

Protecting the Newborn: Covid Antibodies in Lactating Women

Natalia Colon, Gwen Allen, and Dr. Julie Baker-Townsend
University of North Florida, Brooks College of Health
Jacksonville, Florida

INTRODUCTION

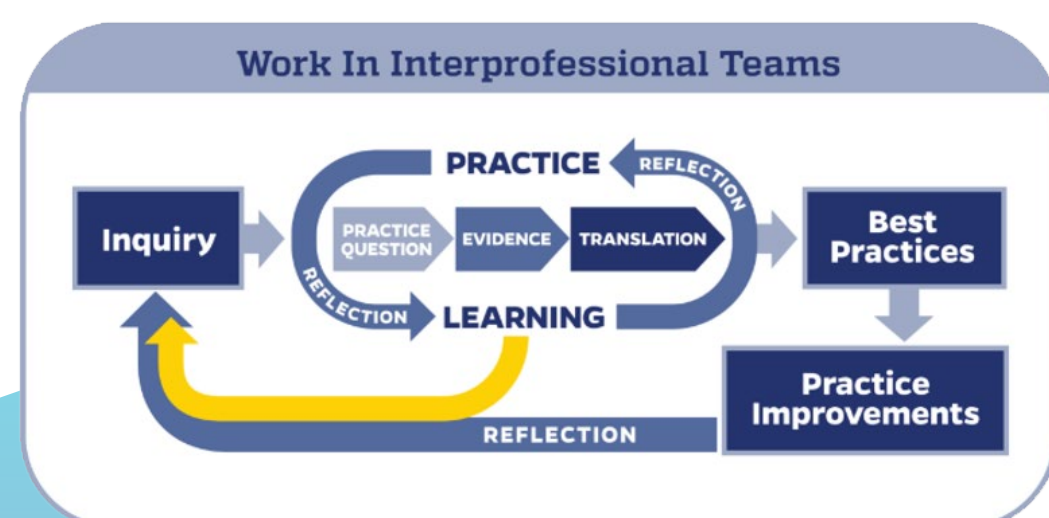
- The CDC recommends the COVID-19 vaccination to everyone over six months of age, including women who are pregnant or breastfeeding.
- Neonates younger than six months are at an increased risk for a COVID-19 infection. There is currently no evidence that active COVID-19 infections are transmitted through breast milk.
- Breast milk has been shown to be a source of protection for neonates with immature immunologic systems.
- Antibodies in breast milk from lactating women who have been vaccinated against COVID-19 may provide neonates with protection from COVID-19.

PURPOSE

- The purpose of this literature review was to assess COVID-19 antibodies for neonatal protection in breast milk after COVID-19 vaccination.

CONCEPTUAL FRAMEWORK

- The Johns Hopkins Evidence-Based Practice model was chosen as the framework due to its ability to work with interprofessional teams including nutrition, infectious disease, lactation, and neonatology.



PICO QUESTION

- "In breastfeeding mothers, are significant amounts of SARS-CoV-2 antibodies present in breast milk after SARS-CoV-2 vaccination compared to mothers who were not vaccinated?"

METHOD

- Search terms included "breast milk," "human milk," "mother's milk," "COVID-19 vaccine," and "COVID-19 antibodies."
- Inclusion criteria included articles in the English language, full-text available, and peer-reviewed within the last five years.
- Using a Prisma, one hundred and ten articles were identified after a comprehensive search of Cochrane, CINAHL, and PubMed databases. Four articles were included and evaluated for evidence synthesis.

SYNTHESIS OF EVIDENCE

Study	Topic of Study	Level of Evidence
Centeno-Tablante, E., et.al. (2020). Transmission of SARS-CoV-2 through breast milk and breastfeeding: a living systematic review	Transmission of the SARS-CoV-2 virus through breastmilk.	I
Charepe, N., (2021). COVID-19 mRNA vaccine and antibody response in lactating women: a prospective cohort study	Amount of IgG and IgA in blood and breastmilk samples from lactating and non-lactating women.	IV
Falsaperla, R., Leone, G., Familiari, M., & Ruggieri, M., (2021). COVID-19 vaccination in pregnant and lactating women: a systematic review	Evaluation of the safety and efficacy of the Covid-19 vaccination for pregnant and lactating women.	I
Whited, N., Cervantes, J., (2020). Antibodies Against SARS-CoV-2 in Human Breast Milk After Vaccination: A Systematic Review and Meta-Analysis	Amount of IgG and IgA in breastmilk samples from lactating women after vaccination.	I

RESULTS

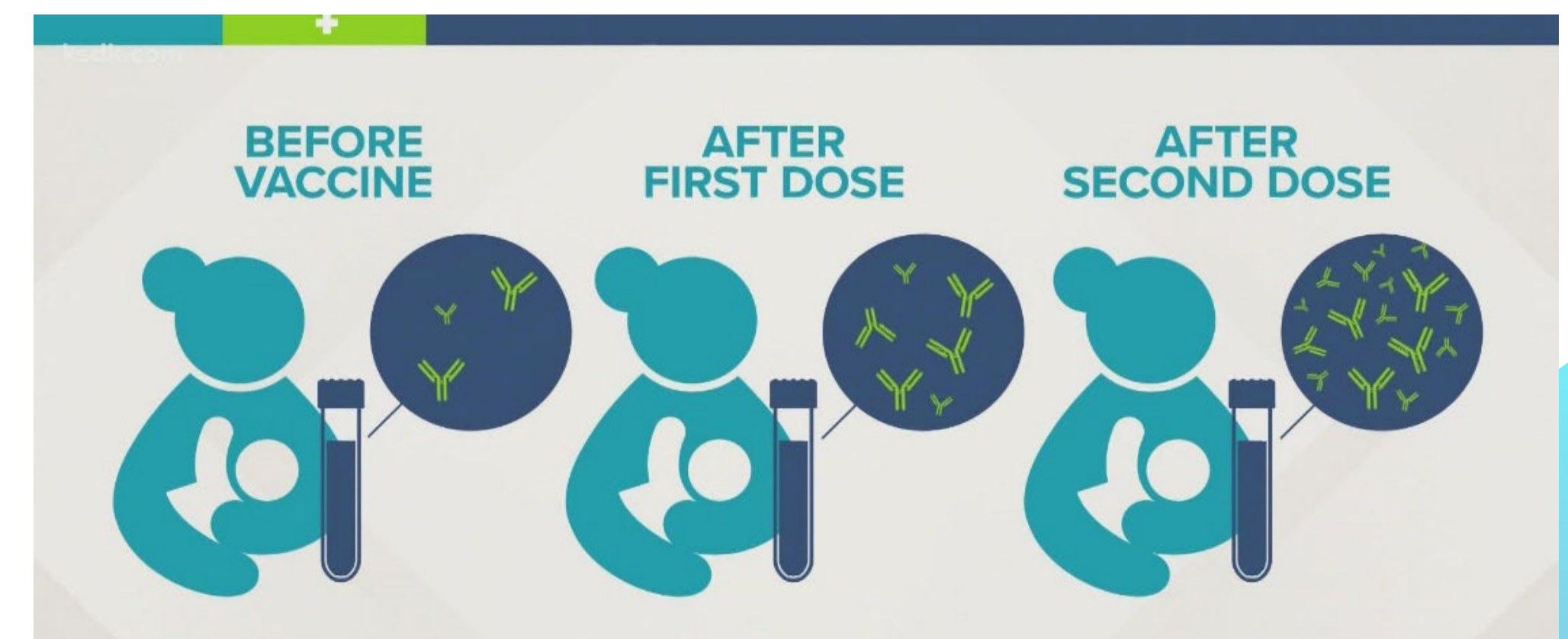
- Three systematic reviews and one cohort study were selected.
- Currently, there is no evidence to support that the SARS-CoV-2 virus can be transmitted from mother to infant via breast milk.
- While evidence of passive immunity to SARS-CoV-2 via breast milk is currently scarce, one prospective cohort study showed that all women had immunity after vaccination with positive antibodies for IgM, IgA, and IgG in their breast milk.
- Adverse effects of the SARS-CoV-2 vaccination have not been shown in pregnant or lactating women or their infants and major amounts of anti-SARS-CoV-2 immunoglobulins are transferred via the placenta and breast milk to the neonate.

DISCUSSION & CONCLUSIONS

- Breast milk from lactating women vaccinated against COVID-19 showed high positivity rates of COVID-19 antibodies, both IgA and IgG, which provides breastfed neonates with immunity to COVID-19 until vaccination is recommended.
- It is essential to promote information on the increased protection in breastfed infants whose mothers have had the COVID-19 vaccine. It is also crucial that vaccinated women who can donate excess milk to milk banks do so to increase immunity in all vulnerable newborns and infants across the country.

LIMITATIONS

More research is needed to determine the rate of COVID-19 antibody transmission from breast milk to infants and how the continuation of exclusive breastfeeding through 6 months affects neonatal immunity against COVID-19. Research is also needed on the duration of COVID-19 immunity in neonates' discontinuation of breastfeeding.



Geographic disparities in neonatal outcomes: A driver diagram for improvement

Teresa Bailey, DNP, APRN, NNP-BC, CNE

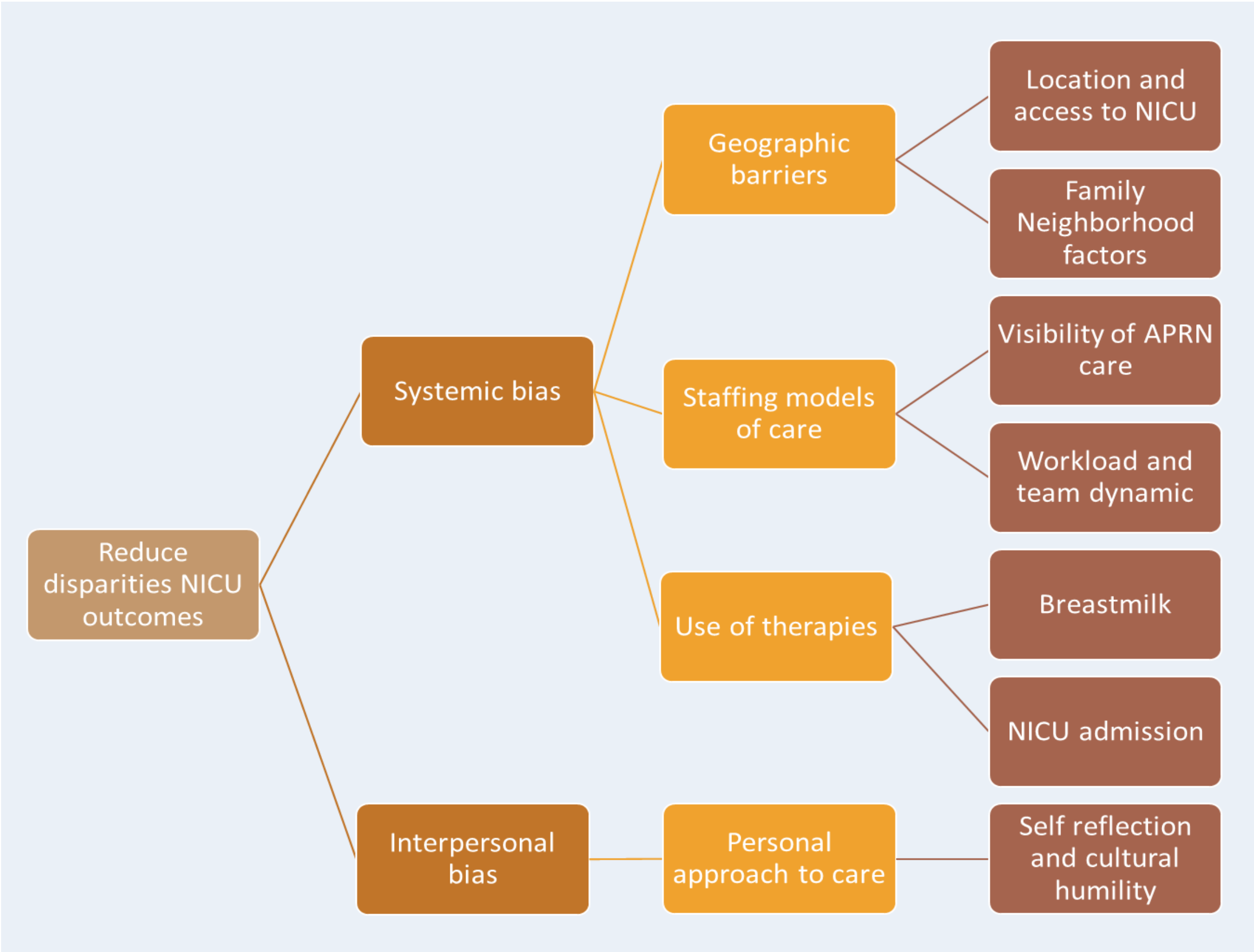
Background:

Recent studies demonstrate disparities in neonatal intensive care unit (NICU) outcomes related to race, geography, and access to care. Literature also describes disparities in outcomes of primary care patients related to restrictive regulations of Advanced Practice Registered Nurses (APRNs). However, the impact of restrictive state and institutional regulation of Neonatal Nurse Practitioners (NNPs) on patient outcomes is not understood.

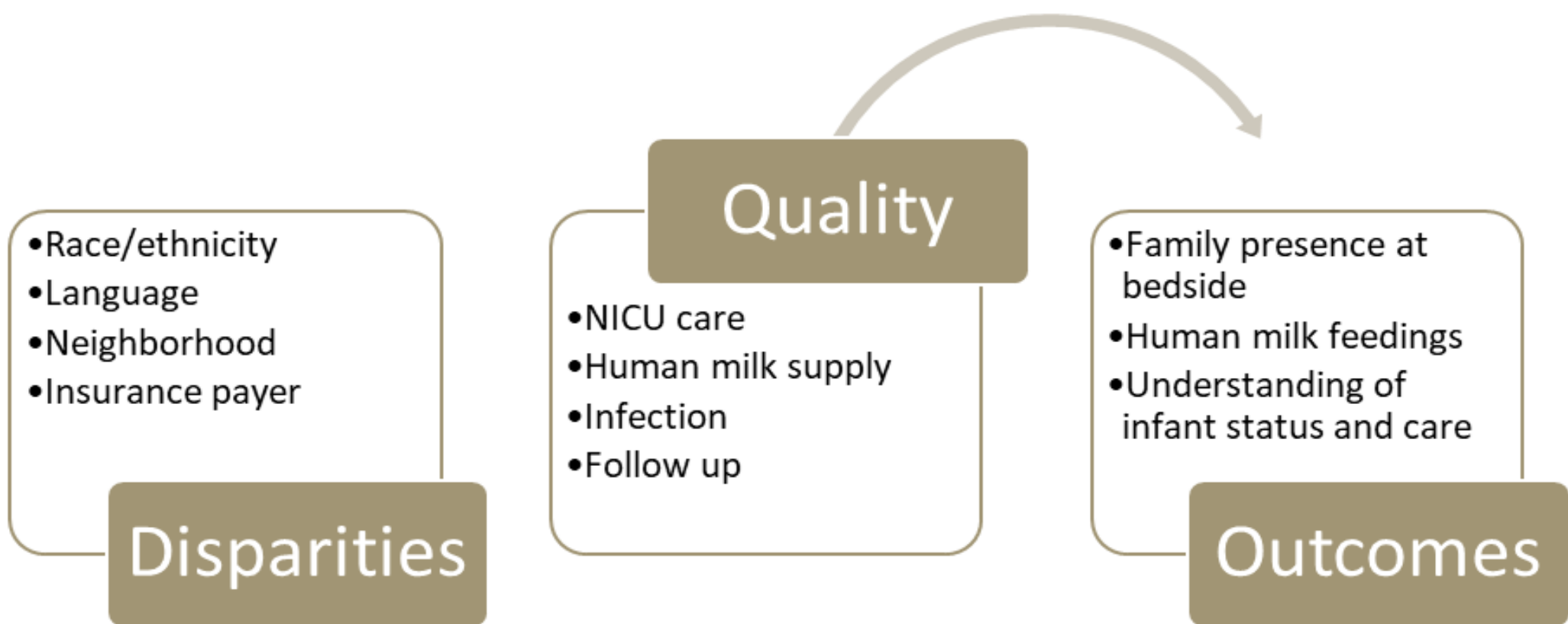
Objective:

This project cross-references a comprehensive literature review of disparities and inequities in neonatal intensive care with data on APRN practice authority restrictions, NNP and acute care APRN workforces, and regional neonatal outcomes.

Driver Diagram:



Systemic Bias and Access to care:



- Understaffing and missed nursing care is more common in NICUs that serve high-black populations.
- The number of available NICU beds does not correlate with regional NICU care needs, and VLBW infants in rural areas are more likely to deliver in hospitals that do not have Level III NICU care

Interpersonal Bias:

- Black mothers report dismissal by healthcare providers, and this is corroborated by White mothers.
- Nurses in understaffed units report prioritizing technical tasks over communication and support of families.

No studies in this review discussed the impact of APRN care on NICU disparities. Literature on APRN practice in midwifery and primary care demonstrates improvement in outcomes for black persons that correlates with expanded practice authority and integration into the healthcare system.

Areas for Study

Access and Equity: Location of NICUs and available services in relationship to populations served

Collaboration: NNP and Neonatologist staffing, team dynamics, oversight and workflow

Cultural Humility: Experiences and perceptions of NNPs and impact on approach to care

Visibility: Impact of APRN practice restrictions and NNP care on NICU outcomes

References:



The University of Texas at Austin
School of Nursing

Background and Significance

- A neonatal central line associated bacteremias (CLABSIs) cost ~\$55,000 per event and increases LOS by ~ 19 days¹.
- Premature infants who experience a CLABSI have higher mortality rates, poor growth and more neurodevelopmental complications².
- Prior to 2009, nurses trained in PICC placement were pulled out of patient care to insert lines.
- Bedside nurses performed PICC line maintenance
- The CLABSI rate in 2009 was more than twice the NHSN average: 2.42 per 1000-line days or 23 events in 9500-line days.

Purpose

Using a dedicated PICC team, we aimed to reduce the number of CLABSIs through the standardization of insertion and maintenance practices. Our target was a reduction of our CLABSI rate to zero.

Setting

- 100-bed Level 4 NICU in an academic, regional, referral center
- 1500 NICU admissions annually
- Employ > 250 RNs in the NICU

Implementation

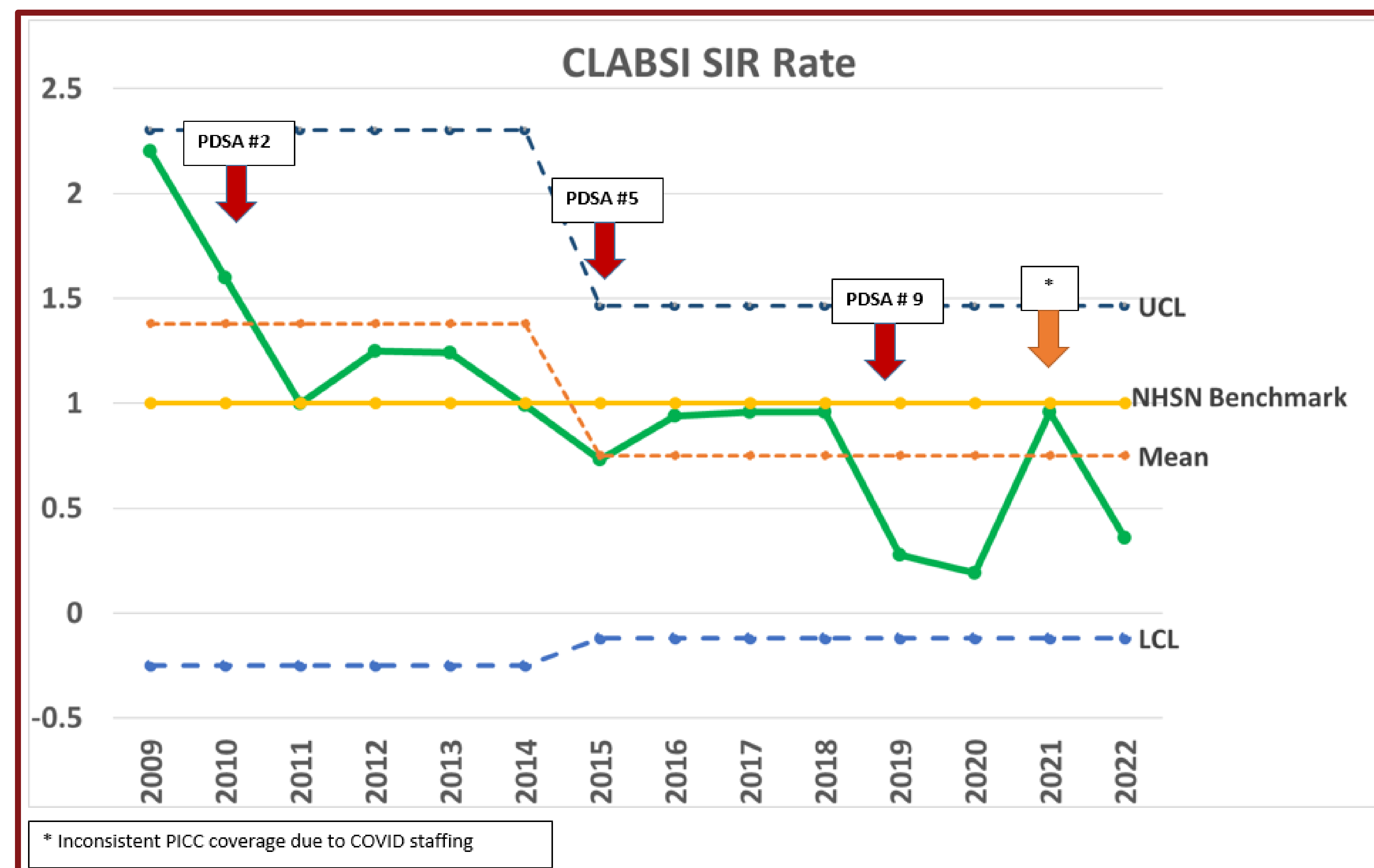
- The clinical nurse specialist (CNS) guided the unit from on-demand PICC placement to dedicated PICC hours.
- A team of 7-10 PICC certified nurses split their work time between patient care and dedicated PICC days.
- The team is responsible for placing and adjusting PICC lines, changing central line dressings, replacing cap locks, and performing central line blood draws.
- With the CNS, they drive quality projects for the prevention of central line bacteremia (CLABSIs), develop policies, educate staff, teach medical fellows proper PICC line techniques and develop and introduce new practices to improve patient safety and outcomes.
- Their informal leadership among the NICU staff allows for rapid-cycle quality improvement and the adoption of evidence-based practices resulting in an immediate impact on patient outcomes.

A Zero CLABSI Rate in a 100-bed, Level 4 NICU is Achievable with an APRN-Led Dedicated PICC Team

Results

12 PDSA cycles have been completed. Significant decreases in CLABSIs occurred with the following PDSA interventions:

- PDSA# 2 (2010): Training and competency evaluation of PICC nurses moved in house to ensure standardized care for placement and maintenance. Documentation was standardized to improve consistency of care. A daily log was developed to aid the PICC nurse with anticipating maintenance and documenting care issues.
- PDSA #5 (2015): Alcohol swab caps on medication lines and use of sterile technique for all fluid line changes.
- PDSA #9 (2019): Discontinuation of lab draws from any PICC line less than 2.0 Fr and hardwired by mid-year.



PICC Nurse Duties

Daily Duties 7am-7pm:

- Place all PICC lines ordered in NICU
- Check all central line dressings daily and replace as needed
- Change connection tubing every 7 days
- Draw all cultures from central lines

Other Duties:

- Provide peer-to-peer teaching at bedside on CLABSI prevention
- Attend bi-monthly PICC Team meetings
- Attend all CLABSI drill down meetings
- Participates in a CNS-led yearly review of best practices
- Champion new CLABSI quality initiatives
- Train new PICC team members and neonatology fellows in PICC placement and maintenance

Outcomes

- The initiative took 6 PDSA cycles to reach a CLABSI rate of zero.
- The team saved ~\$1.4 million in CLABSI-related costs from 2019-2022 compared to 2015-2018
- Trend maintained even with and increase in critically ill and ELBW admissions, and line days (14,400 for 2022)
- Zero CLABSI rate sustained since 2015 with no reported CLABSIs since June of 2022.
- Nursing leadership continues to support dedicated PICC Team hours for insertion and maintenance.

Lessons Learned

A dedicated NICU PICC team can achieve rapid cycle improvements that can lead to a zero CLABSI rate in a large, Level 4 NICUs. Nursing leadership support is vital to sustain a dedicated PICC nurse position.

Acknowledgements



Thank you to our physicians, APRNs, nurses, nursing leadership and dedicated PICC nurses who work daily to prevent CLABSIs.

The Association Between Uncertainty, Hope, Nursing Support and Paternal Bonding with Preterm Infants

Nisreen Alnuaimi, PhDc, RN and Lisa Bratzke, PhD, RN



School of Nursing
UNIVERSITY OF WISCONSIN-MADISON

INTRODUCTION

- Preterm infants are at risk for adverse childhood experiences.
- However, parents’ bonding is a protective factor.
- Delayed bonding is a concerning outcome for fathers of preterm infants and they tend to have lower bonding than mothers.
- Emerging evidence suggests that uncertainty can adversely influence fathers’ bonding with their preterm infants; but hope and nursing support may facilitate bonding.
- No previous study has examined the association between uncertainty, hope, nursing support, and bonding for fathers of preterm infants in the Neonatal Intensive Care Unit (NICU).

AIM

This study aimed to examine the association between uncertainty, hope, nursing support, and bonding for fathers of preterm infants.

THEORETICAL FRAMEWORK

Transition to parenthood, the uncertainty theory in illness, and hope theory guided the work of this study.

METHOD

A cross-sectional research study

- Consecutive convenience sampling using online survey.
- Inclusion of fathers who: 1) Self-identify as fathers of preterm infants. 2) Father’s age is 18 years and above. 3) Ability to read and write English. 4) Live in United States. 5) Have a preterm infant currently in the NICU (infant’s age is up to 6 months after birth).

Measures (self-reported)

- Selected sociodemographic.
- **Bonding:** The Paternal Postnatal Attachment Scale (PPAS).
- **Uncertainty:** Parents’ Perception Uncertainty in Illness Scale (PPUS).
- **Hope:** The Hope for Parenting Scale (HFPS).
- **Nursing Support:** The Nurse Parent Support Tool (NPST).

RESULTS

Sample description (N=396): Fathers: 51.5% (24-34 years old), 72% (White), 93.9% (male), 98.5% (married), 53.5% (bachelor’s degree), 83.3% (full-time employment), 30.8% (annual income: \$35,000 - \$49,999), and 86.4% (previously parented a preterm infant). **Infants:** 65.9% (born at 32 weeks of Gestation or less), 53% (birth weight is less than 1500g), 62.3% (male), and 95.2% (singleton infant).

Table 1: Hierarchal Regression Analysis (Bonding is the outcome)

Variable	B	SE	β	P-value
Uncertainty	-.061	.030	-.068	.047
Hope	.544	.085	.309	<.001
Nursing Support	7.01	.850	.382	<.001

Note. Covariates (fathers’ race, age, education, income, previously parented preterm-infants, infants’ gestational age, postnatal age, and birth status)

Controlling for covariates, 39.4% of paternal bonding is explained by uncertainty, hope, and nursing support (collectively).

DISCUSSION

- Neonatal nurses can maximize a positive experience for fathers of preterm infants in the NICU by the following:
 1. Assessment of fathers’ need to bond with preterm infants (initially after birth and during NICU stay).
 2. Encourage open communications with fathers regarding their feelings and thoughts of uncertainty and hope of infants’ survival and health outcomes.
 3. Facilitate fathers’ engagement in their infants’ caregiving activities.
- More research that address fathers’ need to bond with preterm infants is needed.
- It is advised to conduct nursing educational workshop/s to enhance neonatal nurses’ understanding of fathers’ bonding with their preterm infants.

CONCLUSION

- Findings provide better understanding of fathers’ bonding with preterm infants in the NICU by providing greater insight into influencing factors; i.e., uncertainty, hope, and nursing support.

ACKNOWLEDGMENT

Conger Family Doctoral Student Support

Home is Where My Heart Is: A Cardiac NICU Nurse-Led Parent Education for Single Ventricle Interstage Monitoring

Marigin De Belen, BSN RN RNC-NIC, Rosa Sullivan, BSN RN RNC-NIC,
Maria Cristina Brooks, MN RN RNC-NIC, Danielle Segarra MSN PNP RN



Background

- Hypoplastic Left Heart Syndrome (HLHS) and other Congenital Heart Diseases (CHD) with single ventricle (SV) physiology are complex medical conditions that present a tremendous challenge in home care for the parents and caregivers.
- Literature shows that interstage death after single ventricle Norwood surgery has been historically as high as 16%, with recent data reporting persistent high rates at 10-25%.
- Parents' understanding of the complexity of their babies and the care they should provide at home is paramount in the success of single ventricle interstage survival. Below is the **RED FLAGS** checklist that parents refer to daily in the care of their baby:

Green Zone
4 - 6 wet diapers per day / with BM 1 - 2x/day (without straining) - Pulse Oximeter check 75% - 85% - Temperature normal / No fever - Tolerating feedings without significant spit-ups, able to finish the same amount of bottle (or more) nearly every time. - Your baby is gaining at least 20 grams per day (Goal is 20 - 30 grams/day)
Yellow Zone
- Pulse Oximeter checks show saturations edging toward less than 75% or more than 90% - Feedings aren't going as well. Your baby is having a bit more spit-up, or isn't finishing his feeds by bottle as often - Your baby hasn't met his weight gains this week (less than 20 grams per day for 2-3 days in a row) - Signs of irritability that is not the normal behavior, does not stop crying when held in arms.
Red Zone
- Your baby is sleepier than usual - You see that your baby is bluish in color or less pink than usual - Your baby is not eating well. This can mean he or she is spitting up more, not able to take bottle feeds they normally would, or refusing the bottle - Less than 3 wet diapers, or NO wet diapers in 8 hours. - Your baby's skin feels cooler than usual, and pale or "splootchy" - Oxygen saturations are consistently less than 75% and you notice more effort in breathing

GREEN - Good job! Keep up the good work! **YELLOW** - Contact your Cardiologist **RED** - Call your cardiologist immediately, your baby needs to be seen right away.

- Bedside clinicians are responsible for discharge planning, and the process has to start during admission, with emphasis on the Red Flags.

Problem Identification

In our Infant Cardiac Unit / Cardiac NICU, we realized that our current SV discharge process lacked:

- active parent participation in routine newborn care post de-escalation from Stage 1 palliation, i.e., Norwood surgery
- timely discharge education
- standard bilingual materials and resources
- consistent discharge guidelines implemented by our interdisciplinary team

A pre-intervention survey sent to SV parents revealed dissatisfaction and ample room for improvement.

P - How can we educate our single ventricle parents in a timely manner on single ventricle heart disease-specific home care and improve their confidence in caring for their baby and ultimately prevent morbidity and mortality in the interstage period by utilizing the Red Flags Checklist?

I - "Home is Where My Heart Is", a teaching binder utilizing a heart map introduced to parents by the bedside Nurse upon admission of the baby to our Cardiac NICU - provides information about their baby's complex heart disease, progressing to cardiac surgery performed, specific care instructions, home instructions, and resources for support once they are discharged. It will be available in English and Spanish.

C - Unstructured discharge planning for SV patients: instructions usually given a few days near the discharge date, hence rushed, inadequate and lacking bedside Nurse involvement.

O - Parents who are empowered and confident in taking care of their single ventricle baby; able to recognize early signs of health decline.

T - Parents will be surveyed within the week post discharge to track the success of our newly implemented discharge teaching binder.

Methods

A "Home is Where My Heart Is" learning milestones roadmap was developed to highlight the important discharge teaching education content given by the multidisciplinary team.



The parents' learning journey starts with "How is my baby's heart unique?", taught by the Cardiothoracic Surgery team, followed by topics that will be taught by other members of our team as the baby progresses along the perioperative stages of the first palliation up to the day of discharge.

We consistently have Spanish-speaking families in our unit hence a Spanish version of the teaching binder was also developed.

For every step, the parents are encouraged to ask questions, participate in care if appropriate, and room-in with their baby when the discharge date is near.



5

Results and Discussion

The survey results below **show an improvement** in feedback by the SV parents regarding their readiness to care for their babies at home, and tracking progress & recognizing warning signs of health decline in their infants.

Question	Choices	Pre-intervention % (n = 13)	Post-intervention % (n = 7)
I feel comfortable reporting concerns about my baby to the doctors.	Strongly agree Agree Neutral Disagree Strongly disagree	82% 9% 0 0 9%	100%
I feel comfortable keeping track of my baby's progress	Strongly agree Agree Neutral Disagree Strongly disagree	45.5% 45.5% 0 0 9%	100%
I feel comfortable recognizing my baby's "red flags"	Strongly agree Agree Neutral Disagree Strongly disagree	64% 27% 0 0 9%	100%
I was satisfied with the discharge education I received in the NICU before discharge or transfer	Strongly agree Agree Neutral Disagree Strongly disagree	55% 27% 0 0 18%	100%
I was satisfied with the timing the NICU started preparing me before discharge or transfer	Strongly agree Agree Neutral Disagree Strongly disagree	64% 18% 0 0 18%	100%

- The improvement may be attributed to the **standardized content** in the Home Is Where My Heart Is teaching binder **provided by our multidisciplinary team as soon as the SV baby is admitted.**
- Since this is an ongoing project, we will continue to survey our SV parents to confirm the hypothesis above.
- Continuing interdisciplinary education specially to Nursing staff on timely initiation of discharge teaching is also in progress.

Acknowledgment

We would like to thank our Social Worker, Irene Sprung LCSW-R, former SV Interstage Program Coordinator, Kathy Gilmartin MSN CRNP, our former Patient Care Director Svetlana Verma DNP RN CCRN NE-BC, and our Infant Cardiac Unit Medical Director, Ganga Krishnamurthy MD, for their assistance to our project.

References



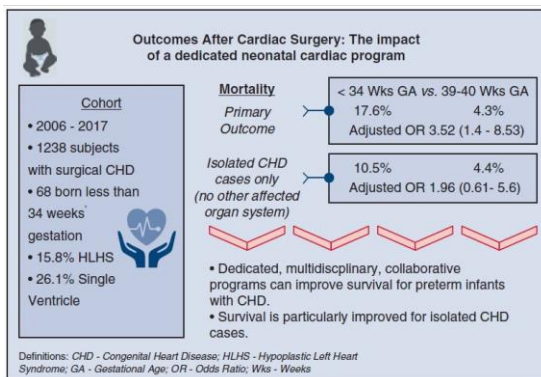
Training Nursing Staff for a Unique Neonatal Cardiac Intensive Care Program

Maria Cristina Brooks, MN RN RNC-NIC



Background

- A dedicated neonatal cardiac intensive care program is not common hence the lack of clinicians trained and competent in this specialty.
- Our institution opened a 17-bed unit dedicated to neonatal cardiac intensive care in 2017 with 70 Nursing FTEs.
- The unique program was affirmed by a retrospective review of 1238 neonates with congenital heart disease (CHD) in 2006 - 2016 that were entirely cared for at our institution's Level IV NICU. It showed one of the lowest mortality and morbidity rates for preterm infants in the recent era.



- Some nurses originally onboarded to the new unit came from our Level IV NICU, and newly-hired ones either had NICU or PICU background (average of 2 years experience). A NICU-based orientation was and still currently provided.

Problem Identification

P – How can we build professional nurse competency in an intensive care setting with a unique care model?

I – Integration of knowledge, skills, values and attitude in the practice of neonatal cardiac intensive care nursing

C – Traditional Level IV NICU Nurses do not recover neonates with CHD postoperatively. Traditional Pediatric Cardiac Intensive Care (PICU) and PICU Nurses are not Neonatal Resuscitation Program (NRP) Providers and admit neonates from the delivery room, nor perform newborn-specific home discharge planning.

O – An evolving nursing competency in neonatal cardiac intensive care as manifested by an improved perception of own competencies, ability to collaborate with the interdisciplinary team, participation in quality improvement and actively assist the patient's family cope with the demands of their baby's illness.

T – After the unit's 5th year anniversary, Nurses who have stayed employed in the unit will be surveyed on their learning needs (LNA) and participation in quality improvement and patient experience initiatives.

Methods and Evidence Review

The methods of training and building competency for the unique program were built around the following:

- At the heart of good clinical judgment and clinical wisdom lies experiential learning from particular cases. (Benner, 2004)
- Organizations with a robust education and competency program create continuous learning that promotes patient safety and contributes to a journey towards high reliability. (Dias and Escoval, 2015)

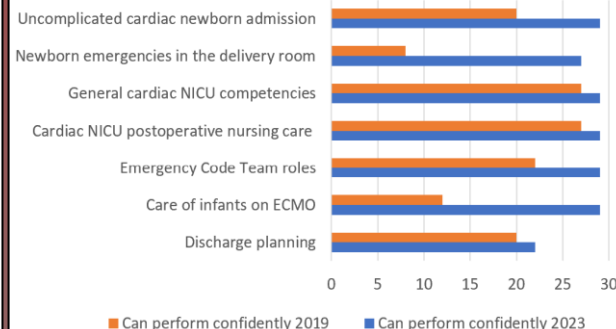
Training Method	Timing/Duration	Learners
Orientation General Pediatrics Policies and Procedure NICU-centric didactic instruction Introduction to Neonatal Cardiac Physiology Neonatal Resuscitation Program Provider Course Clinical area training with Nurse Preceptor	12 – 13 weeks clinical area training 16 weeks 20 – 24 weeks	Nurses with prior NICU/PICU training Nurses without prior NICU/PICU training New graduates
Skills/Competency Days	Once a year, 6 – 11.5 hours	All Nurses
Hi-fidelity Simulation Bedside surgical and non surgical emergencies ECPR	At least once a month	Multidisciplinary
Just-In-Time Training Sessions <i>(Interactive discussion at the bedside on specific cardiac physiology of patient's CHD, surgery performed, pre-brief on what to expect, plan of care determined)</i>	Done everyday prior to patient's arrival from the Operating Room, 15 – 30 minutes	Multidisciplinary
Case/Experience-Specific Discussions Hot and cold debrief, code review Mortality and Morbidity conference Risk-Cause-Analysis Nurse-led case presentation	Hot and cold debriefs done after the event. Once a month After an event Once a year	Multidisciplinary
Self-directed Learning Offerings Monthly newsletter Live and recorded virtual learning sessions Process Meetings (quality and safety) Unit resource binders and textbooks	Anytime 60-minute interactive discussions	Multidisciplinary but mostly Nursing
Pop-up Learning Sessions and In-services	Anytime: as needed or per request	Multidisciplinary

Results and Discussion

- As of January 2023, 37 Registered Nurses remain in our unit since 2017. Below are the characteristics of the respondents:

37 RNs	2019 LNA (n=35)	2023 LNA (n=29)
16 from original program	16	11
18 with level 2-4 NICU experience	17	15
3 with PICU experience	2	3

- The survey specified 7 general competency areas. Each area included specific skills necessitating mastery to achieve the safe delivery of care. Below shows the responses of the RNs who took the same LNA in January 2019 and January 2023.



- The chart depicts a higher level of perception of self-confidence to perform cardiac NICU-specific nursing responsibilities.
- Furthermore, these RNs, since 2018 have been active in shared governance, implementing quality improvement projects geared towards a better patient experience and a low incidence of hospital-acquired conditions.
- The 2023 LNA also revealed the **RNs' preferred mode of learning** (in order): **1. Just-In-Time Training, 2. Interactive discussions/classes, 3. simulations 4. books, journals, newsletters, Google search**
- Through a robust education program planned and implemented over the years, our RNs developed professional competence manifested by confidence in carrying out nursing care for this cardiac NICU population, as well as active participation in quality improvement and patient satisfaction initiatives.

References:



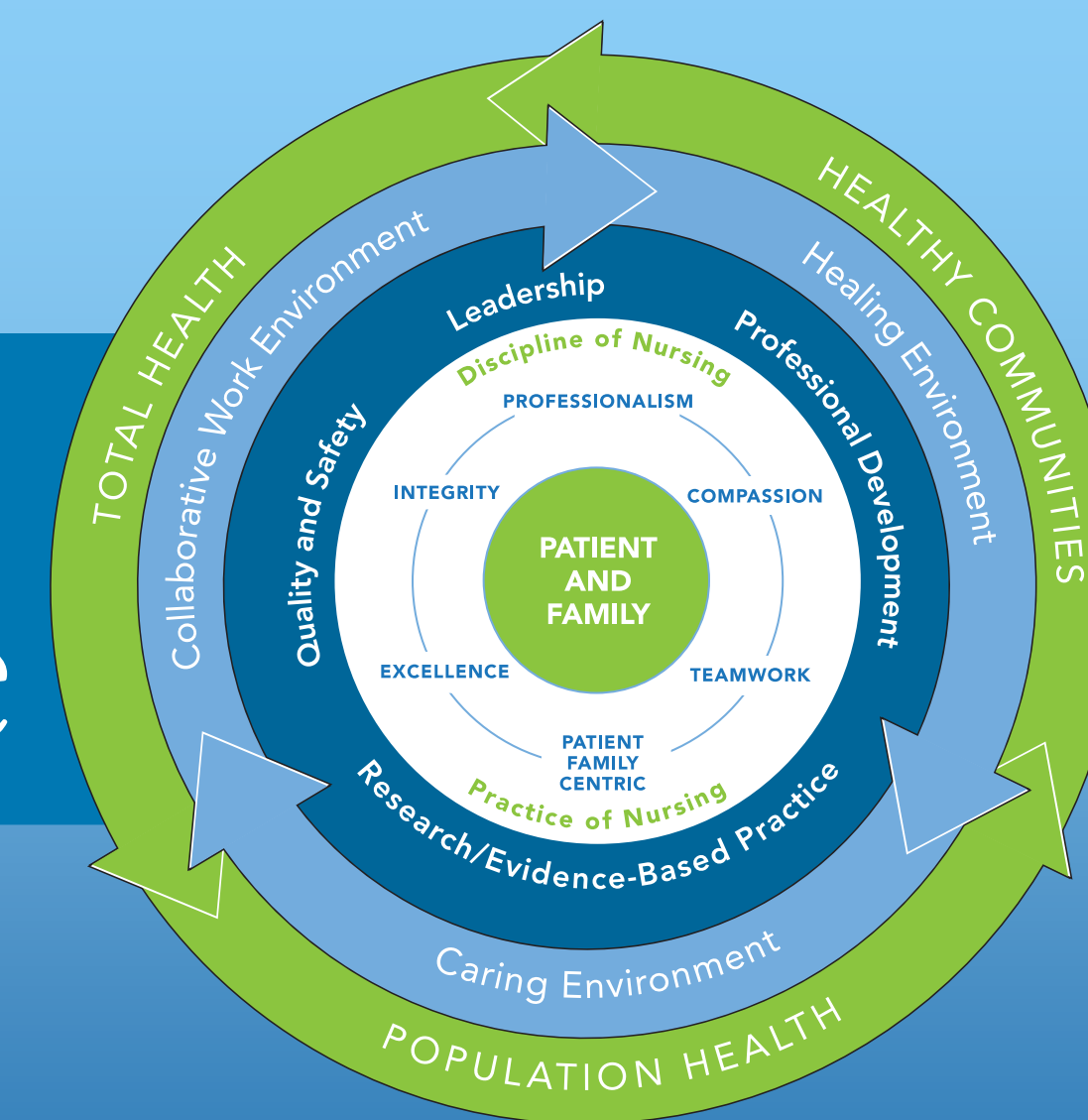
For more information, please contact:
MC Brooks, Clinical Nurse Educator of the Infant Cardiac Unit
Email: mam9166@nyp.org
IG: [cardiacnicu_lifelonglearner](https://www.instagram.com/cardiacnicu_lifelonglearner)



Normothermia Improved with Delivery Room and Admission Practices

Ja-Yee Ann Chu, DNP, CNS, CCRN-K, C-NNIC
Los Angeles Medical Center – Neonatal Intensive Care Unit

Culture of
Excellence



INTRODUCTION

Background Information. According to the Vermont Oxford Network (VON) Heat Loss Prevention (HeLP) Trial, very low birthweight (VLBW) infants who die within 12 hours of admission are less likely to have their temperature measured and have substantially higher rates of hypothermia. In this 2009-2016 trial, ~4 of 10 VLBW infants are cold when admitted to the NICU. From 2011-2012, the California Perinatal Quality Care Collaborative (CPQCC) also focused on delivery room management, which included normothermic temperatures upon NICU admission. After this collaborative, admission temperatures were added as reported metrics for all participating California NICUs.

From January 2015 through December 2017, the Southern California Regional Maternal Child Health group and the 13 local NICU facility leaders assessed normothermia of infants admitted to the NICU. Normothermia was defined as temperatures between 36.5-37.5 °C.

- In **December 2017**, the initial target set was normothermia for $\geq 75\%$ of infants meeting the criteria of **< 32 weeks gestation or $\leq 1,500$ grams admitted to the NICU**. Each year, the target increased in 5% increments until 90%.
- In **July 2018**, the criteria was updated to include—normothermia rates **during the first hour of admission** for all inborn infants < 32 weeks gestation or $\leq 1,500$ grams admitted to the NICU.
- Normothermia within the first hour of life is a predictor of neonatal morbidity and mortality.

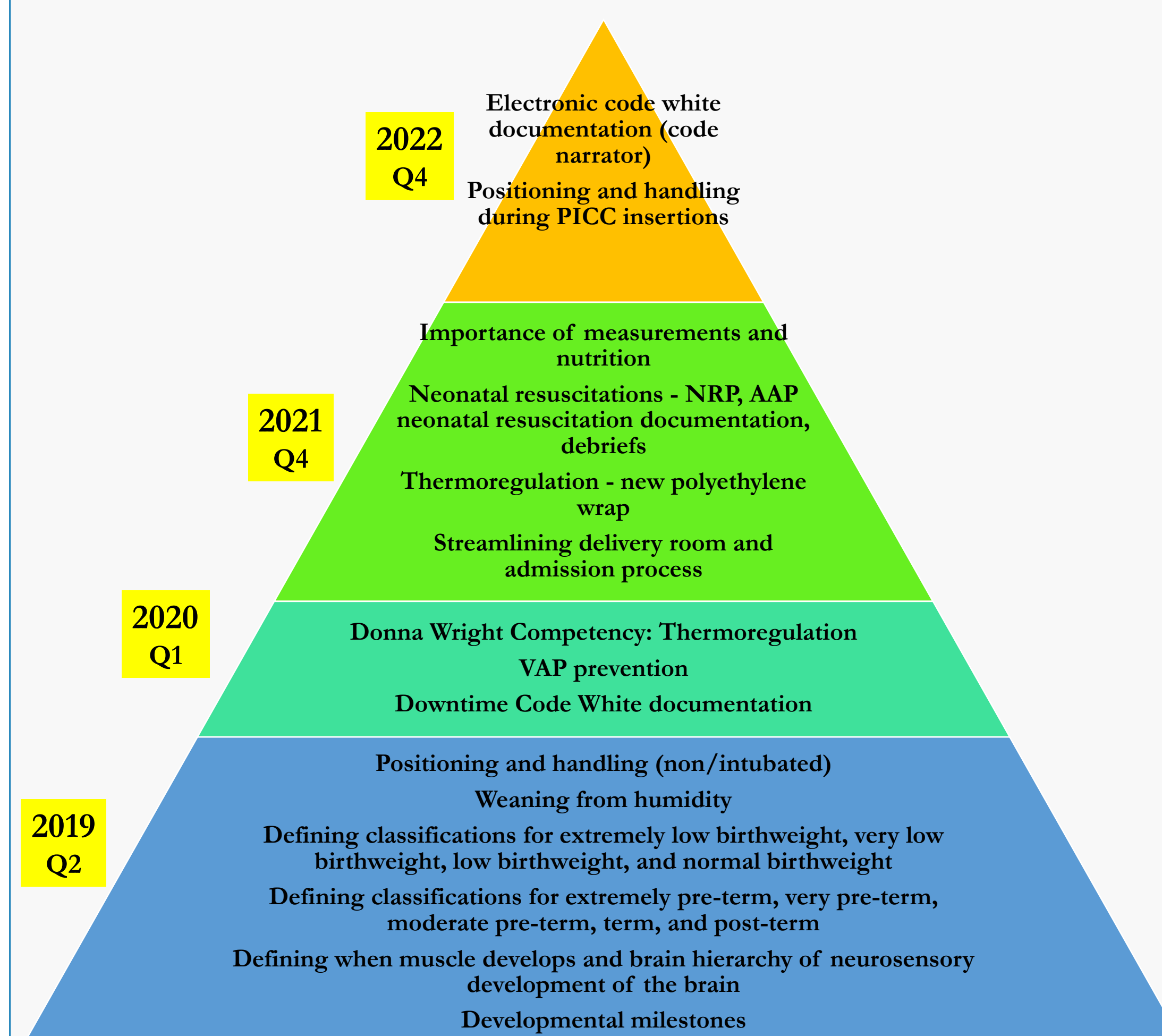
PI/QI Purpose. To create and implement clinical practices and workflows to maintain normothermia for infants < 32 weeks gestation or $\leq 1,500$ grams during delivery room resuscitations through the first hour of NICU admission.

SMART AIM. Between January 2015 to December 2022, we will increase normothermia (36.5-37.5 °C) rates (75% to 90%) during the first hour of admission for all inborn patients delivered at < 32 weeks gestation or $\leq 1,500$ grams and admitted to the NICU.

METHODS

From 2019-2022, developmental and thermoregulation education were discussed at annual professional practice updates (PPUs). Each year's content built upon the previous year's education and implementation practices. The goal was to improve the quality of resuscitations in L&D with NICU attendance and NICU processes to improve thermoregulation at admission.

Educational PPU topics were as follows:



INTERVENTIONS

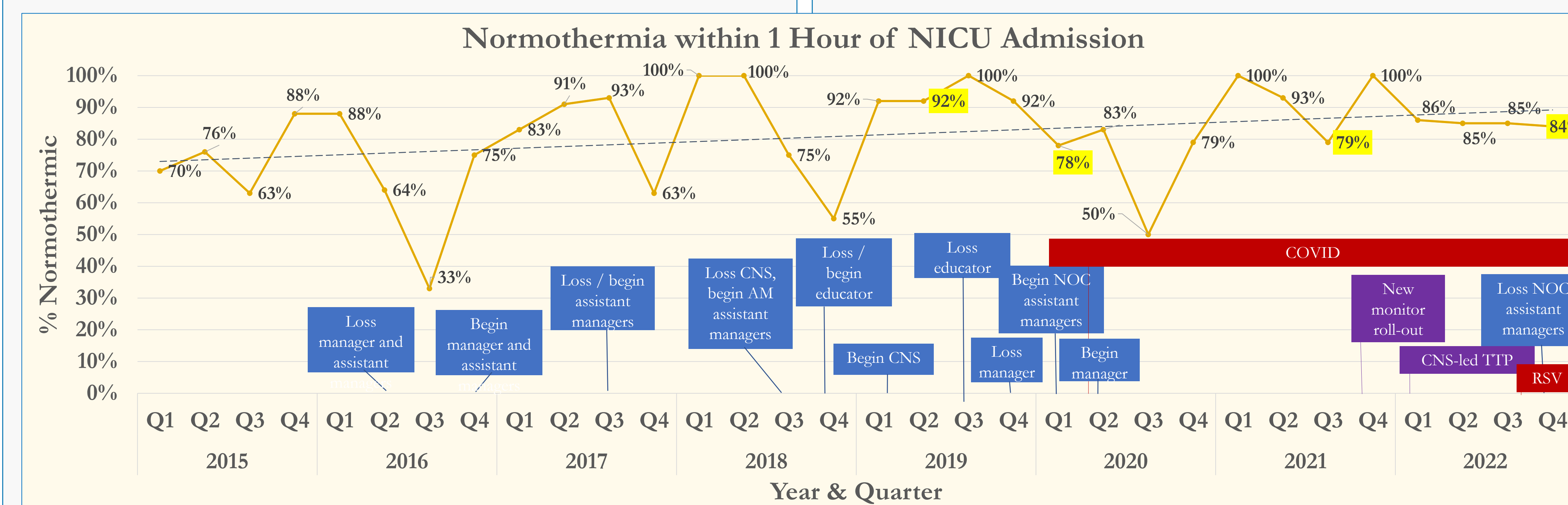
Interventions were the following:

- 2019 – Real-time audits of positioning and handling and thermoregulation at admission, bring resuscitation black box and thermal mattress
- 2020 – Donna Wright Portfolio validation choices for thermoregulation at admission (QI audits, evidence of daily practice, presentation, reflection)
- 2021 – AAP NeoLog adaptation to health system workflow, NICU admission checklist updates, new polyethylene wrap introduction
- 2022 – Maintenance of practices

RESULTS

Average inborn VLBW births per year was 140 infants (2015-2022). Baseline Data were collected from 2015-2017. Intervention and Maintenance Data were collected from 2018-2022, where *n* met inclusion criteria, and % were those normothermic within QI population:

Year	VLBW Inborn Infants Who Met Criteria (<i>n</i>)	% of <i>n</i> Who Were Normothermic	Target % Normothermic
2015	63	74%	N/A
2016	39	65%	
2017	54	83%	
2018	41	83%	75%
2019	46	94%	75%
2020	40	73%	80%
2021	46	93%	85%
2022	51	85%	90%



- For each intervention and maintenance year, the annual normothermia rates fluctuated between 73% to 94%. Annual target rates were met for 3 of 5 years (2018, 2019, 2021).
- From 2015-2017 (75%, 65%, 83%), an average of 74% of < 32 weeks gestation or $\leq 1,500$ grams and admitted to the NICU were normothermic.
- From 2018-2022 (83%, 94%, 73%, 93%, 85%), an average of 86% of < 32 weeks gestation or $\leq 1,500$ grams infants admitted to the NICU during the first hour of admission were normothermic.

IMPLICATIONS FOR PRACTICE

Evidence-based practice education and interventions with improved workflows led to incremental improvements in overall normothermic results through these strategies:

- Providing baseline knowledge on thermoregulation, differentiation of classifications for weight and age, and milestones
- Implementing an adapted version of the AAP NeoLog with additional components to the admission checklist

Further implementation plans are to:

- Revise adapted AAP NeoLog
- Expand clinical practices and workflows into the L&D and Emergency Department for standardization in care, supplies, and equipment for high-risk deliveries
- Assess rates of normothermia for all infants admitted to the NICU.
- Create NICU leadership training program to improve retention of assistant managers

REFERENCES



RESOURCES



CONTACT



CONTACT: Ann Chu (ja-yee.a.chu@kp.org)

ACKNOWLEDGMENT: Special thanks to Kevin B. Litam and Quinn L. Hong, data consultants, and NICU manager and assistant managers during this time period.



Baby Wearing as Non-Pharmacological Treatment in the Neonatal Abstinence Syndrome Infant

Tori Brunett MSN, RN, RNC-NIC

Background

The Neonatal Intensive Care Unit (NICU) had a lack of standardization of care addressing the non-pharmacological needs of a Neonatal Abstinence Syndrome infant (NAS).

Non-pharmacological treatment can promote maternal bonding, infant comfort, and promotion of positive nurse-mother relationship.

PICO Question

In infants being treated in the Neonatal Intensive Care Unit, for Neonatal Abstinence Syndrome, does the implementation of a 1 hour per day baby wearing intervention program decrease overall infant length of stay, as compared with usual practice without baby wearing within 3 months of program implementation?

Interventions

Implementation included 1 hour daily of baby wearing in the carrier by the nurse, cuddler, or parents. Holding time was documented in the EMR.

NICU Staff education and IRB approval

Patient enrollment and carrier distribution

Nursing staff learning and attitude assessment survey data collection

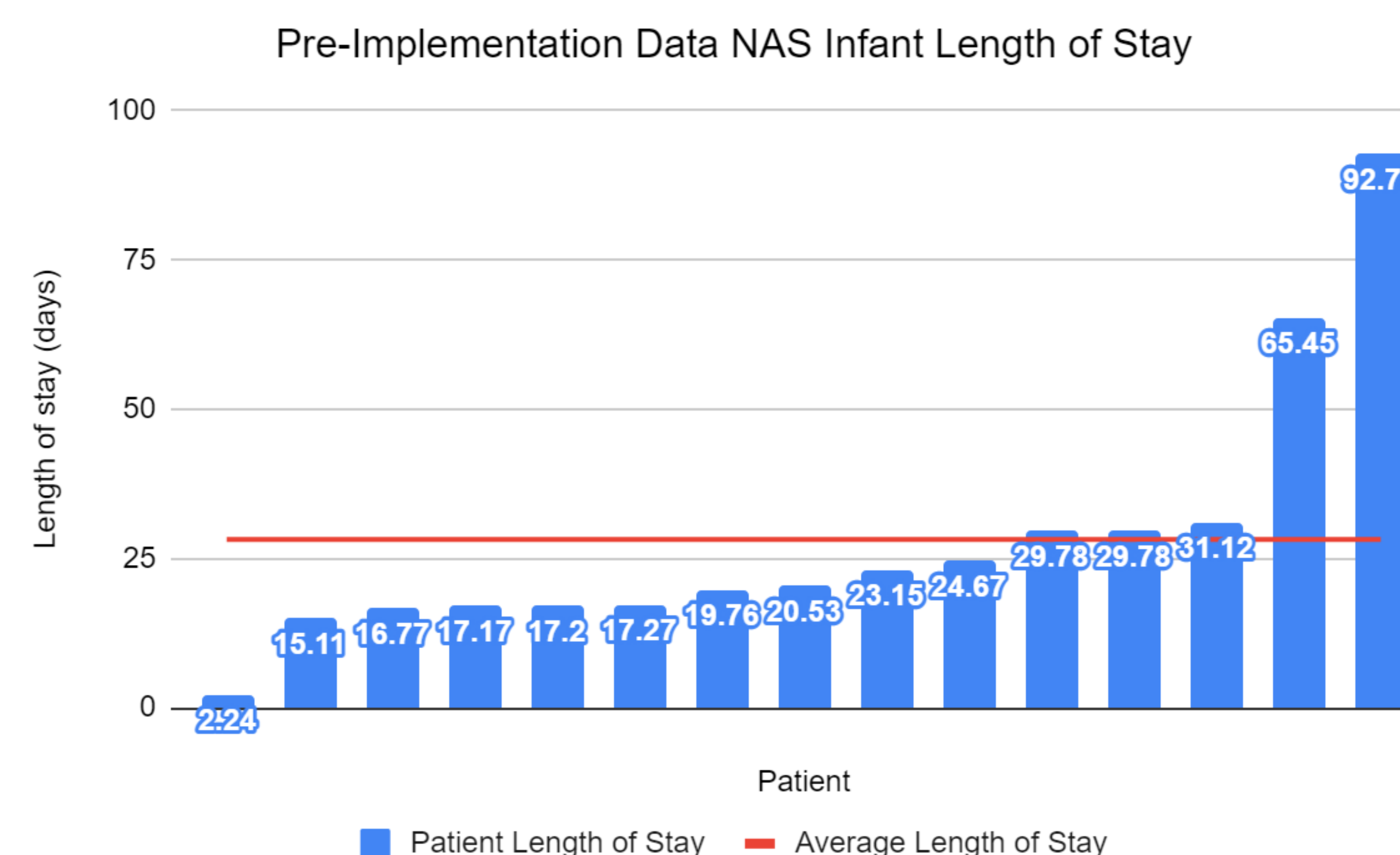
Patient length of stay data collection 3 months post implementation



Results

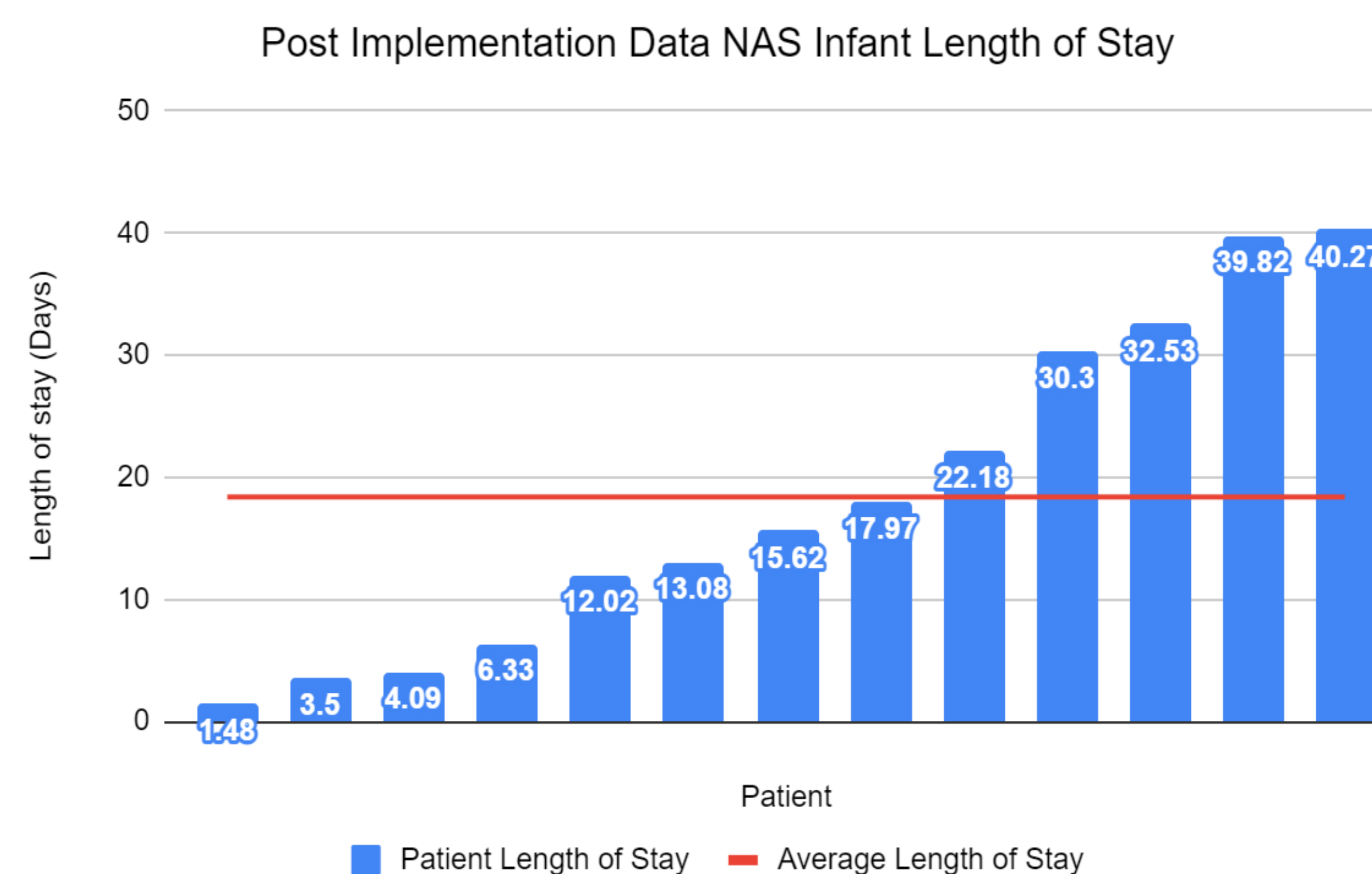
Pre-Intervention Data

NAS infants admitted from January-July 2022, (n=15) length of stay (LOS) was on average 28.2 days.



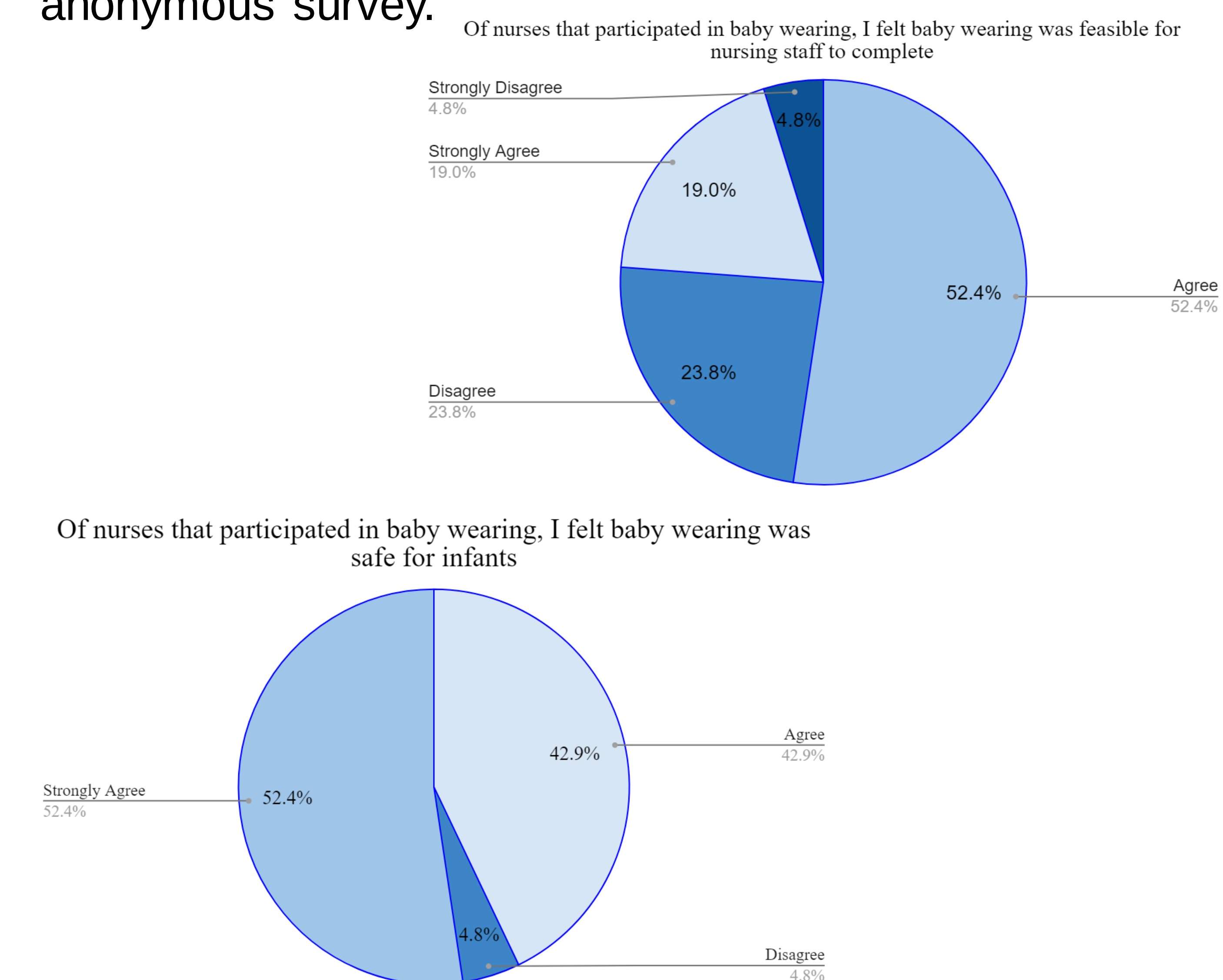
Post Intervention Data

NAS infants admitted from August-December 2022, (n=13) length of stay (LOS) was on average 18.4 days.



Results Cont.

Nurse learning was assessed regarding the benefits of baby wearing and implementation feasibility, safety, and effectiveness by nurses' participation in an anonymous survey.



Nursing staff quotes collected via survey include:

- "This was a great project. The infants loved being in the carriers."
- "Baby was calm and was able to sleep during the holding period"
- "I think this was a beautiful way to connect and bond with baby emotionally and physically."

Discussion

- ❑ With the rising opioid crisis and growing population of NAS infants, NICU care must adapt to include comprehensive, specific quality care.
- ❑ Project Sustainment requires continued support from key stakeholders and must be included in the NICU guidelines of care.
- ❑ Barriers including staffing shortages should be addressed.

Effects of PreEclampsia on the Fetus and Newborn

Marla K Conley, MSN, APRN-NNP
CoCa Educational Concepts

Abstract

PreEclampsia is a common but serious multi-organ pregnancy disorder that is associated with high maternal morbidity and mortality. It occurs after the 20th week of gestation and can have serious consequences for the mother and fetus as well as long term sequelae affecting the heath of both mother and child.



Picture borrowed from Google search: Anissa Keiser/April 17, 2020 The New York Times

Introduction

PreEclampsia is a hypertensive disease of pregnancy that occurs after the 20th week of gestation and can present up to 6 weeks postpartum. It occurs in 2% to 8% of all pregnancies worldwide and accounts for roughly 50,000 maternal and fetal/newborn deaths annually. Risk factors for PreEclampsia are complex and include nulliparity, multiple gestations, IVF, chronic hypertension, obesity, diabetes mellitus, autoimmune disorders, advanced maternal age/teen pregnancies, smoking, sleep apnea, minorities and certain ethnicities. Most cases of preEclampsia occur closer to term, and resolve after delivery. Yet, 5% to 20% of women may go on to experience life threatening and fatal outcomes with long term health implications. Similar outcomes have been reported in the offspring of mothers diagnosed with preEclampsia. The overall preEclampsia cost burden has been reported as \$1.03 billion for mothers and \$1.15 billion for infants. Currently, the only known “cure” for preEclampsia is delivery of the fetus which is not always favorable depending on gestation. Mothers and infants affected by preEclampsia have health care needs that carry on throughout the rest of their lives. Studies prove they both are at risk for chronic adult diseases. Research focusing on the use of biomarkers (maternal, fetal or placental) and modeling may provide new insights into preEclampsia phenotypes which may enhance individualized care and improve outcomes for women and their newborns.

Pathophysiology of PreEclampsia

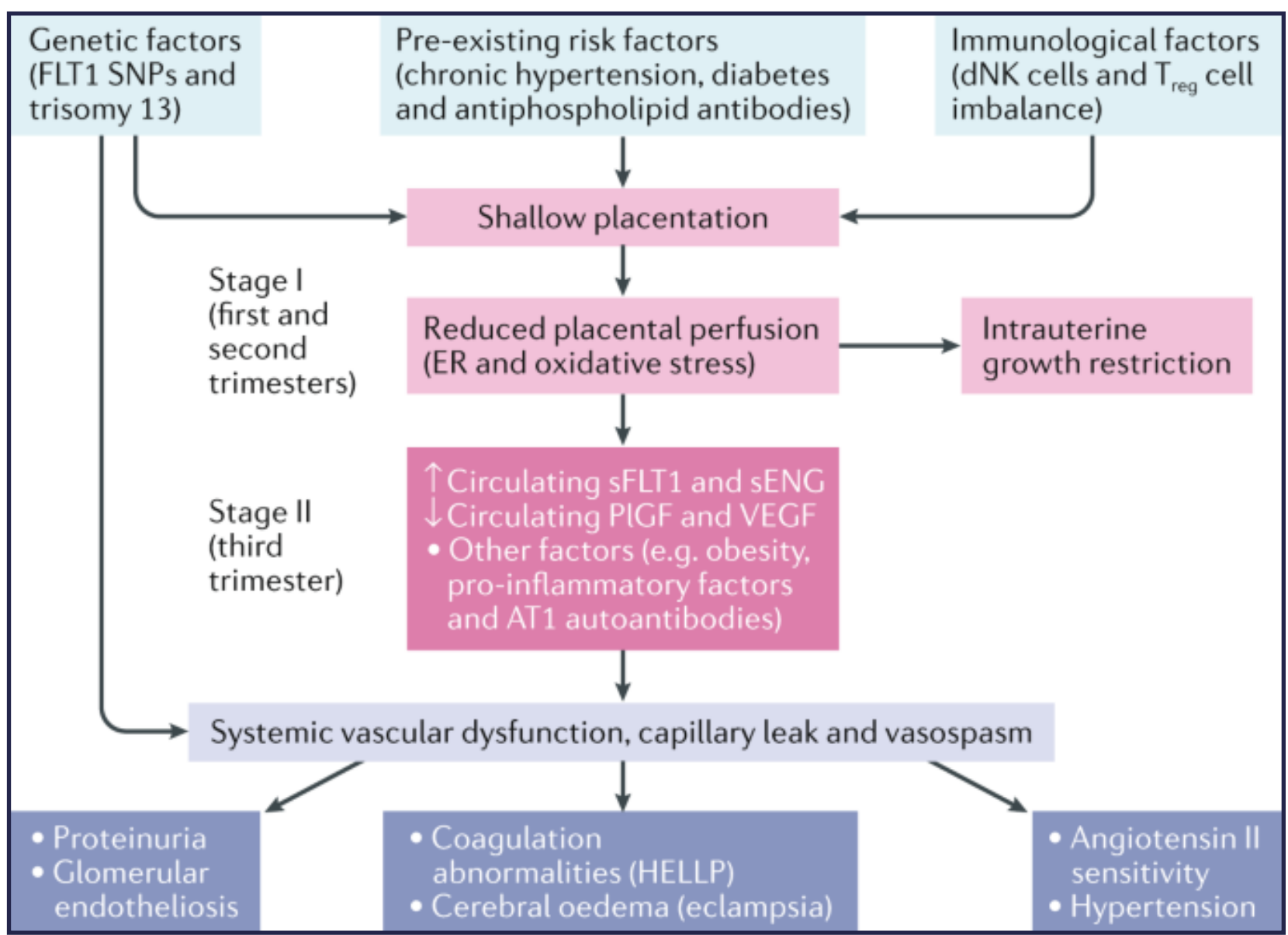


Chart adapted from: Phipps, E.A., Thadhani, R., Benzing, T. et al. Pre-eclampsia: pathogenesis, novel diagnostics and therapies. *Nat Rev Nephrol* 15, 275–289 (2019). <https://doi.org/10.1038/s41581-019-0119-6>

Maternal Effects	Fetal/newborn Effects
Hypertension	Hypoxia/HIE
Seizure/Eclampsia	IUGR/SGA
Cerebral Hemorrhage	Abruption
Vascular disorders: DIC/TCP	Fetal distress
Hepatic Failure/Rupture	Oligohydramnios
Premature delivery	Premature delivery
Cortical blindness/Retinal detachment	Poor fetal growth
Acute kidney injury	Neutropenia/TCP
Abruption	Severe jaundice
Postpartum hemorrhage	Possible some neuroprotection
Emotional stress	Congenital heart disease
Separation of mother & baby	
Long Term Effects	Long Term Effects
Chronic HTN	Chronic HTN
Diabetes	Diabetes
Chronic Kidney Disease	CKD
Stroke	Obesity
Early Death	Neurodevelopmental disorders -ADD/ADHD -Autism
Quality of life concerns	PreEclampsia (in females)
	Asthma
	Parent with chronic illness
	Epilepsy

Future Implications...



- Close follow up by PCP
- Milestone tracking
- Hearing/vision checks
- BMI monitoring
- BP monitoring
- Encourage healthy lifestyles
- Education about adult onset diseases



References:

1. Magee et al. 2022. "Preeclampsia" NEJM Review Article. [NEJM.ORG](https://www.nejm.org/doi/full/10.1056/NEJMra2200000) 386;19
2. Mallette, J, Crudup,B, Alexander, B. 2023. "Growth restriction in preeclampsia: lessons form animal models". *Science Direct. Volume 32 100647.*
3. *National Institute of Child Health and Human Development. "What are the risks of preeclampsia & eclampsia to the fetus?"*
4. Pierre-Yves, R, et al "Progress in the understanding of the pathophysiology of immunologic maladaptation related to early-onset preeclampsia and metabolic syndrome related to late-onset preeclampsia. *American journal of obstetrics and gynecology* 26(2)S867-875, 2022
5. Jung, E et al. "The etiology of preeclampsia" *American journal of obstetrics and gynecology* 226(2) S844-866, 2022
6. Understanding long-term effects of preeclampsia and taking charge. *Preeclampsia Foundation* Nov. 18th, 2021 <https://www.preeclampsia.org>
7. Li, R,et al. A Health and economic burden of preeclampsia: no time for complacency. *J Obstet Gynecol.* 2017, PMID: 28708976

Parechovirus Meningitis: A Case in the NICU

Lisa Dailey DNP, NNP-BC, CPNP-AC, APNP & Abby Brodbeck BSN, RNC-NIC-NNP Student

Purpose

- Identify at risk populations of infants in the NICU for Parechovirus (PeV) infections.
- Recall the signs and symptoms that make Parechovirus (PeV) infection a clinically relevant differential diagnosis.
- Understand the clinically significant manifestations and sequelae of Parechovirus (PeV) infection.

Background

- RNA virus
- Frequently asymptomatic or mild GI or URI S/S in childhood
- Younger patients have more severe illness
- Most severe infection under 6 months

- Spreads: Fecal-Oral or Respiratory Route
- Stool: up to 6 months!
- In-utero transmission may also occur
- Incubation is unknown
- Typically seen in summer and fall months

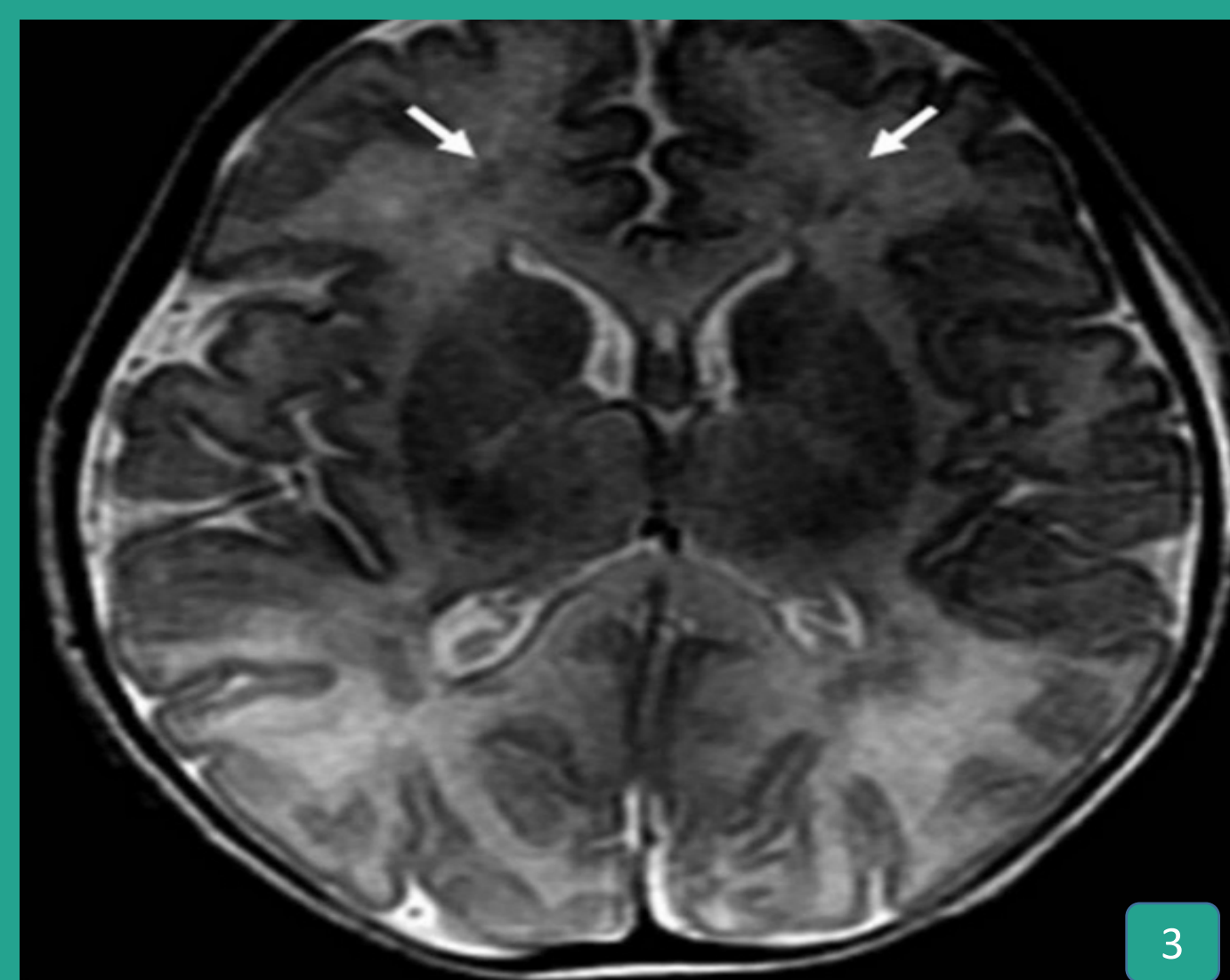
Manifestations include:

- Sepsis-like syndrome
- Pneumonia
- Endocarditis
- Hepatitis
- Coagulopathies
- Meningoencephalitis
- Long term neurological sequelae.



Signs & Symptoms:

P- penia (leukopenia)
A- apnea
R- rash (on palms/soles)
E- erythema (general)
C- CNS involvement (seizures)
H- hot/cold (temps unstable)
O- other causes ruled out (sepsis, HSV, TORCHS)



Case Presentation

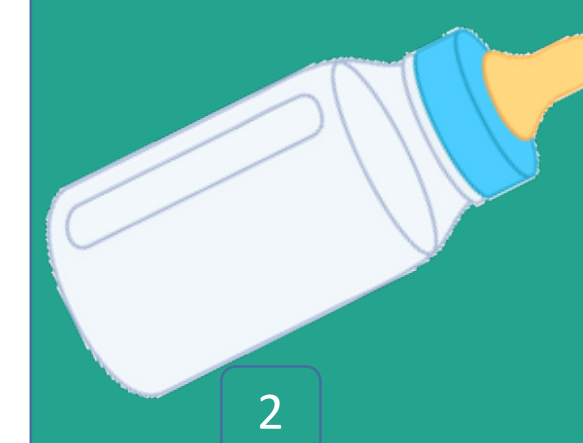
Premature infant

GA: 34w2 CGA: 36w3

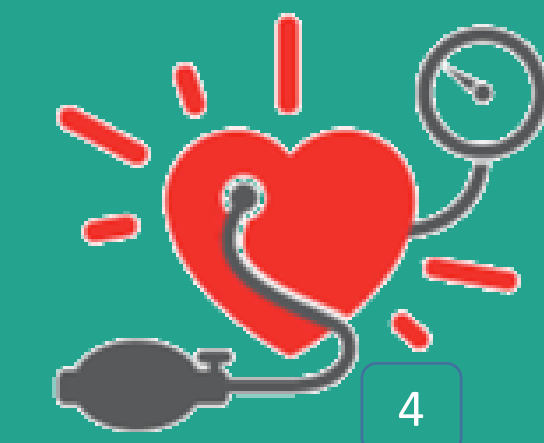
Significant clinical deterioration on DOL 15 just prior to expected discharge

Decreased PO intake

Hypotension



100% PO →
1% PO



MAP = 23

Increased Bradycardia

Hypothermia



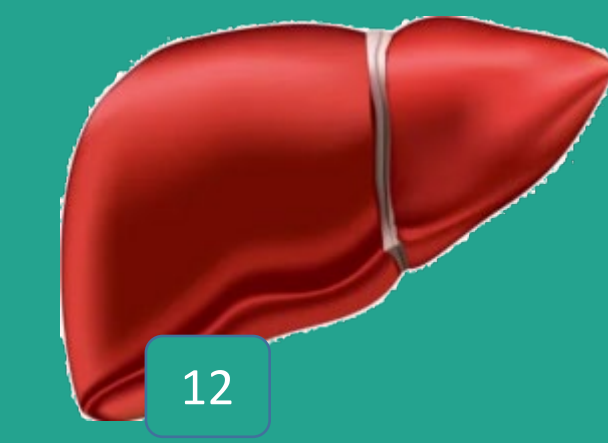
13 alarms



34.4 * C

NICU History

- Polyhydramnios, Preterm Labor, Placental Chorioangioma
- Benign Maternal labs
- (GBS & HSV unknown)
- Vaginal birth, Clear fluid
- APGARs 8/8
- Minimal resuscitation
- CPAP @ 5 MOL (grunting)



- Congenital Hepatomegaly
- Direct hyperbilirubinemia (highest level: 3.6)

Liver failure workup:

- Echocardiogram: ASD
- TORCH: negative
- Abdominal US w/ Doppler: Normal
- Ursodiol 15 mg/kg BID (on DOL 5)

Abnormal Assessment

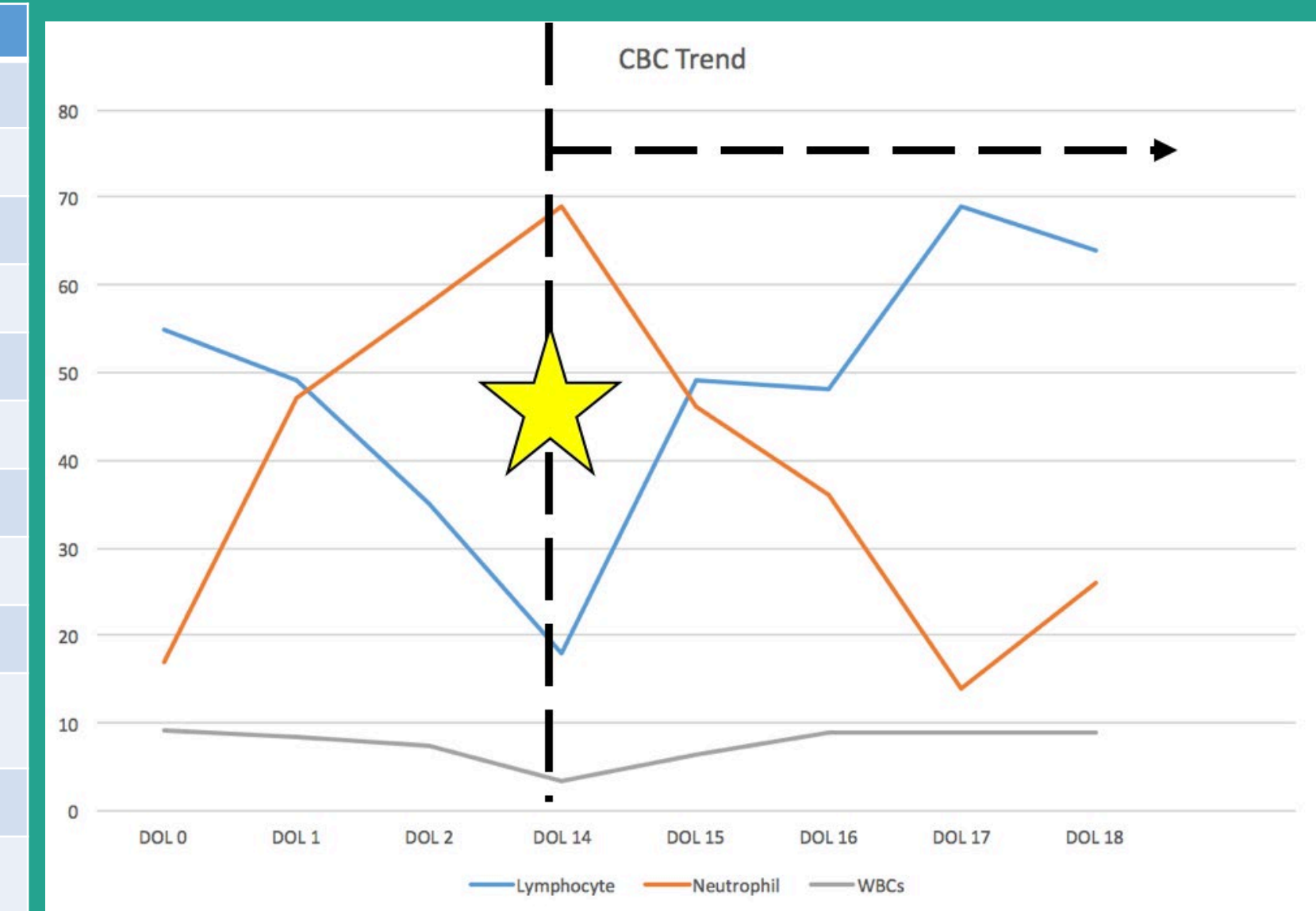
General	Irritable to exam. Not opening eyes.
Skin	Pale grey color in face, ruddy, bronze jaundice on body noted. "Firetruck" red color throughout body. Cobblestone erythemic rash on left foot, follows half way up shin.
HEENT	Anterior fontanel is enlarged. The sutures are split.
Cardiovascular	Murmur appreciated on left lower sternal border. Palmar pulses appreciated. Flash capillary refill.
Lungs	Mild to moderate retractions. Tachypnea and periodic breathing.
Abdomen	Hepatomegaly noted on exam, 3 cm down from RCM. Stool pale yellow.
GU	Normal (circumcised male)
Extremities	+2/+3 pitting edema noted.
Neurologic	Irritable to stimulation and cares. RN reports rigid tone when picking up.

Social History:

Other children at home were ill the week prior to this patient feeling sick. Children tested negative for Covid-19. Diagnosed with a URII, likely viral by the pediatrician. Mother never felt ill and continued to visit. *Grandmother did visit while she was ill.*

Diagnostic Results

Lab	Result
Blood Culture DOL 0	No growth
HSV PCR DOL 1	Negative
CMV PCR DOL 1	Negative
Toxoplasmosis DOL 2	Negative
Blood Culture DOL 15	No growth
Urine Culture DOL 15	No growth
Respiratory Panel DOL 15	Negative
Coronavirus -19 DOL 16	Negative
CSF Culture DOL 16	(Negative on DOL 22)
CSF Meningitis DOL 16 (includes enterovirus)	+ for human Parechovirus on DOL 20
CSF glucose	52 (serum: 130) (normal)
CSF protein	128.6 (high) (confounded with blood)
CSF RBC's	1,170 (Traumatic Tap)
CSF Nucleated Cells	8 (Normal 0-30)
MRI (outpatient)	Eight locations in brain concerning for periventricular leukomalacia. Largest foci 0.8 cm.



On DOL 19, infant was RA again and eating PO adlib. Infant's clinical presentation improved prior to having a definite diagnosis

Recommendations

US CDC concerned over parechovirus after one child dies

Hepatomegaly and Direct Hyperbilirubinemia at birth presented a difficult question: "Was there a diagnosis which connected the infant's congenital hepatomegaly to his present illness?" OR "Was the illness and the hepatomegaly two separate but co-existing features of the infant's clinical presentation?"

- Segregate patient
- Droplet & Contact Precautions
- PeV highest in Summer and Fall
- Consider nasal swabs, blood, or stool PCR to rule out PeV
- May also collect CSF if clinically concerned of meningitis
- When differential test results and clinical presentation don't match → keep searching
- Educate families who are noncompliant with hand washing, mask wearing, visiting when sick.

References



Utilization of the Nurse Champion Model to Improve the Process of Nurse-driven Change

Holly N. Eatmon, MSN, RNC-NIC, DNP Student
University of North Carolina at Wilmington
School of Nursing

Background/Significance

Nurses directly impact patient, organizational, and various clinical and cost outcomes, and they are critical in the facilitation of evidence-based practice (EBP) change.

Problem: Pinehurst, NC is home to a regional referral center that has 402 patient beds and is equipped with diversely experienced leaders. However, the organization did not receive Magnet redesignation, as there is great need for nurse-driven change and empowerment.

Project Focus: Outcomes driven, nurse-led change that has direct implications on Magnet recognition, decision making authority, EBP implementation, and nursing empowerment.

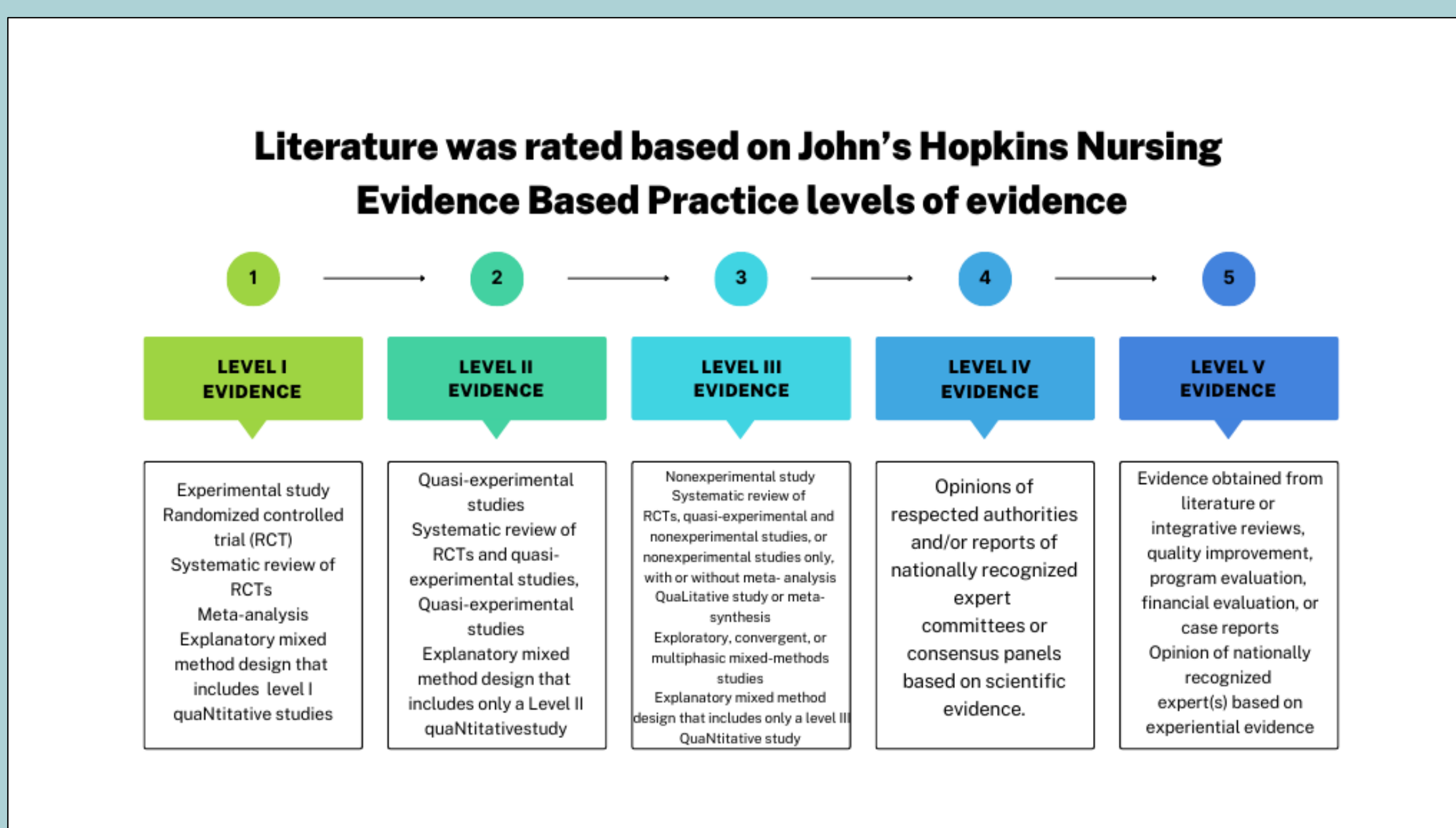
Project Purpose: Using the Nurse Champion Model, this project sought to provide an exemplar that showcases improvement of nurse-driven change. The exemplar occurred in a neonatal intensive care (NICU) setting and targeted improvement of developmental positioning of preterm neonates.

Evidence-based Practice Question

Does utilization of the Nurse Champion Model improve the process of nurse-driven change as evidenced by successful implementation of practice change initiatives?

Methods

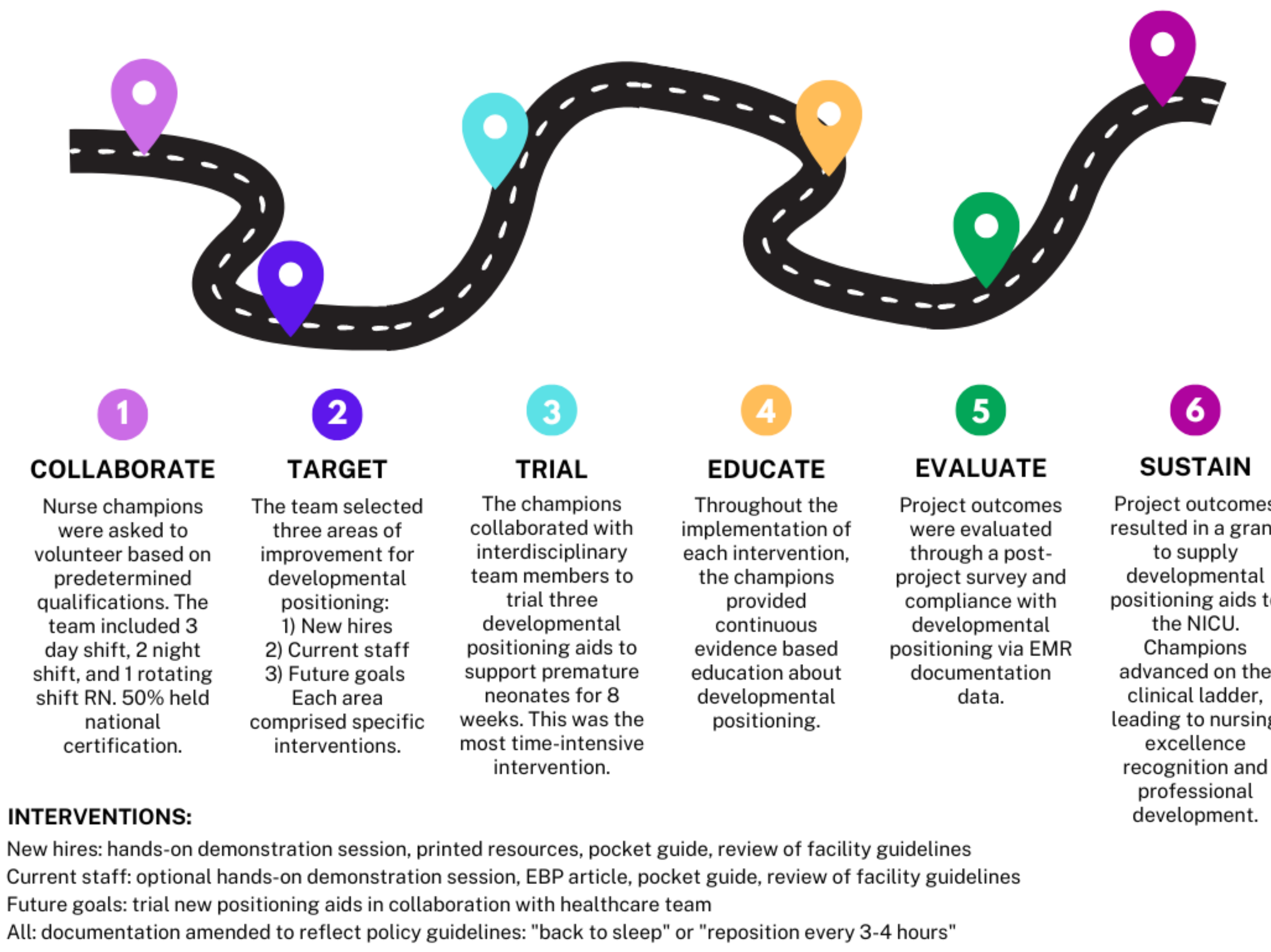
Best practices for change implementation and NICU developmental positioning were determined by extensive literature review.



Best Evidence Recommendation/ Organization Specific Intervention

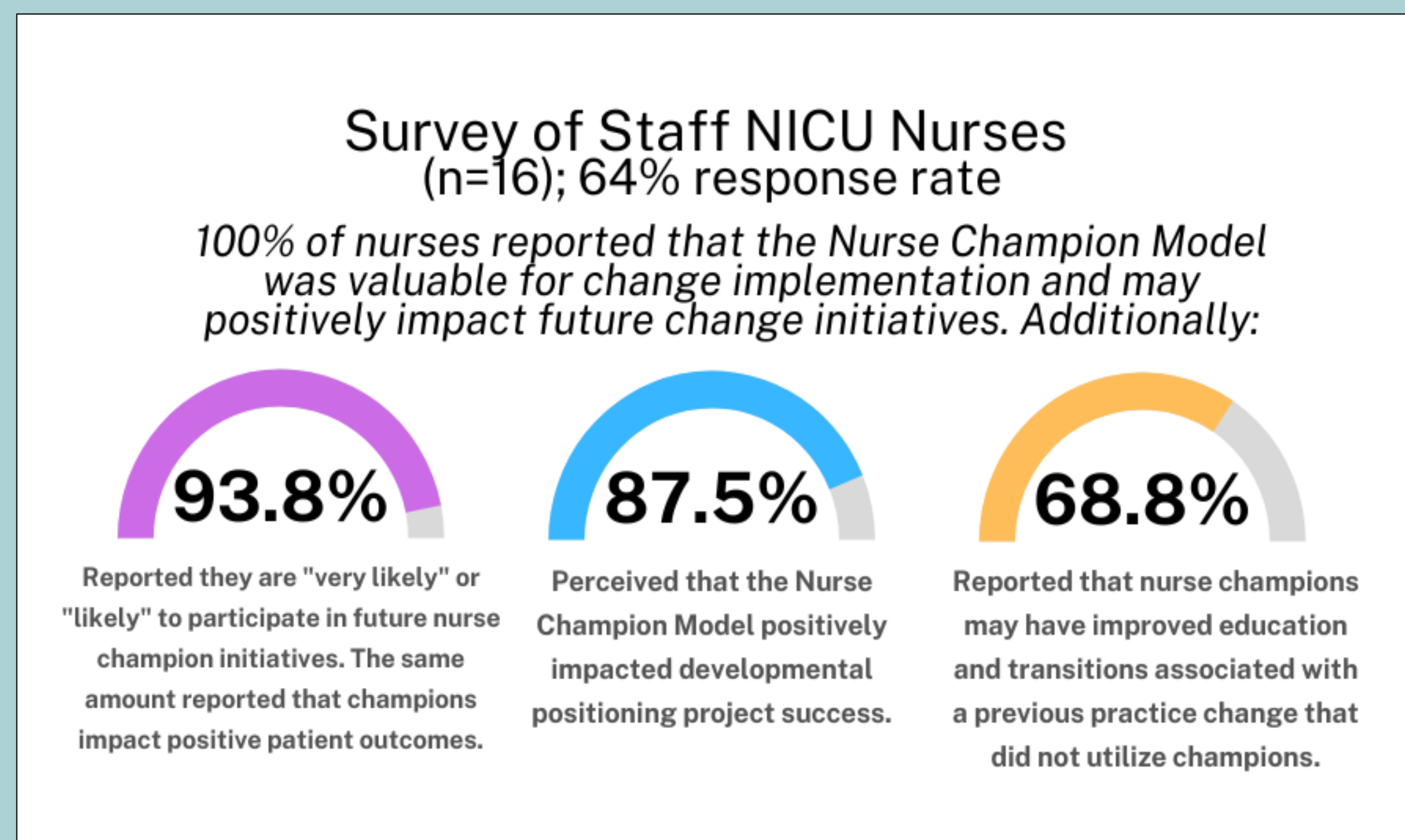
Literature was consistent in its support of nurse champions to facilitate nurse-driven change that is sustainable. A 6-member NICU nurse champion team was constructed to lead this project and improve the developmental positioning practices within a level III NICU setting. A post-project survey assessed perceptions of the Nurse Champion Model and its efficacy on developmental positioning. Compliance with change was evaluated with EMR data.

NURSE CHAMPION WORK



Project Outcomes

Electronic medical record data reflected that staff RNs implemented developmental positioning **87% of the time when indicated** over a period of 10 weeks. This surpassed aggregate benchmark data for stroke patients in the organization who underwent EBP dysphagia screening prior to "by mouth" food/liquids/medications (74.4%). **Of all documentation occurrences considered compliant, 57.19% of these were implored on the target population (infants <35 weeks gestation).**



Discussion and Implications

Utilizing the Nurse Champion Model in the NICU influenced change and improved outcomes. Nurse-driven change is critical to the empowerment of nurses and facilitation of innovative practice improvements.

Literature supports that nurse champions can foster change, shift unit cultures, inspire others, disseminate knowledge and education, impact care, outcomes, and performance, and reinforce quality and safety.

\$10,000

This project resulted in a grant that will support purchasing of developmental positioning aids.

The grant may be renewed each year.

NURSING EXCELLENCE

This QI project allowed for nurse champion clinical ladder advancement, which is organizational recognition of excellence and professional development.

The NICU has the largest number of clinical ladder participants in the division.

EMPOWERING

nurses to engage in EBP allowed for improved outcomes and innovative practice change.



IMPACT



Use of the Nurse Champion Model achieved organizational impact through generating funding, facilitating professional development, and providing evidence of nurse-driven change for Magnet.

This project was accepted for poster presentation at the Academy of Neonatal Nursing's Advanced Practice National Conference in Honolulu, HI.

Acknowledgements

A special thank you to Dr. Melissa Scott, a wonderful UNCW professor, for her continued dedication in helping make this project a bigger success than ever would have been possible alone. Tremendous thanks to the nurse champion team for their support and commitment: Kara Oldham, BSN, RNC-NIC, Caroline Kettlety, RN, Haley Purvis, BSN, Taylor Prall, BSN, and Cynthia Whitaker, BSN, RNC-NIC. Cynthia's leadership and advocacy for this project was invaluable. Thank you to Dr. Lynn, Dr. Vallen, FHMHR leadership, and the FirstHealth Foundation for their approval, support, and grant funding for this project and its sustainment. Finally, thank you to my friends and family- the world's best supporters.

Have questions?
Please feel free to contact me:
hollyeatmonRN@gmail.com



Family Centered Care: Analysis of a Parent Based Approach to Diaper Dermatitis

Esser, M.S. PhD, NNP-BC, CWCN
Bellin Health, Green Bay, WI



Introduction

Skincare is an important component of parenting and an area often easily performed by parents. A consistent approach to diaper dermatitis (DD) was implemented October 2022 using a nursing driven approach.

Objective

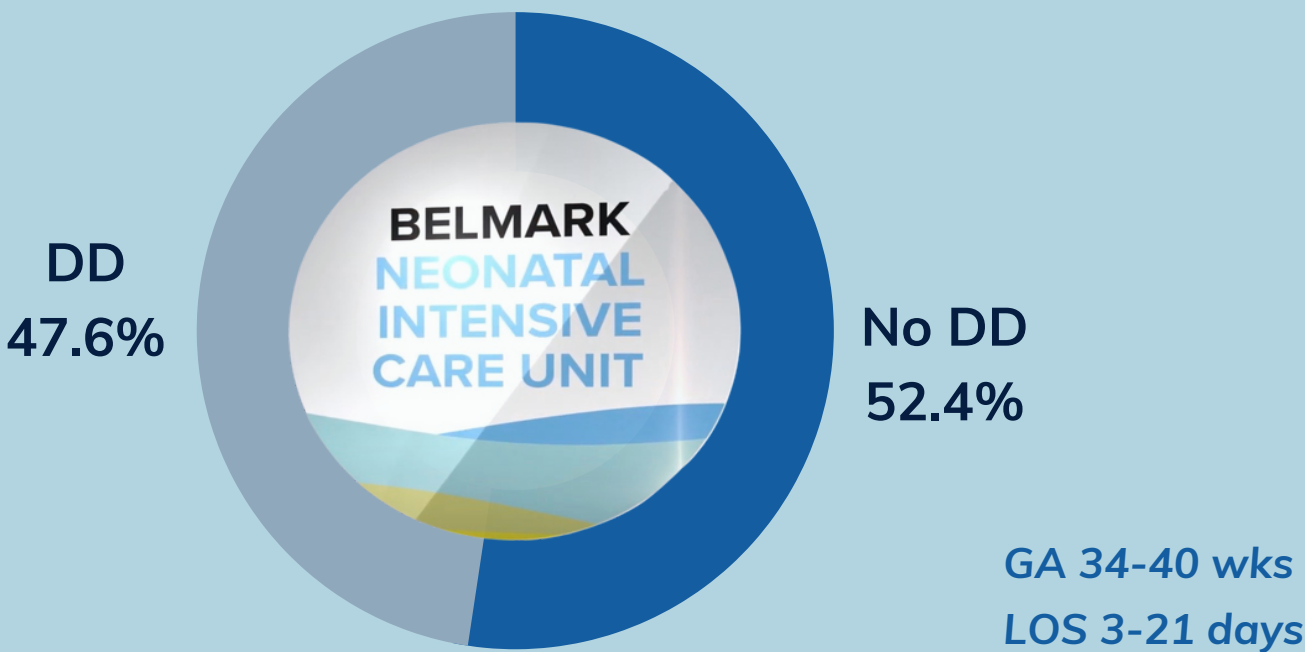
To identify the number of parents that room in after discharge and the prevalence of diaper dermatitis within the level II NICU based on data related to parental involvement in skin care, specifically DD.

Methods

A synthesis of retrospective data collected from the electronic health record was performed for August - September 2022. Data prior to the practice change of DD care was intentional.

Diaper Dermatitis Prevalence

(August - September 2022)
n = 21

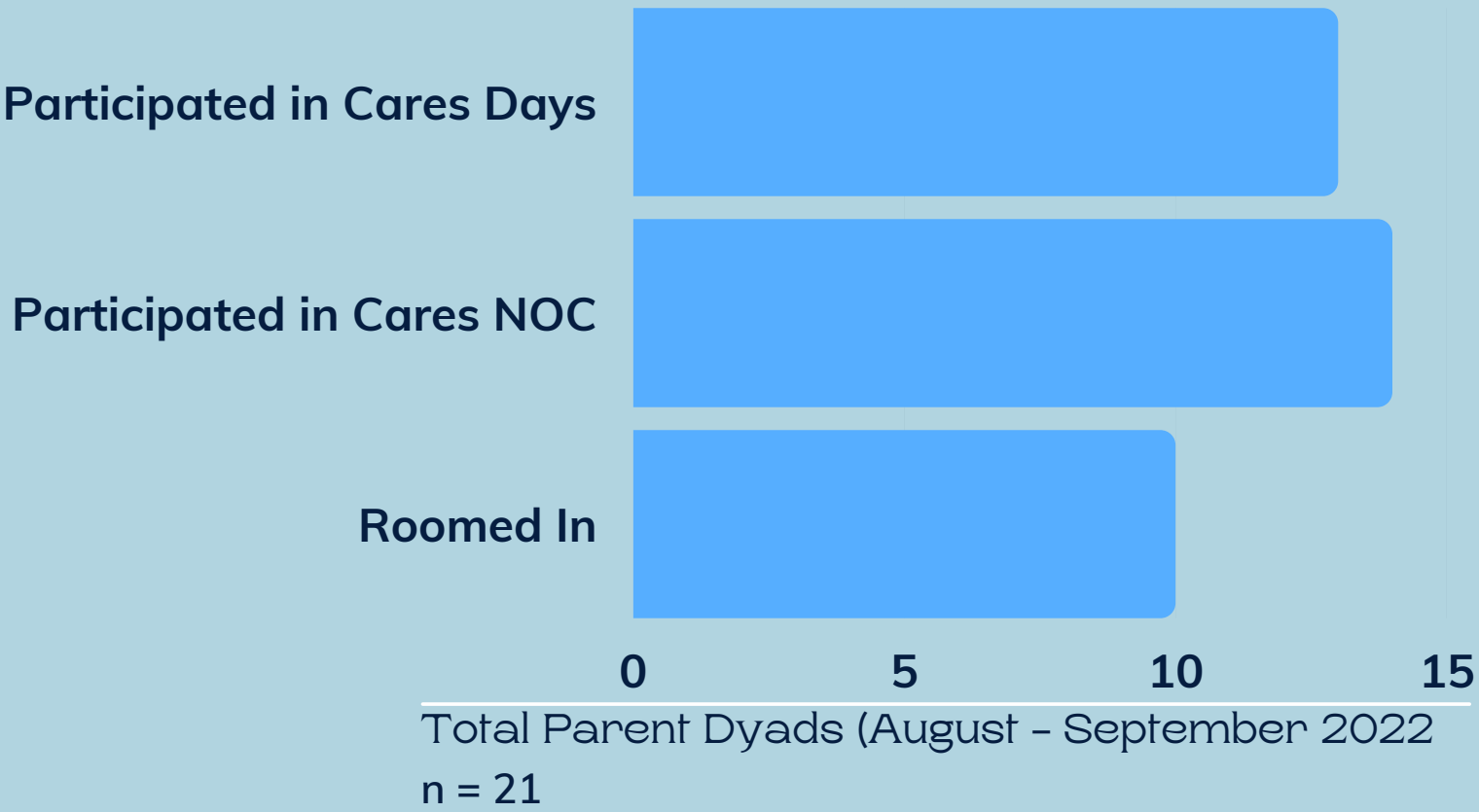


Limitations

Infants that had a length of stay <2days were excluded.

Results

A preliminary analysis provides information to provide the basis for further development of FI-Care as it relates to DD care. Engagement of parents in DD care may result in a lower prevalence of diaper dermatitis over time.



Implications for Practice

Ongoing audits of parent involvement in skin care may be beneficial in decreasing the prevalence of DD.



Conclusion

The identification of areas for improvement in parent involvement should expand to other areas of neonatal care to continue improvement in parent bonding and the health of neonates.

Improving Communication in NICU Post-Operative Handovers

Jessica Wickland MD, Kristen Farnsworth NNP, Tara Kaleh RN, Mary Callaway RN, Petra Poole RT, Angie Bannochie RN, Mohammed Elkhwad MD, and Gregg Martin MD

Division of Neonatology, Phoenix Children's Hospital, Phoenix, AZ

Background

- The Phoenix Children's Hospital (PCH) neonatal intensive care unit (NICU) is comprised of a high number of surgical patients with regular occurrence of post-operative handovers
- Interdisciplinary, team-based handovers improve transition of care between operating rooms (ORs) and ICUs
- Communication errors are a common cause of preventable medical errors with many of these occurring during patient handovers
- Standardization of handovers can improve team communication and patient safety during this critical transition

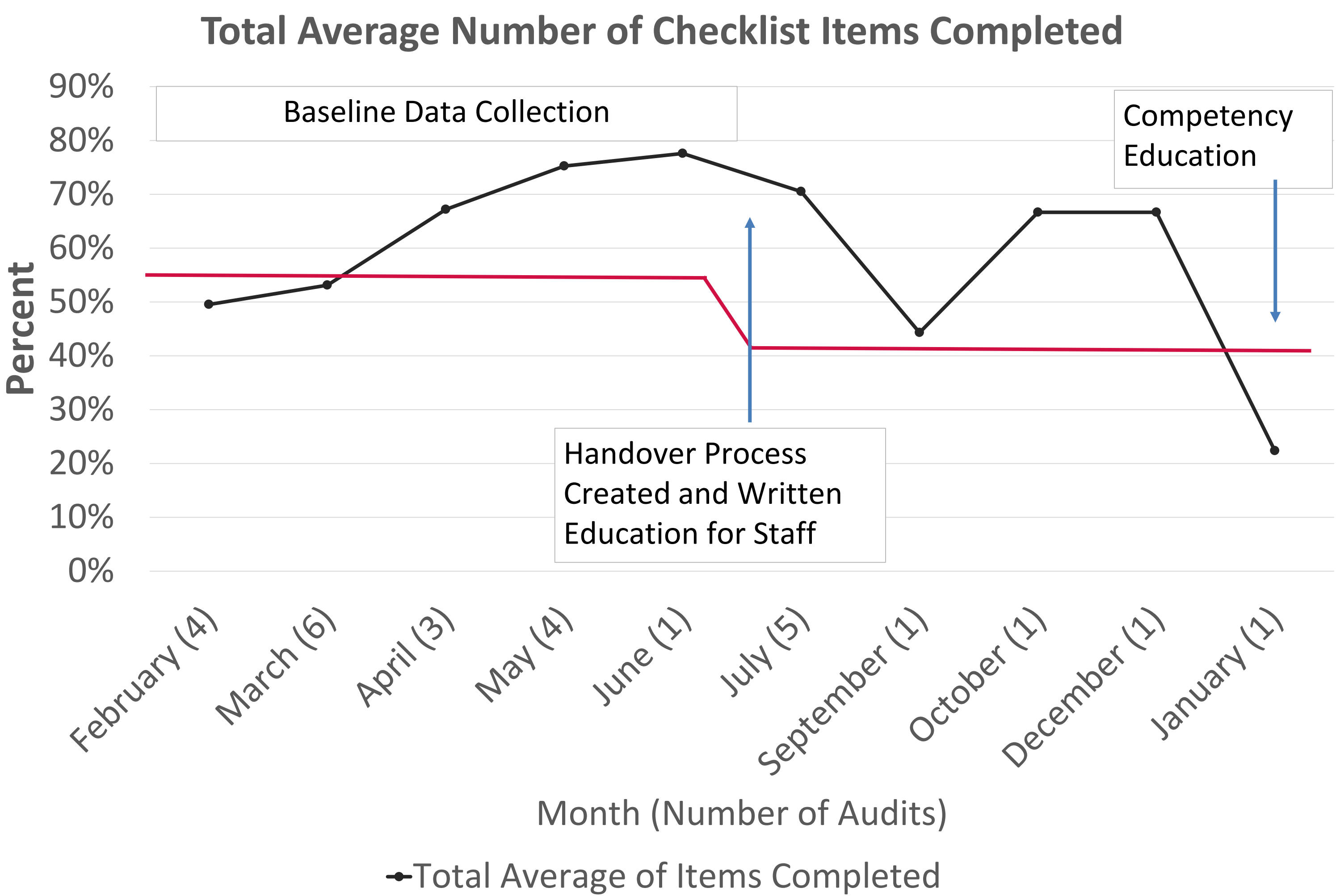
Aim Statement

Improve communication in post-operative handovers occurring in the PCH level IV NICU by increasing percentage of completed handover items to >75% by July 2022

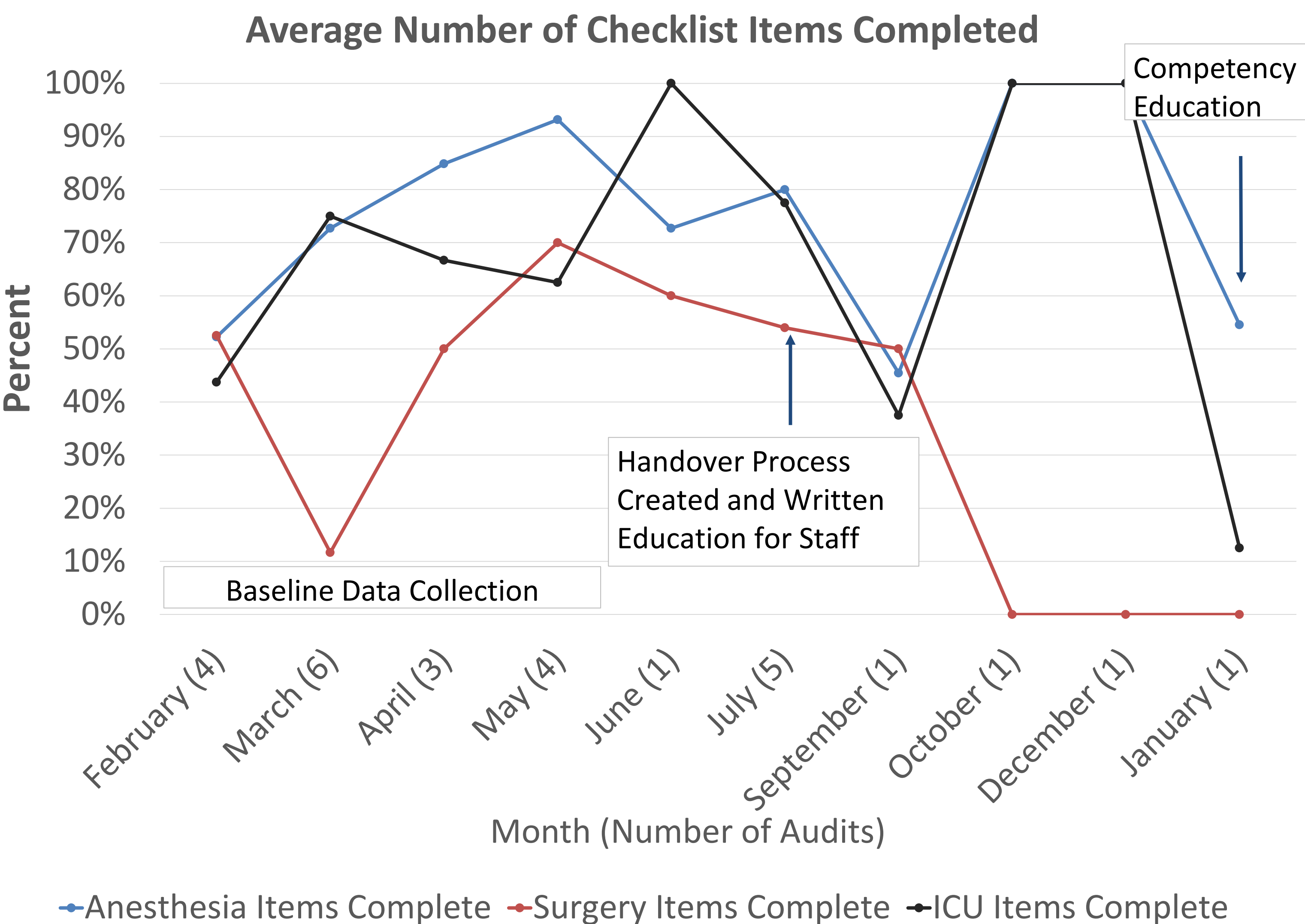
Intervention Description

- Baseline data were collected by random audits, using a standardized data collection tool, of post-operative handovers occurring from February 2021 through June 2021
- A standardized system based handover was created
- Staff were surveyed following the handover process
- NICU staff were provided education on the new multidisciplinary sign out with all team members listening to the standardized system-based handover July 2021
- Quarterly competency education was started February 2022

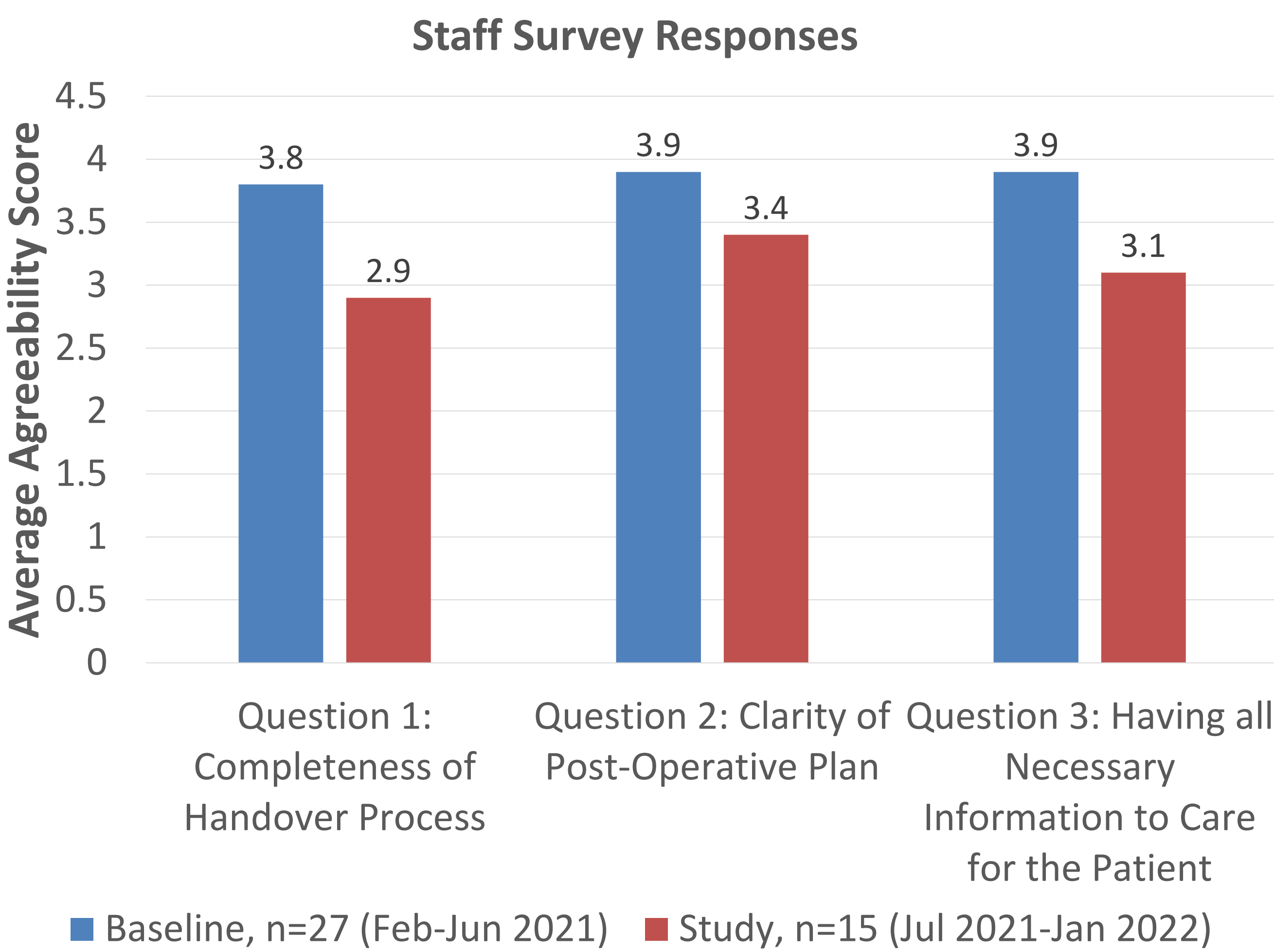
Metrics



- The baseline average percentage of completed handover items reviewed during the post-operative handover for the anesthesia, surgical, and NICU teams were 75%, 49%, and 70%, respectively
- Following implementation of the handover process the average percentage of completed items were 76%, 21%, and 66% for anesthesia, surgical and NICU teams, respectively



Results



- Multiple surgical subspecialties were involved in post-operative care, including general pediatric surgery, urology, neurosurgery, cardiology, ophthalmology and otolaryngology
- During the baseline period six out of eighteen audits (30%) a surgical team member was unavailable during the post-operative handover and this increased to four out of nine audits (44%) during the study period

Conclusions and Future Directions

- The completion of the post-operative handover for NICU and surgical teams, remains below the target of 75%
- Limitation of the data is the small number of audits in the study period, which is likely affected by staffing shortages and high patient census
- Future goals include decreasing the time for the post-operative handover process and increasing direct surgical team member communication during the handover

Human Milk Fortification: Impact of a New Fortifier on Growth Velocity and Tolerance; a Retrospective Study

Jennifer Fowler MS, RDN, LDN¹; Jennifer Dombrowski MSN, NNP-BC²; Olivia Davis PA-C²; Adrian Florens MD²; Kirsten Frank RDN, LDN, CNSC, IBCLC³; Austin Gratton³; Tiffany Blanks ⁴; Fernando Moya MD⁴;

¹ECU Health Medical Center, Greenville, NC, ²Kidz Medical Services, West Palm Beach, FL , ³Novant Health New Hanover Regional Medical Center, Wilmington, NC, ⁴UNC School of Medicine Dept. of Pediatrics, Wilmington, NC



Introduction

- Human milk is the recommended source of nutrition for all infants.
- Standard of care for preterm infants involves the addition of a human milk fortifier (HMF) to the infant's feedings. This is necessary for optimal growth and meeting needs of preterm infants.
- Growth and safety were evaluated using a new non-acidified liquid HMF (NALHMF) vs. the acidified liquid HMF (ALHMF) in preterm infants receiving human milk.

Methods

A multicenter, retrospective comparison of 539 infants receiving NALHMF vs ALHMF during 2020-2021. Demographic information, growth parameters, daily enteral and parenteral intake, serum chemistries, acid base status, and morbidity/mortality data were collected.

Entry Criteria:

- Birth weight <1500g and < 32 weeks
- Maternal or Donor milk feedings, no formula
- Enteral Feeds $\geq$ 80mL/kg

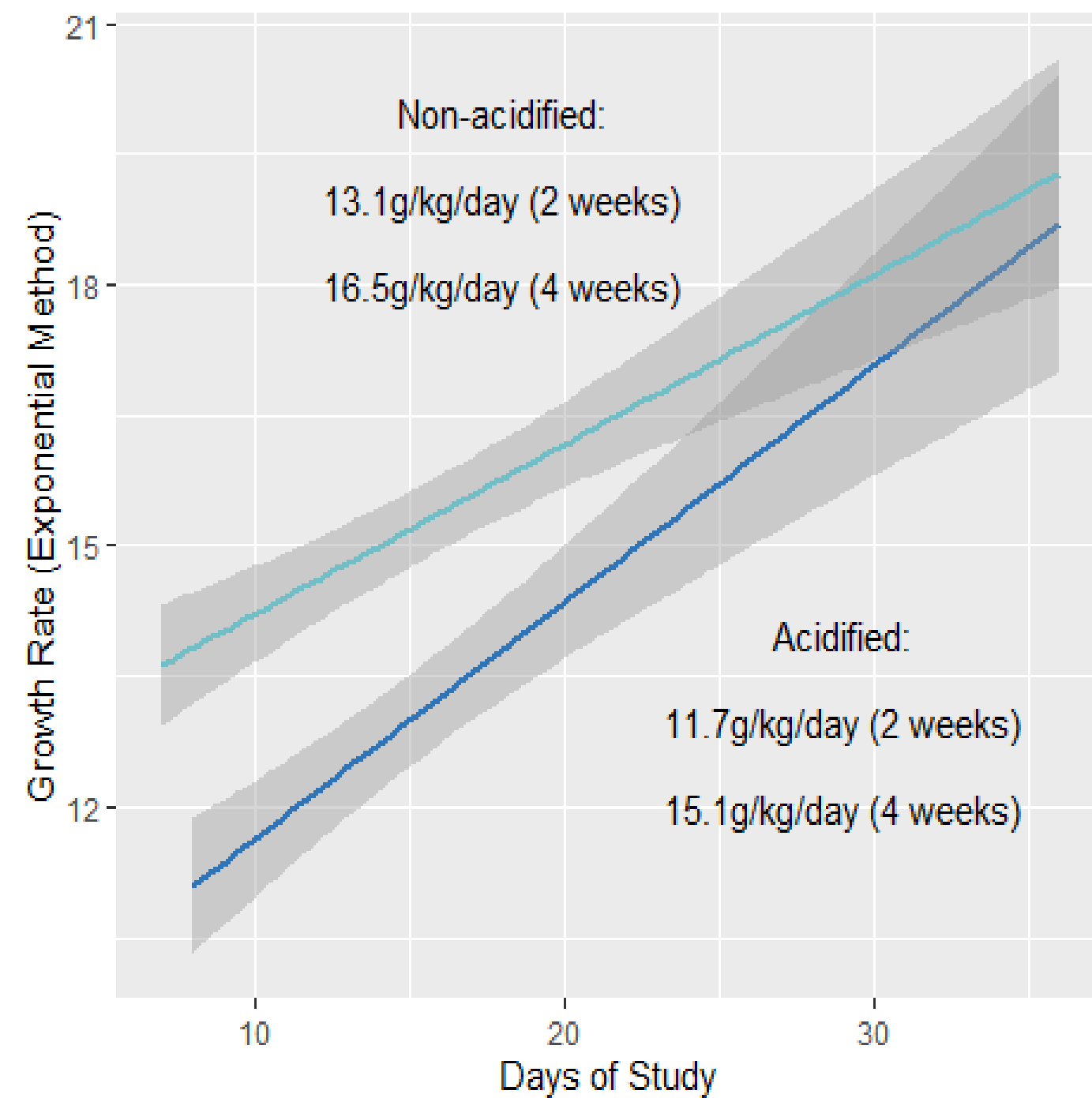
Comparison of Cohorts

Variables: median (IQR)	Acidified HMF (N=264)	Non-Acidified HMF (N=275)	P
Birth weight, g	1100 (863-1299)	1075 (868-1281)	0.52
Birth length, cm	36 (33.0-38.5)	37 (34.0-38.5)	0.37
Birth Head Circ., cm	26.0 (23.5-27.0)	25.5 (24.0-27.0)	0.50
GA, weeks	29+1 (26+6,30+2)	28+5 (26+6,30+1)	0.22
SGA %	27 (11.2)	35 (12.8)	0.67
Day at start of enteral feeds	3 (1.8-6)	2 (1-2)	0.83
Days of age at fortification	7 (6-12)	8 (6-13)	0.09
Days of TPN before start of HMF	6 (5-9)	6 (5-9)	0.90

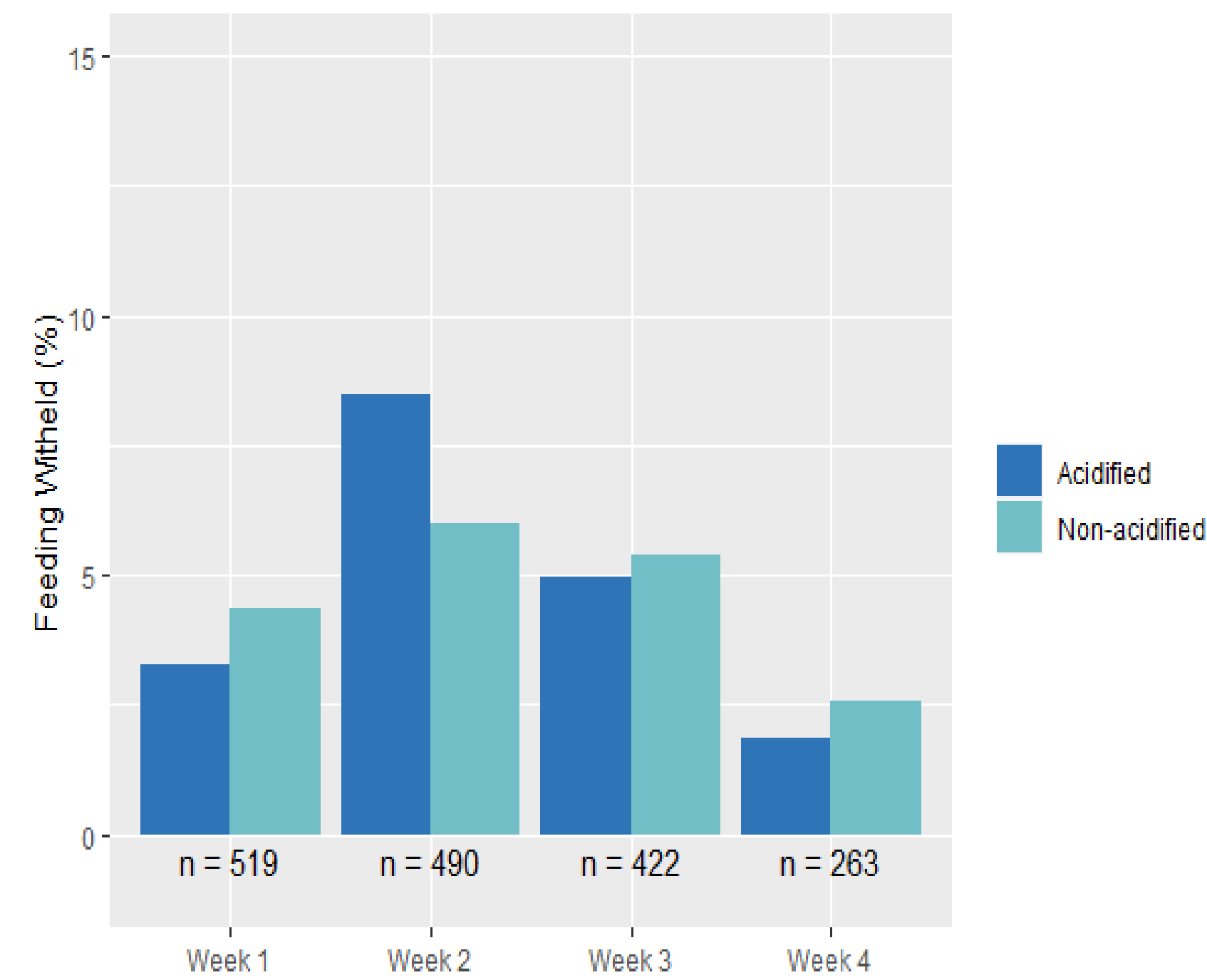
The Wilcoxon Mann Whitney test for continuous variables was used due to non-normality.

Results/Outcomes

Average Growth Velocity at Start of Fortification

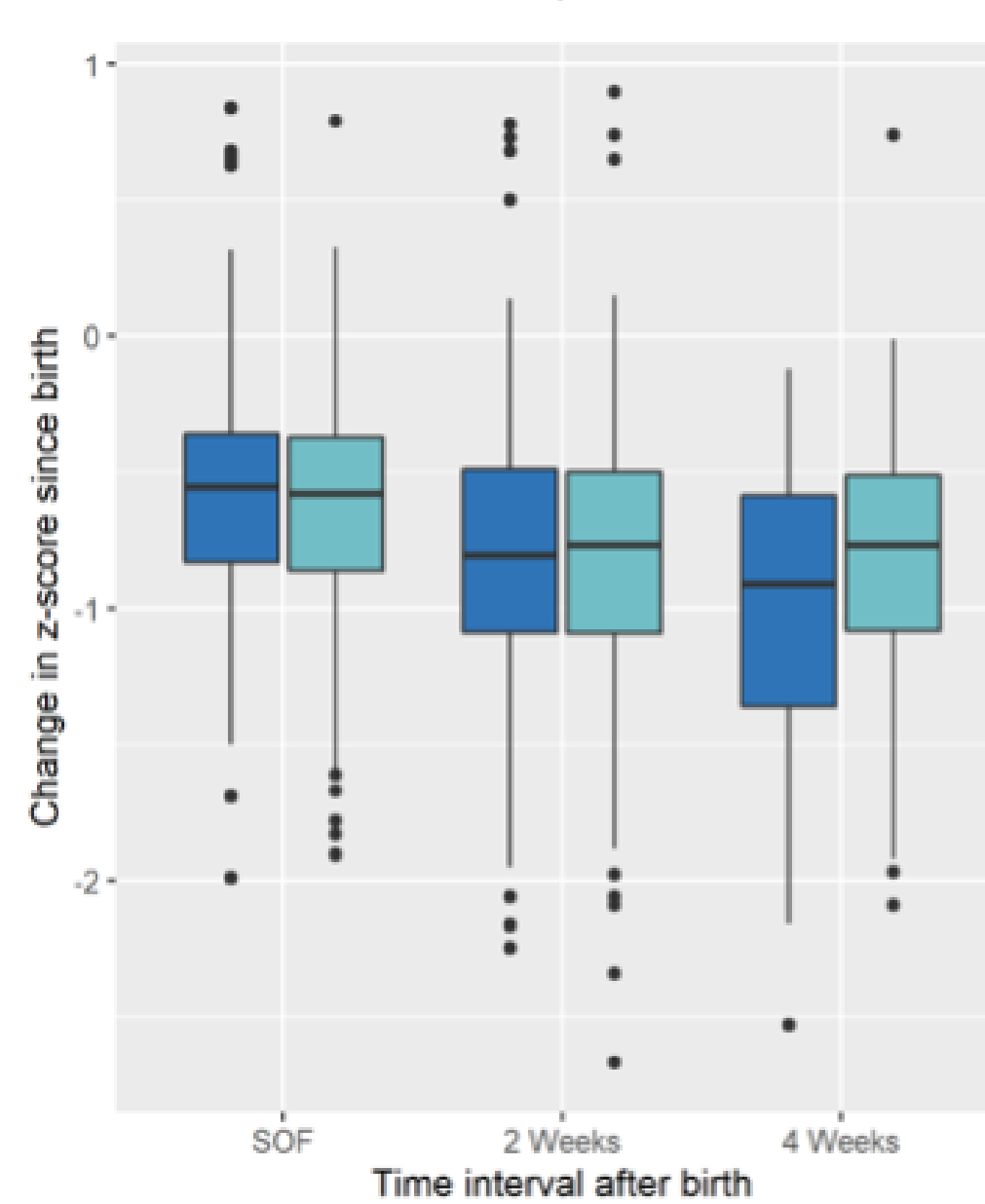


Feeding Intolerance per Study Week (%)

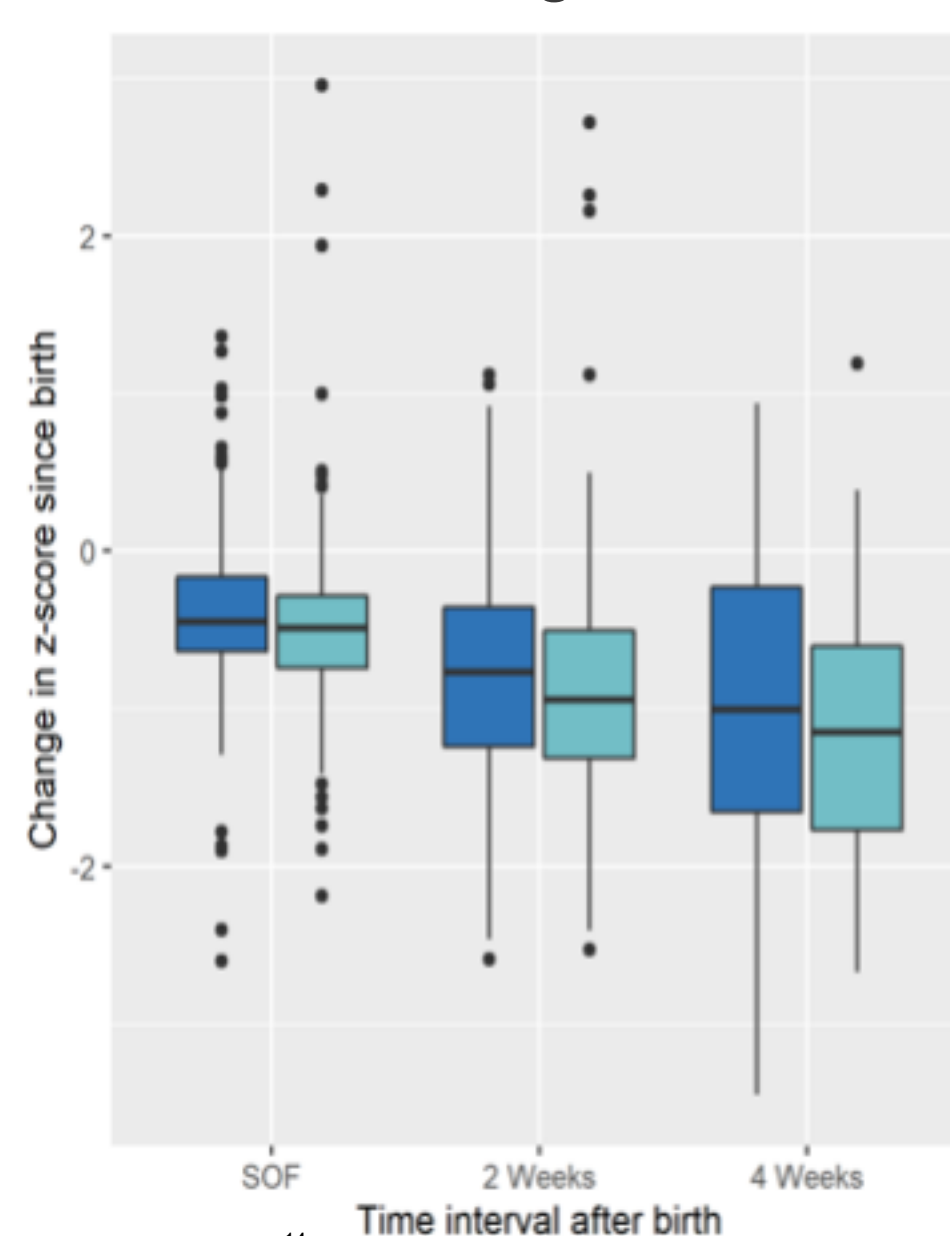


Change in Z score since birth

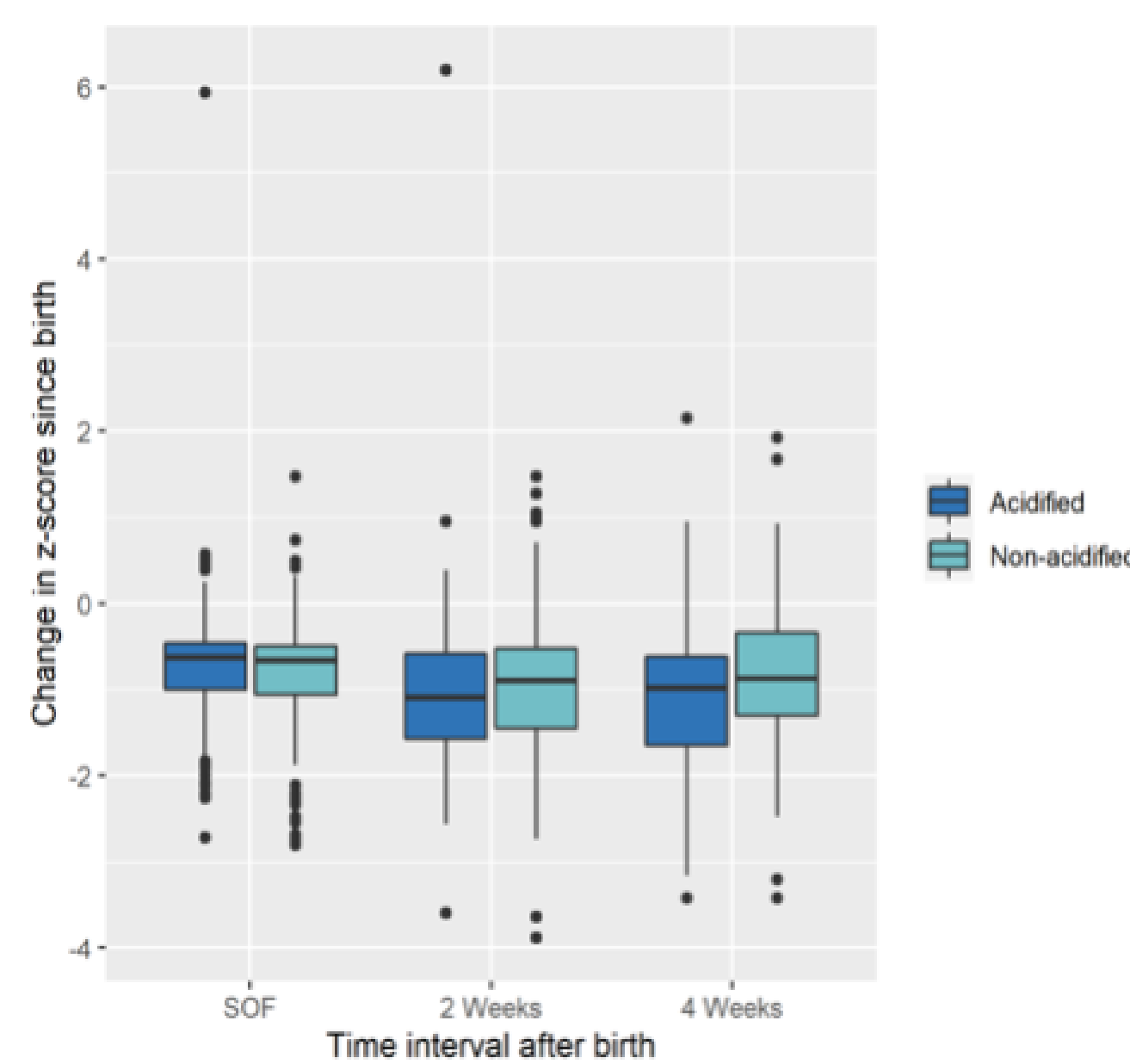
Weight



Length



Head Circumference



Variables: median (IQR)	Acidified HMF (N=264)	Non-Acidified HMF (N=275)	P
Length of stay, days	68.0 (48, 91)	66.0 (48-93.5)	0.69
GA at Discharge, weeks	38+5 (37+0, 40+6)	38+1 (36+4,40+5)	0.15
Discharge weight, g	2670 (2286, 3173)	2635 (2302, 3170)	0.61
Discharge length, cm	45.6 (43.5, 47.5)	45.1 (43.5,47)	0.20
Discharge HC, cm	33.0 (31.5, 34.5)	33.0 (31.5,34.5)	0.54
NEC, confirmed	15 (5.7%)	13 (4.7%)	0.624
Sepsis, culture proven	26 (9.8%)	24 (8.7%)	0.667

Summary

- The baseline demographics were not different between the NALHMF and ALHMF groups.
- Growth velocity was higher in the group receiving the NALHMF versus the ALHMF group after 2 and 4 weeks of fortification.
- Tolerance was comparable between both groups.
- LOS, anthropometrics at d/c, NEC and Sepsis were also similar between groups.

Conclusion

- These data suggest that the new NALHMF is a suitable alternative to the ALHMF for use in preterm infants.

Acknowledgements

The study was supported by a research grant from Mead Johnson Nutrition/Reckitt.

Background and Problem Statement:

The Level IV NICU at Children's Hospital Colorado provides care for critically ill neonates, with an average of 13 patients requiring Extracorporeal membrane oxygenation (ECMO) cannulation annually and 149 days per year with a patient on ECMO over the past five years. ECMO orientation for bedside RNs in our large Level IV NICU was limited, consisting of one shift with a preceptor followed by one independent shift. Additionally, we did not have a system for tracking ECMO patient care hours, nor did we offer continuing ECMO education. Thus, it was difficult for us to accurately assess and maintain bedside RN ECMO competency. This lack of consistency required the ECMO Specialist to provide frequent re-education at the bedside, leading to decreased caregiver satisfaction. After review of this data and feedback, we sought to improve the consistency, education and overall satisfaction of team members caring for patients on ECMO.

Project AIM

The primary project AIM was to decrease the number of RNs caring for each ECMO patient to improve consistency for families, with a goal rate of RNs per patient of <0.6 . The secondary objectives were to increase RN confidence in caring for ECMO patients by 20% as well as increase ECMO Specialist satisfaction with bedside ECMO nursing by 20% during the 2021-2022 rollout.

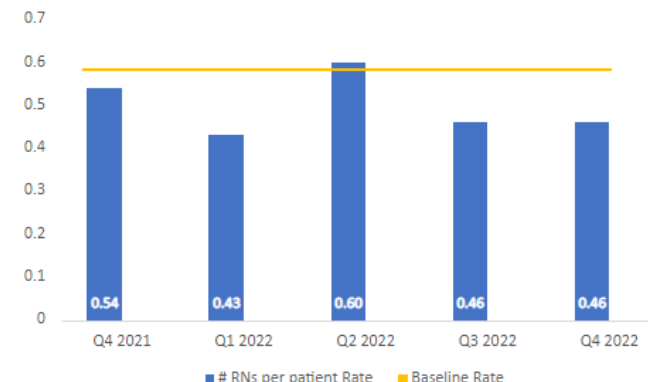
Interventions



- Developed a core team of NICU ECMO bedside RNs
- **Qualifications for application:** Oriented to deliveries and high-acuity patients, PALS certified, preceptor, at least 1 year of experience at Children's Hospital Colorado and 2 years in a Level IV NICU
- RNs sent letters of intent to join ECMO Team with a two-year commitment
- RNs chosen based on scoring system incorporating years of experience, qualifications, and quality of letter of intent
- Assigned specific RNs to ECMO patients each shift (care schedules) and tracked patient consistency and number of ECMO shifts for each RN

- Initial 8-hour education session held for all team members, presented by ECMO Specialists and NICU Attendings
- **Topics:** Indications for ECMO, Fluid Management of the ECMO Patient, ECMO Daily Management, and ECMO in the Management of Patients with Congenital Diaphragmatic Hernia
- Annual required education sessions for all new members
- Quarterly meetings offering ongoing education opportunities and continual process evaluations

Project Results/Performance: Rate of RNs per Patient



Primary Outcome: Tracked unique RNs that cared for patients per shift of ECMO run to calculate rate per patient and then evaluated quarterly

- Improved nursing consistency, as demonstrated by decreased rates of RNs per patient (0.58 to 0.51 in the first year)

Secondary Outcomes: Measured using a 5-point Likert scale survey sent to ECMO nursing team and ECMO Specialists prior to team development and again at 6 months and 1 year

- Increased RN confidence in caring for ECMO patients by 20% at 6 months and 14% at 1 year
- Increased ECMO Specialist satisfaction with ECMO bedside RN care by 33% at 6 months and 28% at 1 year

Challenges and Barriers:

- Inconsistency among charge RNs with care schedule prioritization
- ECMO patients with short runs skewed rates of RNs per patient
- RN resignations and movement from night shift to day shift led to a smaller team on night shift
- Long periods of time without ECMO patients resulted in decreased RN confidence

Lessons Learned and Next Steps:

- Rates of RNs per patient were higher when trying to accommodate all team members on one care schedule.
- Collaboration with ECMO Specialists on this project allowed for education to directly address the knowledge gaps they were identifying, and we utilized their expertise for providing the education.



Decreasing Unplanned Extubations in a Level IV NICU

Alexandra Hamby, MSN, RNC-NIC, Andrea Reinicke, BSRC, RRT-NPS, Danielle Smith, MD, Valeri Batara Aymami, MSN, RN, CNS, CPN, PCNS-BS, Sara Hanlon, BSN, RNC-NIC, Jillayne Debus, BSN, RNC-NIC

March 2023

Background:
In comparison with Solutions for Patient Safety (SPS) pediatric hospital Neonatal Intensive Care units (NICU) across the United States, Children’s Hospital Colorado (CHCO) NICU has experienced a high rate of unplanned extubations (UE). CHCO NICU had a total of 15 and 32 UE outcome events in 2020 and 2021, respectively. Of these events 21 patients required re-intubation within one hour of extubation and 1 patient required re-intubation and experienced cardiac collapse within one hour of extubation. Unplanned Extubations are associated with an increased hospital cost of \$101,310, ICU length of stay days and hospital length of stay days. Comorbidities associated with unplanned extubations include stridor, bradycardia, need for urgent/emergent intubation and cardiac arrest. The NICU at CHCO services neonates and infants in a 7-state region, caring for complex patients requiring Level IV NICU care. Due to their complexities, many patients require long-term intubations and extended ICU stays.

Problem Statement:
Unplanned Extubations are preventable events when correct interventions are in place.

Project AIM (goal statement):

Decrease Unplanned Extubation rate in the NICU by 20% from baseline of 0.62/100 ventilator days to 0.5/100 ventilatory days by the end of 2022.

Key Drivers and Interventions

Parent Holding

- PDSA Cycles for parent holding checklist
- Q 30-minute tube/ baby checks during holding
- Holding readiness discussions in bedside rounds
- Documentation compliance: Q30 minute tube/baby holding checks AND holding readiness discussions

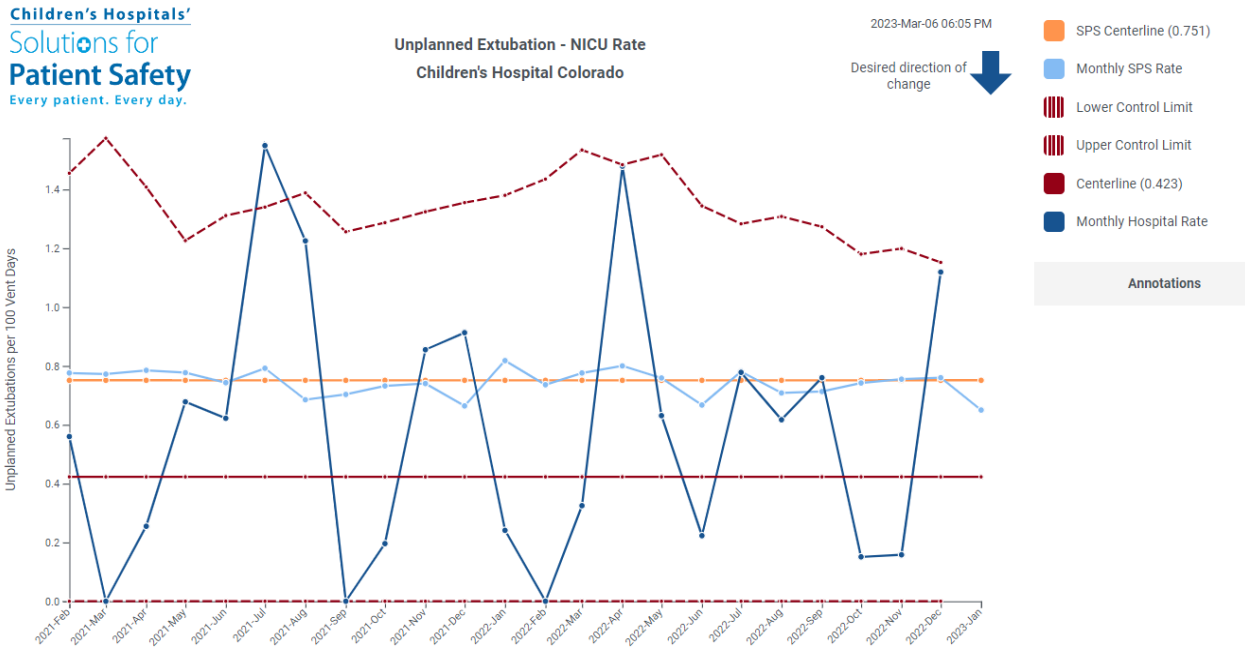
Unit Education & Communication

- NICU Nurse Performance Goal for 2021-2022 Evaluation Cycle includes UE Reduction aims
- Bi-weekly multi-disciplinary Unplanned Extubation Rounding and documentation
- Streamlined communication: Monthly UE reduction aim status updates, rounding trends and event debriefing findings

Unit Standardization

- Airway Cards and Parent Holding checklists in patient rooms for quick reference
- Transition to 3M tape for standardized endotracheal tube securement
- Automated event detection and real time Apparent Cause Analysis event reviews

Project Results / Performance:



	2021-Feb	2021-Mar	2021-Apr	2021-May	2021-Jun	2021-Jul	2021-Aug	2021-Sep	2021-Oct	2021-Nov	2021-Dec	2022-Jan	2022-Feb	2022-Mar	2022-Apr	2022-May	2022-Jun	2022-Jul	2022-Aug	2022-Sep	2022-Oct	2022-Nov	2022-Dec
# of Unplanned Extubation NICU Events	2	0	1	4	3	7	5	0	1	4	4	1	0	1	5	2	1	4	3	4	1	1	8
NICU Ventilator Days (exc. tracheostomy)	357	287	392	590	482	452	408	548	509	468	438	415	371	308	338	317	448	514	486	526	663	631	715

Key Measures	Definitions	Baseline	Goal	Progress
Outcome	Decrease rate of unplanned extubations by 20% from 0.62/ 100 vent days to 0.5/100 vent days.	0.62/100 vent days	0.5/100 vent days	0.49/100 vent days
Process	UE Bundle compliance with standardized audit (number of compliant audits/number of completed audits).	82% 112/136	>90% 20/month	74% 39/53
Balancing	Time to first parent holding.	84.1 hours to first hold	67.3 hours to first hold	23.1 hours to first hold

Challenges and Barriers:

- Ability to meet SPS standard of 20 bundle audits per month per area due to difficulty balancing patient acuity and volumes and turnover of team members.
- Standard location of Airway Card and Parent Holding Checklist due to variability in patient room layouts.
- Re-enforcement of the parent holding checklist past the first time the parent holds due to lack of enculturation.
- Staffing challenges: Attrition rates and new hire rates are high for nursing and respiratory therapy disciplines.
- Competing unit priorities: Several NICU and hospital-wide improvement goals.

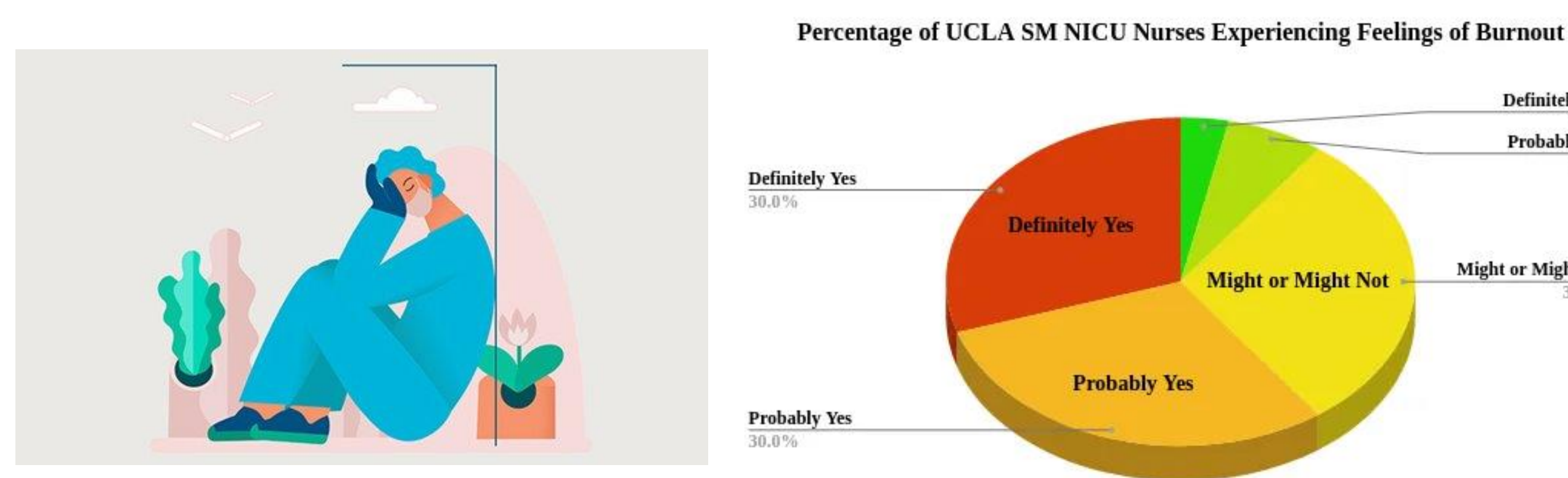
Lessons Learned and Next Steps:

- Extubation Readiness Guidelines targeting post-procedural patients and patients with bronchiolitis, which account for near 50% of Unplanned Extubations in 2021.
- Update to bundle auditor education to reflect securement standardization and to make training a more efficient process.

Fight the Burnout: Phase Two of a NICU Nurse Wellness Bundle

Background and Significance

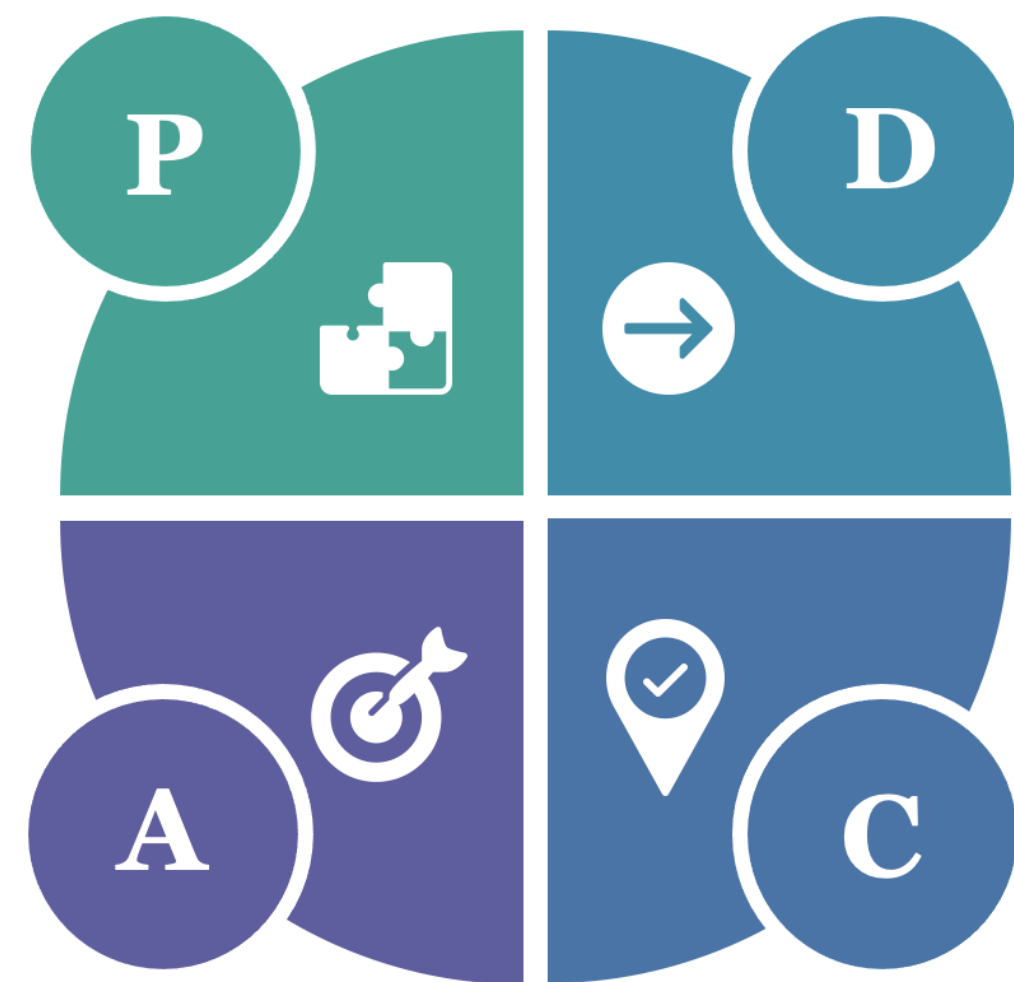
- Pre-pandemic burnout rates among nurses in United States ranged between 35-45% and are likely significantly higher.⁹
- The Intensive Care Unit (ICU) environment contributes to nurse burnout.⁸
- The World Health Organization (WHO) defines burnout as, “a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed. It is characterized by three dimensions: feelings of energy depletion or exhaustion; increased mental distance from one’s job, or feelings of negativism or cynicism related to one’s job; and reduced professional efficacy.”¹²
- Individual costs of burnout include fatigue, memory deficits, depression, suicidal ideation, anxiety, sleep disturbance, irritability, and substance abuse.⁶
- Organizational costs include poor patient satisfaction, employee lack of compassion in care, missed workdays, worse health outcomes, diminished job performance, and high turnover, resulting in increased organizational financial cost.⁶
- In May 2021, 90% of SM Neonatal ICU (NICU) Nurses who completed the “Resilience of the NICU Staff” Survey (30 nurses) reported some level of burnout.



Purpose of Initiative

- Purpose of Quality Improvement (QI) initiative:** Decrease SM NICU nurse burnout.
- PICO(T) question:** In SM NICU nurses, how would a three-year implementation of a Nurse Wellness Bundle, compared to current practice, affect burnout?
- The Plan, Do, Check, Act (PDCA) Model was used for the process and change.³

Plan
Clarify problem, analyze baseline state of NICU nurse burnout using ProQOL5 baseline survey, perform burnout literature search, complete synthesis tables, begin A3, develop goals, and analyze root cause



Act
Refine the NICU Wellness Bundle based on what was learned, determine modifications that should be made, and prepare for another cycle

Do
Implementation of NICU Wellness Bundle, administer ProQOL5 survey at 6 months and yearly for 3 years, document problems and unexpected observations, and begin analysis of data

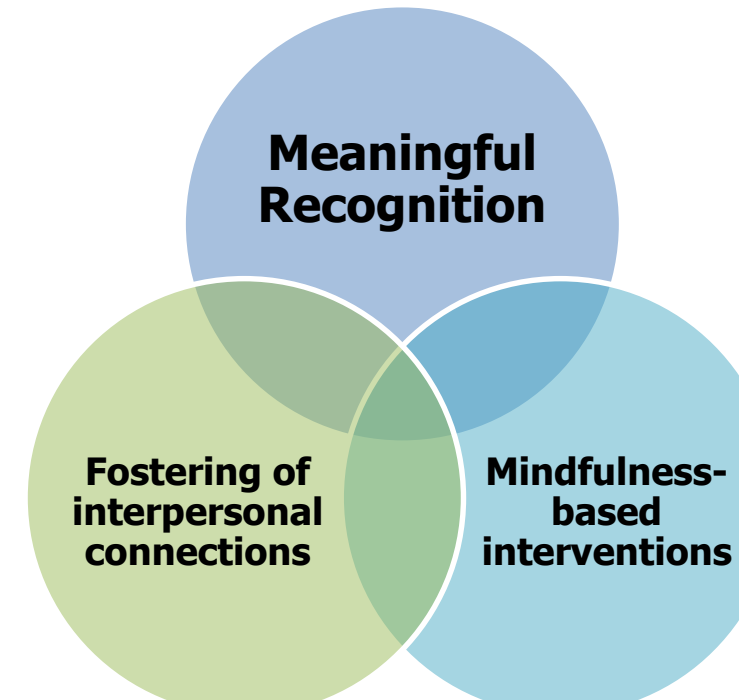
Check
Evaluate mean burnout scores on ProQOL5 surveys and effectiveness of NICU Wellness Bundle, compare data to goals, summarize, and reflect

Synthesis of Evidence

- The working environment of nurses plays a major role in level of burnout and well-being.^{1,4,5,9}
- In models controlling for nurse characteristics including age, level of education, and professional recognition, three key elements of the work environment have been shown to be predictors of burnout: staffing, meaningful recognition, and effective decision making.⁴ SM NICU nurses have little control over staffing, but meaningful recognition and effective decision making is within their scope.
- Meaningful recognition, nurturing of interpersonal connections, and mindfulness-based interventions are associated with lower burnout levels.^{2,4,5,12,13}
- Workplace well-being games that encourage team building can improve socialization with colleagues, collegiality, and recognition.²

Practice Change/Intervention & Implementation Strategies

Multifaceted NICU Wellness Bundle consists of mindfulness-based interventions and interventions that foster meaningful recognition and interpersonal connections:



Meaningful Recognition: QR code submission/posting of staff shoutouts, recognition events (e.g., Beacon and Press Ganey Award Dinner), anniversary/years of recognition in the unit, Neonatal Nurses Week, Certified Nurses Day, Nurses Week, incoming/outgoing Unit Practice Council (UPC) member gifts, employee recognition program (Staff Spotlight), and Staff Birthday List

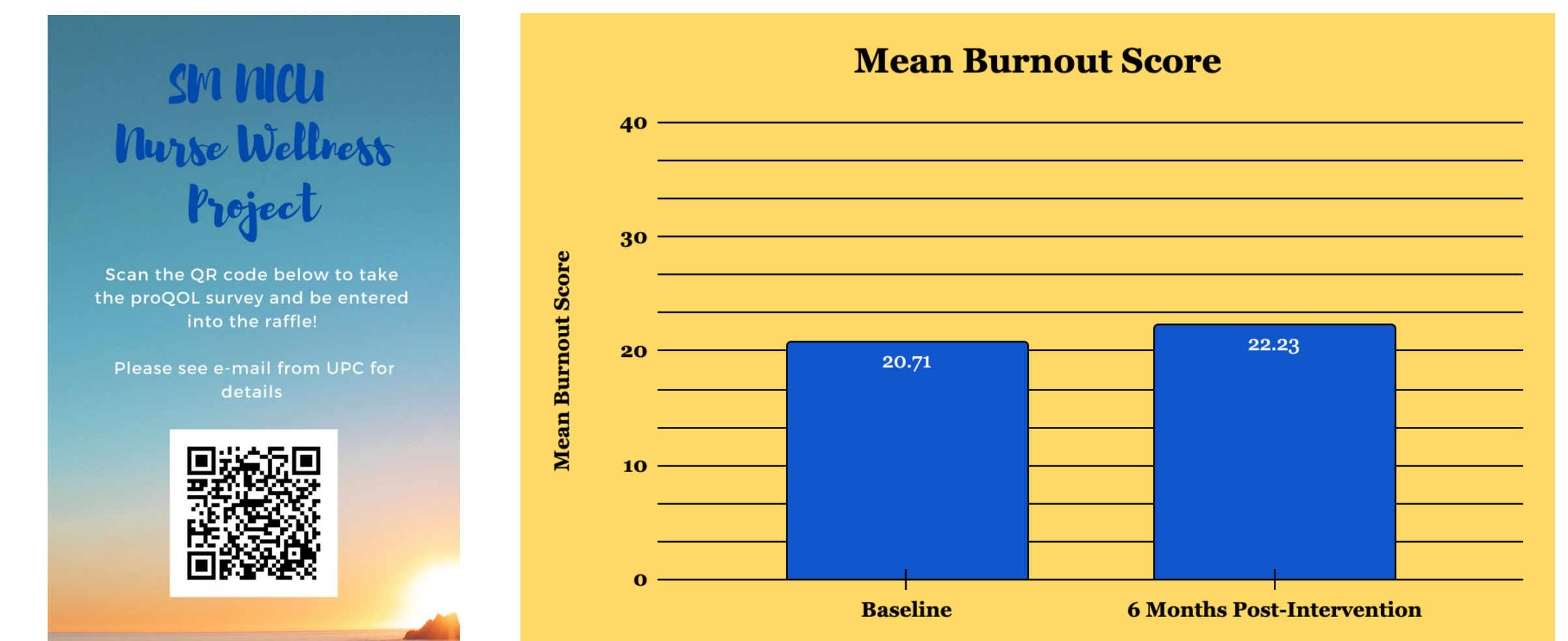
Fostering of Interpersonal Connections: Monthly games with prizes (e.g., Baby Picture Game, Baby Jar Game, Fun Fact Game, Find Joe Bruin Game, NICU Word Search, NICU Bingo, NICU Microbes Game, Valentine’s Day Trivia), social events (e.g., bowling night, 5k run, afternoon tea), 50/50 raffles, unit blog, unit wellness basket, Holiday Gift Exchange, UPC Snack Bar, and wellness resource tip sheet

Mindfulness-based interventions: Quick coherence at UPC meetings, staff meetings, and huddles⁷; Respite Room



Evaluation of Outcomes

- Version 5 of the Professional Quality of Life Scale (ProQOL5) was used to measure burnout and is reliable when used with nursing populations.¹⁰ Scores from 0-22 indicate low levels of burnout, scores between 23-41 indicate moderate levels of burnout, and scores above 42 indicate high levels of burnout.¹⁰
- ProQOL5 survey was given at baseline before complete Wellness Bundle implementation (Phase One), after six months (Phase Two), and will be given yearly for three years (Phases Three through Five).
- The mean baseline burnout score of 14 NICU nurses was 20.71 (low burnout). The baseline range was 13-28, with 11 nurses experiencing low burnout, three nurses experiencing moderate burnout, and zero nurses experiencing high burnout.
- The mean burnout score of 40 NICU nurses six months post-implementation was 22.23 (low burnout). The range was 14-31, with 23 nurses experiencing low burnout, 17 nurses experiencing moderate burnout, and zero nurses experiencing high burnout.
- Goal:** By April 2025, ProQOL5 mean burnout score for SM NICU nurses will decrease from baseline by 5% or more (mean score ≤ 19.67) and zero nurses will show moderate or high burnout scores.



Conclusion/Implications

- A NICU Wellness Bundle that incorporated meaningful recognition, fostering of interpersonal connections, and mindfulness-based activities was implemented to improve work environments and decrease nurse burnout.
- Participation bias and low baseline response rate may have affected the reliability of the data and necessitate another comparative measure of burnout at one year post-intervention.
- A decreased mean burnout score would lead to a favorable return on investment (ROI), likely resulting in increased patient satisfaction, increased employee compassion in care, less workdays missed, better health outcomes, better job performance, less turnover, and decreased organizational financial cost.⁶
- Continuous implementation of the NICU Wellness Bundle and evaluation of burnout will continue until April 2025.

References

- Brooks Carlton, M.J., Hatfield, L., Brom, H., et al. (2021). System-level improvements in work environments lead to lower nurse burnout and higher patient satisfaction. *Journal of Nursing Care Quality*, 36(1), 7-13. <https://doi.org/10.1097/NCC.0000000000000419>
- Cassici, T., Locke, A.B., Henson, A., & Qeadan, F. (2020). A workplace well-being game intervention for health sciences librarians to address burnout. *Journal of the Medical Library Association*, 108(4), 605-616. <https://doi.org/10.5195/jmla.2020.742>
- Institute for Healthcare Improvement (2022). Model for Improvement: Plan-Do-Study-Act Cycles. Retrieved from <http://www.ihi.org/resources/Pages/Howtoimprove/default.aspx>
- Kelly, L.A., Johnson, K.L., Bay, C., & Todd, M. (2021). Key elements of the critical care work environment associated with burnout and compassion satisfaction. *American Association of Critical-Care Nurses*, 30(2), 113-120. <https://doi.org/10.4577/accn.2021.75>
- Kim, L.Y., Rose, D.E., Ganz, D.A., Gannapiran, K.F., Yano, E.M., Rubenstein, L.V., & Stockdale, S.E. (2020). Elements of the healthy work environment associated with lower primary care nurse burnout. *Nursing Outlook*, 68, 14-25. <https://doi.org/10.1016/j.outlook.2019.08.008>
- Letter, M.P., Mellich, C., & Jackson, S.E. (2018). Maslach Burnout Toolkit for medical personnel group report. Retrieved from <http://www.ihi.org/resources/Pages/Howtoimprove/ScienceofImprovement/TestingChanges.aspx?text=The%20Plan%20Do%20Study%20used%20for%20action%20Dormented%20learning>
- Lemire, J. B., Wallace, J. E., Lewin, A. M., de Grodt, J., & Schaefer, J. P. (2011). The effect of a biofeedback-based stress management tool on physician stress: a randomized controlled trial. *Open Medicine*, 5(4), 154-163.
- Moss, M., Good, V. S., Gozali, D., Klempke, R., & Sessler, C.N. (2019). An official Critical Care Societies collaborative statement: Burnout syndrome in critical care health care professionals: A call for action. *American Journal of Critical Care*, 29(4), 368-376. <https://doi.org/10.4529/ajcc.2019.043>
- National Academies of Sciences, Engineering, and Medicine. (2019). Taking Action Against Clinician Burnout: A Systems Approach to Professional Well-Being. Washington, DC: The National Academies Press. <https://doi.org/10.4037/clin2020621>
- Wes, H., Kihner, H., Davies, M.E., Wei, T., & Boyd, J.M. (2020). Self-care strategies to combat burnout among pediatric critical care nurses and physicians. *CriticalCareNurse*, 40(2), 44-54. <https://doi.org/10.4037/ccn2020621>
- World Health Organization (2019). Burn-out an “occupational phenomenon”. *International Classification of Diseases*. <https://www.who.int/publications-detail/burn-out>
- Xie, C., Zeng, Y., Lv, Y., Li, X., Xiao, J., & Hu, X. (2020). Educational intervention versus mindfulness-based intervention for ICU nurses with occupational burnout: A parallel, controlled trial. *Complementary Therapies in Medicine*, 52, 1-7. <https://doi.org/10.1016/j.ctim.2020.102485>

Use of Tissue Adhesive to Reduce Unplanned NICU PICC Dressing Changes

Tamara Cason, RN, C-NPT; Peggy Holub MSN, RNC-NIC, CNS, WTA-C & Neonatal Transport Team (CHET)

BACKGROUND

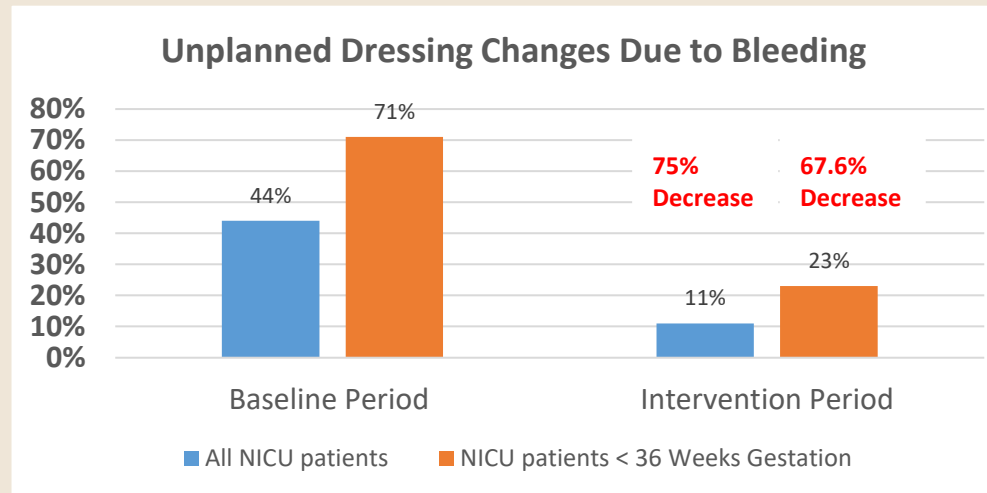
- Neonatal patients are at an increased risk for infection.
- Risk for infection increases with every dressing disruption.⁴
- Post PICC insertion bleeding in the first 24 hours requires unscheduled dressing changes.⁴
- Medical tissue adhesive secures the catheter, seals the insertion site, reduces bleeding, reduces dressing disruption and provides microbial protection.¹⁻⁴

PURPOSE/AIMS

The purpose of this quality improvement project was to evaluate the impact of an evidenced based medical tissue adhesive on insertion site bleeding and unplanned dressing changes following Neonatal PICC insertion.

METHODS

- A QI Pre-Post intervention data collection method was used.
- Retrospective data retrieved from EMR documentation.
- NICU Transport Team (CHET) was trained on the use of the medical tissue adhesive.
- **Baseline data collection** 09/1/2018 -09/30/2019 (no tissue adhesive)
- **Intervention data collection** 10/1/2019 -12/31/2020 (tissue adhesive used)
- **Outcome Measure:**
 - Number of unplanned dressing changes due to bleeding



OUTCOMES/CONCLUSIONS

- **75% reduction** in unplanned dressing changes due to bleeding in intervention group for all NICU patients
- **67.6% reduction** for patients less than 36 weeks gestation
- The reduction in unplanned dressing changes improved the care provided to these vulnerable patients by reducing skin tears from unnecessary adhesive removal, reducing infection risk and additional complications

REFERENCES

1. Alderman, A. (2022). Journey to Zero: CLABSI Reduction in the NICU. Association for Vascular Access Scientific Meeting: Podium Presentation, Oct 1, 2022.
2. Gorski, L.A. et al. (2021). Infusion Therapy Standards of Practice, 8th Edition. Std 50: Infection. J Inf Nurs, 44 (1S Suppl) S1-S224.
3. Spencer, T. (2022). Cyanoacrylate Securement in Neonatal PICC Use – A 4 Year Observational Study. Adv Neonatal Care, June 1: 22(3):270-279.
4. Timsit, J. et. al. (2012). Dressing disruption is a major risk factor for catheter related infections. Critical Care Medicine. Vol. 40(6)

Clinical Nurse-Led ACAs to Inform CLABSI Improvements

Emily Jensen, BSN, RNC-NIC¹
¹Children’s Hospital Colorado



Children’s Hospital Colorado

BACKGROUND

Central Line Associated Blood Stream Infections (CLABSI) in the neonate population are a preventable infection with a mortality rate 4-20%.

- Associated with added healthcare expenditures.

ACAs should follow a CLABSI occurrence.

- Identify potential infection sources.
- Provide ways to mitigate future infections.

Non-bedside personnel typically conduct the ACA.

- Proximity to resources that can implement proposed changes.

Children’s Hospital Colorado (CHCO) is a Level IV surgical NICU serving a large geographic area of 7 states.

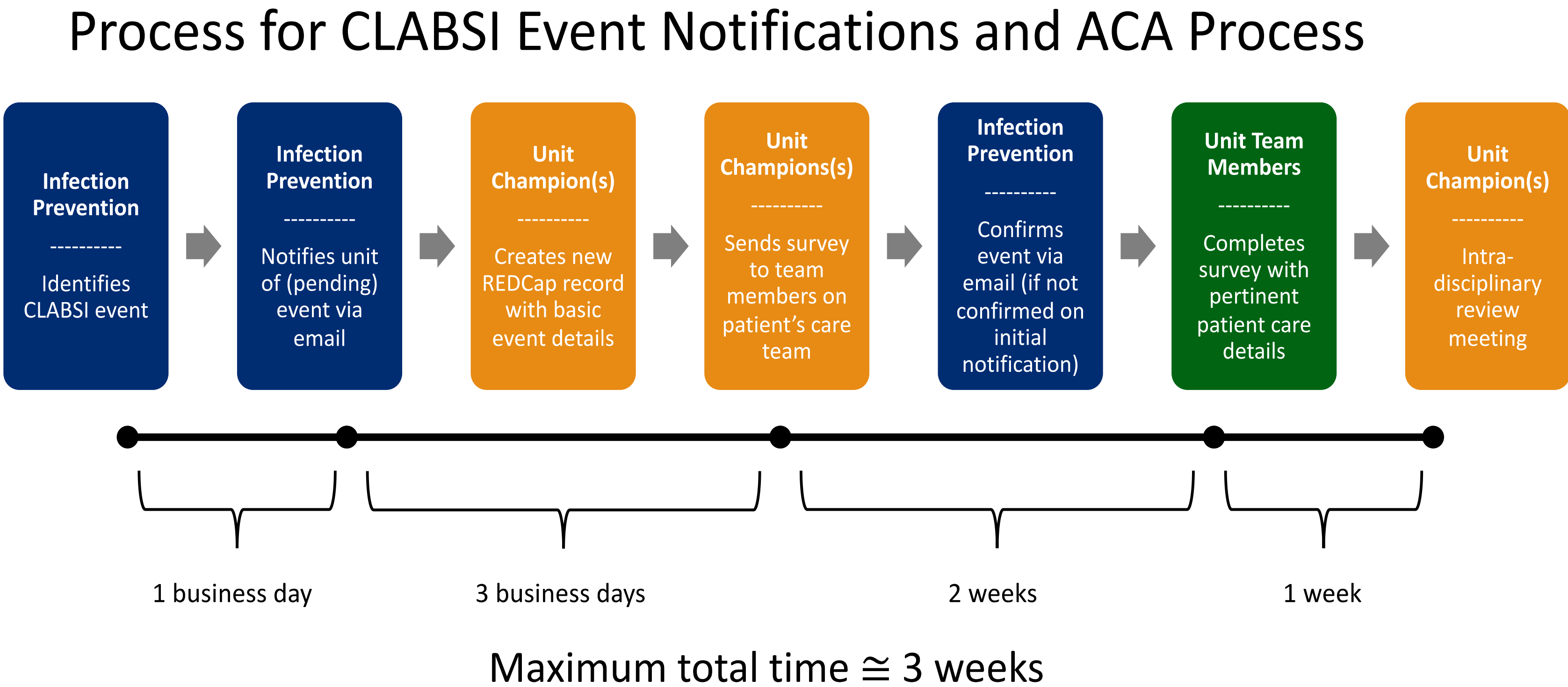
PROJECT AIM

In 2013, CHCO implemented “unit champions,” who are experts in CLABSI initiatives and champion best practice at the bedside.

- One component to this approach was the transition to bedside nurse-led ACA investigations.

This multidisciplinary approach to ACAs allowed for all stakeholders in CLABSI prevention and reduction to have an equal voice.

PROCESS



- CHCO maintains a hospital-wide REDCap ACA database.
- REDCap survey sent to all medical staff that took care of patient in the 7 days leading up to positive culture results.
 - Components of Survey: Staff role in the hospital, line care, skin/bathing/oral care, family’s role in patient care, opinions about potential infection sources.
 - Medical staff get 1 week to respond to survey.
- Unit Champion conducts a chart review while awaiting staff survey results.
 - Components of Chart Review: Patient demographics, skin integrity issues, receipt of certain medications (e.g., steroids, blood products), issues with line integrity, retrospective review of line care and bathing/oral care in preceding 7 days, any access of bloodstream in preceding 2 days.
- Compile a PowerPoint to present to all other stakeholders
 - Findings of survey and chart review
 - Next steps: policy change, unit-level education, process improvement changes at all levels of care.

CHALLENGES & BARRIERS

- Survey response is typically less than 50%. Nurses have highest response rates among the stakeholders..
- Multifactorial findings during the ACA process can make it difficult to parse out the precipitating event and provide concrete recommendations.
- CHCO serves a unique patient population, regularly receiving medically-complex, high acuity cases.

LESSONS LEARNED

- Bedside nurse-led ACAs result in a more complete understanding of a patient’s flow of care.
- Peer-level source of information to other unit nurses regarding central line care.
- Better translation of policy and practice changes.

ACKNOWLEDGEMENTS

Thank you to Alexandra Hamby, Sarah Velasco, Kelly Reichert, Kellie Rusin, and Bryce Clark who have supported the CLABSI ACA process and aided in the formulation of infection reduction strategies in our NICU.

Improving Enteral Feeding Practices and Human Milk Consumption in Multiple NICUs: A Quality Improvement Project

N. Bhopal¹, L. Ulm¹, D. Tom¹, S. Kaprolet¹, J. Parker², M. Shea¹, C. Wieweck¹, S. Akey¹, J. Wickland¹, W. Ruben¹, O. Kudin¹, J. Weber¹, M. Ellsworth¹, K. Ellsworth¹, P. Griffiths¹, K. Allred¹, K. Marshall¹, N. Whittington¹, N. Lattanzio¹, M. Elkhwad¹ and G. Martin¹

1. Division of Neonatology, Phoenix Children's Hospital, Phoenix, AZ 2. University of Arizona College of Medicine, Phoenix, AZ

Background

Authors' Disclosures: Nothing to disclose.

Optimal nutrition is essential to overcome common disease processes in preterm and high-risk term newborns. Introduction of enteral feeds creates a possible risk of developing necrotizing enterocolitis (NEC). NEC is a potentially devastating inflammatory disease of the gastrointestinal tract, which may lead to intestinal perforation or death. The baseline NEC rate at Phoenix Children's Hospital in 2020 was high at 4.9%. Simple interventions such as prioritizing human milk over formula feeds and following a standardized feeding protocol are well established practices for improving outcomes and reducing NEC.

Objectives

- The Phoenix Children's Hospital Division of Neonatology was established in 2020, providing medical services to a level 4 NICU and two level 2 NICUs.
- We introduced a standardized feeding protocol at all 3 affiliated NICUs.
- We measured feeding protocol compliance in non-surgical infants < 37 weeks, with a sub-analysis in babies < 34 weeks.
- Primary objective:** increase feeding protocol compliance by $\geq 10\%$ over a 1-year period.
- Secondary objective:** increase human milk consumption by $\geq 10\%$ in 1 year.
- Balancing measures:** NEC rate.

Intervention Description

- Feeding data was collected from 3 NICUs from December 2020 to December 2021 using a data collection tool.
- To improve compliance with the feeding protocol, providers were educated, protocol copies were posted at workstations and in bedside charts, and interim metrics were reviewed with the medical team to increase individual accountability.
- If a provider deviated from the protocol, they were requested to document the reason.
- The protocol prioritizes human milk use (donor or maternal) over formula.

Results

- Feeding data collected on 355 infants
- Mean gestational age: 33 weeks $\pm$ 2.7 weeks
- Mean birth weight: 2120 grams $\pm$ 769g
- Mean time to full feeds 4.4 days $\pm$ 2.8 d
- NEC: 4 cases total -- 3 (stage 1-2), 1 (stage 3)

Feeding Protocol Compliance



Figure 1. Compliance with the feeding protocol improved over time in infants < 37 weeks from 72% to 88% (blue) and in infants < 34 weeks from 66% to 81% (orange)

First Feed

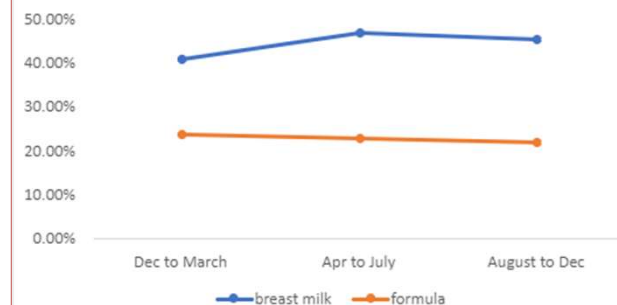


Figure 2. Initiation of Feeds – maternal milk v. formula. Maternal milk had a mild increase from 40 to 45%, while formula use remained the same

Discharge Diet

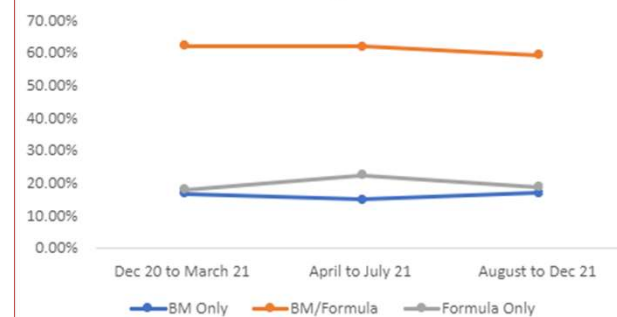


Figure 3. Discharge Diet. Rates of exclusive maternal milk, maternal milk/formula or exclusive formula use at discharge remained the same

Conclusion

- Feeding protocol compliance improved by 16% in babies < 37 weeks.
- There was a trend towards increased maternal milk use for initiating feeds.
- Improvement in full or partial human milk diets were not sustained through hospital discharge. This highlights the challenge in maintaining maternal milk supply during lengthy NICU hospitalizations.
- The overall hospital NEC rate decreased from 4.9% in 2020 to 2.5% in 2021 (includes NICU and CVICU).

Background

- One of the most common viruses causing infection
- Newborns are more severely affected than older children
- Either self-limiting or fulminant and life-threatening
- Enteroviruses (EV) - divided into four species based on homology within the RNA region encoding the VP1 capsid protein
- There are more than 100 known serotypes of EV
- Echoviruses and Coxsackievirus B - most common serotypes associated with sepsis
- Typically acquired from asymptomatic mothers

Epidemiology

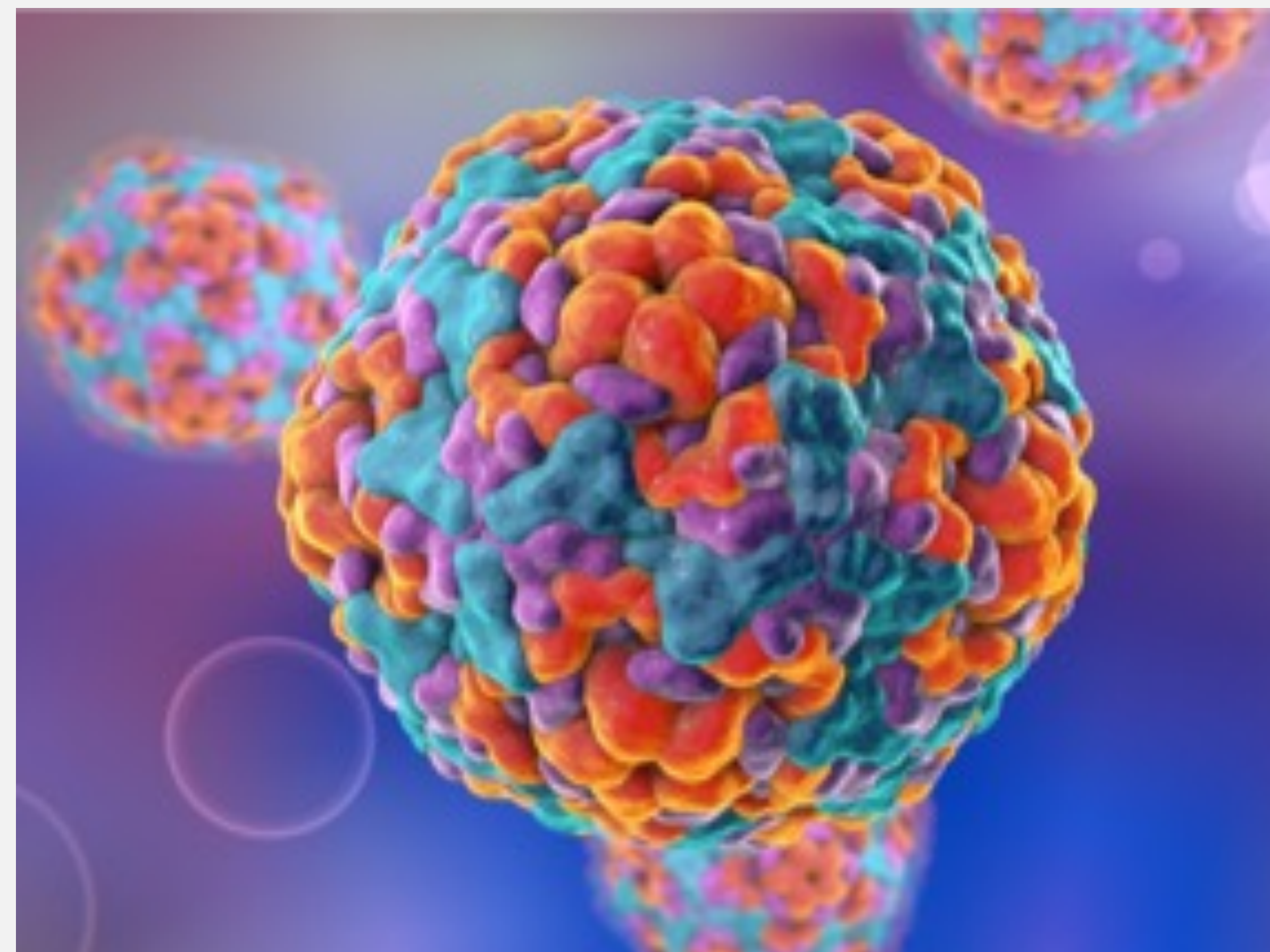
- Seasonal pattern - Summer and Fall
- Epidemiological survey in NY - 12.8% of all newborns were positive for EV
- Seven per 1000 live births were hospitalized (more than GBS, HSV and CMV combined)

Diagnostic Process

- Early manifestations: mild and nonspecific such as transient respiratory distress
- Systemic : fulminant hepatitis, hepatic necrosis, coagulopathy, hypotension, meningoencephalitis, myocarditis, and multi-organ failure
- Cultures: blood, respiratory, CSF
- Reverse Transcriptase - PCR (RT-PCR) for viral load

Patient Data

- 36 6/7 weeks infant born via C/S due to intolerance to labor
- Maternal histories unremarkable, not ill at time of delivery
- DOL 0 - PPV then CPAP
- DOL 2 - intubated
- DOL 6 - fevers, rash, placed on HFOV, DIC, acute liver failure. Positive titers for Coxsackie B4
- DOL 9 - profound coagulopathy. Evaluated for possible HLH. HUS normal
- DOL 12 - Empiric high dose Dexamethasone
- DOL 13 - Brief HTN. HUS: large hemorrhage near brainstem. CT: significant mass effect on the brainstem. Transitioned to comfort care due to catastrophic bleed and likely global ischemic injury



Enterovirus D68. Model built using data of viral macromolecular structure from Protein Data Bank (Shutterstock)

Management

- Antibiotics for underlying infectious process
- Mechanical ventilation
- Blood products transfusion
- Supportive therapy
- ECMO
- IVIG - no clear evidence of benefit
- Pleconaril (capsid inhibitor) - not available for systemic administration
- Currently no approved antiviral therapies for EV infection in newborns

Implications for Practice

- Hand washing, standard precautions
- EV infections should be routinely considered in the differential diagnosis of ill infants, especially during EV season
- Use of rapid RT-PCR test for viral load
- Massive transfusion protocol (MTP) as indicated
- Frequent HUS to assess for concealed hemorrhage

References

Zhang, M., Wang, H., Tang, J., He, Y., Xiong, T., Li, W., Qu, Y., & Mu, D. (2021). Clinical characteristics of severe neonatal enterovirus infection: a systematic review. *BMC pediatrics*, 21(1), 127

Excelling at Curricular Mapping: Neonatal post-Bacc to DNP as an Example

Annette Carley DNP RN NNP, Clinical Professor; Amy L. Renfro MS RN NNP, Assistant Adjunct Professor
University of California, San Francisco, School of Nursing



Abstract

The Essentials: Core Competencies for Professional Nursing Education (“2021 Essentials”), released in 2021, challenged educators to reevaluate advanced practice curricula. Ten domain foci replaced the original eight competency areas. This project aimed to align a proposed post-Baccalaureate-to-Doctor of Nursing Practice (PB-DNP) curriculum with the 2021 Essentials, reveal gaps, and propose recommendations as needed. We first looked at our existing post-master DNP curriculum. An excel spreadsheet mapped DNP course objectives and activities for each of the 2021 domains and competencies. Some gaps were revealed, notably in areas related to direct practice.

The School of Nursing plans to develop a PB-DNP program that will integrate specialty preparation currently at the master’s level., for roles such as nurse practitioner, clinical nurse specialist, and certified nurse midwife. We expanded the mapping project to evaluate how well these existing specialties met the 2021 Essentials. The neonatal specialty was an early program of interest

The expanded mapping revealed improvement in some earlier gaps, including those aligned with direct practice. Gaps persisted in meeting some domains, such as personal and professional development, that will be addressed with new/modified coursework. This project data is currently being used to guide curricular development for the remaining specialties

PB-DNP Core and Neonatal Specialty (Excel excerpt)

			NEONATAL SPECIALTY													
			208		270		232		254.1		254.2		254.3		270.07	
			C/W	A	C/W	A	C/W	A	C/W	A	C/W	A	C/W	A	C/W	A
CORE/DNP CORE			263		263.1		263.2		263.11		263.12		263.13		263.14	
Domain	Subdomain	Description	C/W	A	C/W	A	C/W	A	C/W	A	C/W	A	C/W	A	C/W	A
1	1.1	1.1e Translate evidence from nursing science and other sciences into practice.	Course						Weekly		Both	Yes	Weekly	Yes		
		1.1f Demonstrate the application of nursing science to practice.	Course								Both	Yes	Both	Yes		
		1.1g Optimize an understanding of nursing history in advancing nursing’s influence in health care.							Both	Yes					Both	Yes
	1.2	1.2f Synthesize knowledge from nursing and other disciplines to inform education, practice and research.							Course	Yes	Both	Yes	Weekly	Yes		
		1.2g Apply a systematic and defensible approach to nursing practice decisions.	Course			Course		Course	Yes	Weekly	Yes	Weekly	Yes	Course		
		1.2h Employ ethical decision making to assess, intervene, and evaluate nursing care.														
		1.2i Demonstrate socially responsible leadership.														
		1.2j Translate theories from nursing and other disciplines to practice.							Both	Yes	Weekly	Yes				
	1.3	1.3d Integrate foundational and advanced specialty knowledge into clinical reasoning.	Course		Course		Course		Weekly	Yes	Weekly	Yes				
		1.3e Synthesize current and emerging evidence to influence practice.	Course						Yes	Weekly	Yes	Weekly	Yes			
		1.3f Analyze decision models from nursing and other knowledge domains to improve clinical judgement.									Both	Yes			Both	Yes
	2.1	2.1d Promote caring relationship to optimize outcomes.														
		2.1e Foster caring relationships.														
		2.2g Demonstrate advanced communication skills and techniques using a variety of modalities with diverse audiences.	Course		Course		Course	Yes								
		2.2h Design evidence-based, person-centered engagement														

PB-DNP Program Outcomes

Domain	Outcome statement. <i>The graduate will be able to:</i>
Knowledge for Practice	*Demonstrate ability to enter practice and integrate specialty competencies , applying appropriate scientific and theoretical knowledge and evidence to ethically and with socially responsible clinical reasoning, practice and leadership .
Person Centered Care	* Model, lead and effectively communicate patient-centered practice that is evidence-based, equitable and accountable , and that applies team-based principles and innovative thinking to decision-making and care coordination . *Advance initiatives that acknowledge professional nursing development and self-care needs and recognize and support the full scope of nursing practice .
Population Health	*Integrate population health expertise in data evaluation used to design and lead partnerships that are cost effective, improve health outcomes , and challenge biases.
Scholarship	* Advance the scholarship of nursing through leadership of evidence-based and ethical innovations .
Quality and Safety	* Direct teams in design, implementation, and evaluation of quality improvement initiatives that support a just culture .
IP Partnerships	* Collaborate with interprofessional teams to effectively communicate , instill a culture of safety, and facilitate partnerships that improve quality and health outcomes .
Systems-Based Practice	* Analyze current processes and practices that impact quality, access, and equitability, <u>while applying</u> metrics that demonstrate cost-effectiveness and sustainability. *Lead strategic planning and team-based initiatives that generate sustainable ROI improvements across systems .
Informatics, and Healthcare Technologies	* Appraise information and communication technologies from a fiscal , sustainable, and equitable lens that can support practice workflow , decision-making, provider-client relationships and improved outcomes . *Apply current and emerging information and communication technologies to identify and address practice gaps, optimize outcomes and support equitable and efficient care delivery. *Evaluate information and communication technologies to ensure compliance with regulatory and practice standards for ethical, legal, and secure use.
Professionalism	*Demonstrate ethical, socially just, accountable , and unbiased nursing presence that advocates for individuals and populations, supports health and harm reduction , applies cultural sensitivity and humility, and conforms to professional practice standards. *Actively participate in self-reflection that supports ethical and fair decision making, emotional intelligence, moral courage, respect for diversity and awareness of conscious/unconscious biases. *Advocate for nursing and its core values and support its professional identity and contributions to interprofessional teamwork, full scope of practice, and personal and professional honesty and integrity.
Development	* Model leadership that is theory-informed , applies effective communication and conflict management skills , and equitably and justly applies unbiased feedback to performance improvement efforts. *Demonstrate capacity for self-reflection and healthy self-care behaviors that support lifelong learning and professional development of self and others .

PB-DNP Core and Neonatal Specialty Program of Study

SUMMER 2024 (Q1)	Units	FALL 2024 (Q2)	Units	WINTER 2025 (Q3)	Units	SPRING 2025 (Q4)	Units
BS-DNP Prologue	2	Advanced health policy and advocacy across diverse populations (Δ263.15)	3	Advanced health assessment concepts (Δ270)	2	Improving health outcomes by advancing QI & safety initiatives (merge Δ263.14b/234C)	3
Concepts & contemporary issues for advanced practice (Δ263.11)	3	Foundation in Nursing Scholarship for the nurse leader (Δ262)	3	Advanced physiology and pathophysiology concepts (Δ208)	2		
Racism, healthcare, and social justice (Δ217F)	2	Principles of clinical prevention & population health for evidence-based practice (merge Δ263.18/245A)	3	Advanced pharmacologic concepts (Δ232)	3		
Principles of genomics for the advanced practice provider (Δ294)	1			Neonatal skills lab (NSL413.120 Neonatal Assessment (270.07)	1	Neonatal specialty content Neonatal clinical application	
Total units:	8		9		<12		<12
SUMMER 2025 (Q5)		FALL 2025 (Q6)		WINTER 2026 (Q7)		SPRING 2026 (Q8)	
EBP principles and practice (merge Δ263.12/234C)	3	Utilization of informatics to support equitable healthcare utilization (Δ263.19)	2	EBQI project II ((Δ263B.1)	2	Advancing leadership for nurses and healthcare teams (merge Δ263.21/211)	2
Evidence-based quality improvement (EBQI) Project I (Δ263A.1)	2	DNP leadership practicum (Δ463.2)	1	DNP leadership practicum (Δ463.2)	2		
DNP leadership practicum (Δ463.2)	2			Healthcare financial management across organizations (Δ263.16)	3	DNP leadership practicum (Δ463.2)	1
Neonatal specialty content Neonatal clinical application		Neonatal specialty content Neonatal clinical application		Neonatal specialty content Neonatal clinical application		Neonatal specialty content Neonatal clinical application	
Total units:	<12		<12		<12		<12
SUMMER 2026 (Q9)		FALL 2026 (Q10)		WINTER 2027 (Q11)		SPRING 2027 (Q12)	
EBQI project III (Δ263C.1))	2	DNP leadership practicum (Δ463.2)	1			DNP epilogue (Δ263.2b)	2
Methods for DNP project analysis (Δ263.13b)	3						
DNP leadership practicum (Δ463.2)	1	Neonatal specialty content Neonatal clinical application		Neonatal specialty content Neonatal clinical application		Neonatal specialty content Neonatal clinical application	
Neonatal specialty content Neonatal clinical application							
Total units:	<12		<12		<12		<12

Specialty contributes ~760 direct practice hours (25.5u); DNP practicum units based on 240 indirect practice hours (8u)

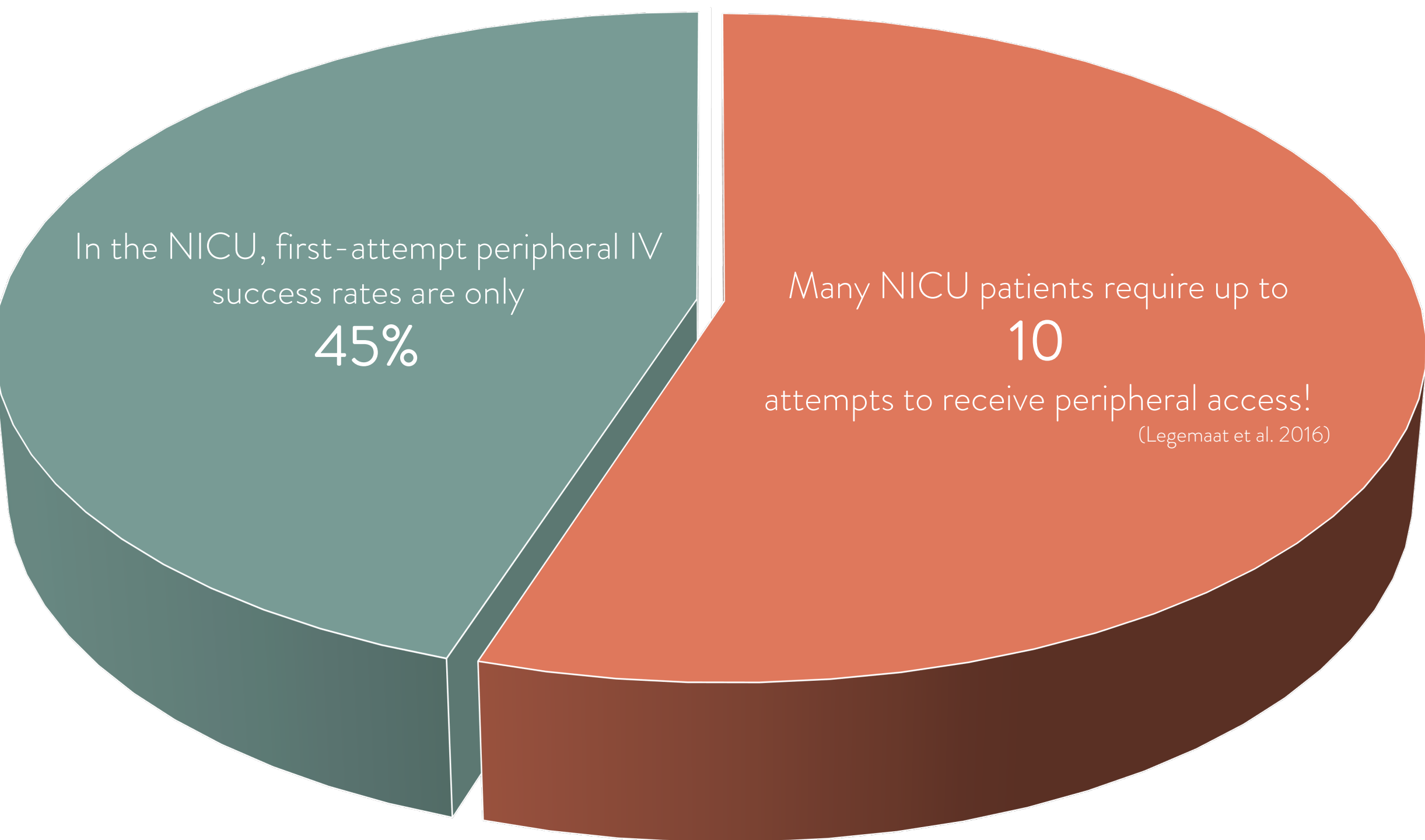
Implementing a Modified Difficult Intravenous Access Algorithm in the NICU to Optimize Intravenous Insertion Competency

Amy L. Renfro, MSN, RN, NNP, Assistant Adjunct Professor
Annette Carley, DNP, RN, NNP, Clinical Professor



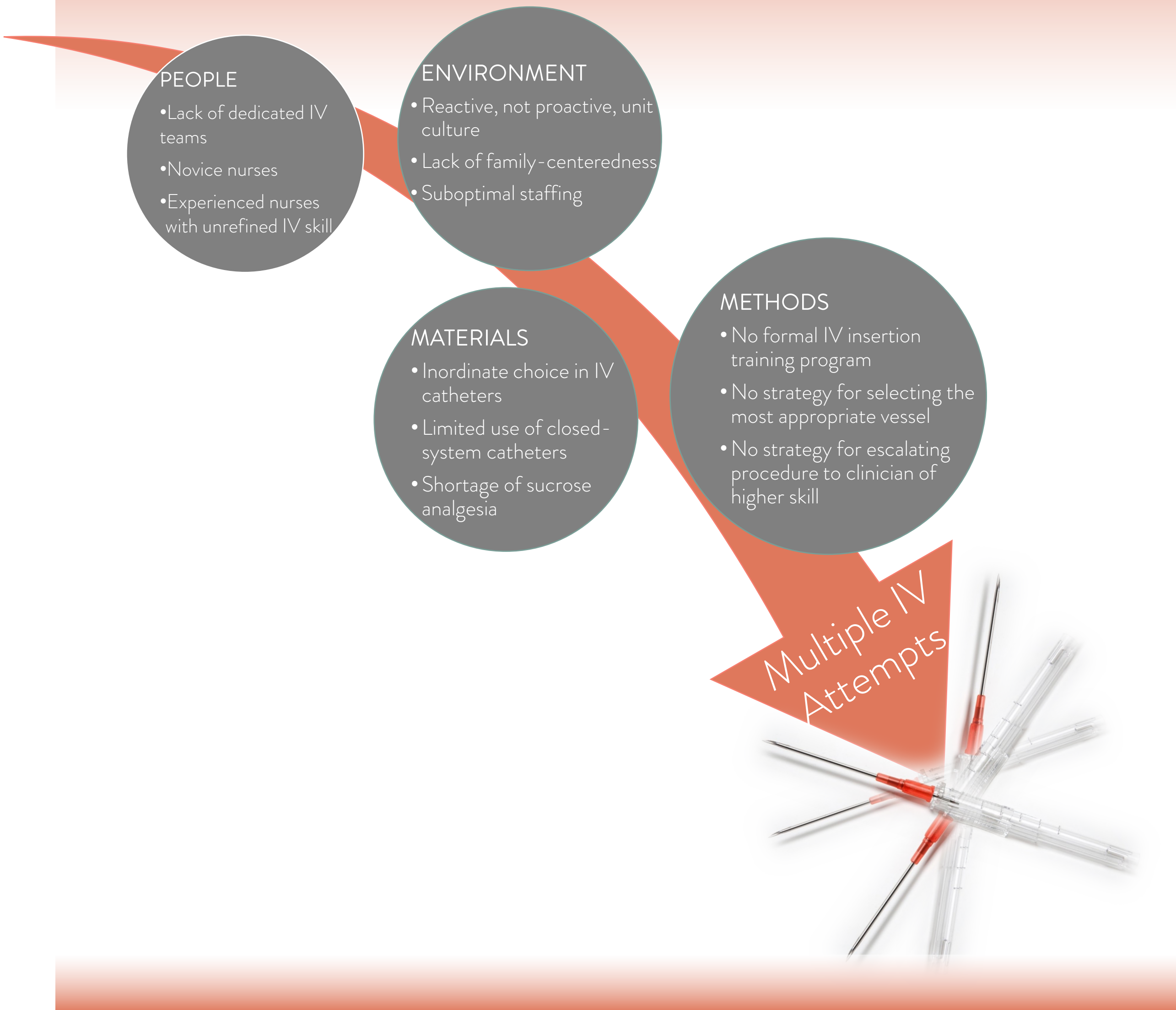
BACKGROUND & SIGNIFICANCE

First-attempt intravenous (IV) success is the standard of practice across patient populations, as recommended by the Infusion Nurses Society (Gorski, 2021). Minimizing IV attempts decreases pain, reduces risk of infection, and increases patient and family satisfaction.



There exists a practical dilemma in improving nurses' peripheral intravenous insertion skills through practice, while knowing that multiple attempts increase negative patient outcomes and are contrary to the goal of first-attempt success.

CAUSE & EFFECT ANALYSIS

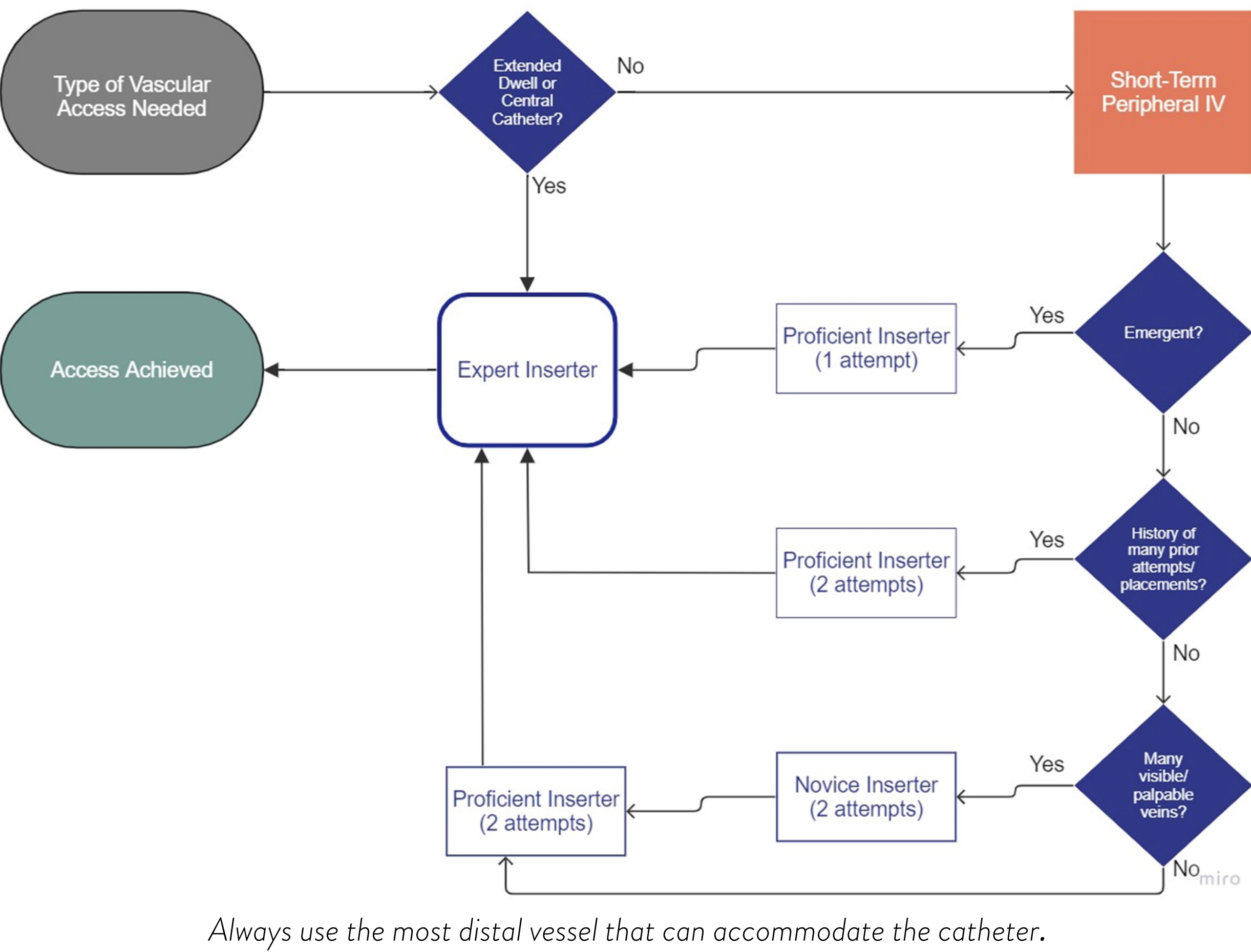


PROPOSED SOLUTION: A MODIFIED DIVA ALGORITHM FOR NICU NURSES

Yen et al. (2008) approached the problem of improving the success rate of IV placement by developing the difficult intravenous access (DIVA) scoring tool. This tool helped to prospectively identify patients who were at high risk of placement failure and provided a pathway for escalation of the procedure to a highly-skilled provider and/or utilization of advanced insertion techniques. The DIVA tool has been externally validated for use in pediatric patients (Giroto et al., 2020).

Due to the small size and fragility of neonates' veins, they meet the accepted definition of DIVA (Bahl et al., 2021). Given the inherent challenges in obtaining neonatal vascular access, it is worthy to refine and implement a DIVA algorithm for the NICU setting.

The following algorithm was created to consider the type of access needed, urgency of placement, vessel quality, and skill level of the practitioner. By identifying patients and vessels which are likely to be successfully cannulated, the novice inserter retains opportunities for progression toward expert skillfulness, while simultaneously achieving the goal of minimizing the number of intravenous attempts.



Using a DIVA algorithm has been shown to decrease the overall number of IV attempts and decrease the number of providers attempting access (Hartman, 2017). In addition to patient benefits and practitioner satisfaction, other gains exist. In adult patients, healthcare costs of peripheral IV insertion jump sevenfold between one and five attempts (van Loon et al., 2020). Far-reaching impacts, which are beyond the scope of this quality improvement project, include decreasing neonatal pain and adverse neurodevelopmental consequences.

SWOT ANALYSIS



PHASE TWO: TRAINING AND IMPLEMENTATION

An international survey of 242 neonatal and pediatric nurses revealed that most were observed placing vascular access only one to five times before being deemed competent and reported no annual insertion requirement to maintain competency (Davis et al., 2020). Less than half of those surveyed reported having a formal procedure to escalate the procedure to an expert clinician. For fostering NICU nurse proficiency at IV insertion, the focus should be on formal, specialized training programs (Hackett et al., 2021).

A formal IV insertion training program, conducted via didactic and simulation methodologies and incorporating use of this modified DIVA algorithm is planned for phase two of this quality improvement project.

Prior to developing the training program, a needs assessment will be conducted to evaluate the current state of IV insertion practices, and what gaps exist in achieving desired best practices, as recommended by guiding national organizations (e.g., Infusion Nurses Society, Association for Vascular Access, National Association of Neonatal Nurses).

Retrospective chart review of the number of IV insertion attempts per patient IV encounter, and self-assessed proficiency of the provider will be noted. These data will also be obtained post hoc to assess for improvement in number of IV attempts per patient IV encounter and increased perceived provider IV insertion proficiency.