Per Os Possible in Post-Op:

Promoting Direct Breastfeeding in NICU Infants who Underwent General Surgery

August 22, 2025

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Disclosures & Acknowledgements

Speakers have no conflicts of interest to disclose

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UW Health
American Family Children's Hospital

Background

The NICU at AFCH is a level IV unit

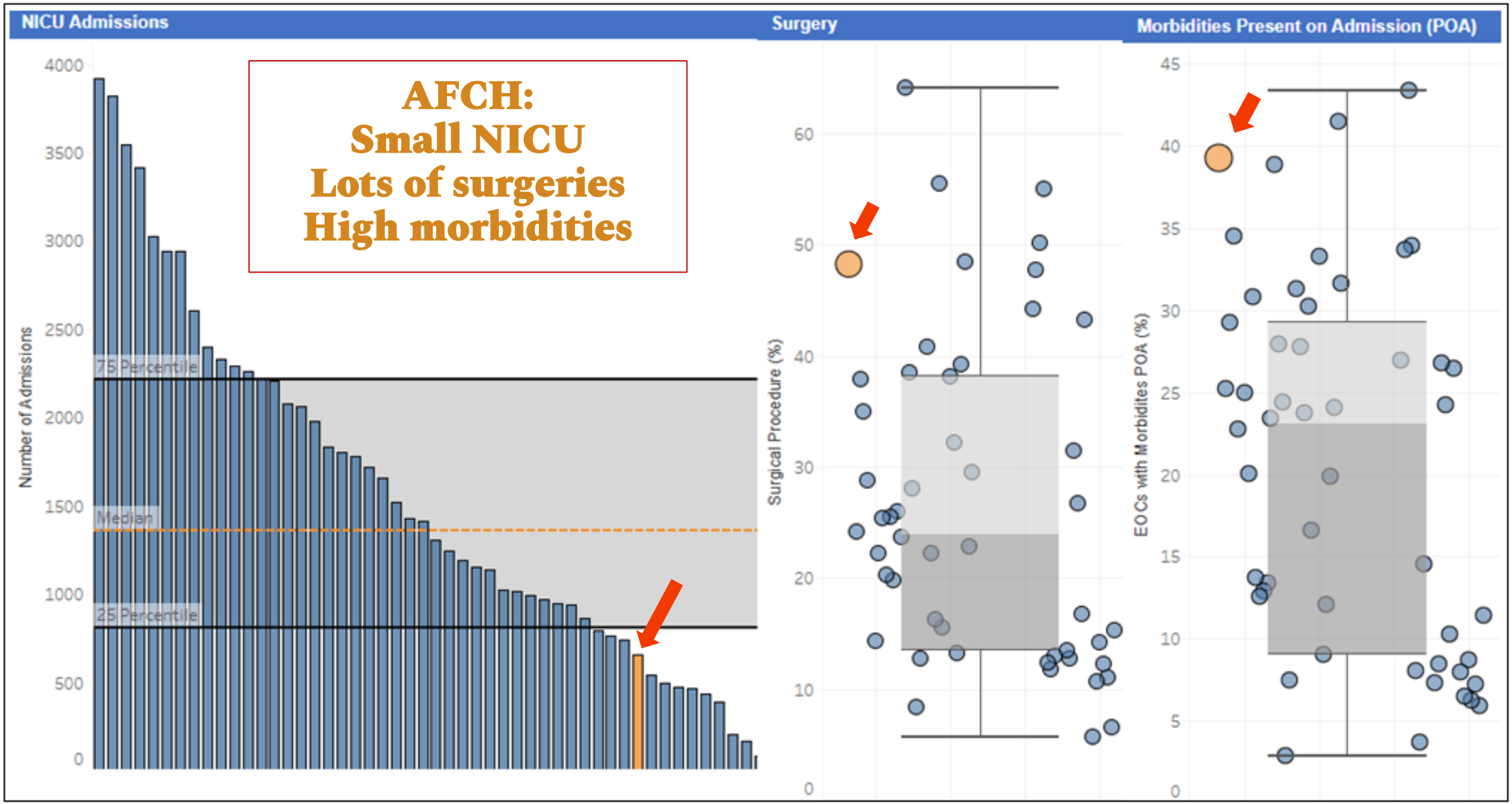
- 26 beds
- Within a Children's Hospital
- Not a delivery hospital
- Provides specialized surgical care for regional NICUs

The Human Milk Workgroup at AFCH is multi-disciplinary team originally formed in 2019

- Physicians
- Nurses
- IBCLCs
- Dieticians
- Speech Therapists
- Nursing Informatics

Participating in Children's Hospital Neonatal Consortium (CHNC)'s "Project HOME (Home On Milk Every time)."

- National quality improvement project among the collaborative of level IV Neonatal ICUs aimed at increasing rates of infants discharged home on human milk.



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Background

Photo Credit: John Maniaci for UW Health

Human milk provides optimal nutrition, immunological protection, and promotes long-term health benefits for both the infant and lactating parent.[1-3]

Direct breastfeeding at any point in the neonatal intensive care (NICU) is associated with increased odds of continuing to provide human milk after discharge.[4]

Many infants who require surgery in the neonatal period rarely directly breastfed during hospitalization despite evidence indicating early enteral feeding safety.[5-7]

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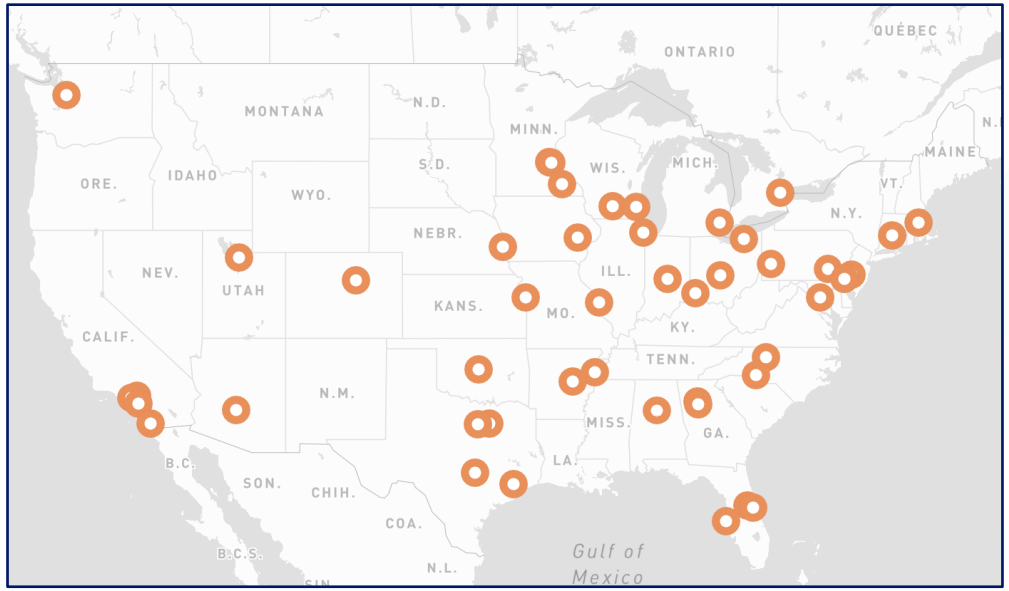
Project Aim

Increase the percentage of surgical NICU patients admitted <7 days of life and discharged <120 days of life who experience their first oral attempt at the breast from a baseline of 10% to a goal of 20% by June 2023.

CHNC
PROJECT HOME
Home On Milk Every Time



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Methods

Patient population:

- Infants < 7 days of life on admission & <120 days of life on discharge/transfer
- Underwent surgery while in NICU (defined as procedure in OR under general anesthesia)

First oral attempt defined as either:

- Non-nutritive suck
  - At a pumped breast
- Nutritive suck
  - Direct Breastfeeding

Process measures:

- Parental lactation counseling within 72 hours of admission
- First oral attempt at breast among non-surgical patients

Balancing measures:

- Post-operative necrotizing enterocolitis (NEC)
- Anastomotic leak
- Un-anticipated re-operation

- **Pre: January 1, 2023 – June 30, 2023**
- **Intervention bundle w/ rapid PDSA cycle**
- **Post: July 1, 2023- December 2023**

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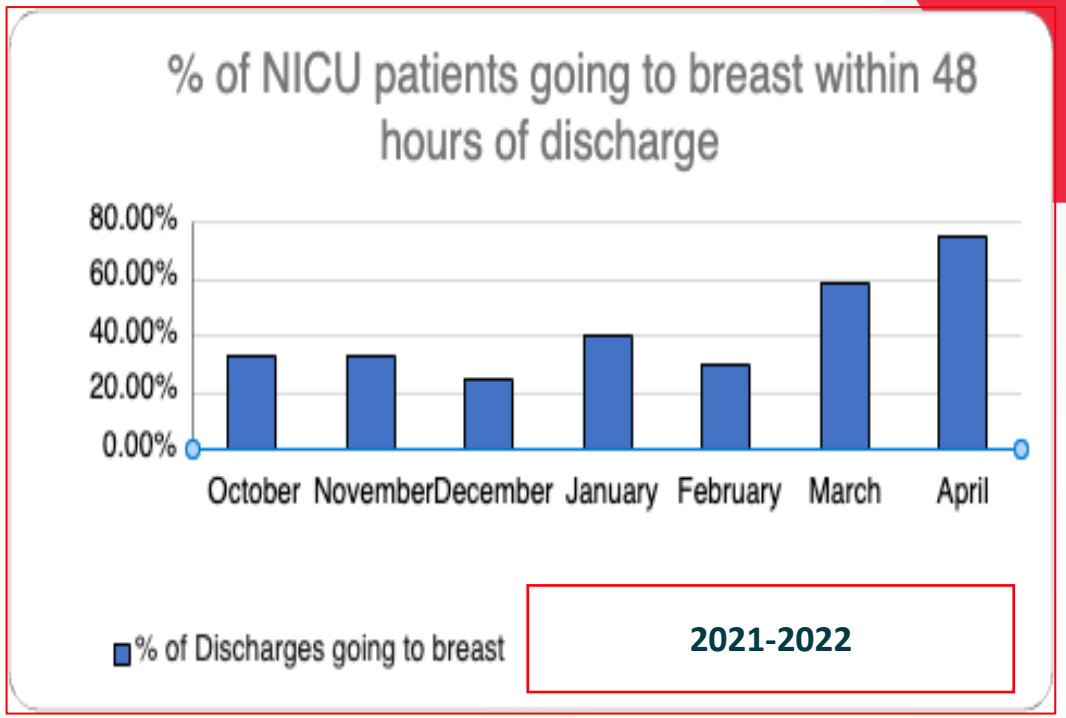
Why First Oral Attempt?

Previous QI Project 2021-2022 focused on improving direct breastfeeding at discharge

- 85% received human milk at discharge while 52% went to breast within 48 hours of discharge
- Aimed to increase to 75%. However, not achieved nor sustained



Lessons learned:

- Many other competing factors
- Not the ideal window for change

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Why First Oral Attempt?

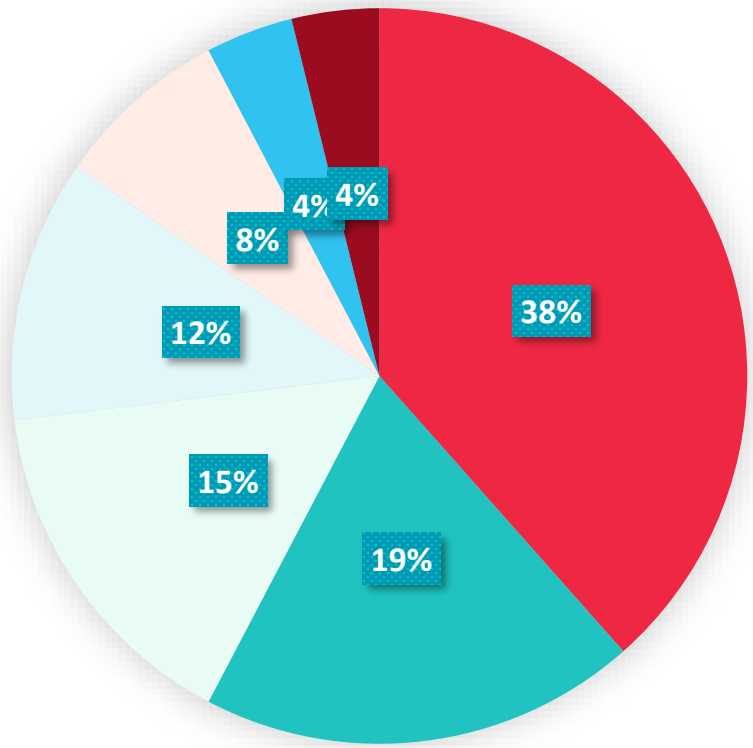
- Small RCTs of preterm infants demonstrated infants who performed NNS at breast (compared to pacifier) have higher rates of exclusive breastfeeding at discharge without difference in time to full oral feeds or hospital length of stay[8-9]

- **Process Measure → Outcome Measure**

Photo Credit: John Maniaci for UW Health

Staff Engagement

- Survey: “What do you think makes breastfeeding difficult in a surgical NICU?”



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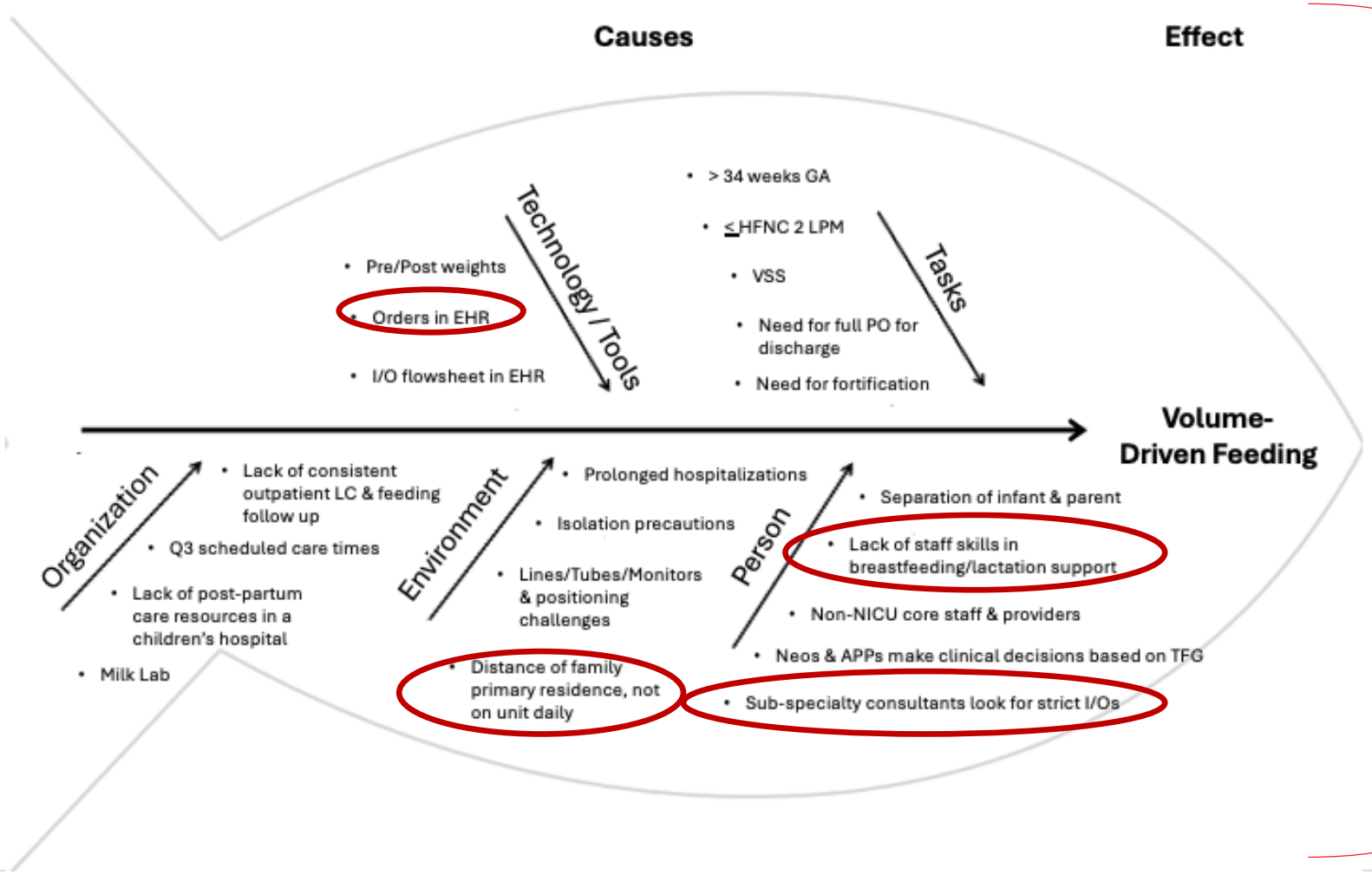
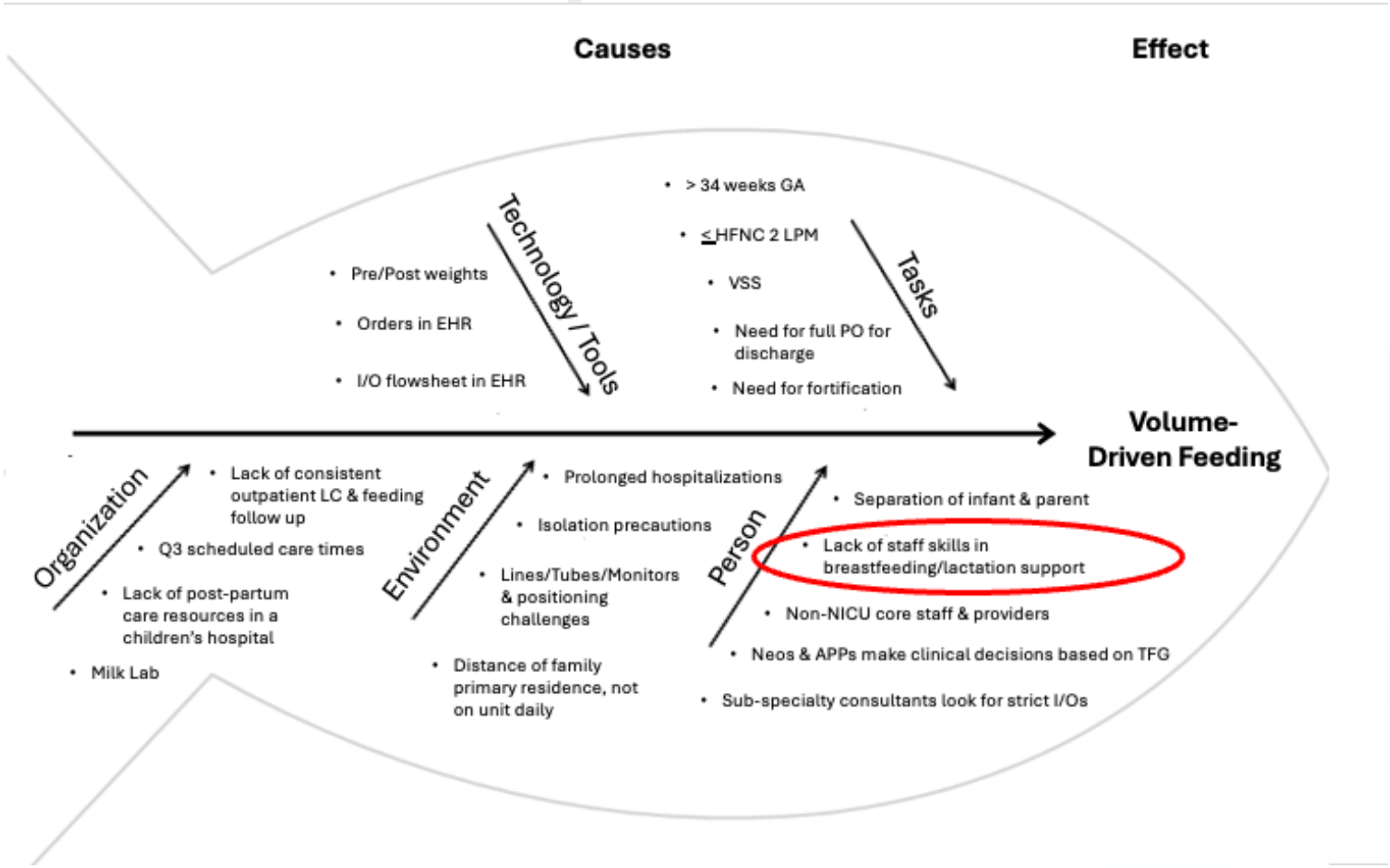
Understanding Variation & Contributors



- Four Intervention bundles

Understanding Variation & Contributors

- Empowering Staff to talk about /help/encourage Lactation



Provider education & empowerment

American Board of Pediatrics tests on the "Principles & Applications of Breast Milk" ☺

Family-Friendly Phrases	Enter in Epic	Science Supporting the Statements
• After giving birth, there are breast changes that are normal. A lactation consultant can share more information and answer question you may have.	• "Basic timeline of lactogenesis I & II" • "Supply/Demand nature of human milk production" • "Importance of pumping right away & frequently to establish supply"	• Lactogenesis I = colostrum production starts ~16 wks gestation in response to the pregnancy hormone prolactin. Full milk production is inhibited by placenta hormone progesterone • Lactogenesis II = 3-5 days after delivery. "milk coming in/to volume" due to withdrawal of progesterone • Days 5-14 days after delivery = transitional milk • After day 14 = mature milk • Lactation requires the hormones prolactin & oxytocin (let-down, or milk ejection). Infrequent pumping or breastfeeding → drop in baseline prolactin level → gradual decrease in milk production ("weaning") (4)
• The smell and taste of breastmilk can be very calming for a baby in the hospital	• "Benefits of human milk to baby" • "Human milk as a medicine"	• RCTs have demonstrated that breastfeeding before & during vaccination injection helps reduce pain in babes up to 1 year (2) • Breastmilk contains more tryptophan than formula. Tryptophan is a precursor of melatonin, which increases endorphins (2)
• Even if you're not sure you want to breastfeed after going home from the hospital, any milk you pump right now helps your baby.	• "Benefits of human milk to baby" • "Importance of pumping right away & frequently to establish supply"	• Breastmilk contains cortisol & epidermal growth factor • Breastmilk contains cholesterol (formula only has a minimal amount), which is needed for tissue growth & is a precursor for steroid hormones. Maternal diet does NOT affect cholesterol content in breastmilk • Breastmilk contains more inositol than formula. This compound may limit retinal injury & bolster surfactant production (1)

• Please know we respect and support your choice about the way you want to feed your child. I want to make sure you have all the information to make a decision that's right for you.	• "Supply/Demand nature of human milk production"
	• "Benefits of human milk to baby"
		• The AAP, ACOG, & WHO recommend exclusive breastfeeding for the first 6 months of life, after which can continue along w/ introduction of appropriate foods for 2 years or as long as mutually desired by mom & baby
		• Without pumping after delivery, prolactin falls to pre-pregnancy levels by 2 weeks
		• Common barriers to providing human milk are employment concerns, perception of inconvenience, or history of past breastfeeding problems. However, there are risks of not breastfeeding/providing human milk (HM):
		  • Formula-fed babes have higher risk of diarrhea, otitis media, hospitalization for lower resp. tract infection, SIDS, adult metabolic syndrome compared to breastfed babies (4)
		  • Women who don't provide HM have higher risks breast & ovarian cancer, MI, HTN, T2DM (4)

1. Brodsky, D and C. Martin. Neonatology Review. 2nd ed. Hanley & Belfus, Inc. 2010.

2. Harrison, D. et al. "Breastfeeding for procedural pain beyond the neonatal period." Cochrane Database Syst Rev. 2016 (10): CD011248.

3. Sweeney E.L. et al. "The effect of breastmilk and saliva combinations on the in vitro growth of oral pathogenic and commensal microorganisms." Nature Sci Rep 8, 15112 (2018).

4. Eglash A. and K. Leeper. The Little Green Book of Breastfeeding Management for Physicians & Other Healthcare Providers. 8th ed. The Institute for the Advancement of Breastfeeding and Lactation Education (IABLE). 2023.

5. Robertson C. et al. "Incidence of necrotizing enterocolitis before and after introducing routine prophylactic Lactobacillus and Bifidobacterium probiotics." Archives of Disease in Childhood – Fetal and Neonatal Edition 2020; 105: 380-386.

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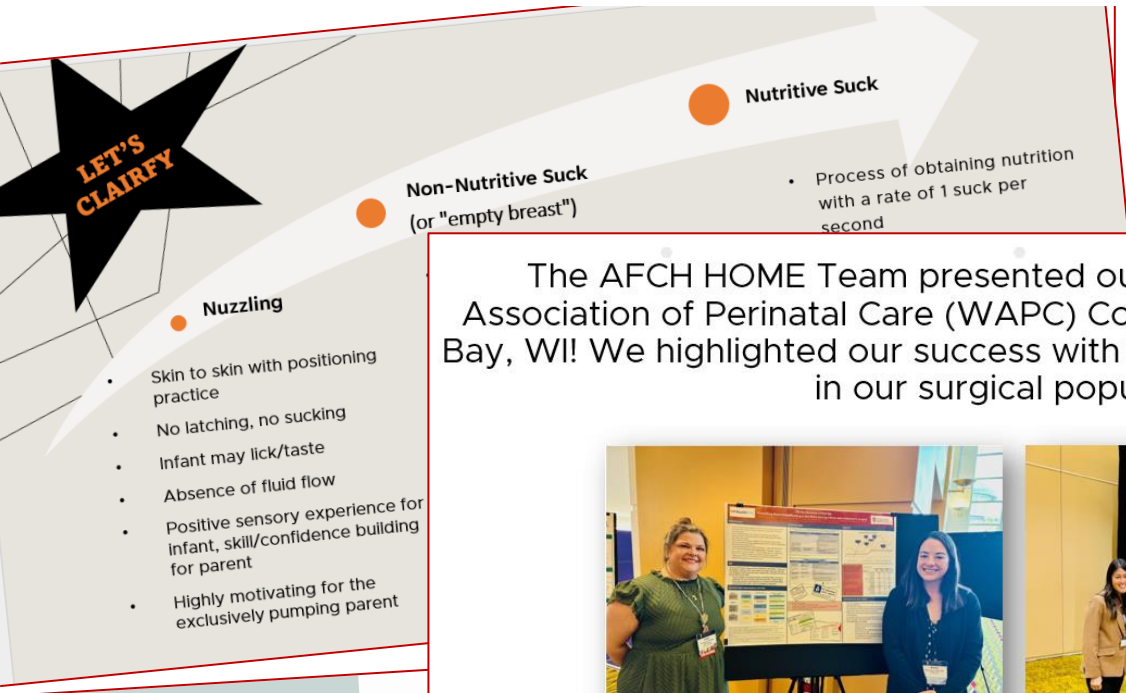
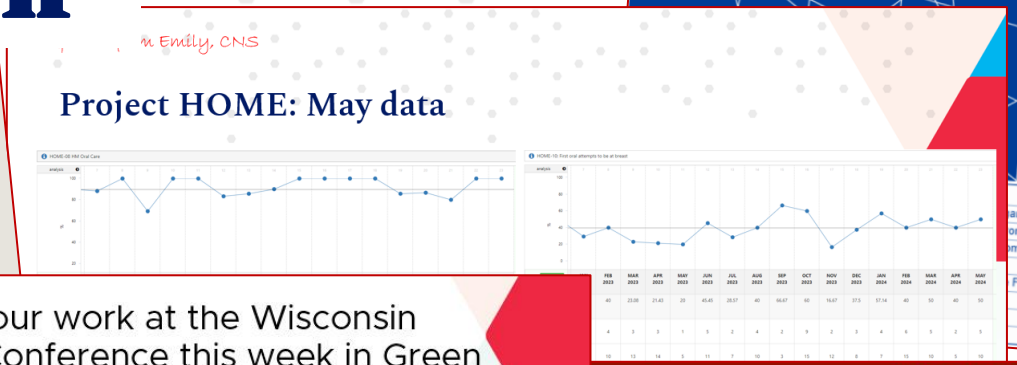
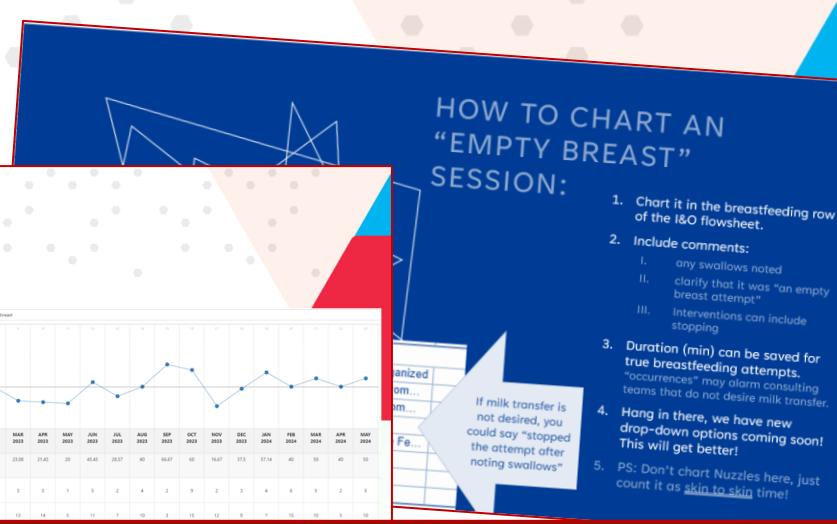
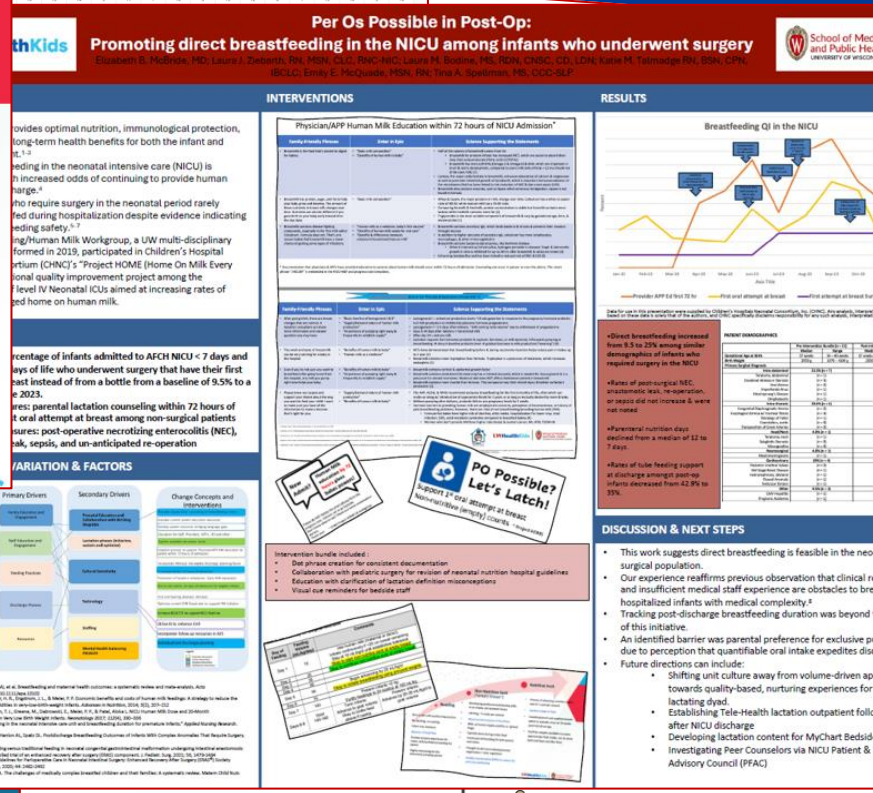
NICU Staff education-

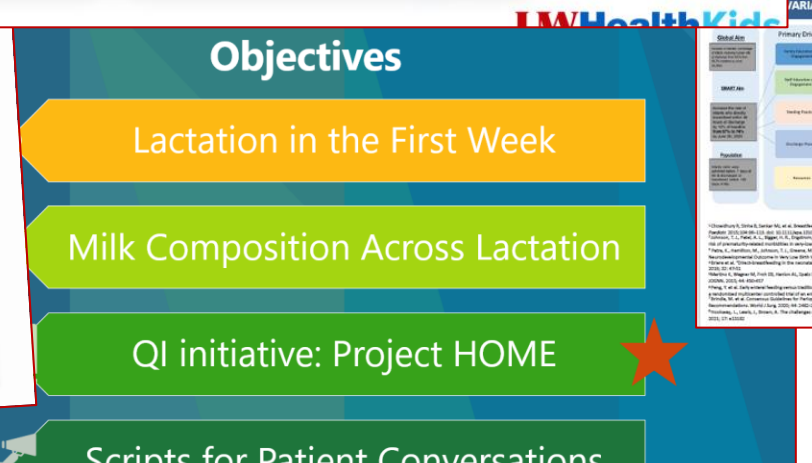






The AFCH HOME Team presented our work at the Wisconsin Association of Perinatal Care (WAPC) Conference this week in Green Bay, WI! We highlighted our success with increasing first feed at breast in our surgical population.





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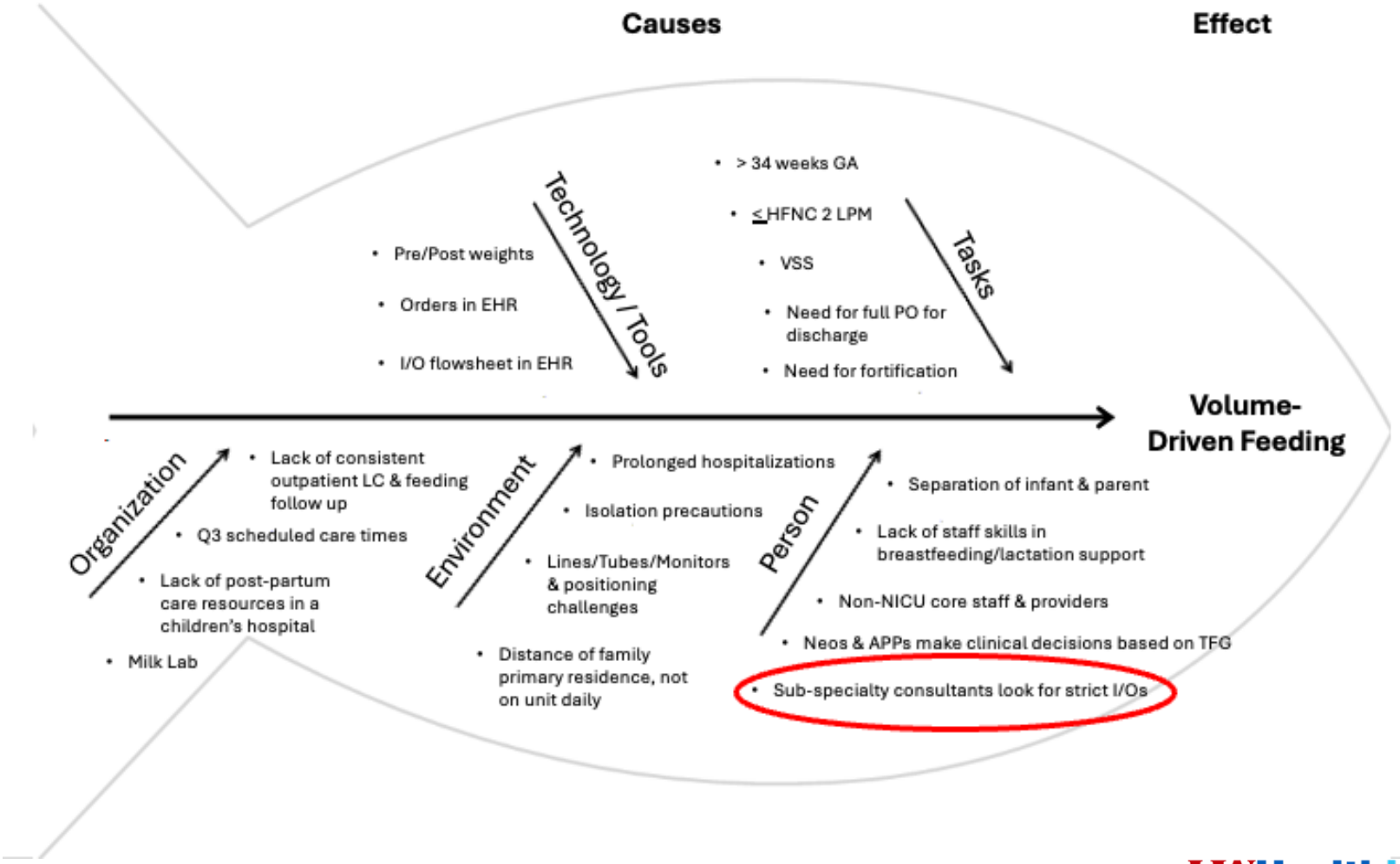
Understanding Variation & Contributors

- NICU and Peds General Surgery Collaboration



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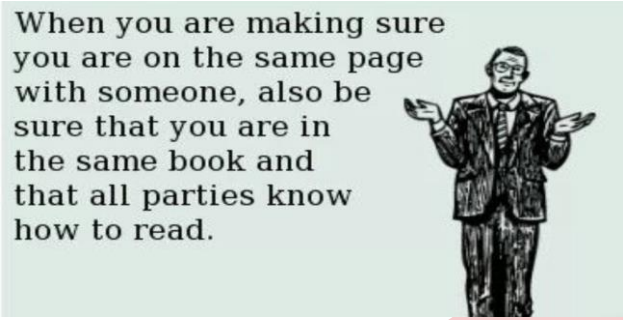
Defining Terminology



Nuzzling

- Skin to skin with positioning practice
- No latching, no sucking
- Infant may lick/taste
- Absence of fluid flow
- Positive sensory experience for infant, skill/confidence building for parent
- Highly motivating for the exclusively pumping parent

Non-Nutritive Suck ("empty breast")

- Developing positional and latching skills at an empty, pre-pumped breast
- Latching, ~2 sucks per second
- Absence/minimization of fluid flow
- NNS: on human nipple, pacifier, or gloved finger
- Typically done during a tube feed
- Continued skill building for both parent and infant.
- Thought to aid neuro-developmental organization / state regulation
- Initially monitored by SLP/LC to assess for and stop swallowing.

Nutritive Suck

- Process of obtaining nutrition with a rate of 1 suck per second
- Involves intake of fluid
- Coordination of suck-swallow-breath patterns typically occur at 34 weeks post-menstrual age
- Pre/Post weights available to assess approximate fluid intake, can be done both mid feed and after feed.

Collaboration with Pediatric General Surgery

- Defined common language about breastfeeding stages across the inter-disciplinary team
- Early enteral feeds were safe & well tolerated without increase in NEC or anastomotic leakage[6,10]

Table 4: EN Pathway for Surgical Neonates

Day of Feeding	Feeding Volume (mL/kg/day)	Comments	
Day 1	10	Use human milk (maternal or donor). Initiate continuously if <20 cm bowel remaining Stay at 10 mL/kg/d until establishes tolerance Okay to start non-nutritive suck at empty breast	
Day 2	20	Okay to continue non-nutritive suck at empty breast	
Day 3	30		
Day 4	40		
Day 5	50	Begin advancing by 25 mL/kg/d Okay to initiate breastfeeding using pre-post weights	
Day 6	75		
Day 7	100	Preterm Infants <2 kg: Fortify feedings to 24 kcal/oz at 100 mL/kg	
Days 8-9	Goal 140-160	Term Infants: Advance to goal volume Okay to bottle feed above if cueing	Preterm Infants: Advance by 20-30 mL/kg/d to goal volume

4. EXCERPT FROM HOSPITAL NUTRITION GUIDELINES WITH MODIFICATION HIGHLIGHTED

4. **Oral Feedings**[2,12]
   a. It is encouraged to order a Speech Language Pathology therapy consult for initiation and advancement of oral feedings.
   b. Begin oral feedings as clinically able and based on patient's gestational age (usually between 32 to 34 weeks GA) and respiratory status. It is encouraged for the first feeding to be at breast.
   c. For neonates (both surgical and non-surgical) waiting for EN initiation, use human milk for oral cares. Okay to start nuzzling while NPO.
   d. Once patient is taking > 75% goal volume through oral intake, consider transition to cue-based oral feeding schedule.
   e. Lactation Definitions:
      4.e.1. Nuzzling: skin-to-skin with positioning practice and absence of fluid slow. No latching or suck; infant may lick/taste.
      4.e.2. Non-Nutritive Suck: developing positional and latching skills at a pre-pumped breast with absence-to-minimal fluid flow. Latching occurs with approximately 2 sucks per second. Monitored by Speech Language Pathologist or Lactation Consultant to assess for and stop swallowing.
      4.e.3. Nutritive Suck: Process of obtaining nutrition with a rate of 1 suck per second and requires coordination of suck-swallow-breath patterns. Pre-post breastfeeding weights available to assess approximate fluid intake.

Collaboration with Pediatric General Surgery- Maintenance

My Note

Note Details

Date of Service: 7/24/2025 1721 Type: Service: Lactation

☐ Cosign Required?

Insert SmartText

Per the *Inpatient Clinical Practice Guidelines for Neonatal Enteral Nutrition,* the following steps can be taken to work towards the dyad's breastfeeding goals while the infant heals from surgical intervention:

1. Nuzzles = NPO->9ml/kg/day.
    a. Infant can do skin to skin while nuzzling at the breast
    b. Infant may explore and lick, but any latches should be broken until infant is tolerating 10ml/kg/day.
2. Empty Breast= 10-49ml/kg/day
    a. Dyad may start empty breast/ latching practice with SLP/LC supervision to start.
    b. Nutritive suck should be limited to 1-2 swallows.
3. Full Breast feeding= comfortably tolerating 50ml/kg/day feeding volumes
    a. Dyad can begin full breastfeeding with SLP/LC supervision to start.
    b. Pre/post weights are necessary when infant has demonstrated their ability to transfer any milk at the breast.

This dyad is currently at * ml/kg/day. So far, the dyad has *** .Please continue to reassess for breastfeeding readiness daily.**

Photo Credit: John Maniaci for UW Health

Standardized feeding volumes to benchmark eligibility for each step towards breastfeeding

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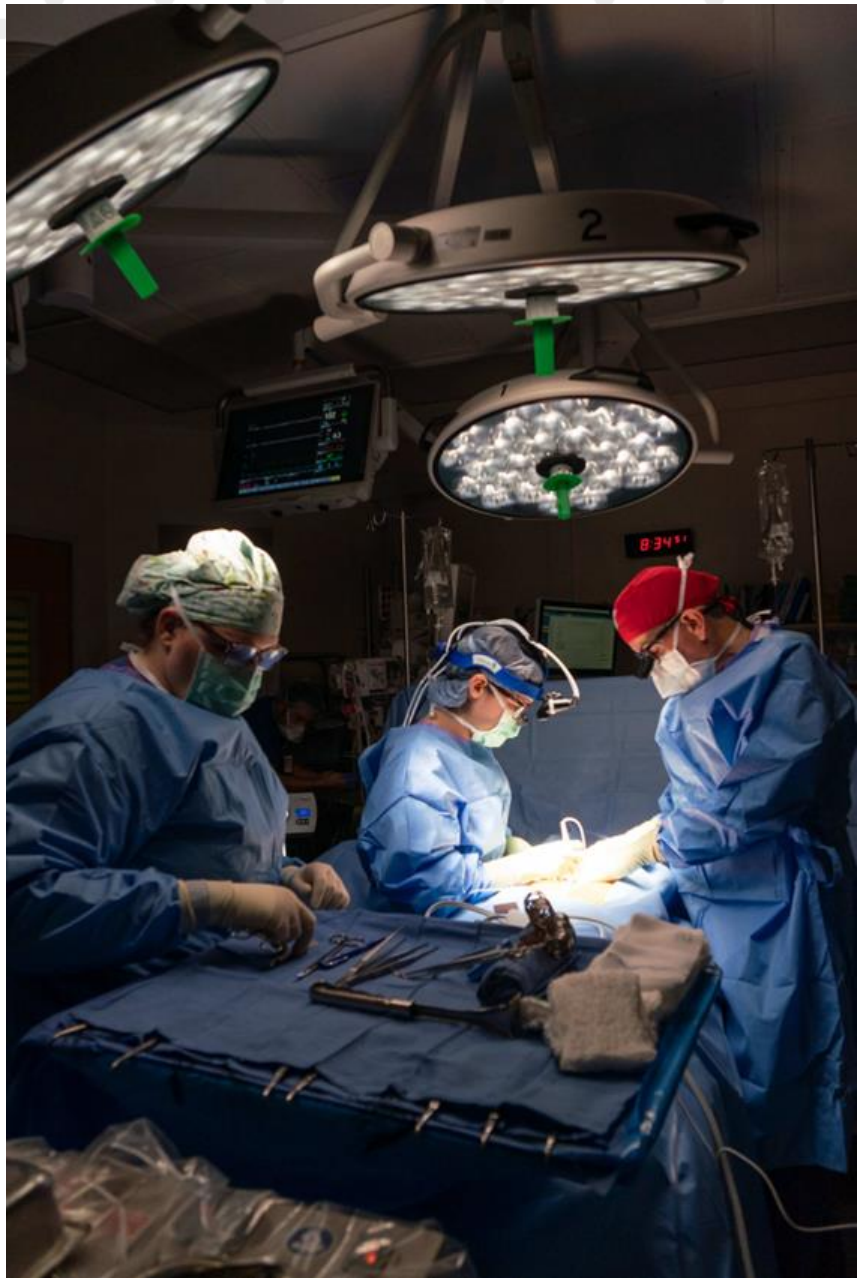

Photo Credit: John Maniaci for UW Health

Collaboration with Pediatric General Surgery- Outcome

Moved from a hierarchy or priorities model of patient care to shared decision-making model

Reduced variation in feeding advancement to a clear, standardized approach

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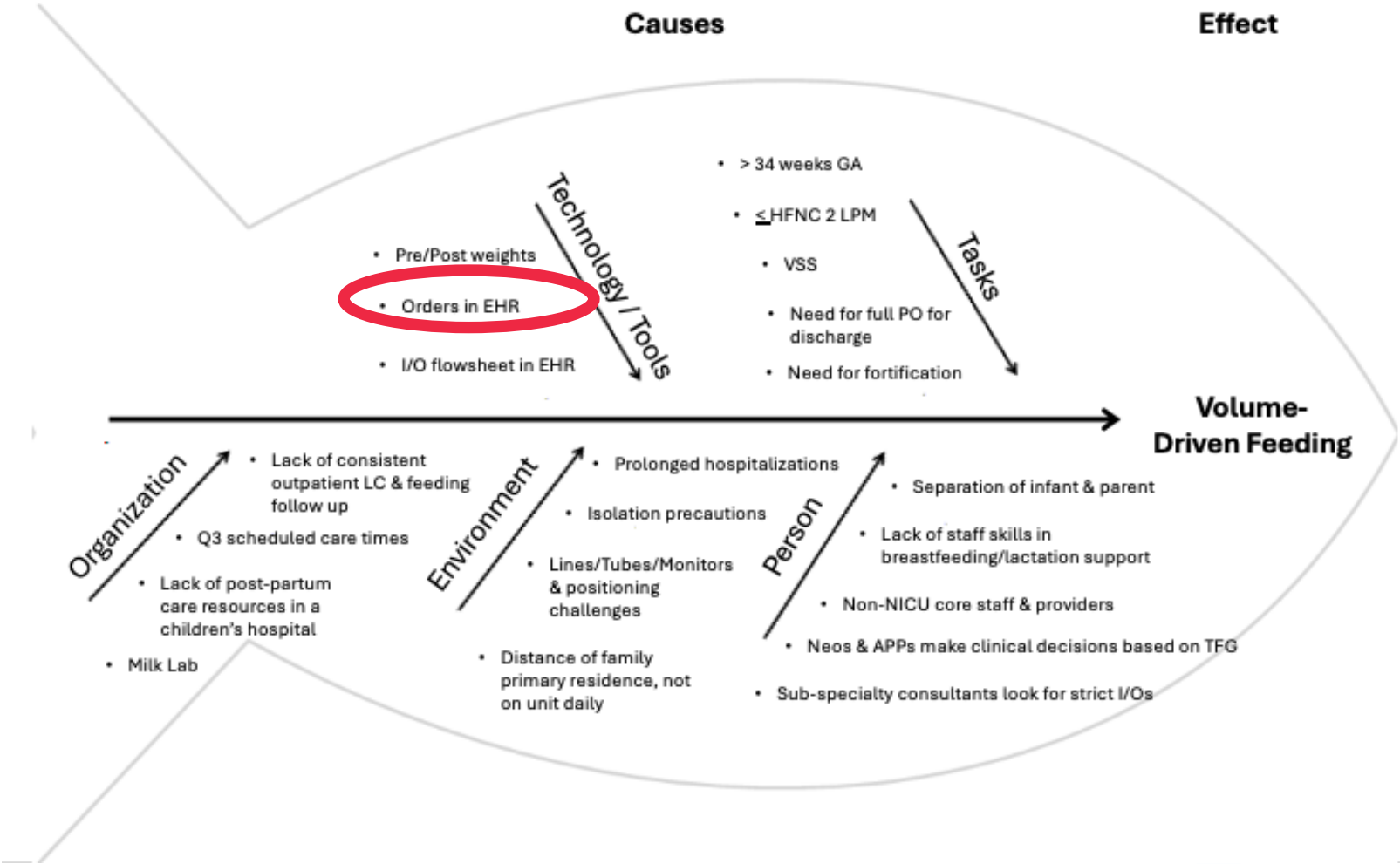
Understanding Variation & Contributors

- Connecting on QI goals across the NICU



Multi-disciplinary Team Communication

1. Signs on WOWs…

PO Possible?
Let's Latch!
Support 1st oral attempt at breast
Non-nutritive (empty) counts ~ Project HOME

Photo Credit: John Maniaci for UW Health

…and on bottle storage

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Multi-disciplinary Team Communication

2. Electronic Health Record quick references

Care Plan Sticky Notes

Lactation goals:
Short term: establish pumping routine, skin to skin as often as tolerated
Long term: Exclusive Breastfeeding (latching and pumping) and protect supply, feed baby in whatever way is working

Project HOME/ nutrition Goals:
- EBM oral swabs by day 4: achieved on 9/21 continue oral cares per protocol
- s2s by day 14: Achieved on 9/22, continue s2s as often as dyad tolerates
- 1st oral attempt at breast: when medically safe to do so
- provider edu by 72hrs: achieved on 9/21

reminder to return stress surveys weekly

Last edited by Catherine M Talmadge, RN on 09/25/23 at 1515

Lactation Notes

Lactation will follow up with this dyad next week for a check in, or earlier if requested

Thank you for the opportunity to care for this family.

Please call or page with questions or concerns.

Katie T, RN, BSN, CPN, IBCLC
AFCH Lactation Consultant
890-8227 pager 8477

Project HOME/ nutrition Goals:
- **EBM oral swabs by day 4:** achieved on 7/16 continue oral cares per protocol
- **s2s by day 14:** achieved on 7/18 continue s2s as often as tolerated
- **1st oral attempt at breast:** when medically safe to do so
- **provider edu by 72hrs:** achieved on 7/15

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Multi-disciplinary Team Communication

Photo Credit: Laura Konkol

3. Admission order set changes

Patient Care Communication

Assess Physiologic Systems - UWH — Modify | Discontinue

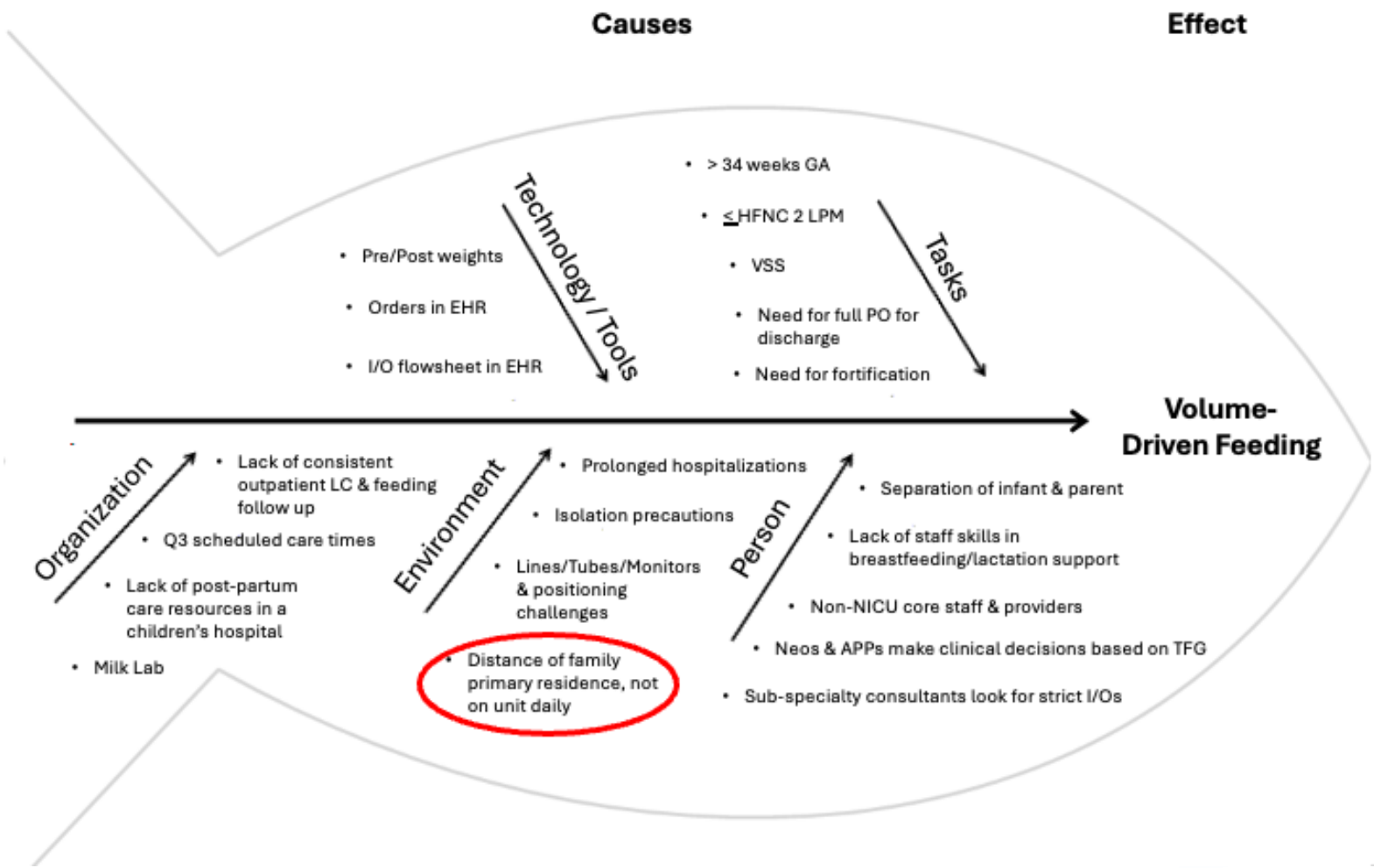
SEE COMMENTS, Starting on Sun 9/3/23 at 0745, Until Specified, Routine, Once upon admission, then every 30 minutes times 2, then every 3 hours and PRN.

First Oral Attempt At Breast when PO clinically indicated — Modify | Discontinue

CONTINUOUS, Starting on Mon 9/11/23 at 1015, Until Specified, Routine
Order Name (Only necessary if something other than "Nursing Communcation" is preferred.): First Oral Attempt At Breast when PO clinically indicated
When ready for PO, first oral attempt should be at empty breast

Understanding Variation & Contributors

- Separation of Dyad



Ronald McDonald House Charities® Madison

Partnering with Ronald McDonald House

Added milk storage bags, breast pads, & lanolin to personal hygiene closet

Added an additional, universally accessed refrigerator for human milk storage

Mini refrigerators and dish racks available for each guest room

Confirmed ability to accommodate special diets, if made aware & welcomed hospital providers can advocate for patient & their families

Photo Credit: Ronald McDonald House Website

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Continuing to Close the Separation Gap

Photo Credit: John Maniaci for UW Health

- NicView cameras (protected with passcodes) enables family to view babe until birth parent can get to the bedside following delivery.
- Empowering parents to participate in hands on bedside cares.
- Educating families on the importance of biofeedback between caregiver and babe, use of scent hearts and encouraging skin to skin when together.
- Providing positive feedback for nurses who consistently encourage and facilitate kangaroo care.

Photo Credit: NicView.com

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Photo Credit: John Maniaci for UW Health

Limitations

An identified barrier was parental preference for exclusive pumping due to perception that quantifiable oral intake expedites discharge.

Small sample sizes limited our conclusions

Tracking post-discharge breastfeeding duration was beyond the scope of this initiative

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Results

Variable	Pre-Intervention Bundle (n = 21)		Post-Intervention Bundle (n = 20)		p-value
	Median	Range	Median	Range	
Gestational Age at Birth [IQR]	37 weeks [37,38]	31 – 40 weeks	37 weeks [37,39]	33 – 40 weeks	0.484
Birth Weight [IQR]	2852 g [2320, 3620]	1070 – 4190 g	2920 g [2280,3290]	1750 – 4800 g	0.938
Parenteral Nutrition (PN) Length[α] [IQR]	12 days [3,16]	0 – 65 days	9 days [5,15]	0 – 74 days	0.814
First Oral attempt at Breast	10% (n = 2)		25% (n = 5)		0.211
Enteral Feeding Support at Discharge/Transfer	**43% (n = 9)**		**35% (n = 7)**		0.718
Gastrostomy Tube	24% (n = 5)		10% (n = 2)		0.614
Nasogastric Tube	19% (n = 4)		25% (n = 5)		0.614
None	57% (n = 12)		65% (n = 13)		0.614

Direct breastfeeding as first oral attempt **increased from 10% to 25%** among infants who required surgery in the NICU

↓ Parenteral Nutrition days

↓ tube feeding support at discharge

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Results

Variable	Pre-Intervention Bundle (n = 21)		Post-Intervention Bundle (n = 20)		p-value
	Median	Range	Median	Range	
Primary Surgical Diagnosis					
Intra-abdominal	**33% (n = 7)**		**40% (n = 8)**		0.489
Teratoma, abdominal	(n = 1)		(n = 0)		
Duodenal Atresia or Stenosis	(n = 3)		(n = 2)		
Ileal Atresia	(n = 0)		(n = 1)		
Imperforate Anus	(n = 1)		(n = 3)		
Hirschsprung's Disease	(n = 1)		(n = 0)		
Omphalocele	(n = 1)		(n = 2)		
Intra-thoracic	**29% (n = 6)**		**30% (n = 6)**		0.489
Congenital Diaphragmatic Hernia	(n = 2)		(n = 1)		
Esophageal Atresia w/ tracheal fistula	(n = 3)		(n = 2)		
	(n = 1)		(n = 0)		
Tetralogy of Fallot	(n = 0)		(n = 2)		
Coarctation, aortic	(n = 0)		(n = 1)		
Transposition of Great Arteries					
Head/Neck	**5% (n = 1)**		**10% (n = 2)**		0.489
Teratoma, neck*	(n = 1)		(n = 0)		
Subglottic Stenosis	(n = 0)		(n = 1)		
Micrognathia	(n = 0)		(n = 1)		
Neurosurgical	**5% (n = 1)**		**15% (n = 3)**		0.489
Myelomeningocele	(n = 1)		(n = 3)		
Genitourinary	**19% (n = 4)**		**5% (n = 1)**		0.489
Posterior Urethral Valves	(n = 0)		(n = 1)		
End Stage Renal Disease	(n = 1)		(n = 0)		
Hydronephrosis, bilateral	(n = 1)		(n = 0)		
Cloacal Anomaly	(n = 1)		(n = 0)		
Testicular Torsion	(n = 1)		(n = 0)		
Other	**10% (n = 2)**		**0% (n = 0)**		0.489
CMV Hepatitis	(n = 1)				
Propionic Acidemia	(n = 1)				
Balancing Measures	5% (n = 1)		0 (n = 0)		1.000
Post-Surgical Necrotizing Enterocolitis Un-anticipated re-operation Anastomotic leak	*Ex-lap for pneumoperitoneum				

[α]2 patients in the post-intervention cohort were discharged with PN

Balancing measures un-affected

Photo Credit: John Maniaci for UW Health

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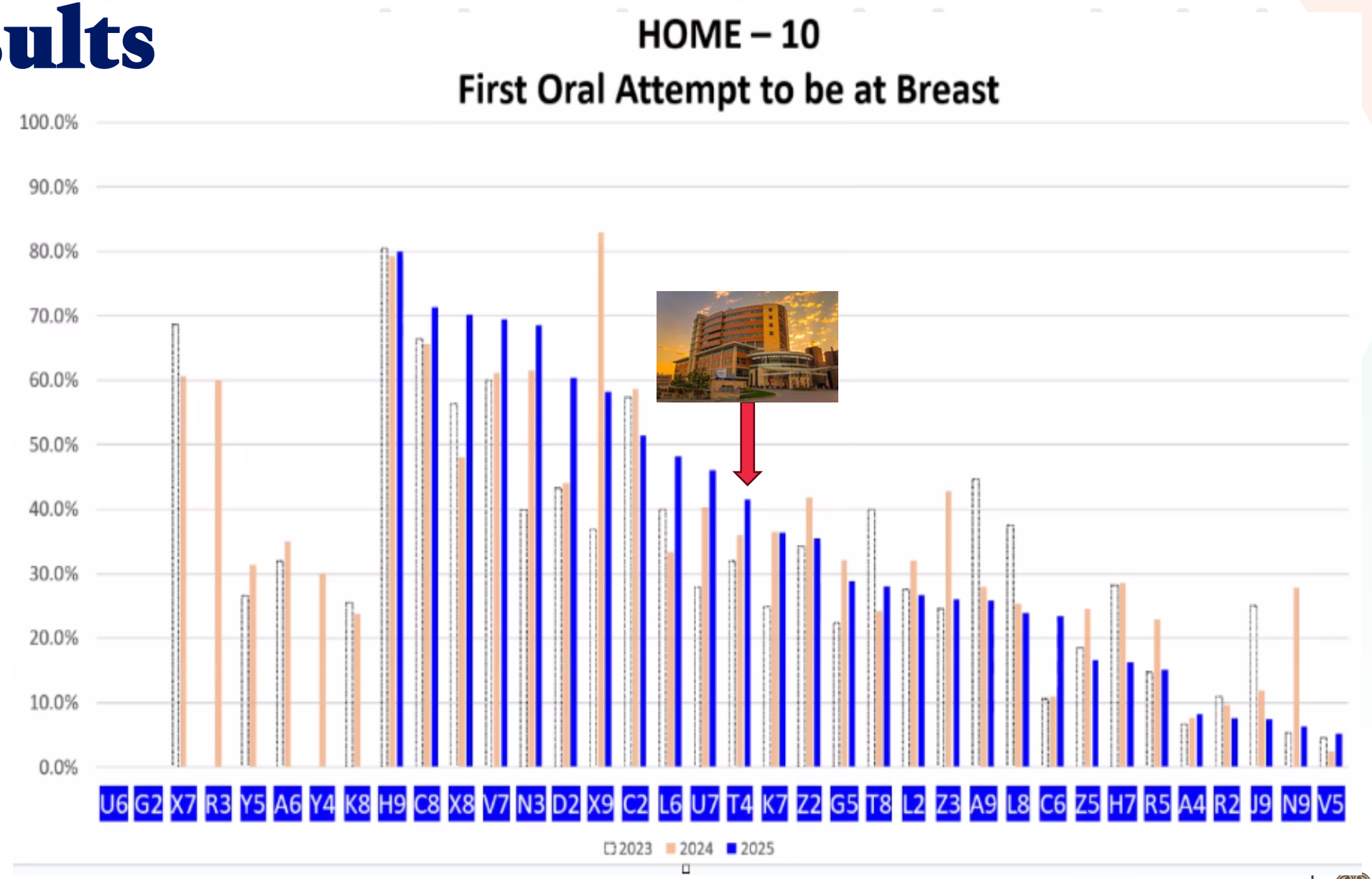
Results



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Discussion & Next Steps

This work suggests early direct breastfeeding is safe & feasible in the neonatal surgical population.

Our experience reaffirms previous observation that clinical routines and insufficient medical staff experience are obstacles to breastfeeding hospitalized infants with medical complexity.[12]

Future directions can include:

- Shifting unit culture away from volume-driven approaches towards quality-based, nurturing experiences for the lactating dyad.
- Establishing Tele-Health lactation outpatient follow-up after NICU discharge
- Developing lactation content for MyChart Bedside
- Investigating Peer Counselors via NICU Patient & Family Advisory Council (PFAC)
- Bring this work to other subspecialties like Cardiac Surgery Team
- Work with our unique transport team to bridge parental support

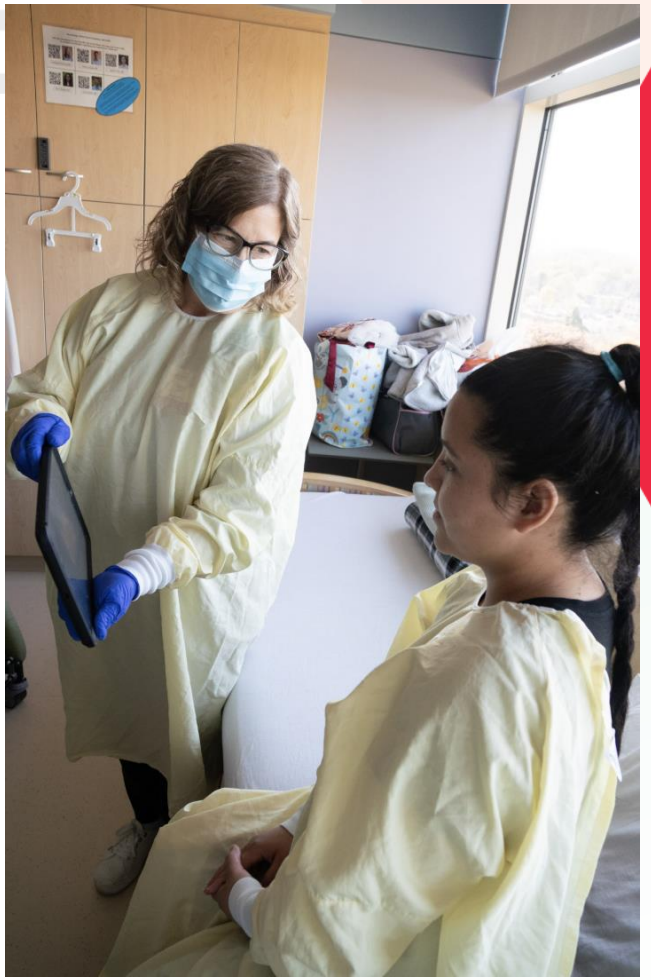

Photo Credit: John Maniaci for UW Health

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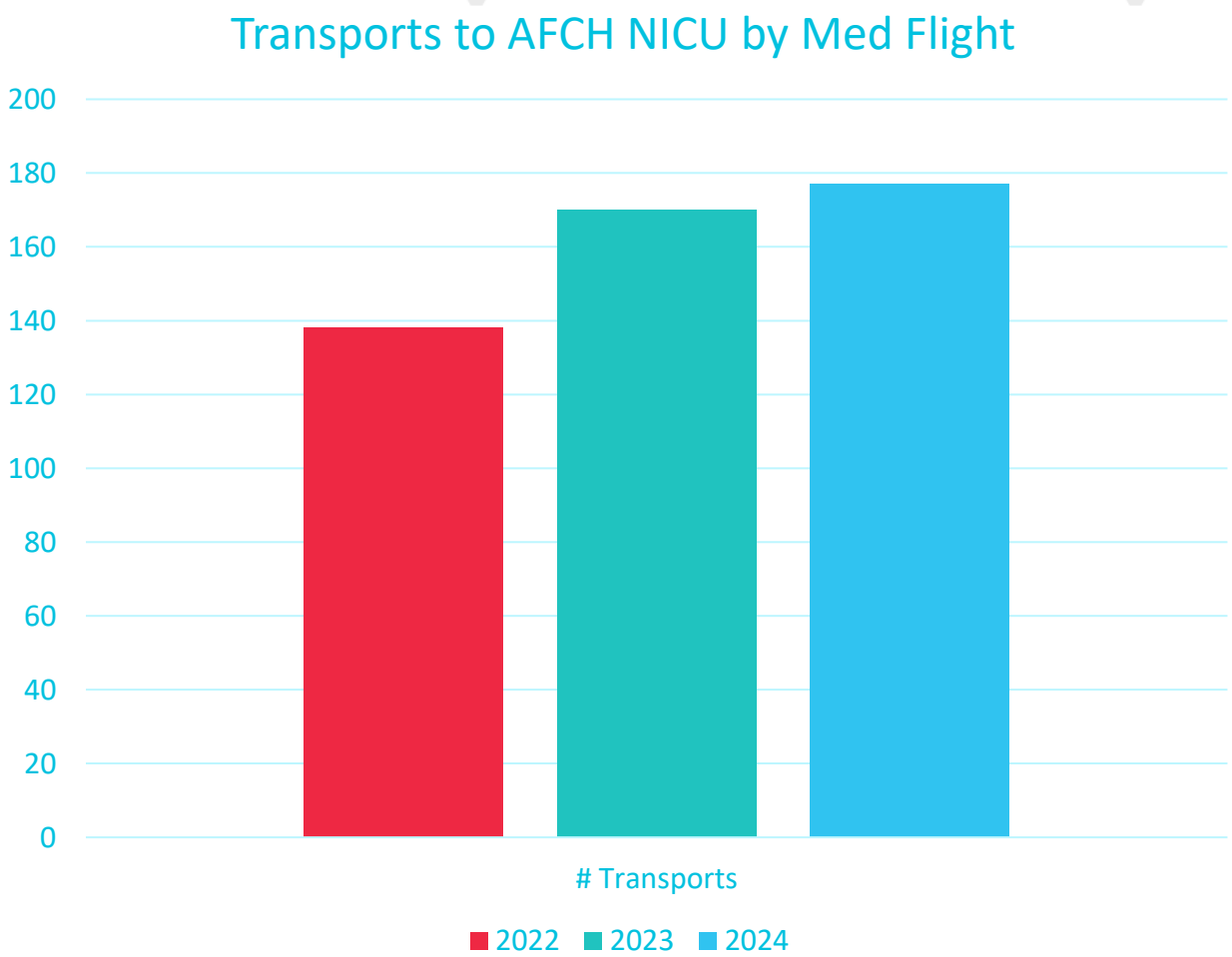
Transport Team



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Questions?

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