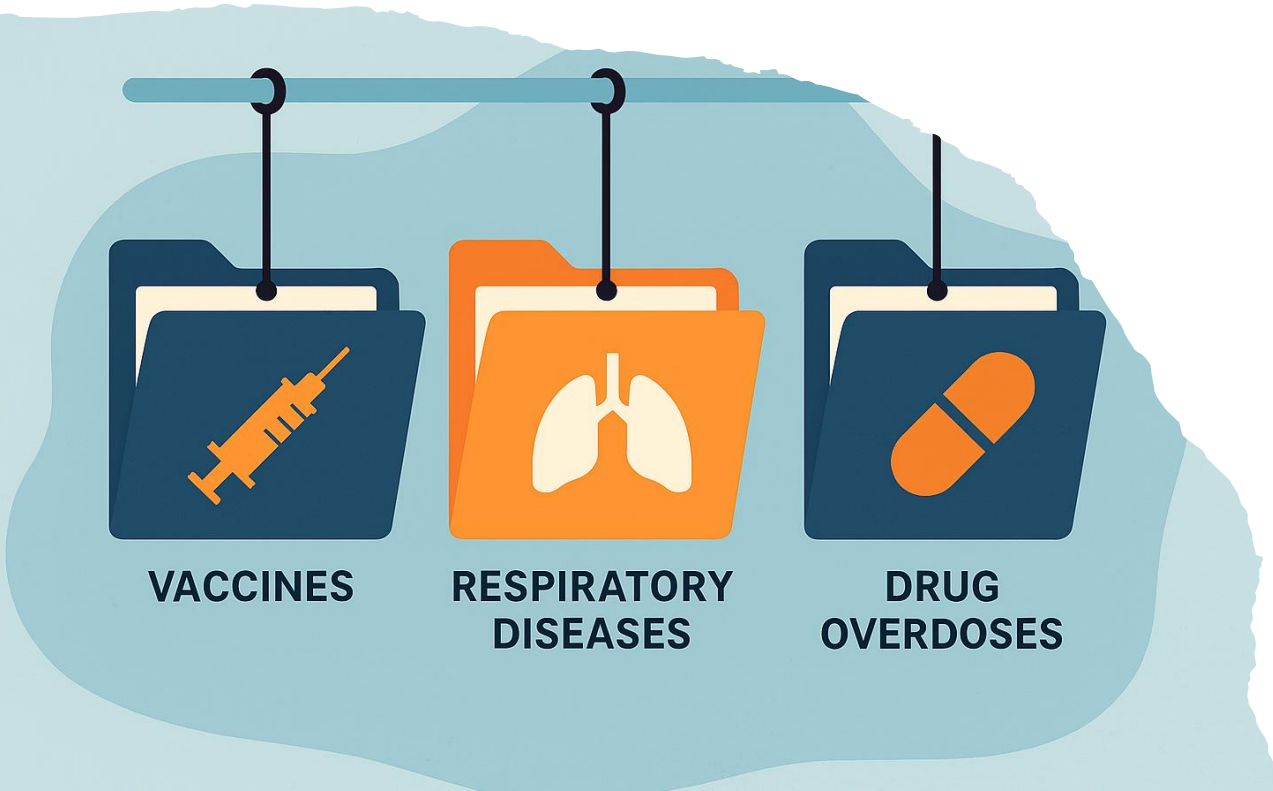
Outline

- The Data
- What is bronchiolitis?
- Which interventions should you perform?
  - Diagnostic testing
  - Inhaled medications
  - CPT
  - Heliox
  - High flow nasal cannula

Lecture Objectives



Many CDC datasets simply stopped updating



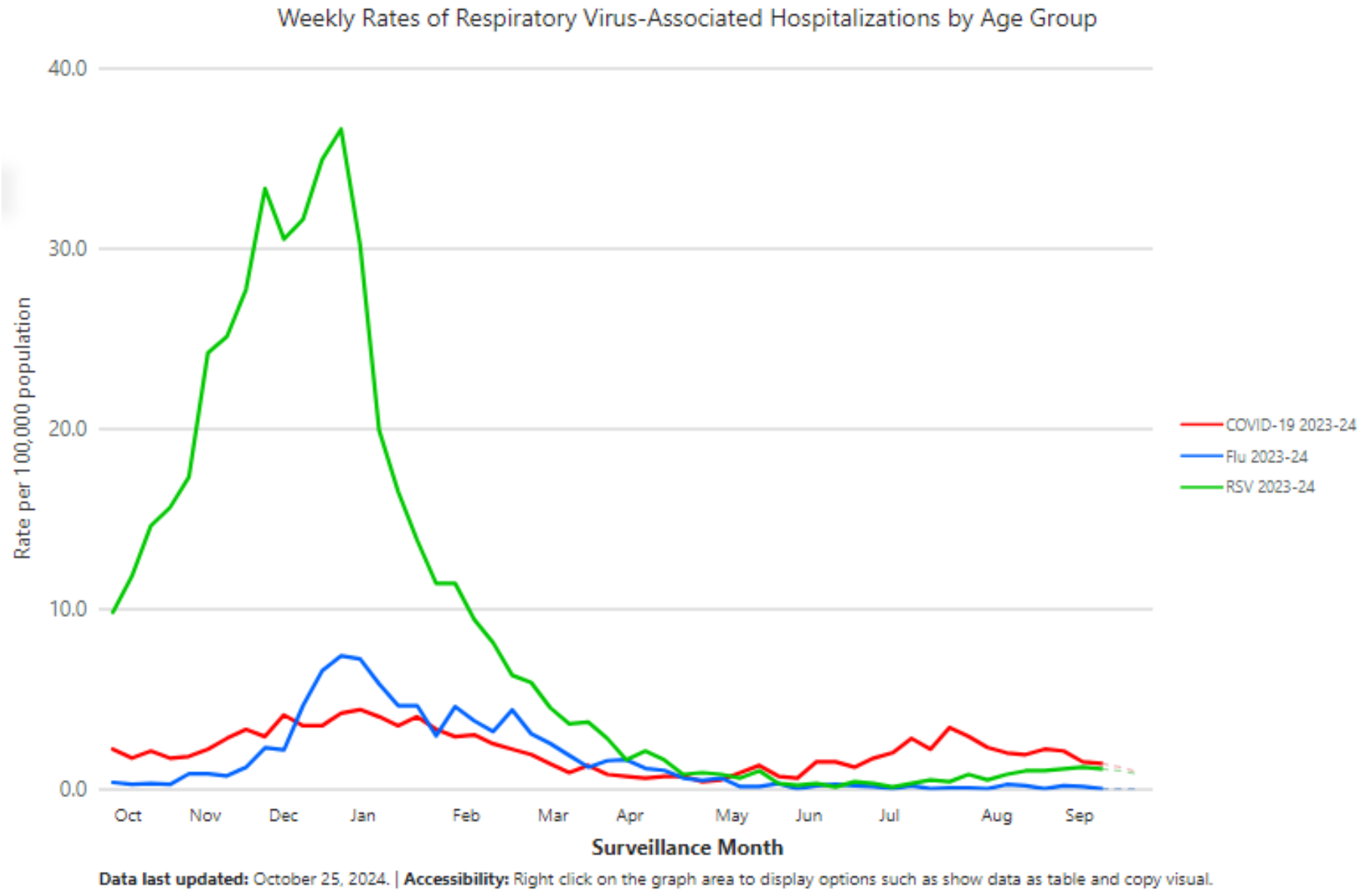
- A 2026 study found **~46% of regularly updated CDC databases were paused or delayed in 2025**
- Of 82 routinely updated datasets, **38 stopped updating—often for 6+ months**
- Most affected areas:
  - Vaccinations (the majority)
  - Respiratory diseases
  - Drug overdoses
- 👉 This alone created big holes in real-time public health visibility.

Internal disruption and staffing issues

- Reports point to:
  - Layoffs and restructuring
  - Leadership instability
  - Changes in advisory panels and priorities
- These contributed to **reduced capacity to maintain and publish data** (reported widely in 2025–2026 coverage).

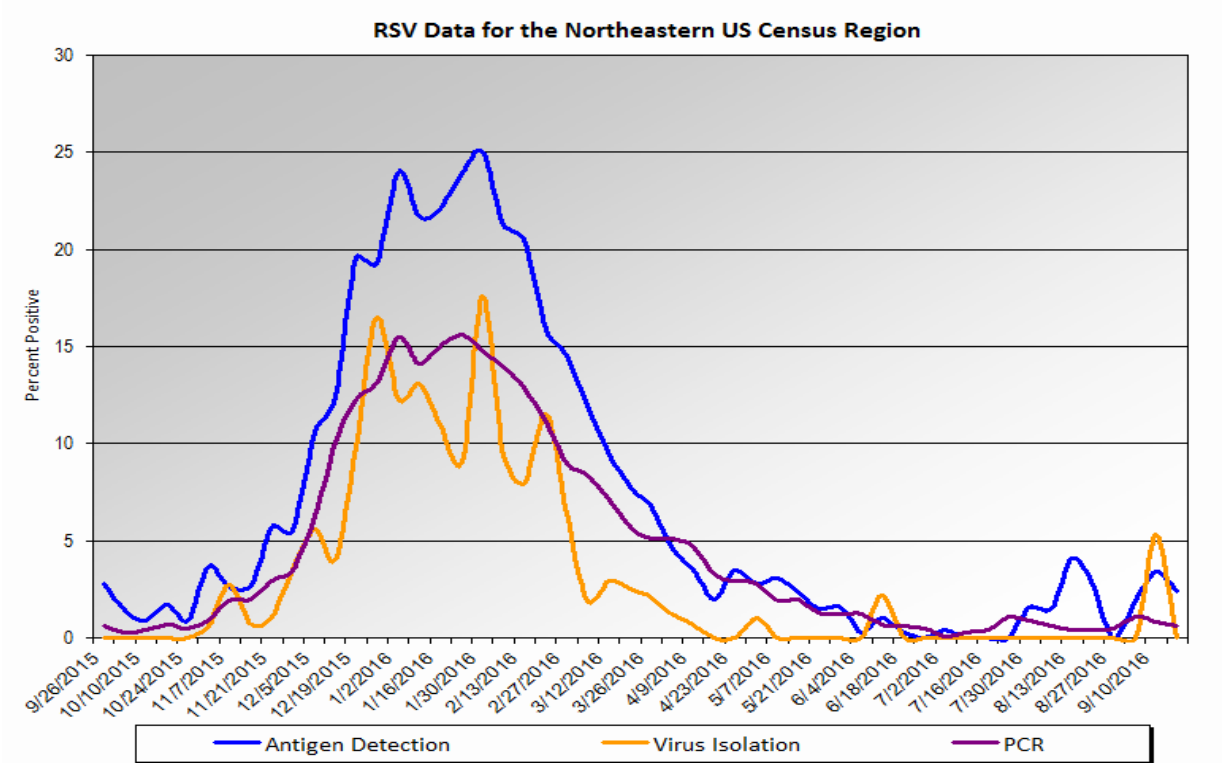
- Some delays were technical / processing changes
- In at least one case, CDC said it would **release 2024 and 2025 data together later (in 2026)** due to system changes
- 👉 Not all gaps were political—some were due to modernization efforts.

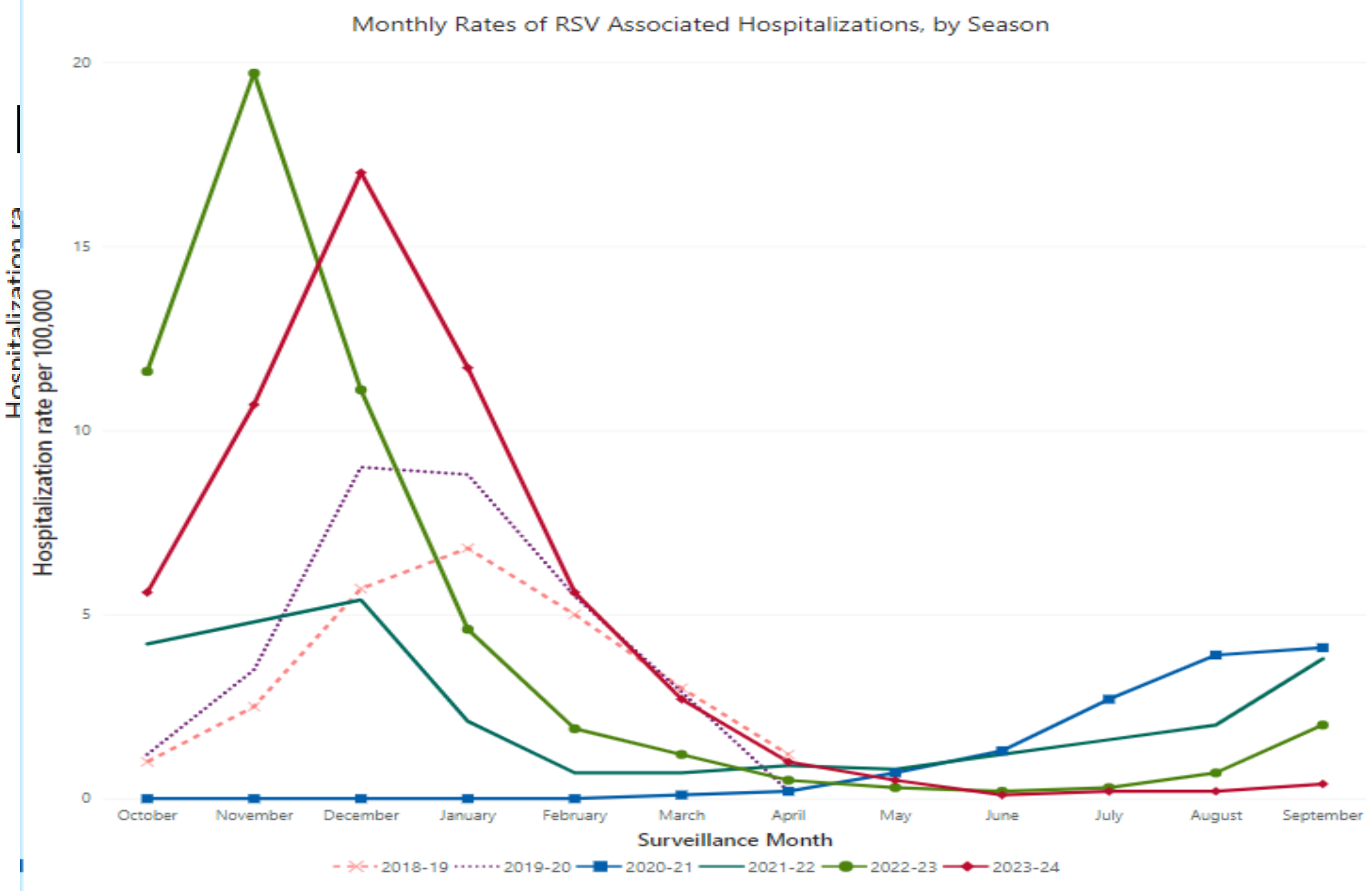
Hospitalization in kids <5 years old



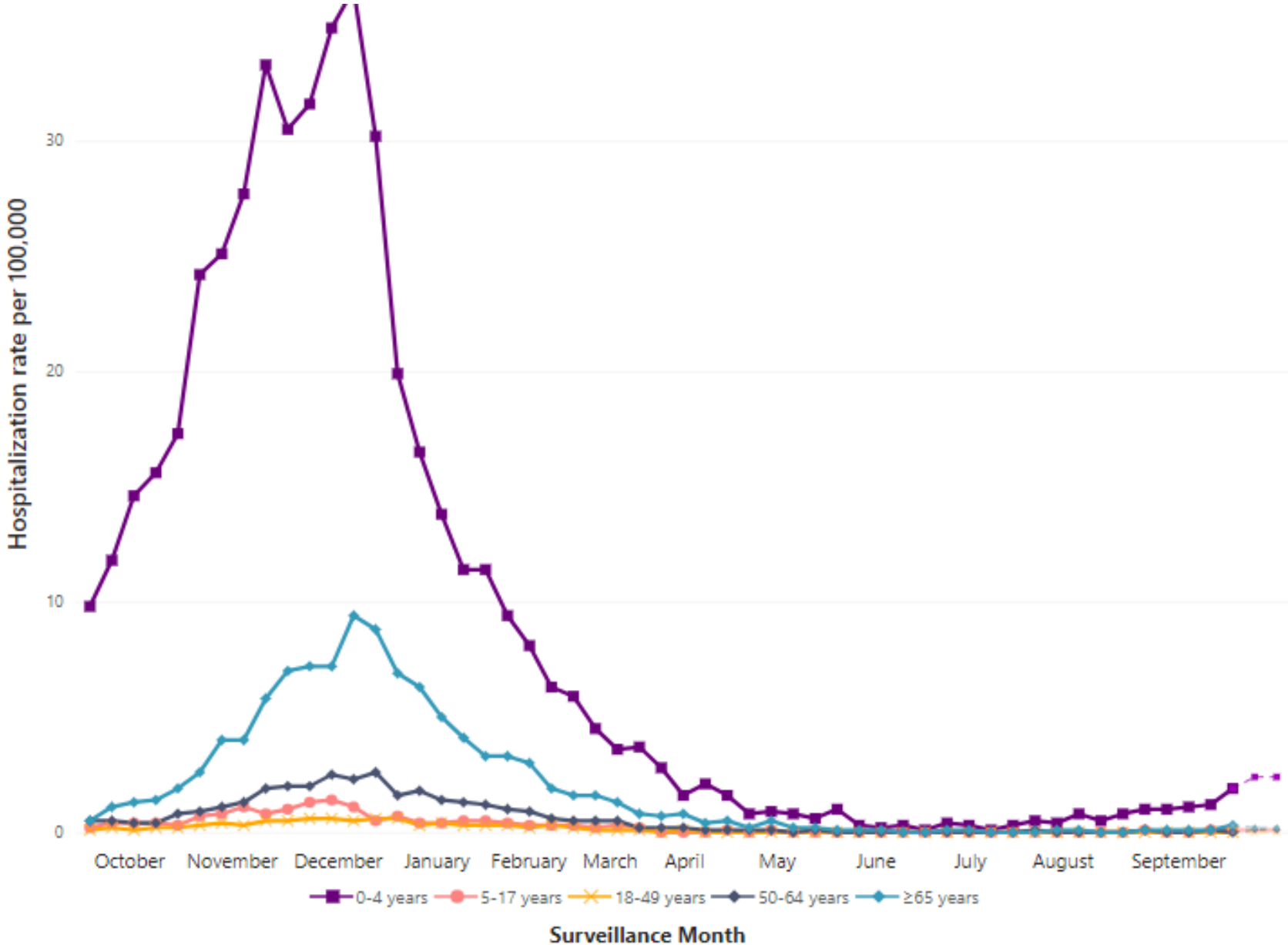
RSV

- Seasonal outbreaks
- Usually occurs between November to April
  - Peak in January or February




Monthly Rates of RSV Associated Hospitalizations, by Season
Hospitalization rate per 100,000
20
15
10
5
0
October
November
December
January
February
March
April
May
June
July
August
September
Surveillance Month
2018-19
2019-20
2020-21
2021-22
2022-23
2023-24

Hospitalization By Age



2025 - 2026

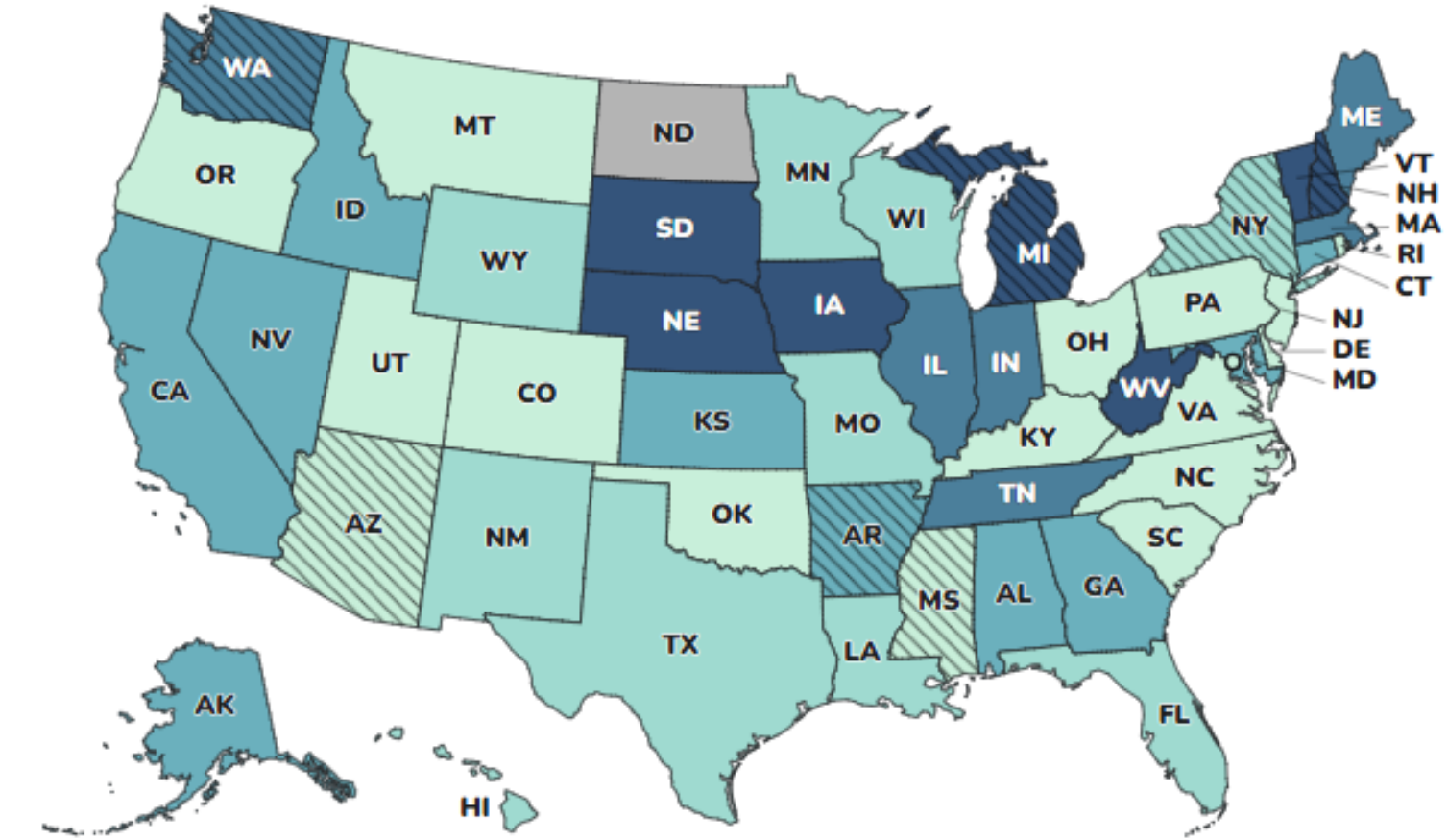
- Flu hit early
  - Influenza A
    - Sub variant H3N2
    - Came on rapidly
    - Intense symptoms
    - Very contagious
    - Lasted longer
    - Kids reported vomiting
    - Flu shot provided some coverage but was not engineered around the H3N2 variant
  - Influenza B
    - Came in late, end of February
    - Flu shot provided coverage
  - Norovirus
    - Spread rapidly

RSV

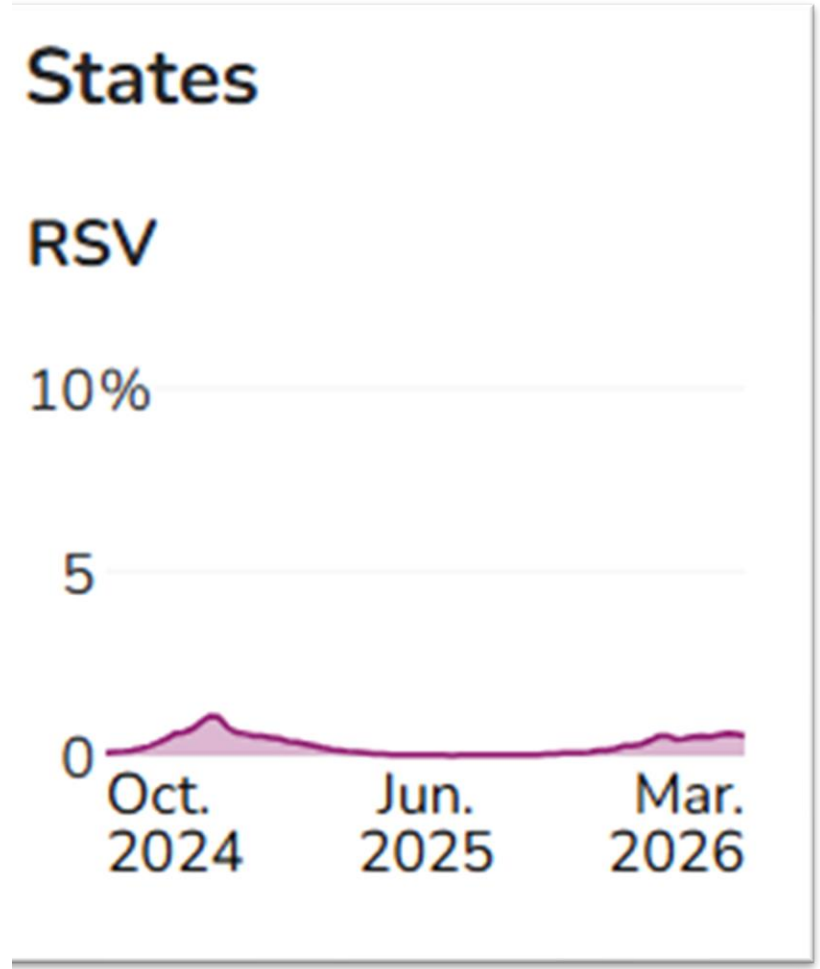
- RSV activity started later than expected in most regions of the United States
- Illness is not more severe compared with recent seasons
- This unusual timing means that higher levels of RSV activity may continue into April
- Again, emergency department visits and hospitalizations for RSV are highest among infants and children less than 4 years old.

Wastewater Viral Activity Level

Limited Coverage*



States



U.S. territories

GU VI

RSV: As of March 6

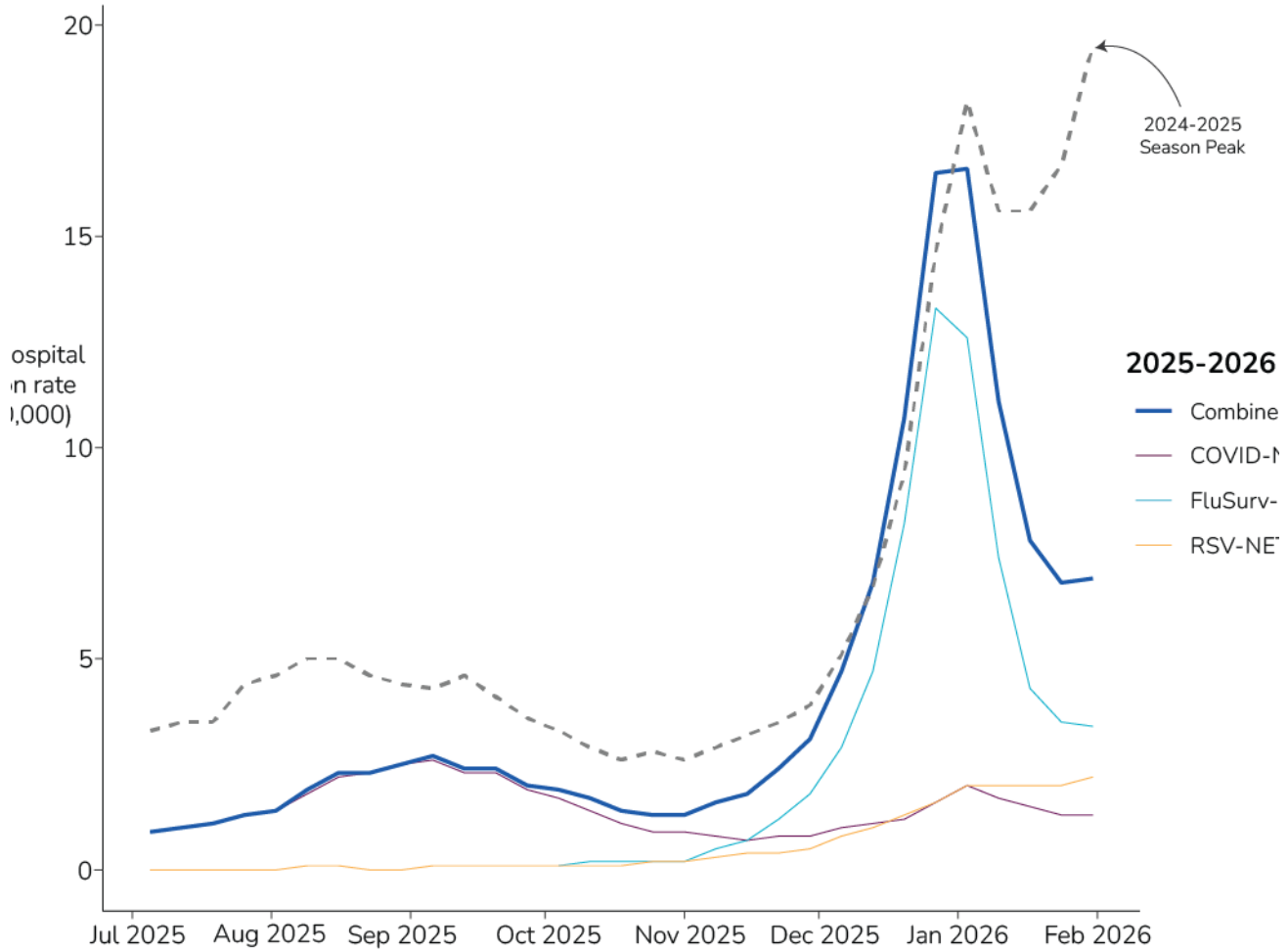
- RSV activity is elevated and increasing in some areas of the country
- The estimated hospitalization rate due to RSV for the week ending February 21, 2026, is 3.2 hospitalizations per 100,000

Combined

- As of March 6, the season's highest combined hospitalization rate for COVID-19, influenza, and RSV occurred in the week ending January 3, 2026, with 16.6 hospitalizations per 100,000.
  - This was lower

Flu

- As of March 6, seasonal influenza activity remains elevated nationally



Mycoplasma pneumoniae Infection

- Bacteria called *Mycoplasma pneumoniae* can cause respiratory tract infections.
- These infections are generally mild but sometimes can be severe.
- Most will recover without medicine, but some people need antibiotics to get better.
- There's no quick way to test for *M. pneumoniae* infections, unlike some other respiratory illnesses.
- **Most common**
  - A swab from the nose or throat
  - X-Ray

Mycoplasma pneumoniae Infection

- Mycoplasma pneumoniae: *There is no routinely published national weekly hospitalization rate series for M. pneumoniae comparable to FluSurv-NET/RSV-NET/COVID-NET.*
- CDC instead published alerts and analyses in 2024 showing increases (NSSP syndromic ED signals, percent positive lab signals, and MMWR analyses of hospitalized children).

M. pneumoniae infections are common in the United States, with an estimated 2 million infections occurring each year. However, many infections aren't diagnosed, so the actual number is likely higher.

The number of *M. pneumoniae* infections varies over time. There are usually peaks of disease every 3 to 7 years. Variation in strain types contributes to this pattern.

In 2023, *M. pneumoniae* began to re-emerge globally. This re-emergence occurred after a prolonged period of low incidence of infections since the start of the COVID-19 pandemic.

RSV

Respiratory syncytial virus (RSV) causes acute respiratory tract illness in persons of all ages.

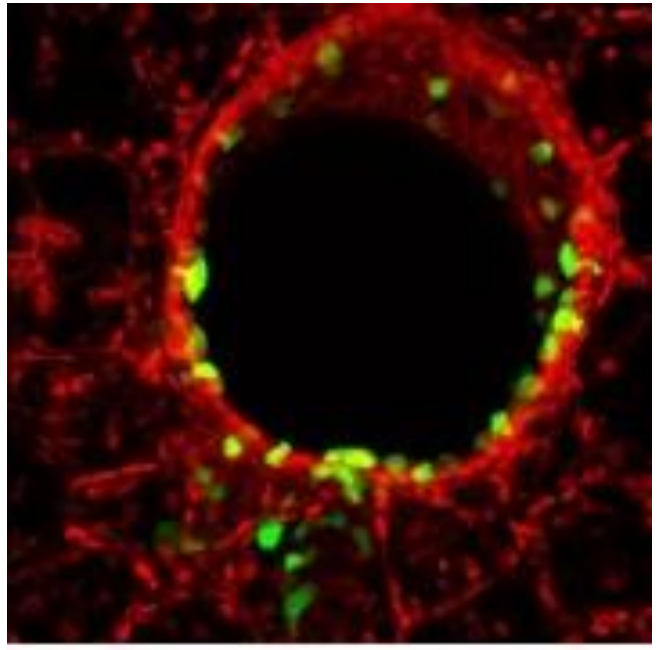
Almost all children are infected by two years of age, and reinfection is common.

The clinical manifestations vary with age, health status, and whether the infection is primary or secondary.

Most common cause of lower respiratory tract infection (LRTI) in children younger than one year

What is RSV?

- Seasonal viral respiratory infection and the most common cause of bronchiolitis in infants world wide.



The History

- RSV was identified in the 1950's when an infection in a chimp lab was traced back to the human caretakers!

Diagnosis of RSV

The laboratory diagnosis of RSV is made by analysis of respiratory secretions.

- A nasal wash usually provides the best yield.
- A nasopharyngeal swab or throat swab may be adequate.

Patients who are intubated or are undergoing bronchoscopy:

- A tracheal aspirate
- Bronchoalveolar lavage should be obtained

$$$

Age / Setting / Severity	Typical Cost per Episode (USD) / Notes
Infants (< 12 months) — hospitalization (average)	**≈ US $11,487** per hospitalization (base-case) (CDC)
Infants / young children (< 24 months) — hospitalization **with ICU admission** (on Medicaid)	**US $23,514–$24,835** per hospitalization when ICU required. (OUP Academic)
Infants / young children (< 24 months) — hospitalization **without ICU** (on Medicaid)	**US $8,039–$8,990** per hospitalization. (OUP Academic)
Emergency Department (ED) visit — children / infants	~ US $463–$482 per ED visit. (OUP Academic)
Outpatient clinic visit — children / infants	~ US $145–$151 per outpatient visit. (OUP Academic)
Adults (≥ 18 years) — hospitalization (community-onset RSV, confirmed)	Mean cost ≈ US $8,403 per hospitalization. (PMC)

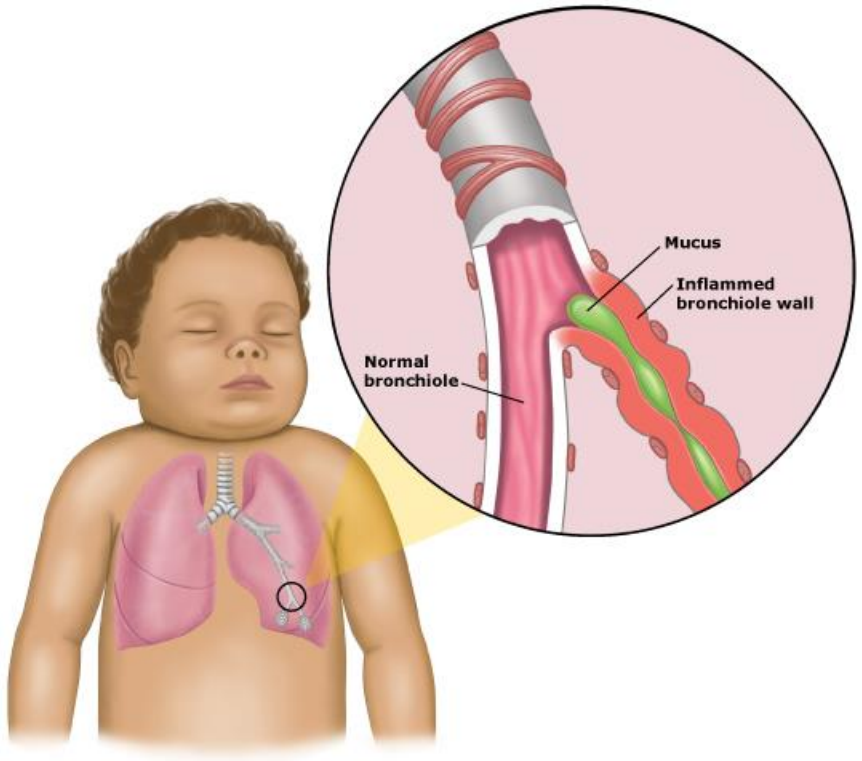
Large People

- Between $1.2 and $1.8 billion for adults
- Between $150 million and $1 billon for elderly
- $6.6 Billion total

- ⚠️ **Interpretation — Why Estimates Vary**
- The “average” hospitalization cost (e.g. US $11,487) reflects a **base-case mix** of severity, insurance types, and care settings. CDC+1
- Severe cases (requiring ICU) — especially in preterm or very young infants — can cost **several times more** than the average. OUP Academic+1
- Outpatient visits or ED visits are much cheaper than hospitalizations, but because RSV can lead to many such visits (especially mild/moderate illness), the **aggregate burden** (hospital + outpatient + indirect) becomes large. PubMed+2SpringerLink+2

RSV

- RSV can cause severe lower respiratory tract disease
- Bronchospasm
- Pneumonia
- Acute respiratory failure
- Bronchiolitis



Bronchiolitis

- Bronchiolitis imposes the largest health care burden on non-elective pediatric hospital admissions worldwide
- Infection with the agents that cause **bronchiolitis** may occur at any age, the clinical entity of **bronchiolitis** includes only infants and young children.
- About 75% of cases of **bronchiolitis** occur in children younger than 1 year and 95% in children younger than 2 years.

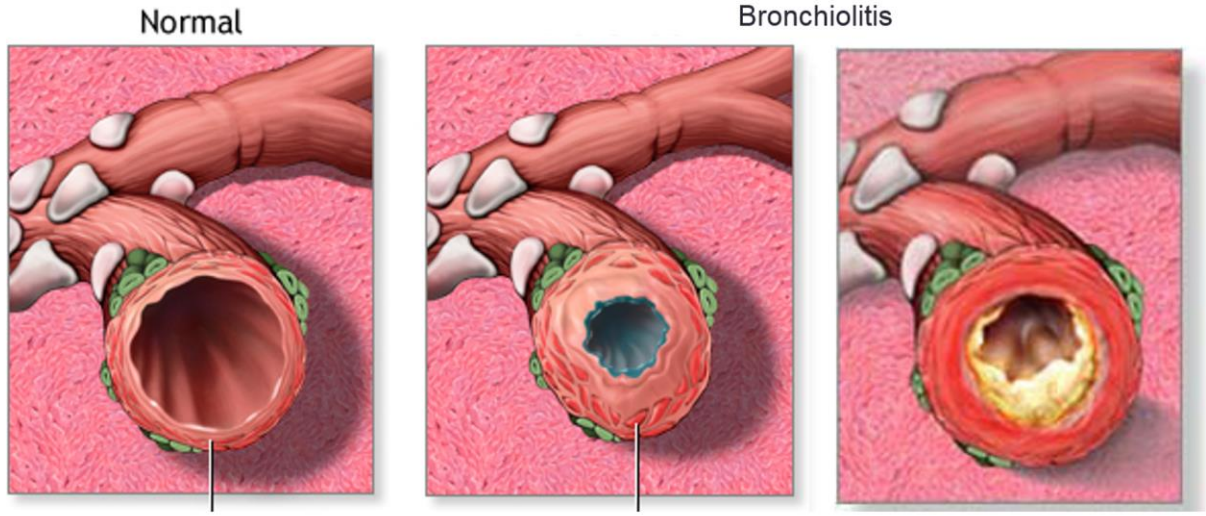
Bronchiolitis

Broadly defined

- As a clinical syndrome that occurs in children <2 years of age.

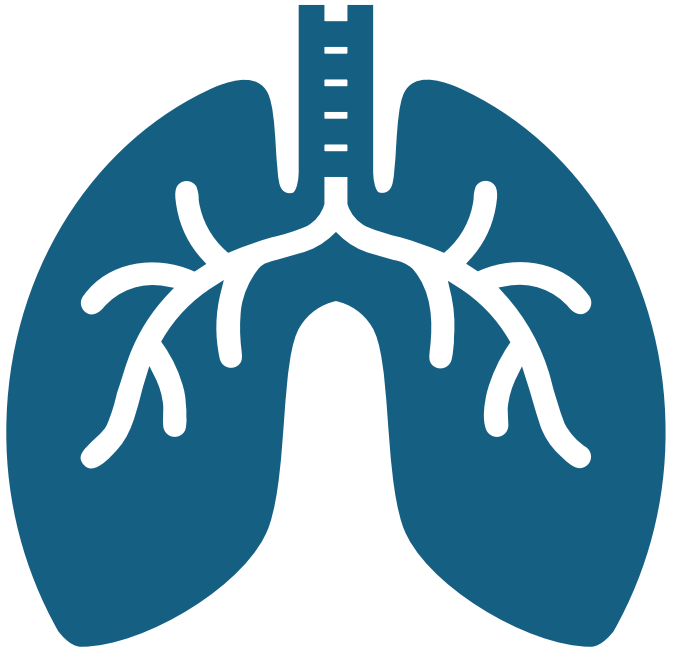
Characterized

- By upper respiratory symptoms (eg, rhinorrhea- aka runny nose)
- Followed by lower respiratory (eg, small airway/bronchiole) infection with inflammation
    - which results in wheezing and or crackles (rales).



Bronchiolitis By The Numbers

- About 10% of children with bronchiolitis are hospitalized
  - Between 2 and 6% of all children with bronchiolitis require care in an ICU
- 16% of all infant hospitalizations (< 2 years)
- 8% of hospitalized children with bronchiolitis have high risk medical conditions



Mild Bronchiolitis

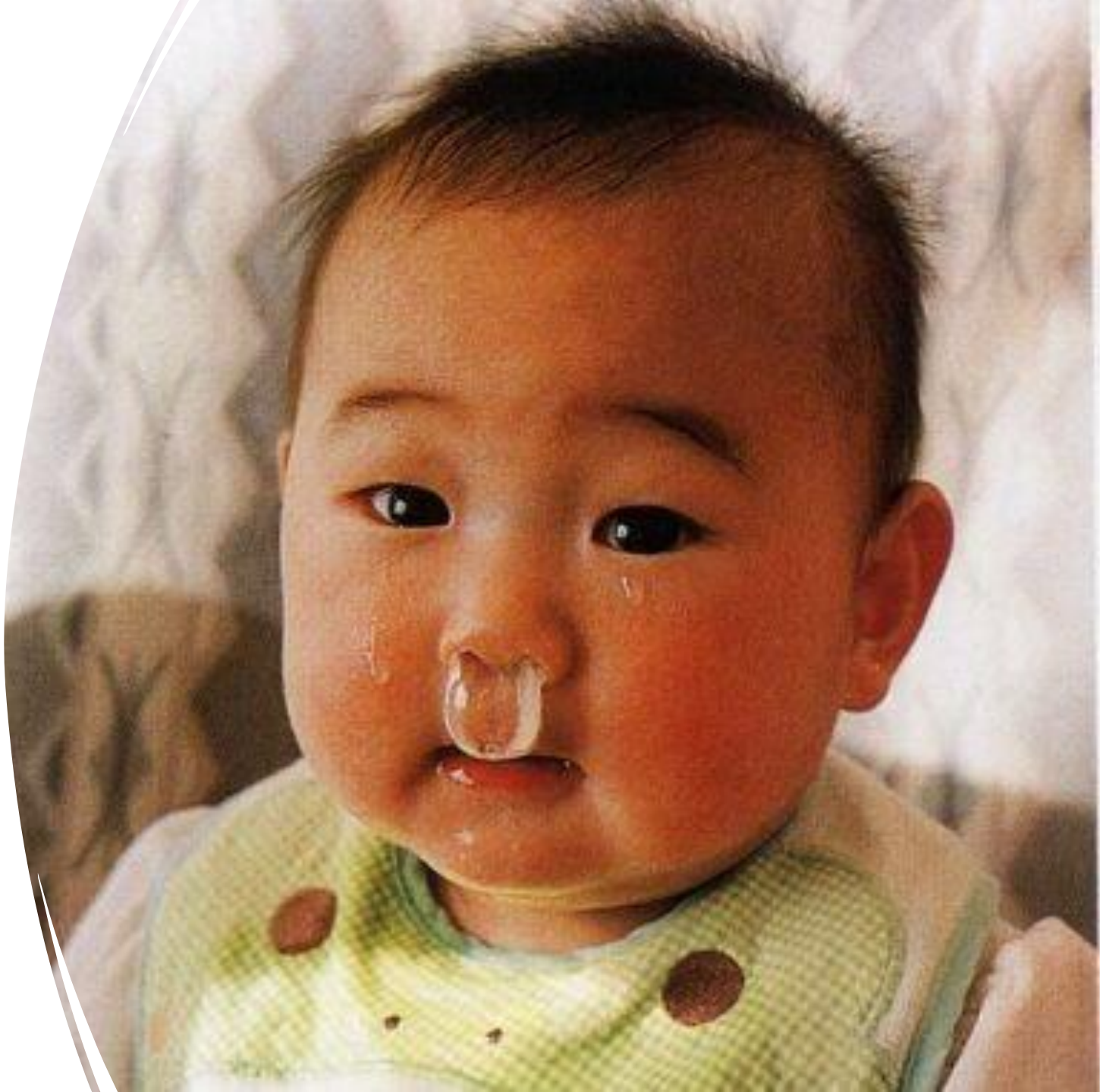
Characterized by end-expiratory wheezing, and absent or minimal retraction.

- Frequency is < 40 breaths/min
- $S_{pO2} \geq 94\%$
- Feeding is normal

Moderate Bronchiolitis

Characterized by wheezing that is mainly expiratory, with intercostal retraction and poor feeding ability.

- Frequency ranges from 40 to 60 breaths/min
- S_{pO2} from 90% to 93%.



Severe Bronchiolitis

Characterized by retraction as well as inspiratory and expiratory wheezing

- A breathing frequency exceeding 60 breaths/min
- $S_{pO2} < 90\%$
- Nasal flaring
- Somnolence
- Apnea can also be present

Hospitalization is required; minimal handling is the rule, and oxygen is needed, as well as intravenous hydration and, in some cases, mechanical ventilation.

Pathology

Bronchiolitis

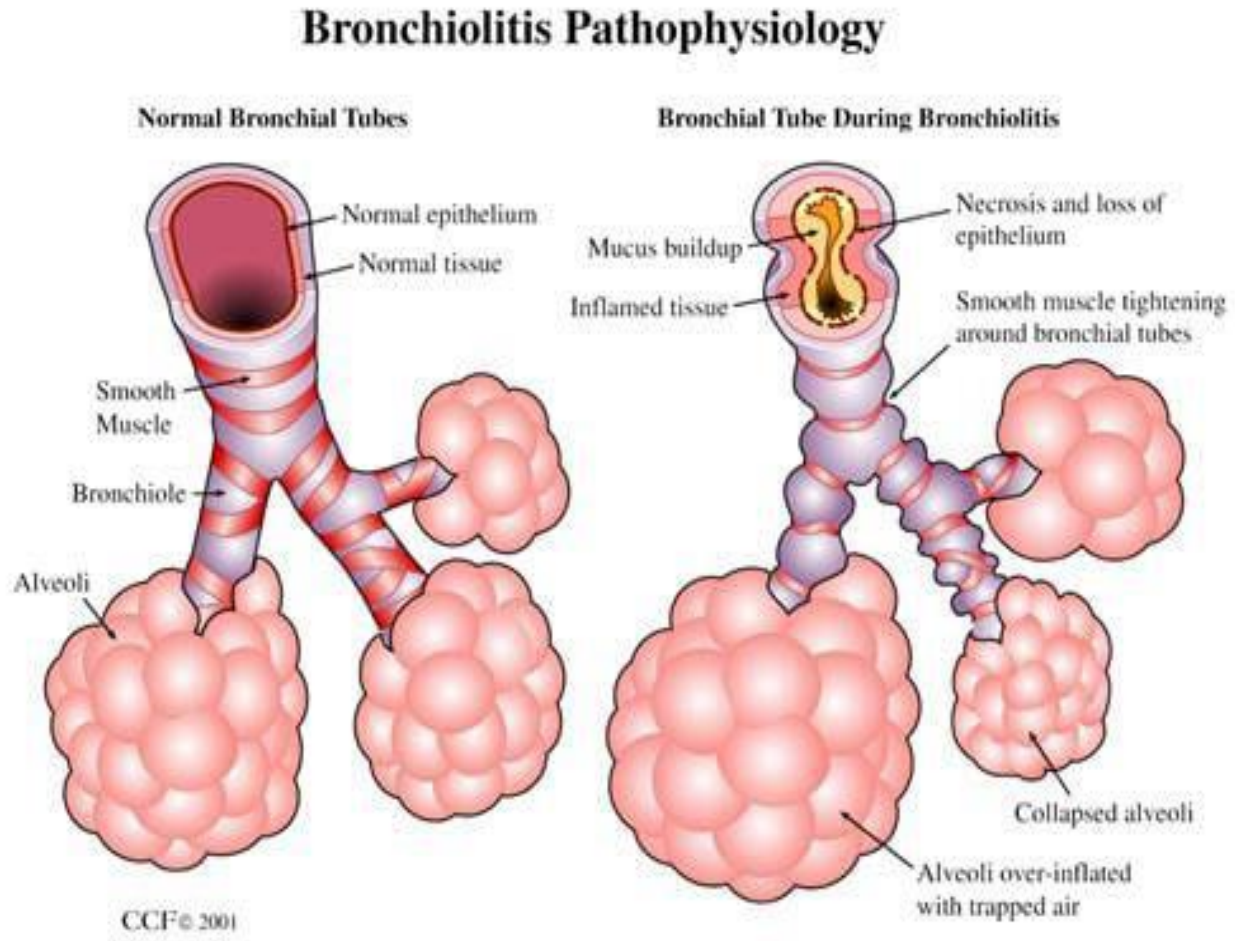
🟢 **MILD**
• End-expiratory wheeze
• Minimal or no retractions
• RR < 40 / min
• SpO_2 ≥ 94%
• Feeding normal

🟡 **MODERATE**
• Expiratory wheeze
• Intercostal retractions
• Poor feeding
• RR 40–60 / min
• SpO_2 90–93%

🔴 **SEVERE**
• Inspiratory **and** expiratory wheeze
• Marked retractions / nasal flaring
• RR > 60 / min
• SpO_2 < 90%
• Somnolence or apnea
• **Hospitalization required**
– Oxygen
– IV fluids
– Minimal handling
– ± Mechanical ventilation

Severe Bronchiolitis

- Step 1 – Primary Care
- Step 2 – Ambulance
- Step 3 – Emergency Room
- Step 4 – Inpatient Floors
- Step 5 – PICU setting



Transmission

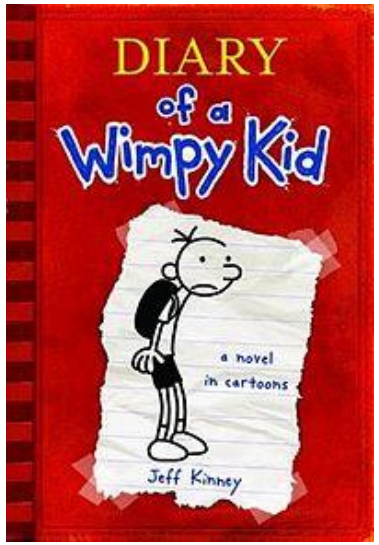
- Contact with Resp Secretions
- Live on counter tops for 30hrs
- Live on hands and clothes x 1hr

Incubation period is 3-5 days

Symptoms up to 3 weeks

Risk Factors

- <6 months
- Preemie <35wk
- CHD
- BPD
- Neurologically Impaired
- Congenital Anomalies
- Multiples
- Maternal Education
- Daycare <1yr
- School age Siblings
- Smoke Exposure
- Male



- Up to 6 months, anti RSV antibodies are transferred through the placenta in term infants and are therefore partially protected.

Diagnosis

Diagnostics-Pro

- One hospital study reports benefits of rapid viral testing with bronchiolitis included:
  - Decreased length of stay compared to the previous winter.
  - Associated cost savings.
- Identification of the responsible virus in hospitalized patients may help to avoid health care-associated transmission by permitting cohorting of patients and/or caregivers.

Clinical and Financial Benefits of Rapid Detection of Respiratory Viruses: an Outcomes Study
Barenfanger et al, J Mircobiology, 2000

Viral Testing

- Routine viral testing will NOT alter clinical management or outcome of the patient
  - Particularly in the outpatient setting
- Cohorting has the potential to increase the risk of infection with other respiratory viruses leading to prolonged hospitalization.
- It may be more logical to isolate all infants with bronchiolitis

- Common culprits
  - RSV (73%)
  - Rhino (26%)
  - Influenza (1%)
  - Coronavirus (7%)
  - Human Metapneumovirus (7%)
  - Parainfluenza (3%)
  - Enterovirus (5%)
  - Adenovirus (8%)
  - M. pneumoniae (1%)
  - B. pertussis (0.2%)
  - **Co-infections 30%**

Diagnosis

- Bronchiolitis is diagnosed clinically
- Healthcare providers diagnose acute bronchiolitis by asking patients questions about symptoms and doing a physical examination.

CXR - Pro

- Like viral testing CXR can help rule out other causes of respiratory failure
- The chest foundation recommends that a chest X Ray be performed to rule out a pneumonia may help direct antimicrobial therapy.

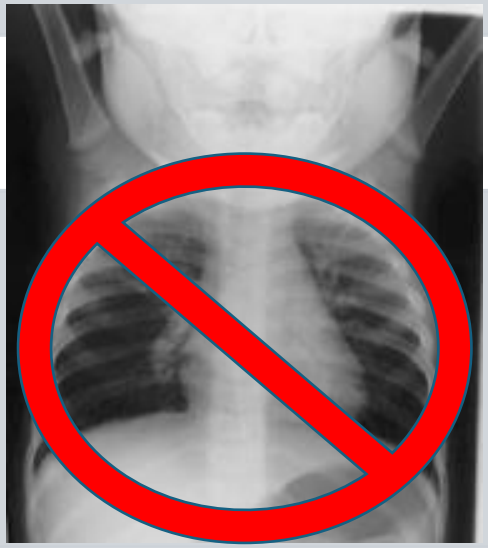
Chest X-Ray - Con

No evidence to support routine use of CXR:

- CXR findings do not correlate with disease severity
- Risk of bacterial pneumonia is low
- Risks: Unnecessary antibiotic use
  - Kills good bacteria
  - Reduces your immune system

Consider if increased pre-test probability for bacterial pneumonia:

- > 2 days of fever
- Asymmetric chest exam
- No clinical improvement
- Unusually high O2 need



Inhaled Meds

Inhaled Medications Pro

- Children with severe disease or respiratory failure generally were excluded from trials evaluating inhaled bronchodilators in children with bronchiolitis.

- A Subgroup of Responders May Exist

•Infants with **underlying reactive airway disease tendencies**
•Infants with **atopic history** (eczema, family history of asthma)
•Infants who are **borderline between bronchiolitis and early asthma**

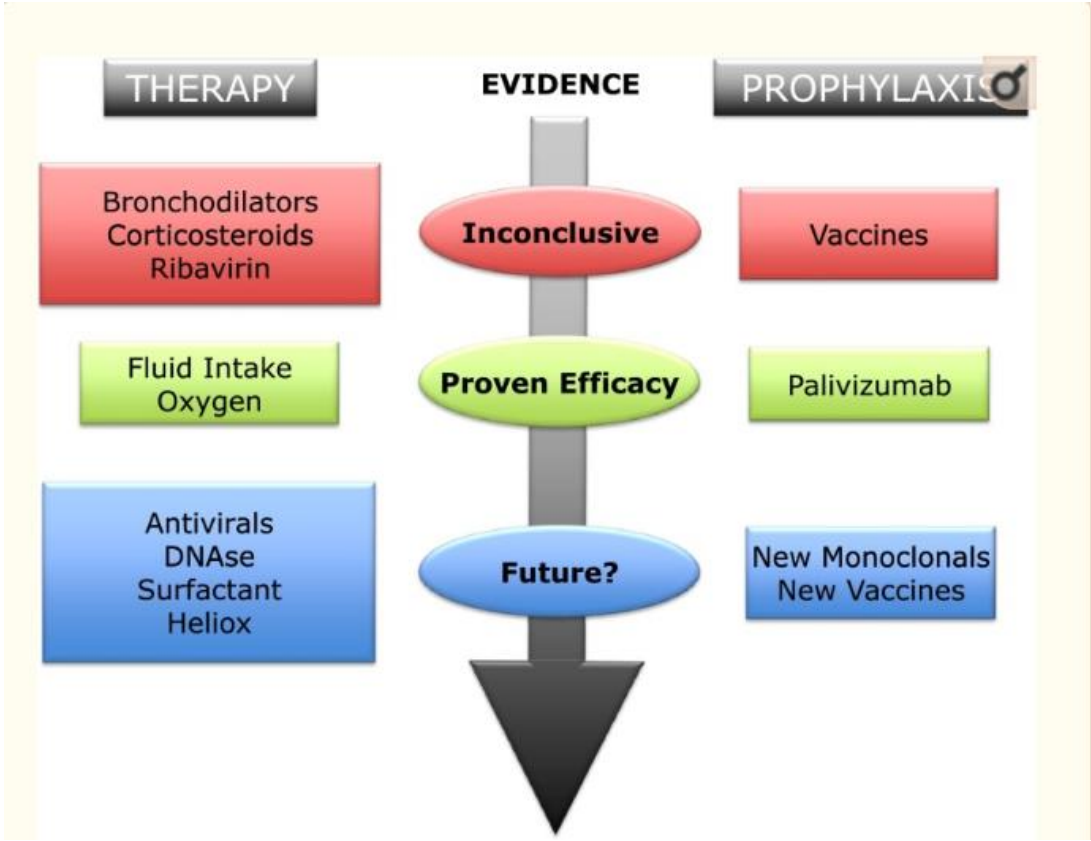
- **Clinical Variability Between Viral Strains**

- Not all bronchiolitis is identical:
- Rhinovirus bronchiolitis **often behaves more like asthma**.
- RSV subtypes vary in severity and airway reactivity.

Respiratory Syncytial Virus Infection and Bronchiolitis
Piedimonte et al, Pediatr Rev. 2014 Dec; 35(12): 519–530.

Inhaled Medications Pro

- Most of the literature reviewed utilized small volume nebs
  - Upper airway bronchospasm
- Depositions of inhaled medications to infants is minimal at best with cheap, old small volume nebs.
- Vibrating mesh nebulizers may deliver up to 5 times the dose
  - For lower bronchospasm



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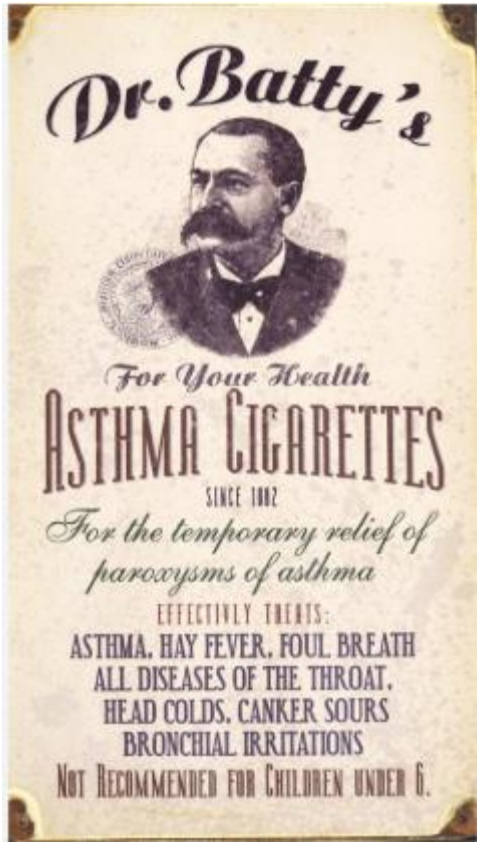
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Inhaled Medications - Con

Inhaled Bronchodilators

- We do not suggest routine administration of inhaled bronchodilators for children with bronchiolitis.
- Meta-analyses of randomized trials and systematic reviews suggest that bronchodilators may provide modest short-term clinical improvement but do not affect overall outcome or LOS
- May have adverse effects,
  - tachycardia
  - oxygen desaturation
  - and tremors
- And increase the cost of care

- A one-time trial of inhaled bronchodilators (albuterol or epinephrine) may be warranted for infants and children with bronchiolitis and severe disease.

Asthma vs RSV/Bronchiolitis

✅ **Asthma**

What's going wrong?

Asthma is primarily a disease of **airway smooth-muscle constriction**.

- The small airways tighten/spasm.
- This narrowing is **reversible** when you relax that muscle.

Why bronchodilators work

Albuterol and similar medications directly relax smooth muscle.

- ➡️ **Smooth muscle relaxes → airway opens → symptoms improve.**

Asthma also has inflammation and mucus, but the bronchospasm is the part bronchodilators fix immediately.

❌ **RSV / Bronchiolitis**

What's going wrong?

RSV bronchiolitis affects infants' bronchioles in a totally different way:

- **Mucus plugging**
- **Cell debris** from infection
- **Airway wall swelling (edema)**
- Very **little smooth muscle involvement**, especially in young infants
- Airways literally get clogged with mucus, not squeezed shut

This means the airways are obstructed by **gunk and swelling**, not muscle tightening.

Why bronchodilators don't work

Bronchodilators only relax smooth muscle.
But in bronchiolitis:

- ➡️ There is **almost no bronchospasm to relax**.
- ➡️ Opening the airway requires clearing mucus and resolving swelling—bronchodilators don't help with either.

Wheezes

- Bronchospastic
- Junky/Coarse

Inhaled Medications: Hypertonic Saline 3%

A 2018 meta-analysis of eight randomized trials evaluating administration of hypertonic saline in the ED, hypertonic saline reduced the rate of hospitalization.

Inhaled Medications – Hypertonic Saline

Substantial Heterogeneity

- For infants and children admitted to the hospital, three meta-analyses found low-quality evidence that nebulized hypertonic saline reduces length of stay (by approximately one-half day).
- Another meta-analysis found no effect when the data were reanalyzed for heterogeneity.

- Hypertonic Saline:
  - Increased number of negative studies since 2014
  - ? Shorten hospital stays:
    - AAP 2014 consider if expected LOS > 3 days
  - 2015 Pediatrics – no difference in LOS, clinical worsening, or 7-day readmission
  - 2017 – French trial stopped early due to 4/61 with “severe” adverse events
  - 2017 – comparison of three wards, hypertonic saline associated with longer period of desaturations and hospital stays

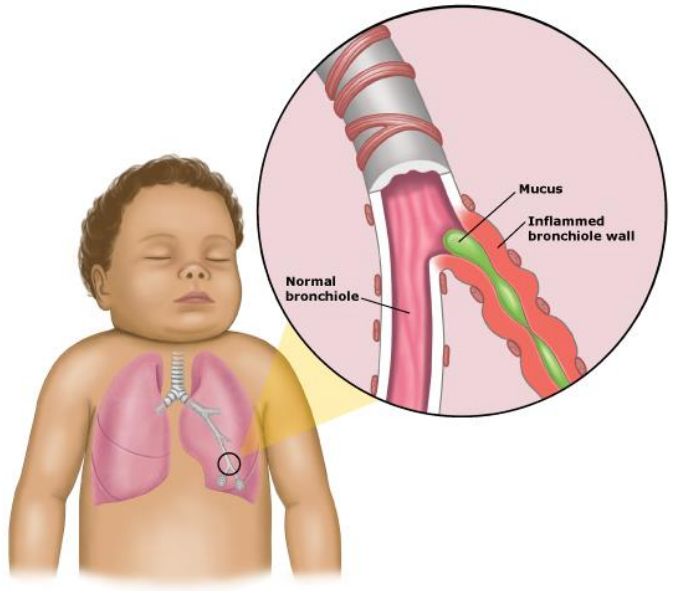
Chest Physiotherapy

Chest Physiotherapy

Definition - Prevents the accumulation and enhances mobilization of bronchial secretion from the airway to facilitate drainage.

Indications for Chest Physiotherapy - Conditions with copious retention of airway secretions

- Ordering CPT helps facilitate care for patient maintenance.
- CPT will decrease pressures in intubated patients.



CPT - Con

AAP Diagnosis and Management of Bronchiolitis

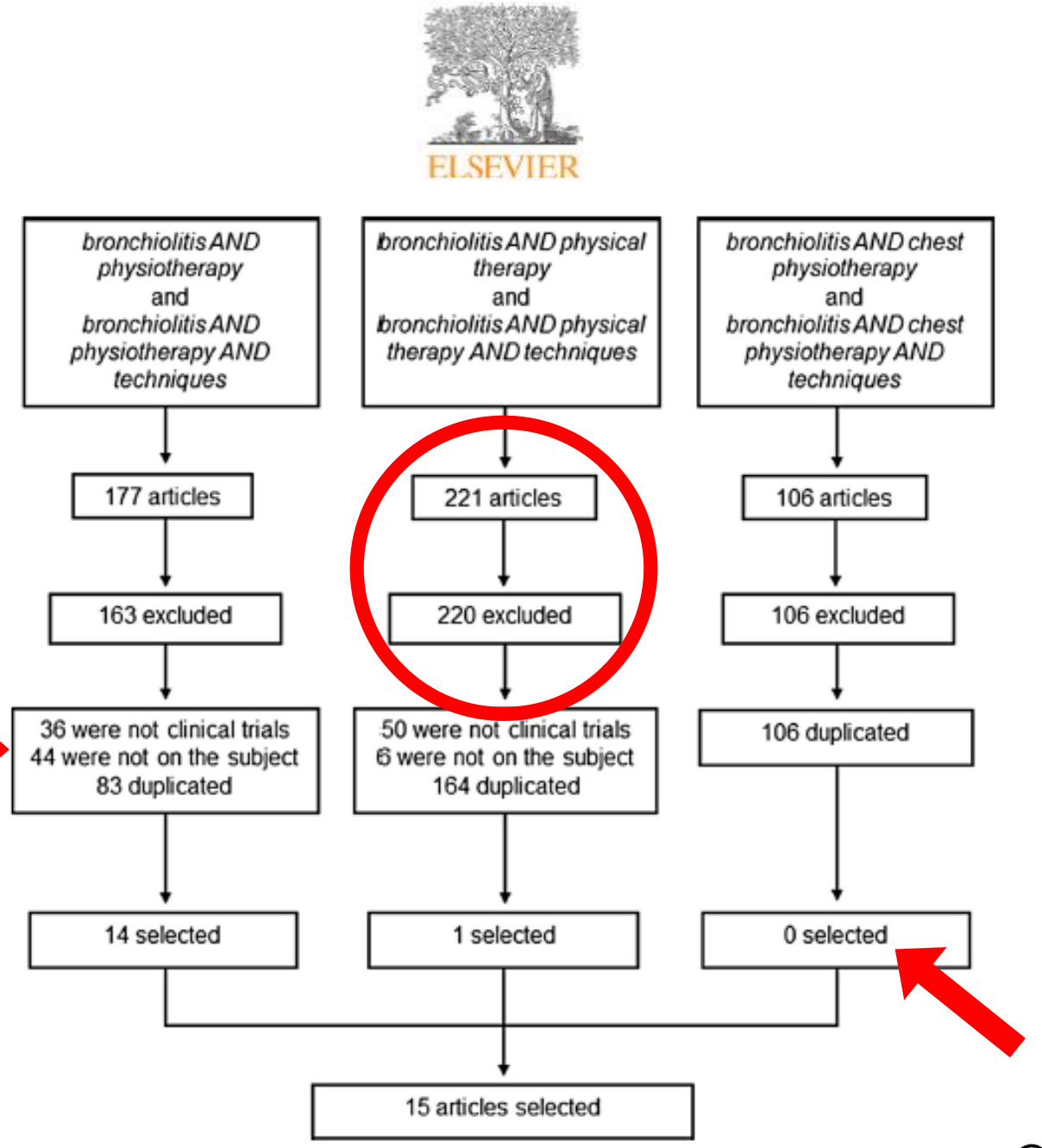
"6b. Chest physiotherapy should not be used routinely in the management of bronchiolitis (recommendation)."

European Respiratory Society

"Chest physiotherapy has failed to show any clinical effects in infant RSV bronchiolitis."

Chest Physiotherapy

1. Van Ginderdeuren F, Vandenplas Y, Deneyer M, et al. Effectiveness of airway clearance techniques in children hospitalized with acute bronchiolitis. Pediatr Pulmonol 2017;52:225–31.
   - Concluded CPT significantly reduced the LOS compared to no CPT
2. Effects of the use of respiratory physiotherapy in children admitted with acute viral bronchiolitis
   - CPT is safe
   - In moderate severity, CPT reduced LOS



At UVM

- No routine CPT on Floors
  - Hands On vs. Vest Therapy

- ICU
  - When Intubated
    - at the discretion of the RT/MD
- Available Tools
  - IPV
  - Percussor
  - Mask/Cups
  - Hands on

O2 Therapy

Supplemental Oxygen

Supplemental oxygen should be provided by:

- Nasal cannula
- HFNC
- Air Entrainment Device
- Head box

First Line of Defense

- Nasal cannula with oxygen flow meters

- Standard flow rates for oxygen through nasal prongs or nasal catheters are
- 0.025–1 L/min for neonates,
- 1–2 L/min for infants,
- 1–4 L/min for older children

Nasal Cannula

Because an infant's Ve is so low, the FiO2 at any given flow differs drastically from the FiO2 of an adult NC. Infants are at risk for swallowing air on a NC if the flow rate exceeds the pt's Ve.

If your infant weighs 3 kg, his predicted Vt is 30 cc and respiratory rate is 60 bpm his Ve is :

Vt	x	RR	=	Ve
.03	x	60	=	1.8 lpm

Administration of 2 lpm via NC might blow excess gas into his stomach.

Nasal Cannula

- $FiO_2 = ((F \times (B - 21) / 100)+(0.21 \times R \times W \times 5.5)) / (R \times W \times 0.055)$

- The equation has four variables:
  - Weight in kg (W) ,
  - Respiratory rate (R),
  - Gasflow (F)
  - Percentage of oxygen in the gas (B).

- A tidal volume of 5.5mL/kg is assumed.

- For Example
  - 3Kg on 1 LPM NC = 47% FiO2

Note that Neil Finer's study looked at infants with weight ranging from approximately 600g to 4000g

HFNC

Non-invasive HFNC

Facilitate earlier respiratory support may have an impact on outcome by avoiding progression of the disease process.

Provide humidified air flow to deliver a non-invasive form of positive pressure support with titratable oxygen fraction

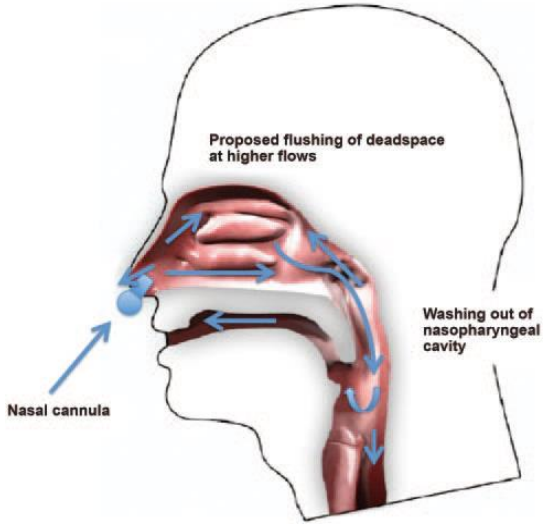
Uses a simple interface

Heated and humidified

- Well-tolerated noninvasive method of ventilatory support that permits high inspired gas flows
  - it cannot be provided by simply turning up the flow from the wall unit
- Possibly Airway distending pressure maintaining FRC
- Suggests to avoid endotracheal intubation in infants and children at risk for respiratory failure
- **High flow can be administered with or without increased oxygen concentration (Blender)**

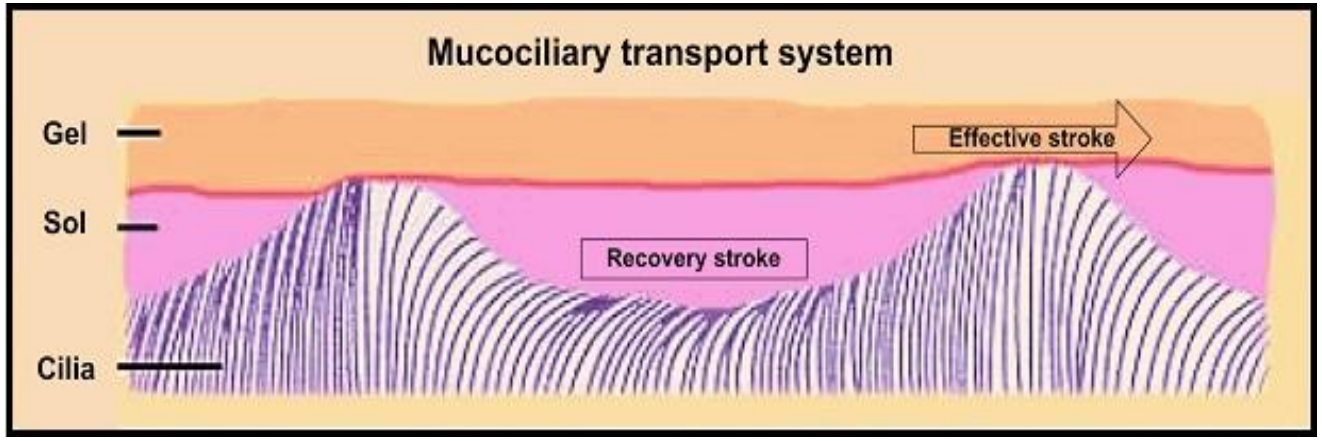
Washout of Dead Space

- Continuous flow washes out the upper airways and leads to improved oxygenation
- Reservoir of fresh gas in upper airway
- Avoids rebreathing of high-CO2 gas in dead space



Courtesy of Walsh et al, Resp Care 2009

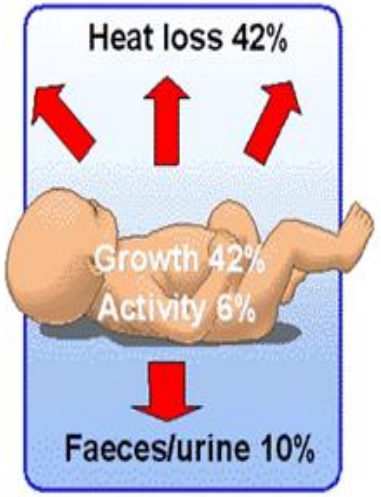
- Heated Humidity
  - Humidification systems optimize the mucociliary transport system
    - The pathogens are trapped within a layer of mucous and transported from the airway to be swallowed or suctioned



Humidification

The mucociliary transport system at optimum humidity

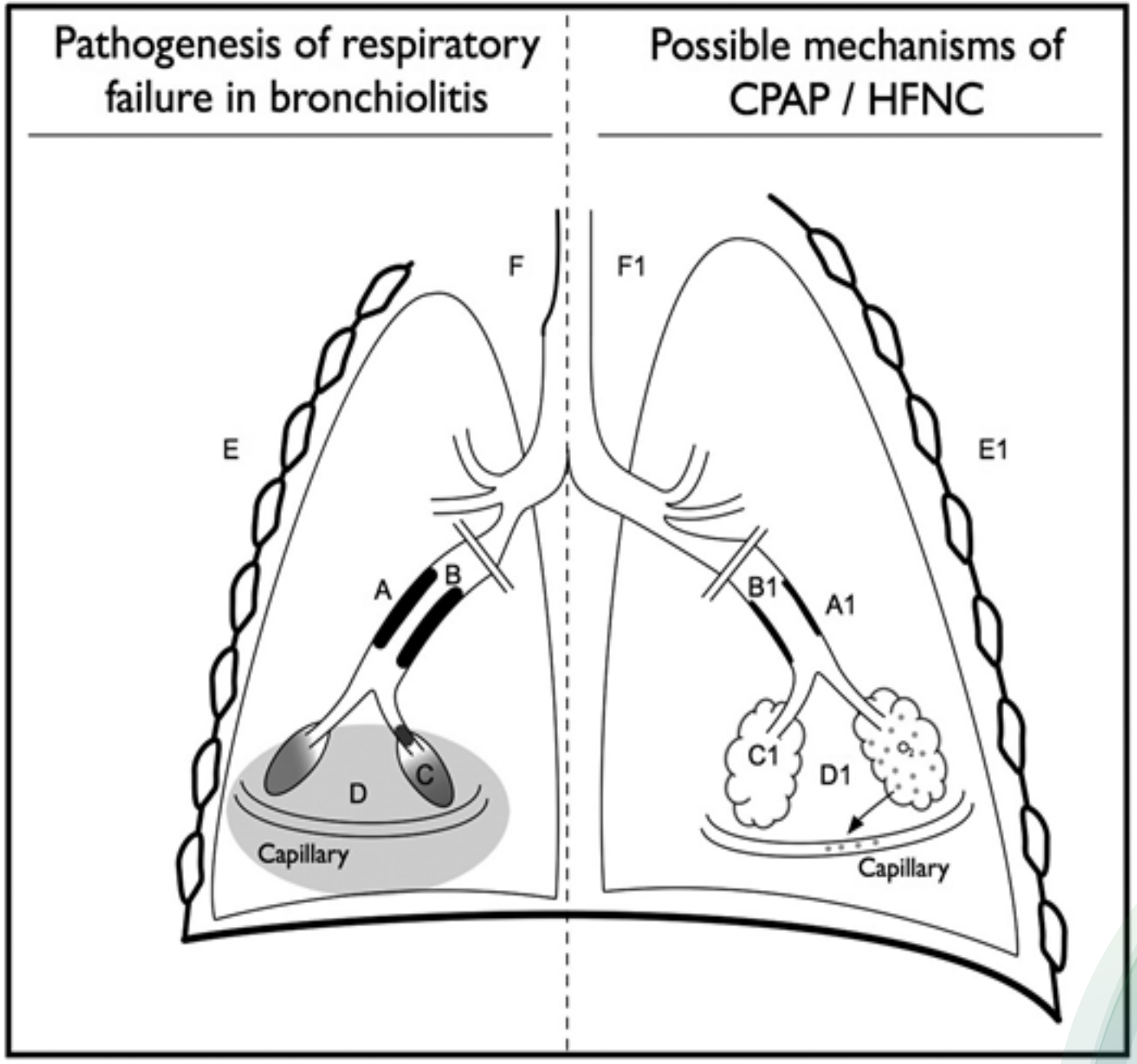
The mucociliary transport system at less than optimum humidity



- Heated Humidity
  - Aids in thermoregulation
- Evaporative Losses
  - When inadequate levels of humidity are inhaled, water vapor is drawn from the airway mucosa until the inspired gas has reached 37 °C, 44 mg/L. The energy cost to the infant for each gram of water removed from the mucosa is 0.58 kCal (2.4 kJ)

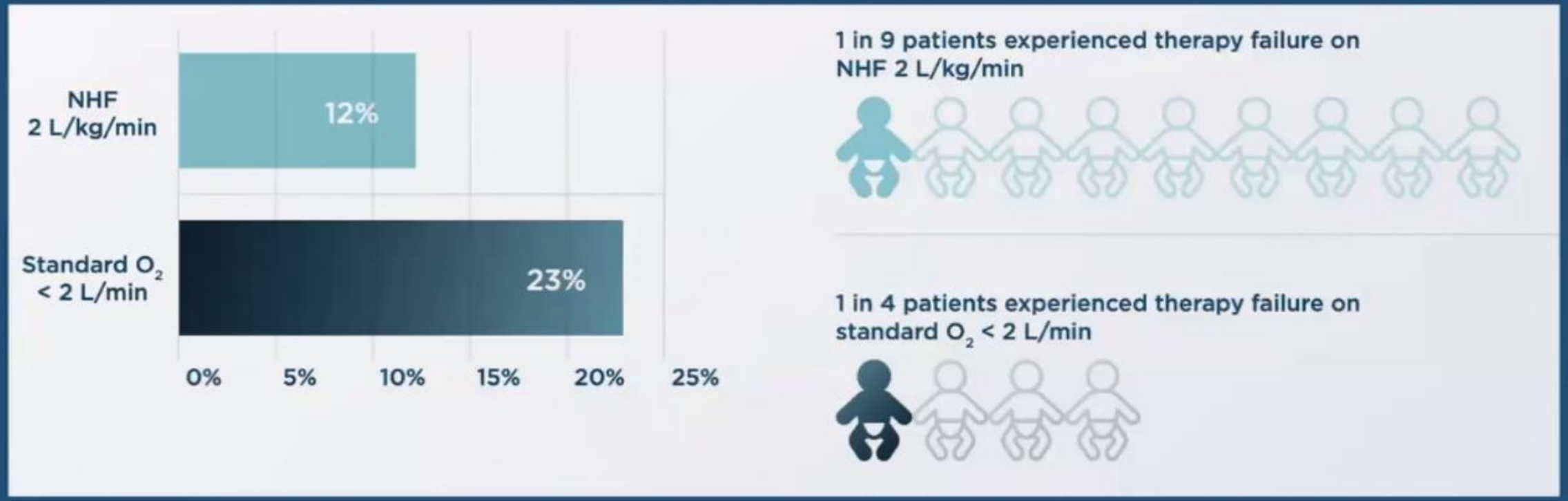
HFNC

(Sneaky PEEP)



HFNC vs LFNC: % requiring escalation of care

12 vs 23%, P < 0.001



Franklin et al., NEJM 2018 – HFNC complications and outcomes in bronchiolitis

HFNC - Con

"Current National Institute for Health and Care Excellence (NICE) guidelines for bronchiolitis state that 'the use of this medical device is becoming widespread without demonstration of additional efficacy'.

Recent studies by Kepreotes *et al*2 and Riese *et al*3 have shown that the use of ward-based HFNC in children with bronchiolitis did not reduce the hospital length of stay (LOS) or rate of admission to the pediatric intensive care unit (PICU), when compared with standard low-flow oxygen therapy"

"limited evidence to substantiate its clinical benefit or economic worth"

- Studies were mostly observational:
  - Reducing symptoms
  - Reducing need for CPAP
  - Inconclusive at best
  - More research is needed to support this
  - More evidence needed, to targeted outcomes

Humidified high-flow nasal cannula oxygen for bronchiolitis: should we go with the flow?
Mace, BMJ, 2017

HFNC - Con

- Evidence does not show consistent reductions in hospital length of stay, PICU admission, or intubation rates with HFNC versus low-flow oxygen, in general pediatric ward populations

- Excessive flows
  - Clamp down
  - Push secretions deeper

Franklin, D., Babl, F. E., Schlapbach, L. J., Oakley, E., Craig, S., & Fraser, J. F. (2018). A randomized trial of high-flow oxygen therapy in infants with bronchiolitis. *New England Journal of Medicine, 378*

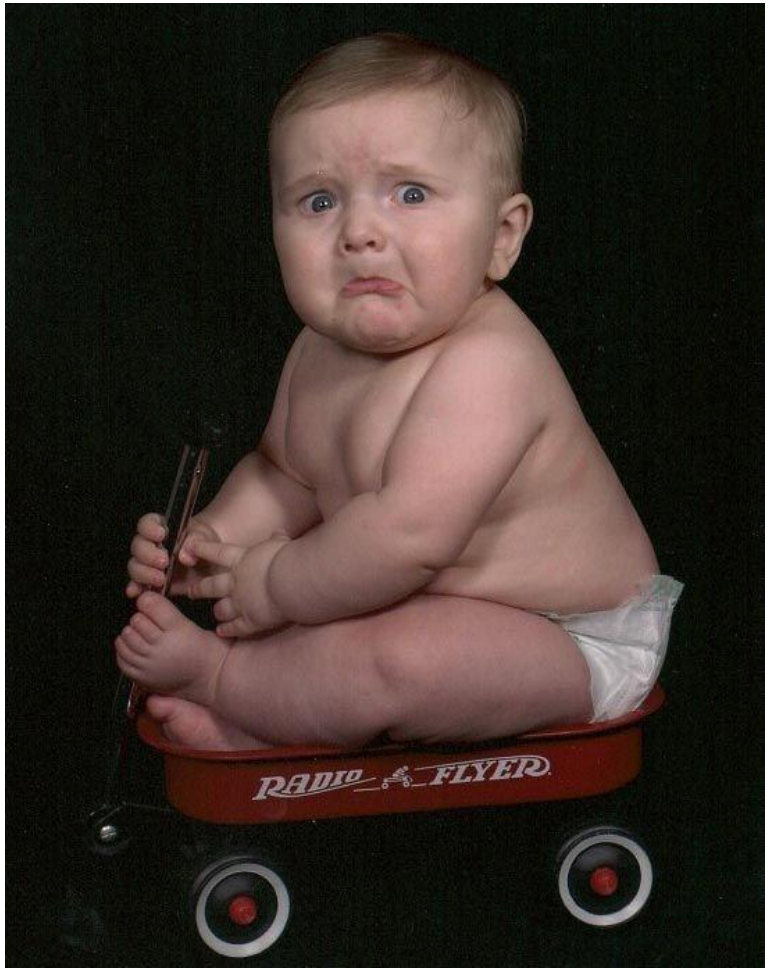
Oxygen Saturation is a Poor Indicator

- Infants receiving HFNC who are clinically deteriorating may develop significant respiratory acidosis (hypercapnia), despite high oxygen saturations
- Better indicators are
  - Marked retractions
  - Decreased or absent breath sounds
  - Fatigue
  - Poor responsiveness to stimulation

RA saturation <80% contact PICU and prepare for transfer

Complications

- Abdominal distension
- Nasal septum breakdown
- Aspiration
- Barotrauma
- Pneumothorax (rare)



Quality initiatives

A recent multicenter quality collaborative demonstrated success in reducing HFNC **overuse** in bronchiolitis by tightening initiation criteria and embedding reassessment—reflecting a consensus to use HFNC thoughtfully rather than reflexively.

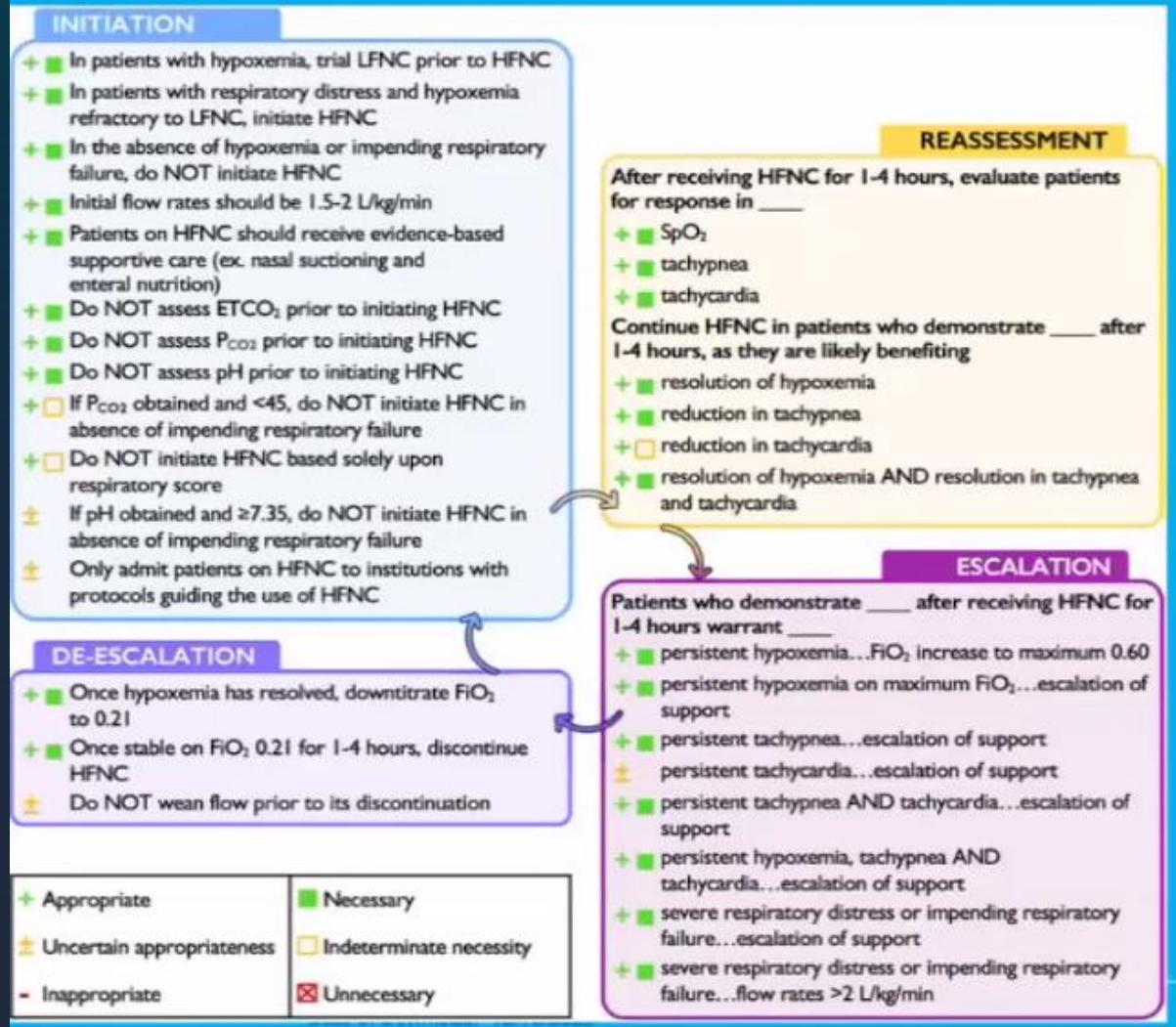
Guideline uptake: National-level guideline implementation reports underscore structured criteria, titration, and de-escalation strategies to standardize HFNC use across hospitals, aiming to balance benefit with resource stewardship.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN®

From: The Appropriate Use of High-Flow Nasal Cannula in Bronchiolitis: A Delphi Approach

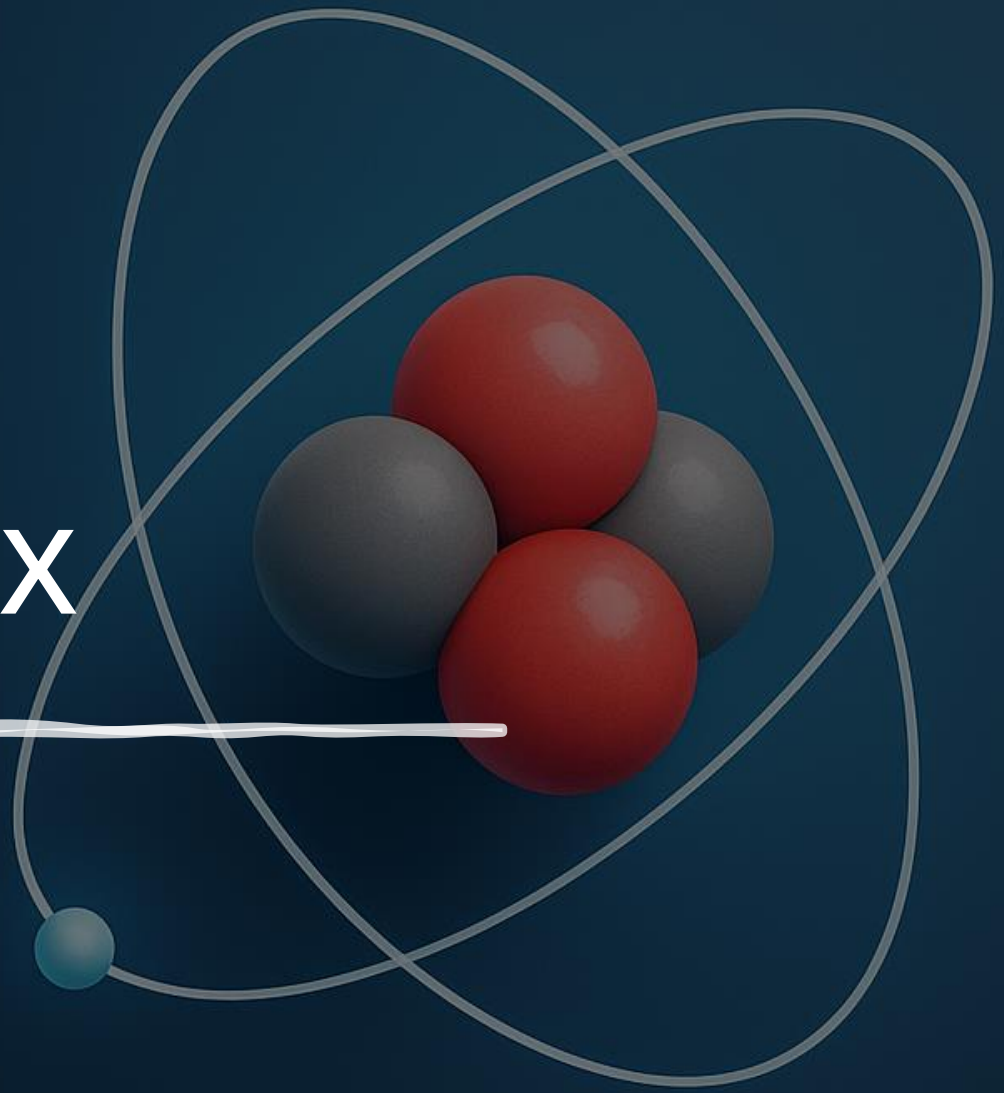
Hosp Pediatr. Published online December 08, 2025. doi:10.1542/hpeds.2025-008398



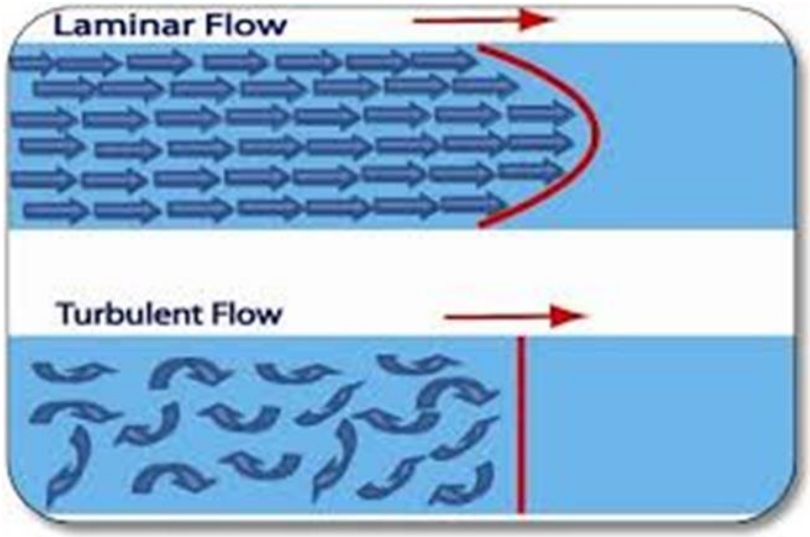
- Panel 15 experts
- Reviewed all studies on HFNC therapy in bronchiolitis
- Drafted proposed use recommendations

+ Appropriate	Necessary
± Uncertain appropriateness	Indeterminate necessity
- Inappropriate	Unnecessary

Heliox



heliox



How it works

- Heliox is a mixture of Helium and Oxygen.
- Inhaling Helium decreases WOB by increasing gas flow in small or partially obstructed airways by lowering resistance to gas flow.
- Because of its lower density Heliox creates a less turbulent gas flow through the airways
- Decreases work of breathing
- Carbon dioxide diffuses through helium four to five times faster than air

Heliox

- Four trials involving 138 infants used a clinical respiratory score system, with increased severity receiving a higher score.
  - The pooled results show that infants treated with heliox had a reduction in this respiratory score in the first hour.

- Another trial showed a small subgroup of infants who were started on a nasal device providing a continuous positive airway pressure right from the start, because of the severity of their disease, heliox inhalation reduced length of overall treatment.

Heliox Con-siderations

- Strong evidence is lacking in any population.
- Results mainly improved symptoms, not outcomes
- Largely observational/anecdotal
- One article actually showed that heliox combined with racemic epi showed positive results (JAMA pediatrics)

- Although reduced respiratory score:
  - No change in intubation rate
  - ER discharge
  - Length of symptoms
- Should be reserved for severe cases
- Costly with minimal benefit.

Heliox is of minimal benefit in bronchiolitis but is more costly

Liet, Jpeds, 2012

Helium-Oxygen Therapy for Infants With Bronchiolitis

Kim, JAMA, 2011

Bronchiolitis management has shifted from **intervention-heavy** to **supportive, reassessment-driven care.** Escalation of support should be **clinical**, not saturation-driven alone. Quality initiatives show benefit when we: Set **clear initiation criteria**

Require **frequent reassessment**

Build in **de-escalation pathways**

Advanced tools (HFNC, CPAP, Heliox) are **adjuncts**, not fixes.

Heliox Bridge

- For the asthmatic population, heliox buys us time to allow the steroids and bronchodilators to take effect.

Treatment Strategies

Nasal Suctioning

- For children hospitalized with bronchiolitis, we suggest:
  - Mechanical aspiration of the nares Q4 or as necessary to relieve nasal obstruction (combined responsibility)
  - Saline nose drops and mechanical aspiration of nares may help to relieve partial upper airway obstruction, in infants and young children with respiratory distress or feeding difficulties.
- There is little evidence to support routine, frequent “deep” suctioning of the oropharynx or larynx

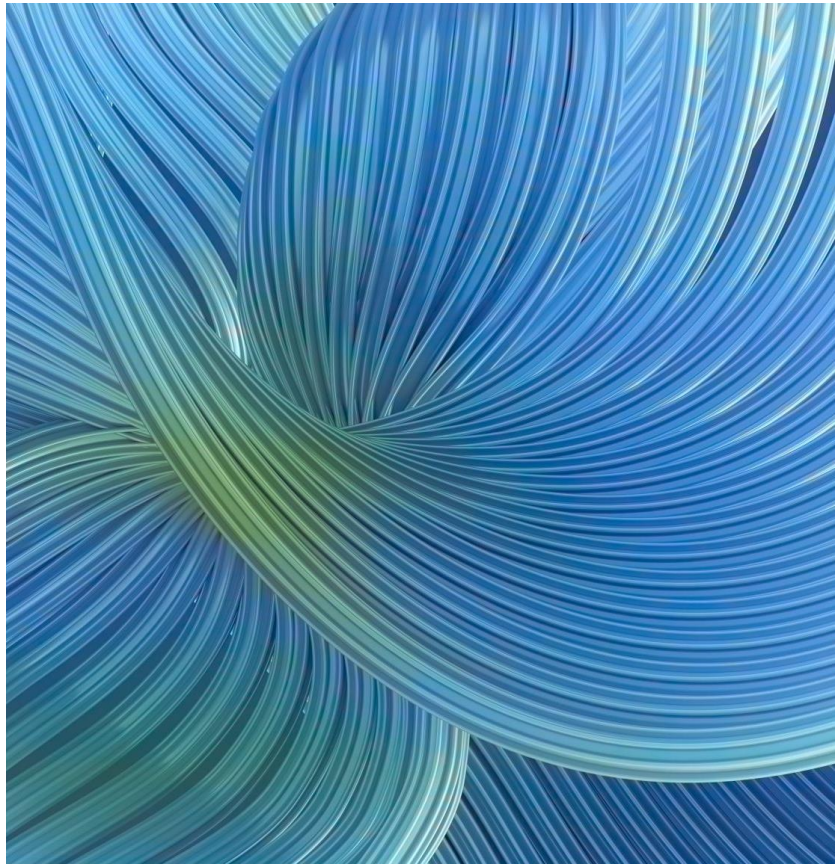
A retrospective cohort study of 740 infants (aged 2–12 months) hospitalized with bronchiolitis.

🔎 **What the study found**

The authors looked at “suctioning lapses” — defined as gaps of **more than 4 hours** between suctioning events during the first 24 hours of admission. JAMA Network+1

More frequent lapses were associated with a **longer hospital length of stay**. For example: geometric mean LOS was about **1.62 days** when there were **no suctioning lapses**, but **2.64 days** when there were **3 or 4 lapses**. PubMed+1

In other words: infants with bronchiolitis who's nasal (or nasopharyngeal) suctioning was more intermittent (“missed” or spaced out) tended to stay in hospital longer. PMC+1



Respiratory Support

Nasal Suctioning

Supplemental oxygen

A trial of heated humidified high-flow nasal cannula (HFNC) therapy

Continuous positive airway pressure (CPAP) before endotracheal intubation

TAKE HOMES

- Basics
  - Suction / Reduce Fever
- Trial of Albuterol if in distress
- LFNC if hypoxic
- HFNC if respiratory distress & refractory hypoxia
  - Reassess and escalate / de-escalate
  - If not PICU bound – Obs in ED…
- Call a friend if needed

AAP Guidelines - Bronchiolitis

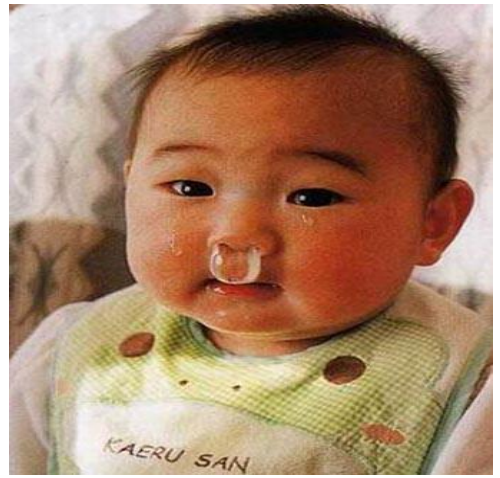
Do:

- Suction!
- Give IV vs. NG fluids
- Consider O2 therapy

Don't:

- No CXR
- No Albuterol trials
- No epinephrine (other than potentially as rescue medication in severe disease)
- No oral steroids
- No antibiotics
- No chest PT
- No hypertonic saline (well…we don't think so)

- Best practice suggests:
  - Supportive care targeting symptoms
  - Having protocols/guidelines helps streamline care and shorten LOS.
- Suction, Suction, Suction
- Oxygen
- Fluids
- Temp control



•Liu L, Gallaher M, Davis R, et al. Use of a Respiratory Clinical Score Among Different Providers. Pediatric Pulmonology 2004; 37:243-8.
•Perlstein PH, Kotagal UR, Boiling C et al. Evaluation of an evidence-based guideline for bronchiolitis. Pediatrics 1999; 104:1334-1341.

Bronchiolitis: Evidence-Based "Don'ts" & Exceptions

Guidelines do not apply to:

- Immunodeficiency / HIV
- Solid organ or stem-cell transplant recipients
- Significant comorbid disease:
  - Recurrent wheezing
  - BPD / chronic neonatal lung disease
  - Neuromuscular disease
  - Cystic fibrosis
  - Hemodynamically significant CHD

Chest X-Ray (CXR)

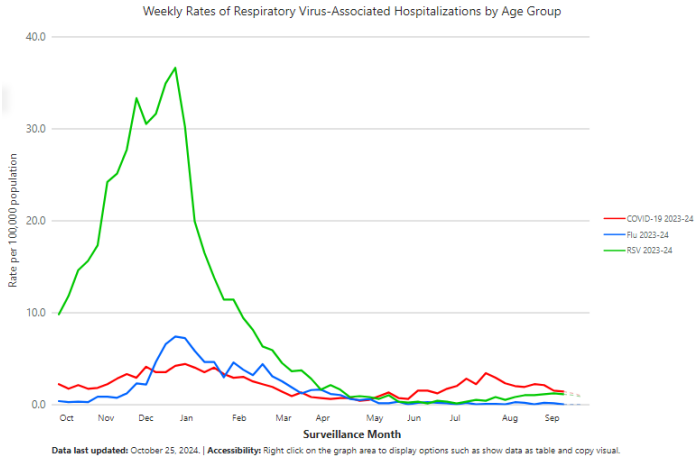
- Abnormal findings common
- Poor correlation with disease severity
- CXRs → ↑ antibiotic use without outcome benefit
- Consider only if:
  - ICU-level severity
  - Suspected complication (e.g., pneumothorax)

Bronchodilators (Albuterol)

- No routine trials have showed benefit
- Transient symptom improvement only
- No effect on outcomes (LOS, admission, resolution)
- Adverse effects + ↑ cost
- Cochrane reviews: no overall benefit

Bottom Line-

Bronchiolitis looks reactive, but it isn't asthma – and bronchodilators change symptoms, not outcomes.



Hospitalization in kids <5 years old

- RSV Antibody shot (Nirsevimab) will help.
- Reduces hospitalizations by 80-90%

Reducing Cost:
Partnering to Reduce Pediatric RSV Admissions

- Nirsevimab reduces the risk of RSV admissions and ED visits for children.
- Nirsevimab cost is **~$271/dose** to administer
- **Partnerships** formed between primary care, NICU, Baird 7, Vermont Department of Health, and Vermont Child Health Improvement Program to **increase nirsevimab administration in all care areas**.
  - Primary care, specialty care, NICU, Newborn Nursery
- In FY 2025, fewer RSV admissions led to **$600,000+** savings

VCHIP
Vermont Child Health Improvement Program
UNIVERSITY OF VERMONT LARNER COLLEGE OF MEDICINE

VERMONT
DEPARTMENT OF HEALTH

University of Vermont Health | Golisano Children's Hospital

Therapeutic Clinician Prescription