

AI INTERACTIVE WORKSHOP

Zachary A.Vesoulis, MD MSCI


*Co-Director, NeuroNICU Program, St. Louis Children’s Hospital*

*Associate Professor of Pediatrics*

*Department of Pediatrics, Division of Newborn Medicine*

*Washington University School of Medicine*

FANNP’s National Neonatal Nurse Practitioner Symposium: Clinical Update and Review, 2025 ©



1

Disclosures

**I have the following financial disclosures:**

Edwards LifeSciences (research support, ended April 2024)

Medtronic (consulting, research support)

ReAlta Life Sciences (research support)



Department of Pediatrics  
Division of Newborn Medicine

2

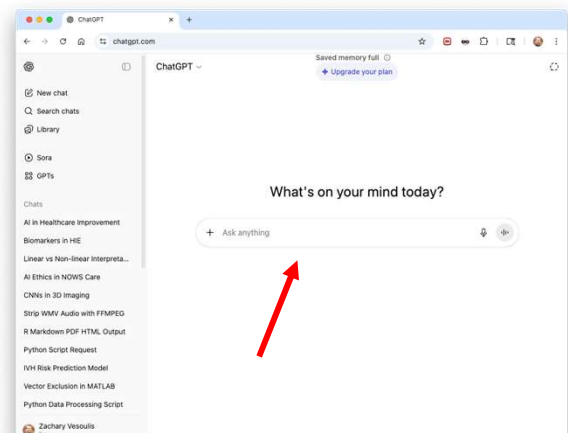
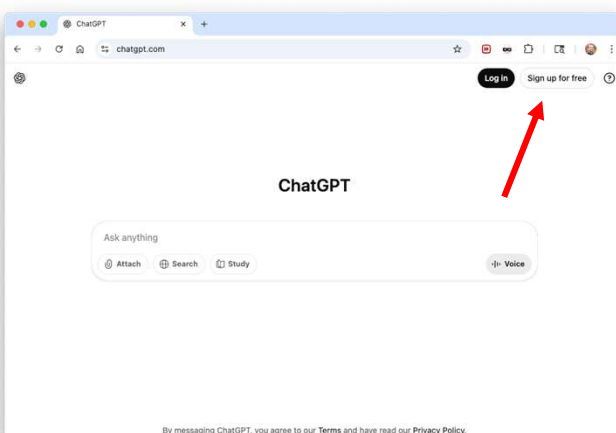
## Objectives

- Examine the functionality of AI and Big Data tools through live demonstration
- Practice skills through structured activities in the handbook
  - LLM practice
  - OpenEvidence and “deep research” search
  - Epic SlicerDicer
  - Bonus: NeoMIND-AI tools
  - Extra Bonus: Big Data analytics in R Studio
  - Super Extra Bonus: Advanced Big Data analytics in Octave/MATLAB

3

## ChatGPT sign up screen

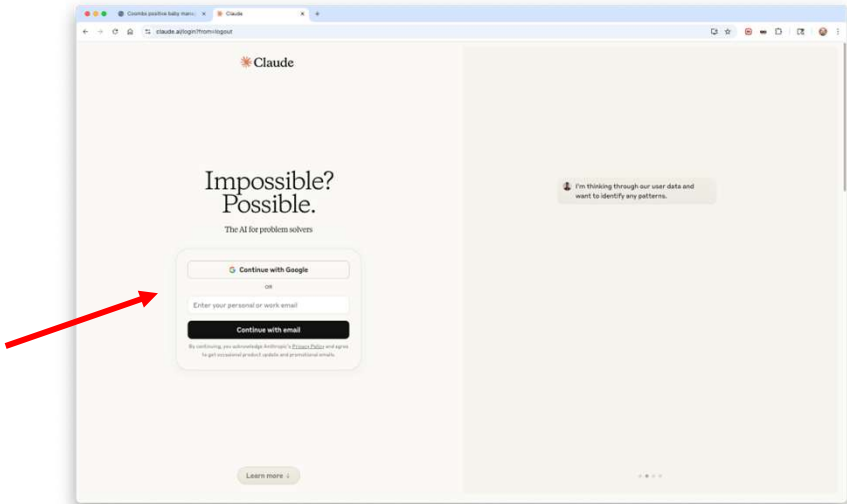
<https://chatgpt.com>



4

Claude sign up screen

<https://claude.ai>



5

**Example 1:** Make a diagram of how to manage a Coombs positive baby in the NICU

6

Coombs positive baby manage...

Coombs Positive Baby NICU...

chatgpt.com/cj08b73a2f-bef0-8330-933a-f6c5c36c7969

ChatGPT

Saved memory full

Share

3. Make a diagram of how to manage a coombs positive baby in the NICU.

MANAGING A COOMBS POSITIVE BABY IN THE NICU

Coombs positive baby

Evaluate neonatal jaundice

Assess hemoglobin levels

Treat hyperbilirubine

Consider exchange transfusion


Monitor bilirubin levels

Provide supportive care

Ask anything

ChatGPT can make mistakes. Check important info.

Children's HOSPITAL • ST. LOUIS

 WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

7

Coombs positive baby manage...

Coombs Positive Baby NICU...

claude.ai/chat/c3e75e5-4576-46cf-a46e-7d27b469c7d4

Coombs Positive Baby NICU Management

1. Make a diagram of how to manage a coombs positive baby in the NICU.

I'll create a comprehensive flowchart diagram for managing a Coombs positive baby in the NICU. This will include assessment, monitoring, and treatment pathways.

Coombs Positive Baby Management in NICU Diagram

This flowchart provides a comprehensive approach to managing Coombs positive babies in the NICU. Here are the key components:

**Initial Assessment & Risk Stratification:**

- Baseline laboratory studies including bilirubin levels, blood typing, and hemolysis markers
- Risk stratification based on cord blood bilirubin (>4.5 mg/dL = high risk)

**Monitoring Protocols:**

- High-risk babies: More frequent bilirubin checks (q4-6h) and clinical assessments
- Moderate-risk babies: Standard monitoring intervals

**Treatment Pathways:**

- Phototherapy:** Initiated based on standard guidelines with intensive double phototherapy
- Exchange Transfusion:** Reserved for severe cases with specific indications
- IVIG:** Considered for severe hemolytic disease

**Key Decision Points:**

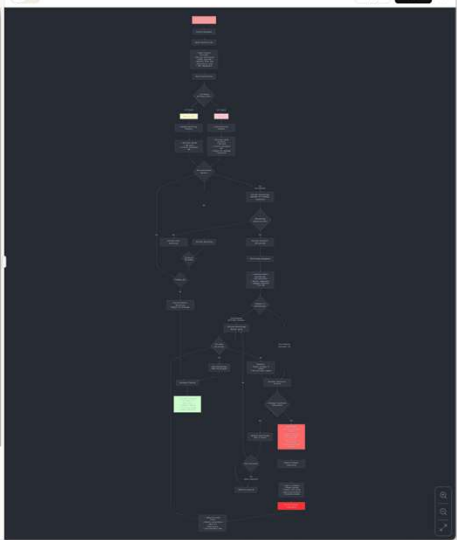
- Rate of bilirubin rise (>0.5 mg/dL/hr is concerning)
- Response to phototherapy
- Exchange transfusion criteria (total bilirubin >20 mg/dL in term infants, severe anemia, signs of kernicterus)

**Discharge Criteria:**


- Bilirubin <13 mg/dL
- No neurological signs
- Adequate feeding

Reply to Claude...

Claude Sonnet 4



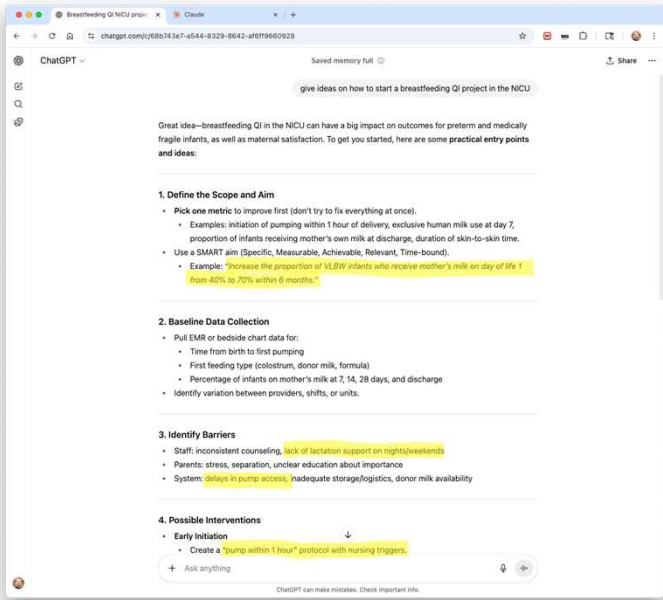
Children's HOSPITAL • ST. LOUIS

 WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

8

**Example 2:** Give ideas on how to start a breastfeeding QI project in the NICU



Cloud

New chat

Chats

Projects

Artifacts

NICU Breastfeeding Quality Improvement Project

Example 2: Give ideas on how to start a breastfeeding QI project in the NICU

Here are practical ideas for launching a breastfeeding quality improvement project in the NICU:

Assessment and Baseline Data

Start by establishing current performance metrics like exclusive breastfeeding rates at discharge, time to first milk expression, and maternal pumping frequency. Survey staff to identify perceived barriers and conduct chart reviews to understand documentation practices around lactation support.

Evidence-Based Interventions

Implement skin-to-skin care protocols for stable infants, establish early and frequent pumping guidelines (within 6 hours of delivery, every 3 hours thereafter), and create standardized breast milk handling procedures. Consider adopting the "Ten Steps for NICU" framework, which adapts baby-friendly hospital practices for critically ill newborns.

Staff Education and Training

Develop competency-based training for nurses on positioning, latch assessment, and pump troubleshooting. Include lactation consultants in daily rounds and create quick reference guides for common breastfeeding challenges in premature or sick infants.

Family Support Systems

Establish peer support programs connecting current NICU parents with graduates, provide private pumping spaces near the unit, and create educational materials addressing unique NICU breastfeeding challenges like managing milk supply during long hospitalizations.

Process Improvements

Standardize lactation consultant referrals, implement daily breast milk intake tracking, and establish protocols for transitioning from tube feeding to breastfeeding. Consider creating a "breast milk champions" role among nursing staff.

Measurement Strategy

Track both process measures (percentage of mothers receiving lactation support within 24 hours) and outcome measures (any breast milk + discharge, exclusive breastfeeding rates). Use Plan-Do-Study-Act cycles to test small changes before full implementation.

Reply to Claude...

Research

Claude Sonnet 4

Aim

Increase exclusive breastfeeding at NICU discharge to 70% by Dec 2025

Primary Drivers

Early Milk Establishment

Staff Competency

Family Support

System Processes

Secondary Drivers & Change Ideas

Pump within 6 hours

Daily SSC protocol

LC on rounds

Nurse education program

Prenatal NICU class

Peer mentor program

Feeding readiness criteria

Dedicated pump rooms

Children's Hospital • ST. LOUIS

WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

11

Example 3: Recreate an editable table from a scanned document

Children's Hospital • ST. LOUIS

WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

12


10/17/2025

6


NICU Quality Dashboard: NEC, BPD, ROP Outcomes (2023-2024)

Annual Outcome Summary

Quarter	Total VLBW Admissions	NEC Cases	NEC Rate (%)	BPD Cases	BPD Rate (%)	ROP Stage ≥3	ROP Rate (%)
Q1 2023	45	2	4.4%	12	26.7%	3	6.7%
Q2 2023	52	4	7.7%	18	34.6%	5	9.6%
Q3 2023	48	3	6.3%	15	31.3%	4	8.3%
Q4 2023	51	3	5.9%	16	31.4%	4	7.8%
2023 Total	196	12	6.1%	61	31.1%	16	8.2%
Q1 2024	49	3	6.1%	14	28.6%	3	6.1%
Q2 2024	53	2	3.8%	19	35.8%	6	11.3%
Q3 2024	47	4	8.5%	13	27.7%	4	8.5%
YTD 2024	149	9	6.0%	46	30.9%	13	8.7%



Children's  
HOSPITAL • ST. LOUIS

WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

13

PDF Table Extraction

PDF

recreate a table from this PDF file, keeping the exact format

I'll recreate the table from the PDF file with the exact same format and data.

NICU Quality Dashboard: NEC, BPD, ROP Outcomes (2023-2024)


I've recreated the table exactly as shown in the PDF, maintaining the same structure, data, and formatting. The table shows NICU quality metrics tracking NEC (Necrotizing Enterocolitis), BPD (Bronchopulmonary Dysplasia), and ROP (Retinopathy of Prematurity) outcomes for very low birth weight (VLBW) admissions across quarters from 2023-2024.

NICU Quality Dashboard: NEC, BPD, ROP Outcomes (2023-2024)

Annual Outcome Summary

Quarter	Total VLBW Admissions	NEC Cases	NEC Rate (%)	BPD Cases	BPD Rate (%)	ROP Stage ≥3	ROP Rate (%)
Q1 2023	45	2	4.4%	12	26.7%	3	6.7%
Q2 2023	52	4	7.7%	18	34.6%	5	9.6%
Q3 2023	48	3	6.3%	15	31.3%	4	8.3%
Q4 2023	51	3	5.9%	16	31.4%	4	7.8%
2023 Total	196	12	6.1%	61	31.1%	16	8.2%
Q1 2024	49	3	6.1%	14	28.6%	3	6.1%
Q2 2024	53	2	3.8%	19	35.8%	6	11.3%
Q3 2024	47	4	8.5%	13	27.7%	4	8.5%
YTD 2024	149	9	6.0%	46	30.9%	13	8.7%

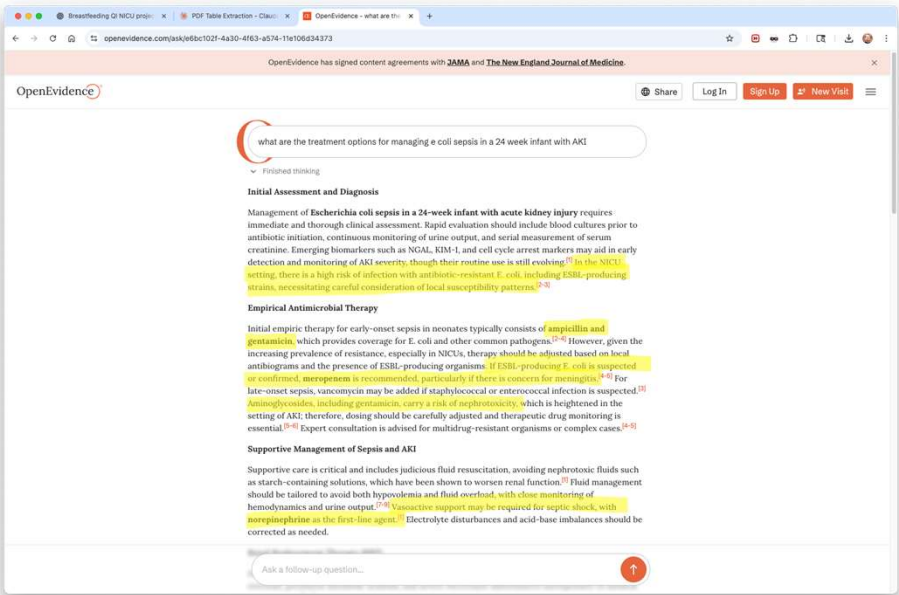
Children's  
HOSPITAL • ST. LOUIS

WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

14

Example 4: Antibiotic selection for treating complicated sepsis





Example 5: Review of the literature on tracheostomy in BPD

17

How can I help you today?

[Research](#)

Write Learn Code Life stuff

using deep research, Help me sort through all of the evidence for tracheostomy in former preterm infants now with BPD

Identifying and navigating to PubMed paper link

Skip >

Tracheostomy in Preterm BPD Infants

Help me sort through all of the evidence for tracheostomy in former preterm infants now with BPD

I'll do some comprehensive research on the evidence for tracheostomy in former preterm infants with BPD. Just a couple quick clarifying questions to make sure I cover exactly what you need:

1. Are you looking for evidence comparing tracheostomy vs. prolonged mechanical ventilation, or are you also interested in timing of tracheostomy (early vs. late) and outcomes?
2. Are there specific outcomes you're most interested in (e.g., mortality, length of stay, neurodevelopmental outcomes, respiratory outcomes, complications)?
3. What patient population specifically - any particular gestational age ranges or severity of BPD you want me to focus on?

Tracheostomy in BPD research

80 sources and counting... 1m 1s



early vs. late, length of stay, all preterm infants

Perfect, that helps focus the research. I'll dive into a comprehensive analysis of the evidence for early vs. late tracheostomy in former preterm infants with BPD, with particular attention to length of stay outcomes across all gestational ages.

Tracheostomy timing research

Creating my research plan... 19s

Reply to Claude...



Department of Pediatrics  
Division of Newborn Medicine

18

ChatGPT deep research


### When tracheostomy likely helps

- **Refractory ventilator dependence** with escalating sedation or failure to thrive because the ETT precludes oral feeds/therapies: trach can allow comfortable ventilation, reduce sedatives, enable oral care, and improve participation in developmental therapies. Frontiers
- **Recurrent extubations/failure of noninvasive support** despite optimized lung and airway management (diuretics, bronchodilators, steroids where appropriate, pulmonary vasodilators when indicated, meticulous NIV). (Framework from ATS + sBPD care literature.) PMC
- **Long anticipated duration of positive-pressure support** (months to years) based on physiology (severe parenchymal disease, high PEEP needs), growth trajectory, and comorbidities. These infants tend to be the ones who *eventually* get liberated/decannulated over years rather than months. Nature

### Where the tradeoffs are sharp

- **Neurodevelopment:** **Tracheostomy itself may be a marker of severity**; some datasets show independent negative associations (language/cognition) versus sBPD without trach, but others show earlier trach (in high-severity phenotypes already receiving postnatal steroids) associates with **better cognitive outcomes** than later trach. **Takeaway: avoid prolonged cycles of intubation/sedation if trach is clearly inevitable; if proceeding, unnecessary delay may be harmful.** Nature PubMed
- **Airway morbidity & caregiver burden:** Expect frequent airway infections/granulomas/stenosis and high readmission utilization; dedicated training and home supports mitigate risk, but early post-op tracheitis and later infections are common. **Trach-related death is rare but devastating; insist on redundancy in caregiver training and safety planning.** PMC AAO-HNSF Journals

Children's  
HOSPITAL • ST. LOUIS

WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

19

ChatGPT deep research


### Outcomes you can counsel around (with numbers you can use)

- **Ventilator liberation:** median ~27 months of age post-discharge for sBPD on home vents; patient factors dominate over center effects. Nature
- **Decannulation:** median ~49 months; most survivors eventually decannulate, but time varies widely with illness severity and readmissions. Nature
- **Complications:** tracheitis and stomal granulomas are common; **trach-related mortality is low (~1–2%)** in contemporary series but not zero. PMC AAO-HNSF Journals
- **Neurodevelopment:** conflicting data; if proceeding, avoid prolonged delay once criteria for trach are met; “earlier vs later” signals favor earlier among high-severity infants already receiving steroids (retrospective). PubMed

### Key studies & resources (recent/high-yield)

- **Multicenter timing predictors:** Agarwal et al., *J Perinatol* 2024—patient-level factors drive timing; median 27 mo liberation, 49 mo decannulation. Nature
- **Outpatient outcomes & variation:** Manimtim et al., *Pediatrics* 2023 (multicenter home-vent sBPD). PMC
- **Early vs late trach (NDI signal):** 2023 retrospective cohort—**earlier trach associated with better cognitive scores vs later in steroid-exposed sBPD.** PubMed
- **Potential adverse developmental association:** Cammack et al., *J Perinatol* 2020—language/cognitive deficits vs non-trach sBPD (residual confounding likely). Nature
- **Complications & trach-related mortality:** Contemporary OHNS cohort summaries. PMC AAO-HNSF Journals
- **Practice standard:** ATS Pediatric Chronic Home Invasive Ventilation guideline + 2022 summary refresh. PMC Guideline Central

Children's  
HOSPITAL • ST. LOUIS

WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

20

### Early vs. Late Tracheostomy in Preterm BPD

The strongest available evidence suggests **early tracheostomy placement before 120 days of life significantly improves neurodevelopmental outcomes** compared to later placement in preterm infants with bronchopulmonary dysplasia (BPD). However, this recommendation is based on limited observational data, as no evidence-based clinical guidelines currently exist for optimal timing decisions. <sup>PubMed Central +2</sup> **The landmark multicenter study found early timing was associated with a 50% reduction in odds of death or neurodevelopmental impairment** (adjusted OR 0.5, 95% CI 0.3-0.9), representing the most compelling evidence to date. <sup>PubMed Central +2</sup> Despite this finding, overall outcomes remain challenging regardless of timing, with substantial healthcare utilization, prolonged hospitalizations, and significant long-term morbidity affecting families and healthcare systems.

### Critical evidence gaps define current practice

The medical literature reveals a striking absence of high-quality evidence synthesis on tracheostomy timing in preterm infants with BPD. **No systematic reviews, meta-analyses, or randomized controlled trials** specifically address this clinical question, despite its significant impact on patient outcomes and healthcare resources. <sup>BioMed Central +2</sup> **The American Academy of Pediatrics explicitly acknowledges that "no evidence-based criteria or consensus clinical practice guidelines exist to inform tracheostomy placement in this growing and vulnerable population."** <sup>ResearchGate +2</sup> This evidence vacuum has resulted in substantial practice variation, with tracheostomy rates ranging from **2% to 37% across pediatric centers** <sup>ScienceDirect +2</sup> and timing decisions varying by weeks to months between institutions.

The most robust evidence comes from a single multicenter retrospective cohort study by DeMauro and colleagues through the NICHD Neonatal Research Network. This landmark study analyzed 8,683 very preterm infants (less than 30 weeks gestation) from 16 centers between 2001-2011, identifying 304 infants who received tracheostomies. <sup>PubMed Central</sup> The study's strength lies in its multicenter design, large sample size, and standardized neurodevelopmental outcome assessments at 18-22 months corrected age. However, as an observational study, it cannot establish causation, and selection bias may influence the timing comparisons since sicker infants might receive later tracheostomies.

### Early timing shows neurodevelopmental advantages

The DeMauro study defined early tracheostomy as placement **before 120 postnatal days** (approximately 17 weeks of life or 42 weeks post-menstrual age for extremely preterm infants), while late placement occurred after this threshold. <sup>PubMed Central +3</sup> **The primary composite outcome of death or neurodevelopmental impairment occurred in 83% of infants with tracheostomies compared to 40% without tracheostomies.**

<sup>PubMed Central +2</sup> More importantly for timing decisions, early placement was associated with significantly better outcomes than late placement, with an adjusted odds ratio of 0.5 (95% CI 0.3-0.9) for the composite endpoint. <sup>NCBI +3</sup>

Supporting evidence from single-center studies reinforces potential mechanisms underlying this timing benefit. The transition to tracheostomy enables **reduced sedation requirements, increased caregiver interaction, and enhanced participation in developmental activities.** <sup>Childrensmcrgy +3</sup> Luo and colleagues demonstrated **significant improvements in growth velocity within four weeks of tracheostomy placement**, along with increased physical therapy participation and reduced daily sedation medications. <sup>NCBI +3</sup> These findings suggest that earlier placement may optimize the critical window for neurodevelopmental interventions during infancy.



Current practice patterns show **significant institutional variation in timing decisions.** Across multiple studies, the **median timing ranges from 42-51 weeks post-menstrual age**, <sup>PubMed Central</sup> <sup>Frontiers</sup> corresponding to approximately 4-6 months chronological age. <sup>PubMed Central +3</sup> The BPD Collaborative multicenter data reveals a median placement at 48 weeks post-menstrual age, <sup>ScienceDirect</sup> but with substantial center-to-center variation. <sup>PubMed Central +4</sup> This variation reflects the absence of standardized criteria and suggests that institutional culture, family preferences, and provider experience significantly influence timing decisions.

Claude Research Report



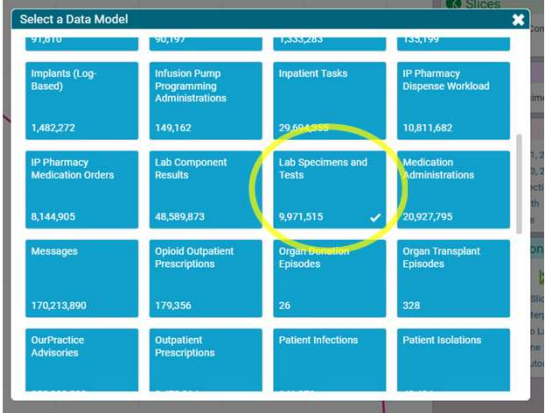
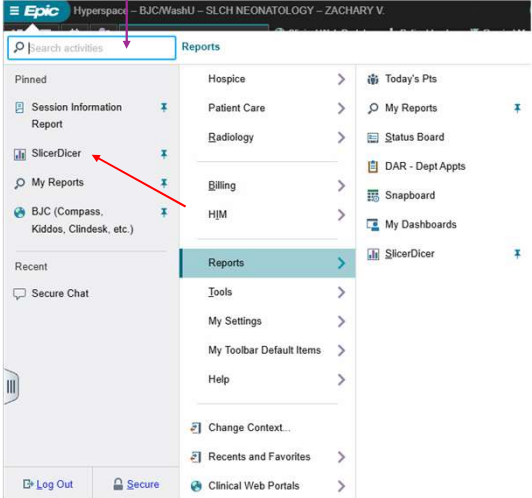
Department of Pediatrics  
Division of Newborn Medicine

### Example 5: Examine trends in cord pH at different thresholds over time



Department of Pediatrics  
Division of Newborn Medicine

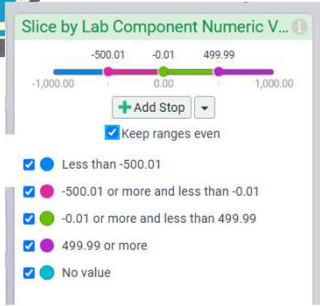

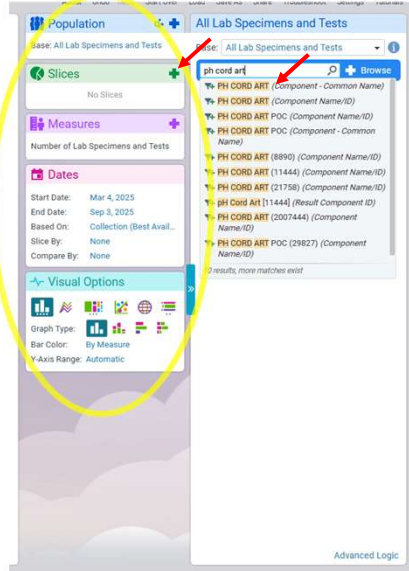
If you don't see SlicerDicer, type "slicerdicer" into this box to search for it



Childre<sup>n</sup>'s HOSPITAL • ST. LOUIS WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

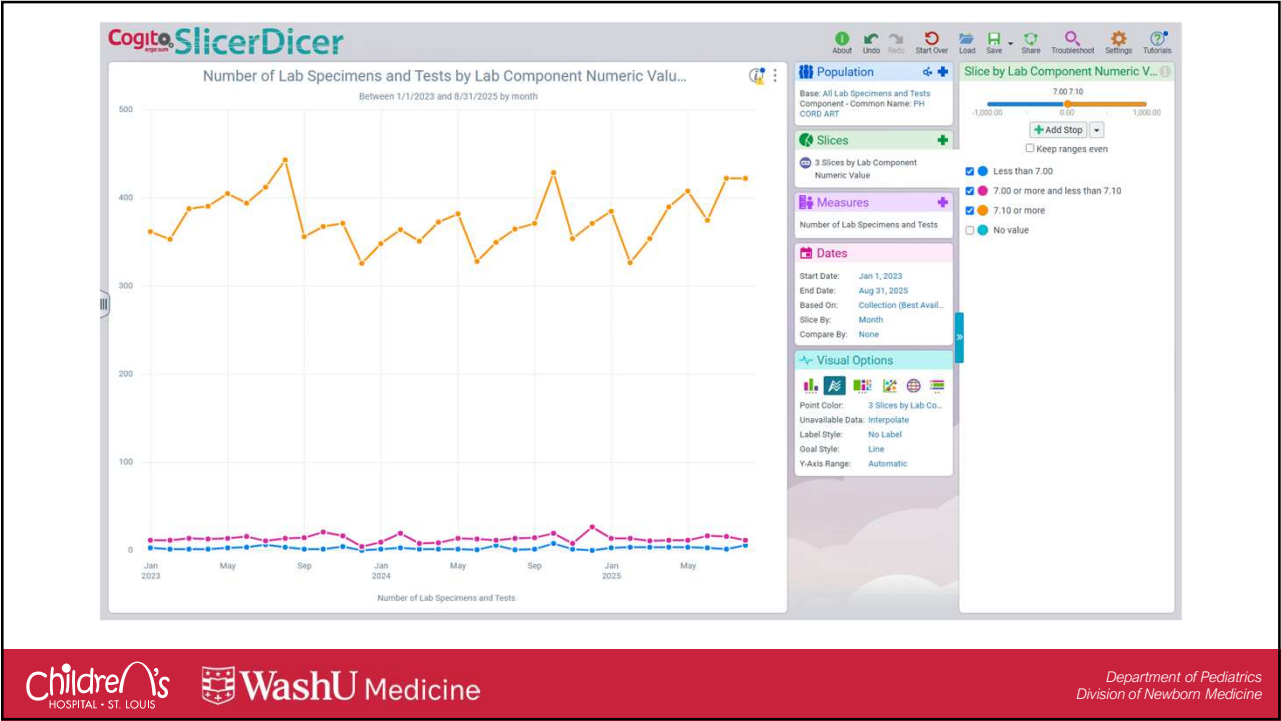
23



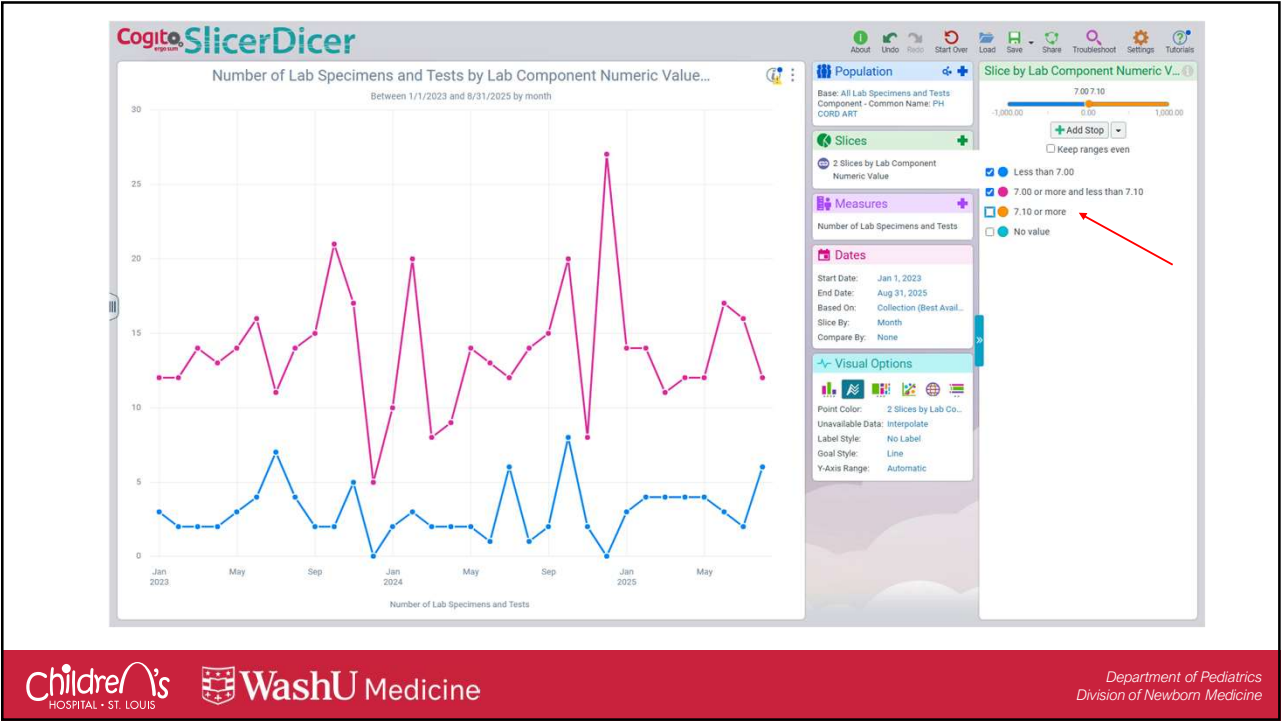
Childre<sup>n</sup>'s HOSPITAL • ST. LOUIS WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

24



25



26



**Example 6:** Identify patterns in platelet counts in a NICU unit

Population

Lab Component Results

Patients

Slices

4 Slices by Numeric Value

Measures

Number of Lab Component Results

Base: All Patients

Between 3/4/2025 and 9/3/2025

Search for criteria

Department

SLCH 5400 NICU

Population

Lab Component Results

Patients

Slices

4 Slices by Numeric Value

Measures

Number of Lab Component Results

Base: All Lab Component Results

Search for criteria

Component - Common Name

PLATELETS

Slice by Numeric Value

49.9

99.9

149.9

0.0

40.0

80.0

120.0

160.0

200.0

Add Stop

Keep ranges even

☒ Less than 49.9

☒ 49.9 or more and less than 99.9

☒ 99.9 or more and less than 149.9

☒ 149.9 or more

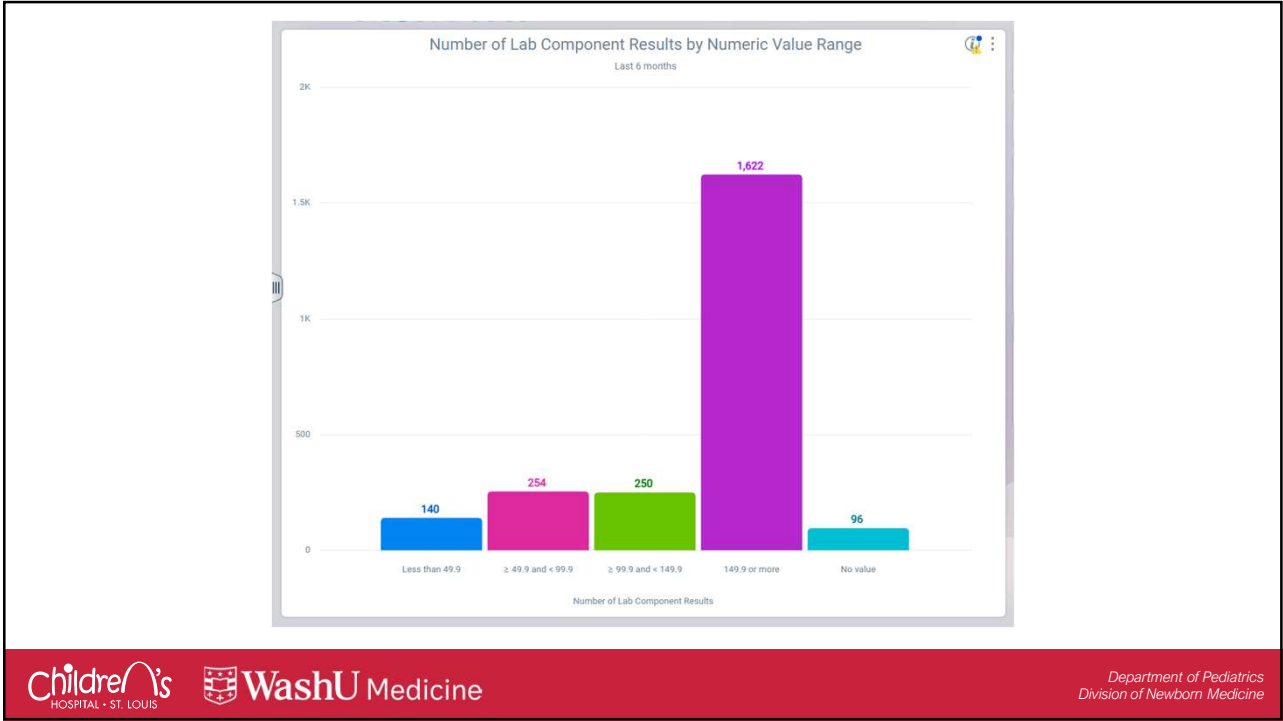
☒ No value

Children's

HOSPITAL • ST. LOUIS

WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine



29

- If you would like to learn more, please check out NeoMIND-AI!
  - Regular webinars from experts
  - Educational materials
  - Links to meetings and presentations
  - AI tools and calculators
  - Visit <https://neomindai.com/> or follow @NeomindAi on Twitter/X or Bluesky for more

**NeoMIND-AI**

Neonatal Machine learning, INnovations, Development, and Artificial Intelligence

Children's Hospital • ST. LOUIS WashU Medicine

Department of Pediatrics  
Division of Newborn Medicine

30