


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

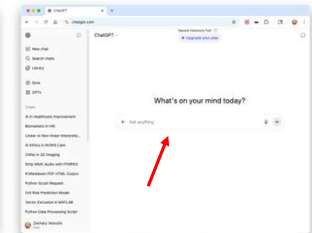
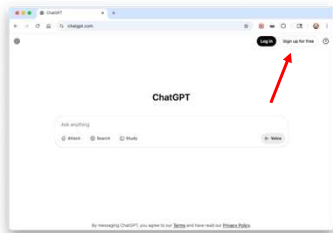




Department of Pediatrics
Division of Newborn Medicine

3

ChatGPT sign up screen

<https://chatgpt.com>



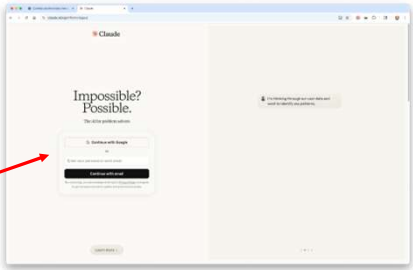




Department of Pediatrics
Division of Newborn Medicine

4

Claude sign up screen

<https://claude.ai>







Department of Pediatrics
Division of Newborn Medicine

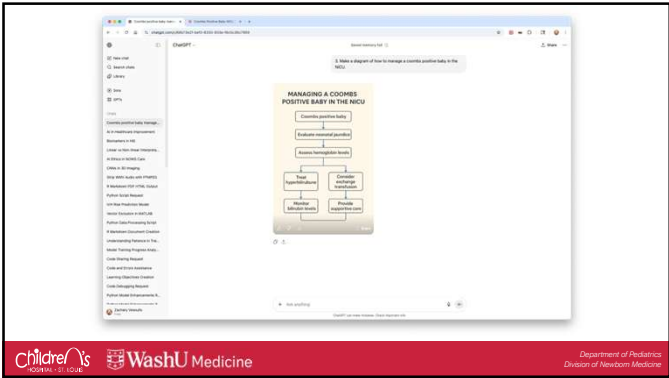
5

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

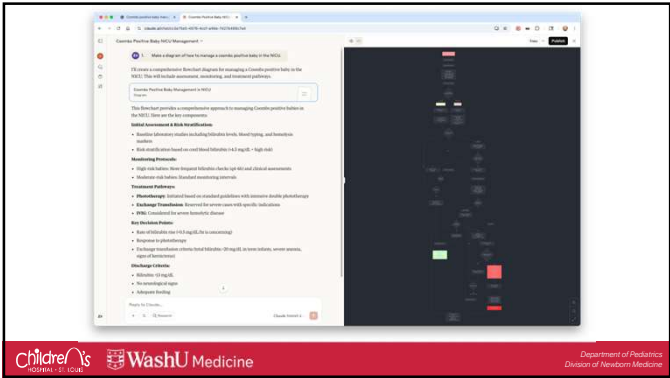


Department of Pediatrics
Division of Newborn Medicine

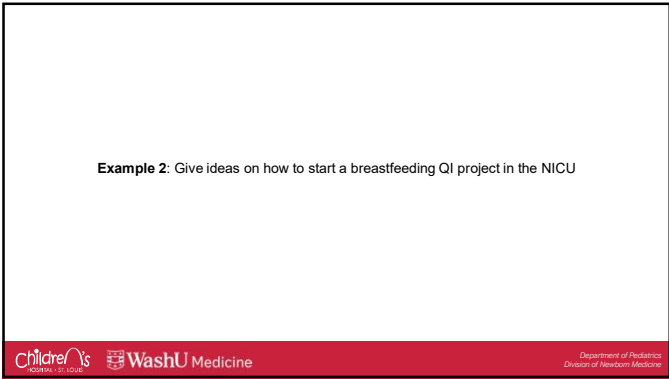
6



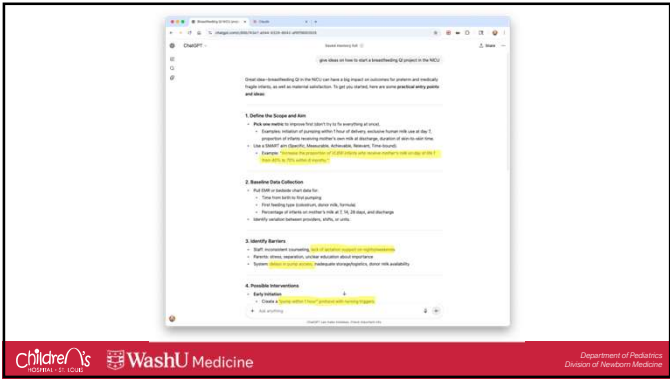
7



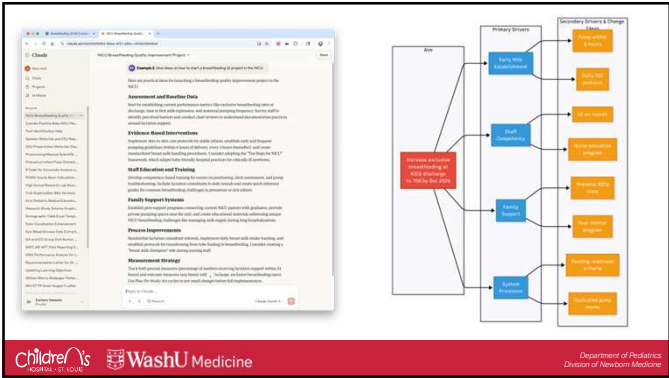
8



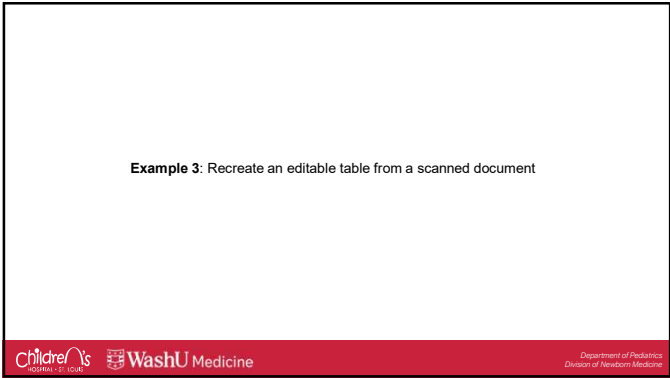
9



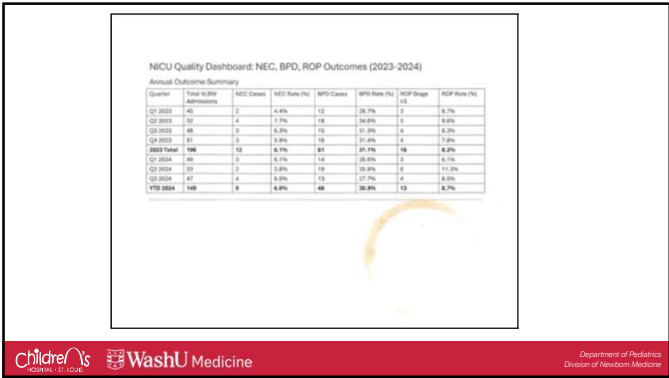
10



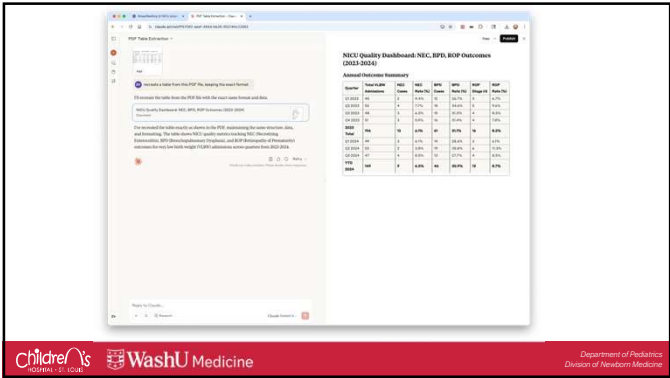
11



12



13



14

Example 4: Antibiotic selection for treating complicated sepsis

15

OpenStax: Antibiotic selection for treating complicated sepsis

What are the treatment options for managing a 24-week infant with SSI?

Initial Assessment and Diagnosis

Management of SSI in the neonatal unit requires a multidisciplinary approach. The first step is to confirm the diagnosis of SSI. This involves a thorough history and physical examination, including a review of the infant's medical history, a physical examination of the wound, and a review of the infant's vital signs. The next step is to obtain a culture of the wound to identify the causative organism. Once the organism is identified, the next step is to select an appropriate antibiotic. The selection of an antibiotic should be based on the results of the culture and the infant's clinical status. The next step is to administer the antibiotic. The next step is to monitor the infant's response to the antibiotic. The next step is to adjust the antibiotic dose if necessary. The next step is to continue the antibiotic until the wound is healed. The next step is to document the treatment and the outcome.

16

Example 5: Review of the literature on tracheostomy in BPD

17

Tracheostomy in BPD: A Review of the Literature

How can I help you?

using deep research, help me sort through all of the evidence for tracheostomy in former premature infants with BPD

Identifying and navigating to Published paper link

Tracheostomy in BPD: A Review of the Literature

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

1. Are there any studies comparing tracheostomy to non-invasive ventilation in former premature infants with BPD?

2. Are there any studies comparing tracheostomy to non-invasive ventilation in former premature infants with BPD?

3. Are there any studies comparing tracheostomy to non-invasive ventilation in former premature infants with BPD?

4. Are there any studies comparing tracheostomy to non-invasive ventilation in former premature infants with BPD?

5. Are there any studies comparing tracheostomy to non-invasive ventilation in former premature infants with BPD?

6. Are there any studies comparing tracheostomy to non-invasive ventilation in former premature infants with BPD?

7. Are there any studies comparing tracheostomy to non-invasive ventilation in former premature infants with BPD?

8. Are there any studies comparing tracheostomy to non-invasive ventilation in former premature infants with BPD?

9. Are there any studies comparing tracheostomy to non-invasive ventilation in former premature infants with BPD?

10. Are there any studies comparing tracheostomy to non-invasive ventilation in former premature infants with BPD?

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.
- 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)
- 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/decanulated over years rather than months.

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. **Earlier trach may be associated with better cognitive outcomes, but this may be confounded by severity of illness.**
- Airway morbidity & caregiver burden: Expect frequent airway infections/granulomatosis 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; avoid callous redundancy in caregiver training and safety planning.**

children's
HOSPITAL OF
WASHINGTON

WashU Medicine

Department of Pediatrics
Division of Neonatal 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.
- Decanulation: ~50% of decannulated survivors eventually decannulate, but time varies widely with illness severity and readmissions.
- Complications: tracheitis and sternal granulomas are common; **trach-related mortality is low (~1-2%) in contemporary series but not zero.**
- Neurodevelopment: conflicting data; if proceeding, avoid prolonged delay once criteria for trach are met; "harder vs later" signals favor earlier among high-severity infants already receiving steroids (retrospective).

Key studies & resources (recent/high-yield)

- Multicenter timing predictors: Agarwal et al., J Perinatol 2024—patient-level factors drive timing; median 27 mo liberation, 48 mo decannulation.
- Outpatient outcomes & variation: Marimón et al., Pediatrics 2023 (multicenter home-vent sBPD).
- Early vs late trach (NDI signal): 2023 retrospective cohort—**earlier trach associated with better outcomes.**
- Potential adverse developmental association: Cammack et al., J Perinatol 2020—language/cognitive deficits vs non-trach sBPD (residual confounding likely).
- Complications & trach-related mortality: Contemporary CHNS cohort summaries.
- Practice standard: ATS Pediatric Chronic Home Invasive Ventilation guideline + 2022 summary refresh.

children's
HOSPITAL OF
WASHINGTON

WashU Medicine

Department of Pediatrics
Division of Neonatal Medicine

20

Early vs. Late Tracheostomy in Preterm RPD

The strongest 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 randomized clinical trials currently exist for optimal timing decisions.

Key findings from observational studies:

- Early timing (before 120 days):** Associated with improved neurodevelopmental outcomes at 18-24 months corrected age, with adjusted odds ratios of 0.5 (95% CI 0.3-0.9) for the composite endpoint.
- Late timing (after 120 days):** Associated with increased caregiver interaction, reduced sedation requirements, and enhanced participation in developmental activities.

Critical evidence gaps define current practice

The medical literature reveals a striking absence of high-quality evidence (randomized or randomized controlled trials) specifically addressing the clinical question: **Does timing of tracheostomy impact long-term outcomes and healthcare resource use?**

The most robust evidence comes from a single-center retrospective cohort study by DeMauro and colleagues through the NICHD Neonatal Research Network. This landmark study analyzed 6,661 very preterm infants less than 30 weeks gestation from 16 centers between 2007-2010, identifying 84 infants who underwent tracheostomy.

The study's strengths lie 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 selective loss may influence the timing comparisons since older infants might receive later tracheostomies.

Early timing shows neurodevelopmental advantages

The DeMauro study defined early tracheostomy as placement before 120 postnatal days (approximately 27 weeks of life or 42 weeks post-menstrual age for extremely preterm infants), while late placement occurred after this threshold.

Key findings from the DeMauro study:

- Improved outcomes if done at an early developmental age (before 120 postnatal days):**
- Reduced risk of death or neurodevelopmental impairment (adjusted OR 0.5, 95% CI 0.3-0.9).**
- Increased caregiver interaction and reduced sedation requirements.**
- Enhanced participation in developmental activities.**

Supporting evidence from single-center studies reinforces potential mechanisms underlying this timing benefit. The transition to tracheostomy may reduce sedation requirements, increased caregiver interaction, and enhanced participation in developmental activities.

Current practice patterns show significant variation in timing, with median timing ranging from 42 to 61 weeks post-menstrual age. 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

children's
HOSPITAL OF
WASHINGTON

WashU Medicine

Department of Pediatrics
Division of Neonatal Medicine

21

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

children's
HOSPITAL OF
WASHINGTON

WashU Medicine

Department of Pediatrics
Division of Neonatal Medicine

22

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

children's
HOSPITAL OF
WASHINGTON

WashU Medicine

Department of Pediatrics
Division of Neonatal Medicine

23

Application: All Lab Specimens and Tests

children's
HOSPITAL OF
WASHINGTON

WashU Medicine

Department of Pediatrics
Division of Neonatal Medicine

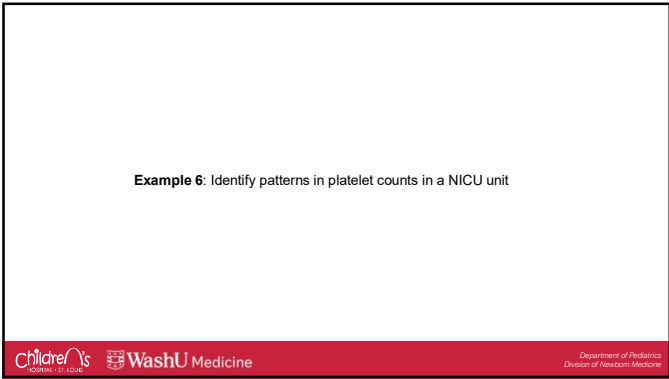
24



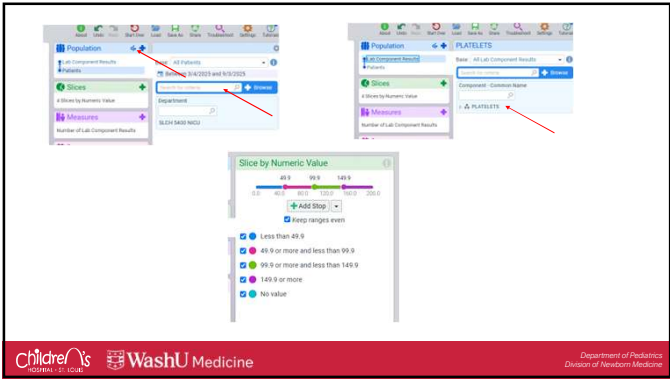
25



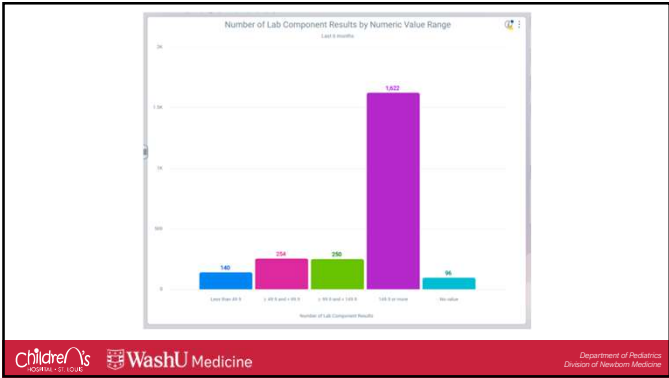
26



27



28



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

Department of Pediatrics
Division of Neonatal Medicine

30