Peer Reviewed

Abstracts from the California Association of Neonatologists Cool Topics in Neonatology 27th Annual Conference

John Cleary, MD

The Poster Abstracts Table of Contents from the 26th Annual

Cool Topics in Neonatology

27th Annual Conference

A Virtual Educational Conference

Friday, Saturday & Sunday
March 5 - 7, 2021

Conference are presented below:

	Period
Abstract # 10	Racial and Ethnic differences in Neonatal and Maternal COVID-19 Infection in the Perinatal Period
Abstract # 11	Implementation of a Dextrose-Gel Algorithm for Hypoglycemia in a Large Birth Center with a Level III NICU
Abstract # 12	RSVH and BH in Children with Higher-Risk CHD Aged ≤24 Months
Abstract # 13	Patent foramen ovale versus atrial septal defect in extremely low birthweight infants: can they be differentiated?
Abstract # 14	Thriving in NICU and at 1 Year Post-Discharge
Abstract # 15	Multi-Omics Approach Suggests a Novel Molecular Mechanism of Necrotizing Enterocolitis in the Preterm Infant Gut Microbiome
Abstract # 16	Biologic Potential of Human Umbilical Cord Mesenchymal Stem Cells Exposed to Antenatal Marijuana
Abstract # 17	A rare anomaly – Duodenal Dieulafoy's lesion in a preterm baby
Abstract # 18	Clinical outcome of newborns born to mothers infected with SARS-CoV-2 during pregnancy: A Prospective cohort study
Abstract # 19	Improving Placental Transfusion Rates at UCSD
Abstract # 20	Trends in Risk of Respiratory Syncytial Virus Hospitalizations in Preterm Infants Over a 10-Year Period
Abstract # 21	COVID-19 UPDATE
Abstract # 22	Preventing Bronchopulmonary Dysplasia (BPD): Evidence-Based Bundle and Multidisciplinary Team Approach
Abstract # 23	Impact of activated Bifidobacterium longum subsp. infantis EVC001 probiotic feeding on preterm patient outcomes
Abstract # 24	Neuroprotective Guidelines (NPGs) for the Prevention of Intraventricular Hemorrhage (IVH) in Extremely Premature Infants
Abstract # 25	The Neuroprotection of Oral Enjoyment by Offering Milk Drops
Abstract # 26	Multidisciplinary Project to Establish and Maintain a Centralized Milk Preparation Room in a Neonatal Intensive Care Unit
Abstract # 27	Use of Human Milk-Based Diet in the Late Preterm and Term Infant in the Neonatal Intensive Care Unit: A Pilot Randomized Controlled Trial
Abstract # 28	BRAVE SPACE: A Diversity, Equity, Inclusion (DEI) initiative in the Intensive Care Nursery (ICN); Perspectives from the bedside
Abstract # 29	Decreasing the Incidence of Intravenous Infiltration Via Quality Improvement Measures
Abstract # 30	Correlation between Total Serum Bilirubin and Transcutaneous bilirubin levels in extremely preterm infants less than 30 weeks gestation
Abstract # 31	Transcutaneous bilirubin levels compared to Total Serum Bilirubin levels in extremely preterm infants less than 30 weeks gestation
Abstract # 32	Decreasing Unnecessary Mother-Baby Separation at Birth by Assigning a Designated Location for the Pediatric Provider at Mother's Bedside
Abstract # 33	B. infantis EVC001 Feeding in VLBW Infants is Associated with Significant Reduction in Rates of NEC

Abstract # 34	CAN 2021 Abstract: Perturbed Gut Microbes and Circulating Cytokines Herald Growth Failure in Preterm Infants
Abstract # 35	Reinforcement of Preventive Bundle Led to Low Incidence in Severe Retinopathy of Prematurity in High Risk Premature Infants: A Quality Improvement Study
Abstract # 36	Improving NICU Nurse's Recognition of Normal and Abnormal Patterns on aEEG Monitoring
Abstract # 37	Quality improvement initiative to reduce antibiotic exposure of asymptomatic infants born to mothers with intraamniotic infection
Abstract # 38	Association Between Umbilical Cord Management and 5 Minute Peripheral Oxygenation In Preterm Infants

Abstract #1

Erase Post-op Pain, a Quality Improvement Project

Irfan Ahmad MD, Melissa Powell NNP, Beverly Walti CNS, Vivian Anaya RN and Grant ShaferMD. CHOC Children's Hospital, Orange County, California.

Background: Unrelieved post-operative (op) pain in infants undergoing surgery can adverselyaffect recovery.

Smart Aim: To decrease the proportion of pain control failures in NICU infants undergoing non- cardiac surgery from baseline of 20.6% (January to May 2019) to below 10 % by December 2020.

Setting: This QI project was carried out at the Surgical NICU at CHOC Children's Hospital incollaboration with Children's Hospitals Neonatal Consortium (CHNC) as a multiple NICU collaborative project.

Drivers of Change: Accuracy of post-op pain assessment, standardization of pain management,timely availability of pain medications and family engagement as shown in figure 1.

Methods: Multidisciplinary team set up and monthly meetings were held with other CHNC teams. Initial intervention was nursing education to accurately assess and document pain scores. Standardized pain management guideline was then developed. Pain management was made part of our structured pre- and post-op huddles. Pain medication were ordered prior to surgery for immediate post-op availability. Partnership was developed with families. Data wereentered on shared Institute for Healthcare Improvement (IHI) extranet site. Multiple Plan-Do- Study-Act cycles were run in accordance with IHI Model for Improvement.

Measures: Post op pain scores utilizing Neonatal Pain, Agitation and Sedation Scale (NPASS)were recorded over 24 hours from time of return of infant to NICU. Pain control failure wasdefined as any two consecutive NPASS scores ≥4 (over 30-60 minutes) during this period.

Results: Data recorded during the first five months of 2019 served as baseline. With adoption ofimprovement strategies, there was a significant shift in mean from 20.6% (baseline) to 7.6% failures and a narrowing of control limits as shown in control chart (figure 2). We were able to meet our goal of <10% pain control failures for most months following April 2020.

Discussion: A structured post-op pain management quality improvement program can lead to better pain control in NICU infants undergoing surgery. We benefitted from collaborating withmultiple teams dealing with similar problems. Multidisciplinary approach with focus on nurse training for accurate pain assessment and use of standardized pain management guidelines were key strategies that led to improvements.

Our next steps would be to solidify the implementation of these strategies to sustain our gainsover the next one year.

Figure 1: Key driver diagram for Erase Pain project.

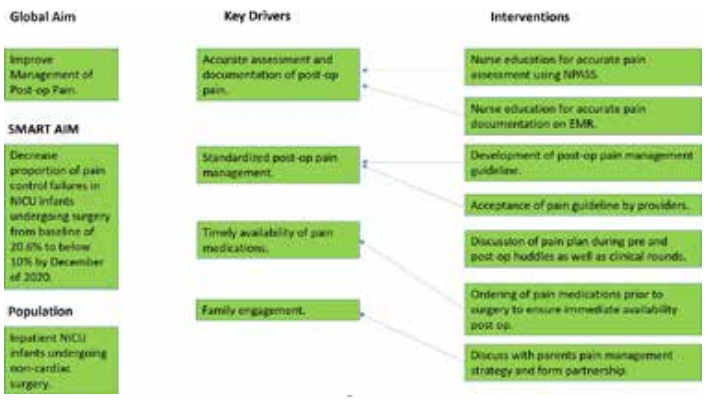
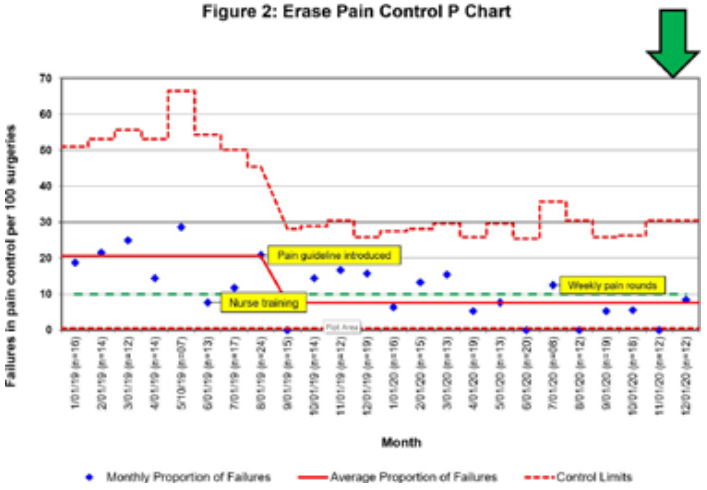


Figure 2: Erase Pain Control P Chart



Abstract # 2

Changes in The Microbiome and Metabolome of Milk Feeds and Stool from Preterm Infants with a Maternal History of Asthma

Shiyu Bai-Tong[1]*, Kelly Weldon[2], Shalisa Hansen[2], Diba Motaza-

California Association of Neonatologists (CAN) and
AAP District IX Section on Neonatal-Perinatal Medicine

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CME OFFICE OF CONTINUING MEDICAL EDUCATION

vi[3], Jessica Kitsen[3], Bob Geng[3], Se Jin Song[2], Jack Gilbert[2], Pieter Dorrestein[2], Rob Knight[2], Sydney A. Leibel[3], Sandra L. Leibel[1]

1 Division of Neonatology, University of California, San Diego, Rady Children's Hospital

2 Center for Microbiome Innovation, University of California San Diego

3 Division of Allergy and Immunology, University of California, San Diego, Rady Children's Hospital

Background:

Preterm infants are independently at risk for asthma and atopy with lifelong consequences. Studies have shown that in term infants, atopic disease risk is increased based on type of milk feeds, species of gut flora and maternal history of atopy. The impact of milk feeds and species of gut flora in the setting of maternal atopy in the preterm infant has not been defined.

Objective:

We hypothesized that the breastmilk from mothers with a history of asthma, as well as the stool from their preterm infants, will have different microbiome and metabolome profiles, compared to mothers without a history of asthma.

Method:

Preterm infants 34 weeks gestational age from a single neonatal intensive care unit in San Diego were enrolled in the MAP (Microbiome, Atopic disease, and Prematurity) Study. Nine infants of mothers with a history of asthma and 9 infants of mothers without a history of asthma (control) were included in the study. Sample size was chosen based on the power calculations for alpha diversity in the stool microbiome. Meconium samples were collected at birth and milk feeds and stool samples were collected at 2 weeks (babies on full NG feeds) and 6 weeks (babies starting to PO feed) of age. Samples were analyzed for microbiome and metabolomic profiles. Metabolites were analyzed by untargeted gas chromatography-mass spectrometry and Kruskal-Wallis H test was used for statistical analysis. Bacterial compositions are currently being analyzed by 16S rRNA gene sequencing.

Result:

Average gestational age between the control and maternal asthma groups were 29.6 weeks vs. 29.7 weeks with birth weights 1381 grams vs. 1242 grams, respectively. Metabolite analysis of the stool showed significant differences between the control and maternal asthma groups at 6 weeks postnatal age ($p = 0.027$ and pseudo-$F = 2.33$) regardless of feeding methods (gavage vs. oral), respiratory support, and antibiotic use. Metabolite analysis of milk samples demonstrated significant difference between the control and maternal asthma group ($p = 0.016$, pseudo-$F = 2.35587$) that appeared to be driven by the dipeptide Leucine-Proline and potentially other dipeptides in the same network.

Conclusion:

Our preliminary results demonstrate novel significant differences in fecal and breastmilk metabolites between preterm infants born to mothers with and without a history of asthma. These findings will be correlated with the microbiome data analysis of the same samples currently in progress.

Abstract # 3

Title: Providing Consistent Developmentally Appropriate Sensory Experiences ina Community Level 3 NICU

Authors: *Malathi Balasundaram, MD[1,2], Stephanie Miller, MD[1,2], Arlene R. Fleming, BSN, RNC-NIC[2], Dharshi Sivakumar, MD[1,2], Melinda Porter, MS, RN, CNS, NNP-BC,C-NNIC[2]. Pediatrics, Neonatology, Stanford University School of Medicine, Stanford,CA[1] and El Camino Hospital NICU, Mountain View, CA [2]

Background: Premature infants experience procedural touch/handling, movement, strong smells, sounds, lights, frequent nociceptive pain, and disruption of sleep during their critical sensory development stage in Neonatal Intensive Care Unit (NICU). The mismatch of underdevelopment and intense NICU environment may cause physiologic instability, affect growth and development, and ultimately impact long term neurodevelopmental outcomes. Providing appropriate positive sensory experiences canpotentially optimize brain development and reverse the morbidity among high risk infants.

Design: Family Centered Care team implemented quality improvement focus on three sensory interventions using SMART aim.**Tactile** with early Skin to Skin Care (SSC) andlonger Out of the Box (OOTB) time. Baseline data was collected. An educational board with instructions and pictures on how to safely transfer infants was displayed in NICU. Informational handout and a "First Hold Certificate" for parents were created. Nurses and RTs were trained on safe transfer of intubated infants. **Taste** with early colostrum**.** During prenatal consultation neonatologists emphasized on early colostrum and provided video on how to perform Hand Expression (HE). Aim was to improve maternal milk supply by expressing colostrum shortly after delivery. A nursing team of championswas formed in Labor and Delivery, NICU and post-partum unit and trained by lactation consultants. Nurses in all units completed the competency with champions to disseminate a consistent message**. Auditory** with positive vocal exposure by reading for 30 mins/day by parents or staff. Reach Out and Read team created parent brochure,staff information, and crib card reminder. To encourage reading after discharge a book bag was designed with a grant from El Camino Health Foundation.

Results: First SSC for ≤ 30 weeks decreased from 174 to 65 hours of life (HOL) and for30-35 weeks decreased from 27 to 12 (Fig 1&2). OOTB time improved from 89 to 153 minutes per day (Fig 3). First oral colostrum interval was reduced from 22 HOL to 8 (Figure 4). Reading time increased to 17 minutes for all and 23 (Fig 5) for babies stayedlonger.

Conclusion: Our results are limited by the small number of very low birth weight infantsin our cohort but improved in all three sensory interventions. Future focus will be on reducing pain using positive touch and noise reduction.

Figure 1

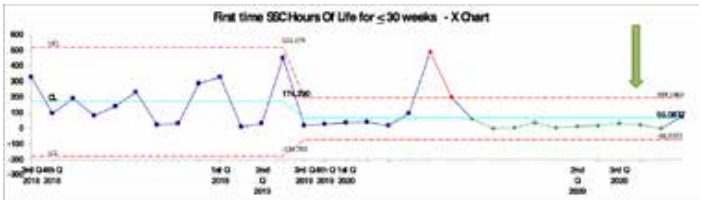


Figure 2

Figure 3

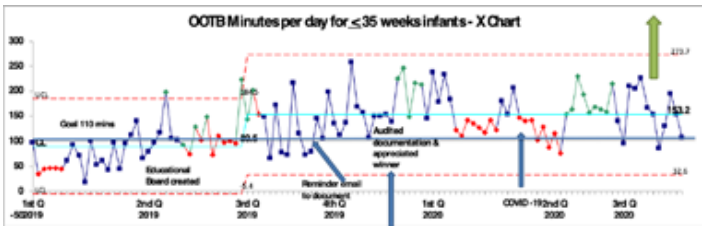
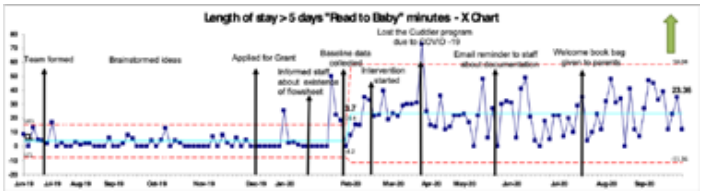


Figure 4

Figure 5



Abstract # 4

Title: "Please Don't Break Up With Us"! How to Stay Connected to Parents PostDischarge.

Authors: **Malathi Balasundaram, MD[1, 2], Melinda Porter, RN, CNS, NNP-BC, C-NNIC[2] Nona Mateo, RN[2], Julie Plank, BSN, RN[2], Judy Baldwin, MSN, RNC-NIC[2], Dharshi Sivakumar MD[1, 2], Pediatrics, Neonatology, Stanford University School of Medicine, Stanford, CA[1], and El Camino Hospital NICU, Mountain View, CA[2].

Background: One of the six components of comprehensive family support in the Newborn Intensive Care Unit (NICU) is Post Discharge Follow Up. The importance of continuity of care for the baby and parents after discharge has long been recognized. Telephone Follow Up (TFU) calls are frequently cited as a cost-effective method to reduce readmission rate and enhance communication with patients and families after discharge. Our 20 bed community level 3 NICU implemented Family Centered Care Program (FCCP) in 2016. Ever since we have implemented staff education and support,family centered developmental care, and parent buddy program. Members of our FamilyAdvisory Board (FAB) suggested TFU project to maintain connectedness with families and to understand their NICU experience and home transition.

Design: During the planning period we considered three decision points to make this project successful. Who should make the call? Which information is essential? What is the optimal timing, frequency and duration of TFU calls. We recruited three nurses, and developed a script with relevant questions. TFU calls were made between one and four weeks after discharge and lasted 15-30 min. During these calls we asked for feed back on our discharge preparation process, quality of the lactation visit in NICU, and home transition. Families were also briefed on the importance of returning the patient satisfaction survey. After an year, we added questions related to their emotional journeyand the factors which helped cope with their stress.

Results:. This project was offered to all infants discharged from the unit. Our "Patient Satisfaction Survey" return rate of 17% in 2018 improved to 21% (above national average) after initiating TFU. We connected with more families through TFU calls compared to the hospital survey response. We also learned about our discharge process and the results are shown in the flow diagram and demographic data in a table.On the quality of the lactation visit in the NICU 95% (156/164) rated 4 or 5.

Conclusion: Parents often express how much they appreciate the follow up. Reachingout with a simple phone call communicates to them, that their NICU journey was important to us. We were able to learn more about our strengths and weaknesses through TFU calls because of parents' insightful candor. This information, when sharedwith the NICU Care Team, created a catalyst for change and improvements to better serve future families.

Table 2: Verbatim comments from our phone calls:

Discharge process regarding tablet-based education:
It is very good informative material and it answered most of our questions.Appreciated the simplicity of the iPad.
Very convenient refresher for experienced parents. Smooth, easy-to-navigate, and self-paced.
Emotional/ coping mechanism:
Open communication from staff and physicians helped us to cope.Knowing that we can visit anytime of the day helped us cope.
Enjoyed follow up phone call, felt very special and connected to NICU team.Daily updates were helpful and reassuring.
It was lot of unknown, explained what to expect helped us, answering all the questions helped a lot.
Things that could be improved:
Providing accommodations for NICU parents.
Moving the baby from space to space was upsetting, hard to adjust to newenvironment each time.
Lactation nurse was very theoretical, not at all hands on.
Differing opinion about their babies progress
iPad education should be tailored to first and 2nd time parents.

Flow diagram :

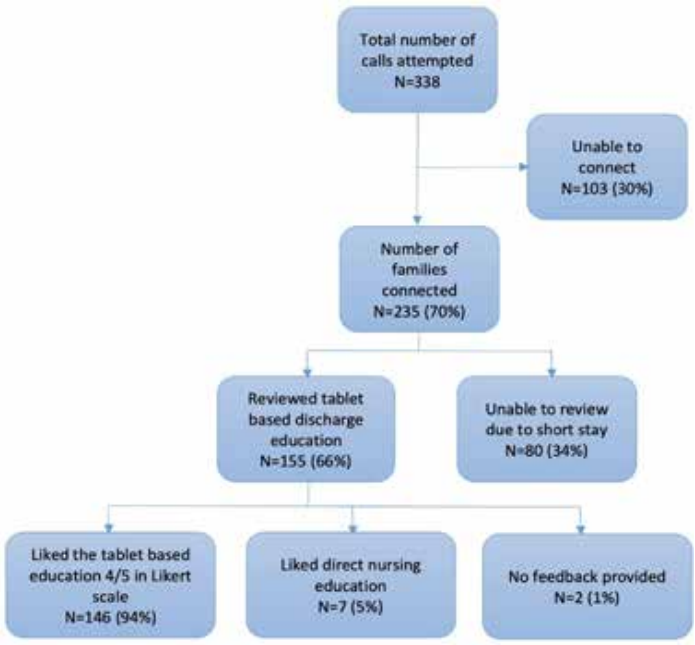


Table 1: Demographics:

	Intervention
Time	April 2019 - Sep 2020
Total call attempted	338
Number of families connected	235 (70%)
Gestational Age	26 3/7 – 41 5/7 median (364/7)
Length of Stay	2-121 days (median 8 days)

Abstract # 5

Standardized Clinical Approach for the Management of Abnormal Cord Blood Gases In Neonates at Risk for Hypoxic-ischemic Encephalopathy

Elizabeth Blecharczyk*[1], Lucy Lee*[2], Krista Birnie[3], Arun Gupta[1], Alexis Davis[1], Krisa Van Meurs[1], Sonia Bonifacio[1], Adam Frymoyer[1]

[1]Pediatrics, Stanford University, Palo Alto, CA; [2]Pediatrics, Palo Alto Medical Foundation, Palo Alto, CA; [3]Pediatrics, University of Washington, Seattle, WA

Introduction:

Infants that have abnormal cord blood gases are at risk for hypoxic-ischemic encephalopathy (HIE) and may benefit from neuroprotective cooling. Both the cord gas and the clinical exam together are essential for diagnosis and determining eligibility for cooling. Our specific aim was to develop a standardized clinical care protocol to screen infants with abnormal cord blood gases to ensure timely identification and evaluation of neonates at risk for HIE.

Methods:

Within a QI framework, a standardized clinical care approach for inborn neonates ≥36 weeks gestation with 'abnormal' cord blood gases was implemented in January 2016 at our institution. Abnormal cord blood gases, defined as pH ≤7.0 or base deficit (BD) ≥10, resulted in a direct call-back from the laboratory to the in-house neonatal hospitalist. The hospitalist then followed an algorithm that centered on the modified Sarnat neurological exam, postnatal blood gas testing, and standardized documentation. Each hospitalist received education on HIE, the benefits of cooling, and how to perform a Sarnat exam. The percentage of direct lab-to-physician call notification of any abnormal cord gases and the percentage of infants with an abnormal cord gas that had a documented Sarnat exam and postnatal infant gas were examined for the six months before and 35 months after QI implementation.

Results:

Of the 203 infants who had abnormal cord gases in the post-QI period, the laboratory made direct contact with the neonatal hospitalist to confirm the abnormal value in 186 cases (92%). In the post-QI period, 190 (93.5%) infants had a documented Sarnat exam, and 191 (94%) infants had a postnatal blood gas drawn compared to 16% of infants who had a documented Sarnat exam and 11% of infants with a postnatal gas in the pre-QI period. Throughout the entire post-QI period, 15 (7.4%) infants were cooled. Of those cooled, 13 (87%) were already in the NICU, but 2 (13%) were identified in the newborn nursery and subsequently admitted to the NICU for neuroprotective cooling. A standardized screening approach in neonates with 'abnormal' cord blood gases led to timely identification and evaluation of neonates at risk for HIE.

Abstract #6

Title: Erythropoietin is not a risk factor for severe retinopathy of prematurity among high risk preterm infants.

Kim Chi T. Bui*, Afshan Abbasi, Maria-Fe Villosis, Marielle Nguyen, Huy Truong, Tameka Watson, Joanna Buchanan, Naomi Ellenhorn, Qiaoling Chen. Department of Pediatrics-Neonatology, Kaiser Permanente Los Angeles, Downey, Panorama City, Orange County, Fontana, Department of Ophthalmology, Kaiser Permanente Los Angeles and Department of Research and Evaluation, Pasadena, CA.

Background:

Retinopathy of prematurity (ROP) is a developmental retinal vasoproliferative disease and a leading cause of blindness in children. Early gestational age at birth, low birth weight, and oxygen exposure are the main known risk factors for the development of ROP.

Recombinant erythropoietin (EPO) has been used for over two decades in the treatment of anemia in preterm infants to lessen

the need for blood transfusions. There is increasing evidence of its positive effects in neuroprotection and in reducing the rate of bronchopulmonary dysplasia in these infants. However, there are conflicting reports of a possible association between EPO use and an increased risk for the development of ROP.

Objective:

To determine whether erythropoietin is an independent risk factor for the development of severe ROP among preterm infants with a gestational age of 23 to 32 weeks and a birth weight of 1500 grams or less.

Methods:

We performed a retrospective study on a cohort of 1762 premature infants born between 2009 and 2014 in the Kaiser Permanente hospitals in Southern California. 902 of these patients received EPO. To examine the association between treated ROP and EPO, a propensity score (PS) analysis was performed using the inverse probability of treatment weighted (IPTW) approach.

Results:

In our study, the incidence of treated ROP was 7.3 % (129/1762). A univariate regression analysis showed that EPO use, intrauterine growth restriction, multiple gestation, and chorioamnionitis were not significant risk factors for severe ROP. Low gestational age, low birthweight, neonatal infections, necrotizing enterocolitis, grade 3 and 4 intraventricular hemorrhage, patent ductus arteriosus, oxygen or respiratory support, and blood transfusions were associated with an increased risk for severe ROP requiring treatment.

The PS analysis did not show an association between EPO treatment and ROP in either the whole population or in the subgroup of babies born at 23 to 28 weeks gestation, in whom the incidence of ROP was the highest.

Conclusion:

Based on our analysis, EPO treatment in preterm infants is not associated with the development of severe ROP.

Abstract # 7

Title: Erase the Pain: Improving Neonatal Post-Operative Pain Management

Author: Rebecca Carter*, Dannielle Heath, Gale Romanowski, Gloria Hwang, Clay Stanley, David Lazar, Hariharan Thangarajah, Jeanne Carroll, Mark Speziale, Laurel Moyer

Background:

Untreated and under-treated pain in neonates has been linked to both short- and long-term physiologic and neurodevelopmental consequences. Opioids are a mainstay of pharmacologic analgesia, but long-term use is associated with prolonged mechanical ventilation, delayed enteral feeds, increased risk of opioid withdrawal, and increased neurologic morbidity. The use of pain and sedation guidelines is recommended by the American Academy of Pediatrics and has been associated with improved clinical outcomes. We conducted a quality improvement project to improve post-operative pain management and reduce opioid exposure in our level IV NICU.

Objective: Decrease the number of patients with unrelieved pain (defined as consecutive N-PASS scores ≥ 4) in the first 24 hours post-operatively, from a baseline of 15% to 10%, by June 2020.

Setting: Our center is a level IV NICU with an average of 20 neonates undergoing surgery each month. There is no standardized pharmacologic approach to pain management.

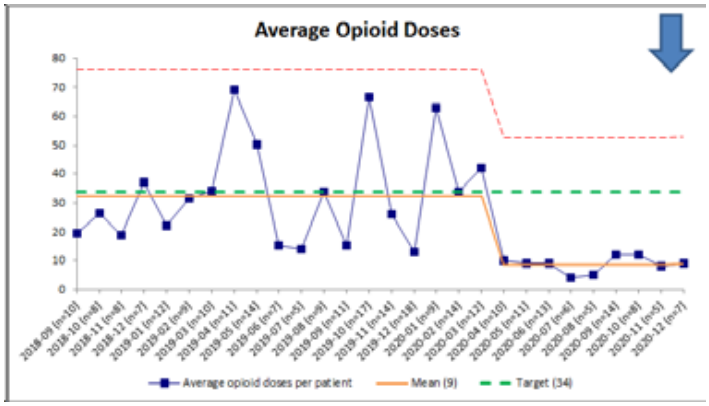
Intervention: A multidisciplinary team was established, and monthly meetings were held to discuss strategies for change. N-PASS scores during the first 24 hours were tracked as a primary outcome measure. Total opioid doses during hospitalization were tracked as a balancing measure.

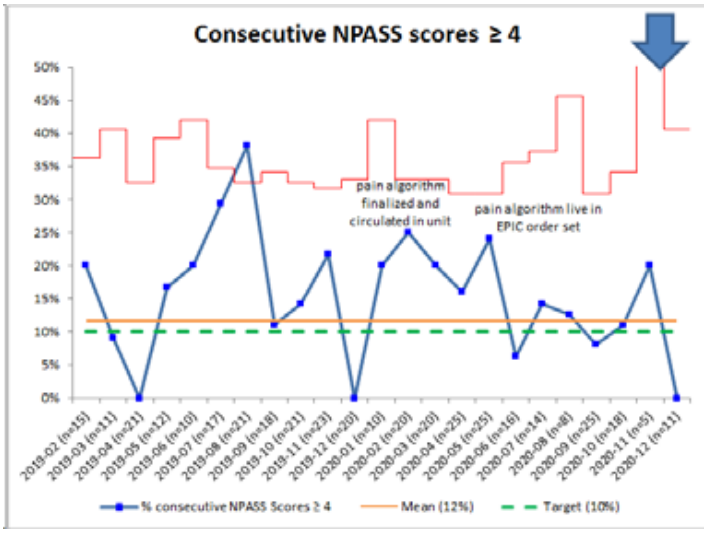
1) Create a multidisciplinary team
2) Implement a standardized pharmacologic guideline for post-op pain management
3) Re-educate staff on pharmacologic and non-pharmacologic pain management strategies
4) Discuss pain assessments on rounds
5) Survey families on post-op pain management

Results: In the baseline period (February to July 2019), 15% of patients had consecutive N-PASS scores ≥ 4 in the first 24 hours post-op. Baseline opioid exposure was 31 doses per patient. In the intervention period (August 2019 – present), opioid exposure was reduced to an average of 9 doses per patient. This was associated with a centerline shift corresponding with the implementation of a standardized pharmacologic guideline. The percent of post-op patients with consecutive N-PASS scores ≥ 4 remained at 15% in the intervention period.

Conclusions and Future Directions:

Through this QI effort, we established a multidisciplinary team to improve post-operative pain management in neonates. We standardized our approach to post-operative pain management and reduced opioid exposure in our surgical population by over 50%. We improved documentation of pain scores and enhanced discussion of pain management amongst medical providers, bedside staff, and families.





Abstract # 8

Bifidobacterium longum Subspecies *infants* EVC001 Improves Intestinal Enterocyte Proliferation and Permeability in Premature Infants *in Vitro* Models

Authors: *S. Chew[1], T. Guo-Zhong[2], A. Ehrlich[3], J. Prambs[1], K. Sylvester[2] and B. Henrick[1]

Evolve Biosystems, Stanford University, Københavns Universite

Introduction

Interventions such as C-section delivery, antibiotics, and formula feeding can foster early dysbiosis of the preterm infant gut microbiome, significantly altering the concentrations of bacterial metabolites available for cellular function. This can lead to a cascade of adverse effects to which premature infants are particularly vulnerable. Previous research shows a significant increase in overall total organic acids produced in *B. infantis* EVC001-fed infants, specifically with an increase in acetate and lactate and a decrease in formate and butyrate. This study investigated the effect of *B. infantis* EVC001 metabolites on intestinal proliferation and integrity in premature intestinal epithelial cell models.

Methods

Pooled fecal water (FW) from infants colonized with *B. infantis* EVC001 (EVC001) or those who were not (control), as well as major bacterial metabolites (acetate, lactate, butyrate, and formate) at physiological concentrations were added to premature human IECs and organoids and analyzed to assess proliferation, membrane integrity, and cytotoxicity.

Results

Intestinal and colonic primary proliferating and differentiated cells exposed to EVC001 fecal water significantly increased enterocyte proliferation as shown by real-time ATP expression compared to medium alone and control FW ($P< 0.01$). Furthermore, intestinal cells exposed to EVC001 FW significantly increased ATP production as compared to control FW, suggesting impaired ATP production in control infants ($P< 0.0001$). EVC001 FW treatment significantly decreased the release of lactate dehydrogenase, a biomarker of damaged cell membrane integrity, indicating a protective effect of EVC001-derived metabolites for enterocytes ($P< 0.05$). Physiological concentrations of acetate and lactate from EVC001-fed infants significantly increased intestinal epithelial cell integrity compared to the lower levels found in control infants ($P< 0.01$). This study provides evidence that EVC001 FW and specific bacterial metabolites, lactate, and acetate, significantly increased ATP production and lowered LDH concentrations, while control FW negatively affected cell growth, suggesting that metabolites produced by EVC001 promote enterocyte growth and improve intestinal integrity in premature infants.

Abstract # 9

Title:

Neonatal COVID-19 Infections Associated with Maternal Contact in the Perinatal Period

Authors:

Kacey Cox*, MD, FAAP, IBCLC, Neonatal Hospitalist, MemorialCare Miller Children's & Women's Hospital Long Beach

Shari Kelly, MSN/MSHCA, RN, NE-BC, C-ONQS, RNC-OB, Executive Director, Women's and Neonatal Services, MemorialCare Miller Children's & Women's Hospital Long Beach

Antione Soliman, MD, FAAP, NICU Medical Director, MemorialCare Miller Children's & Women's Hospital Long Beach

Introduction:

The COVID-19 pandemic has affected more than 57 thousand pregnant women in the United States, but more research is needed to understand transmission and infection in the perinatal period. In the early phase of the pandemic, the Centers for Disease Control and Prevention (CDC) recommended the temporary separation of neonatal-maternal dyads to decrease the risk of transmission. However, early studies indicated low rates of postnatal acquisition if infection control precautions were implemented. In August 2020, the CDC revised contact recommendations to include rooming-in as an option. Risk factors for maternal transmission and neonatal infection remain unclear, but current data suggests that the risk of neonatal infection is the same for infants who are separated compared to those that room in with their mothers after birth.

Methods:

A retrospective electronic health record chart review was completed to compare COVID-19 infection in neonates separated to neonates who roomed in with their mothers. Neonatal symptomatology and readmission within 30 days were collected. This study was conducted at MemorialCare Miller Children's & Women's Hospital Long Beach, which is a large academic birth care center and children's hospital. Data was collected from deliveries that occurred from March 2020 through December 2020. All mothers admitted for delivery were universally tested with one or two COVID-19 PCR tests. Neonates born to COVID-19 infected mothers were tested at 24 and 48 hours of life. Neonates were separated from their mothers from March 2020 to August 2020. Infants roomed in with their mothers, using an isolette as a physical barrier, from August 2020 to December 2020.

Results:

Out of 68 babies born to mothers with documented COVID-19 infection at delivery, five (7.4%) neonates were diagnosed with asymptomatic COVID-19 infection by 48 hours of life. None of the

infants who were separated from their mothers at birth were infected. All five of the COVID-19 infected infants had roomed-in with their mothers. None of the infants infected with COVID-19 were symptomatic or readmitted within 30 days of discharge. While the rate of neonatal COVID-19 infection was higher in the rooming-in group, the number of babies displaying symptoms and requiring readmission remained low.

Conclusion:

Newborns who roomed in with COVID-19 infected mothers had a higher rate of COVID-19 infection but did not have an increase in symptoms or 30-day readmissions. Early close contact between neonates and mothers has been shown to be extremely beneficial for bonding and breastfeeding and should continue to be encouraged, even if maternal COVID-19 infection is present. Research on the long-term consequences of neonatal COVID-19 infection will be useful in further addressing the recommendations for neonatal-maternal contact in the perinatal period.

Abstract # 10

Title:

Racial and Ethnic differences in Neonatal and Maternal COVID-19 Infection in the Perinatal Period

Authors:

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Introduction:

More than 24 million cases of COVID-19 have been documented in the United States with increasing evidence that minority communities bear disproportionately higher burdens of infection relative to their representation in the population. The purpose of this study is to examine the racial and ethnic differences in rates of neonatal and maternal COVID-19 infection during the perinatal period.

Methods:

A retrospective electronic health record review was performed to identify a cohort of neonates and mothers who were diagnosed with COVID-19 infections in the perinatal period. This was a single center study conducted at MemorialCare Miller Children's & Women's Hospital Long Beach, which is a large academic birth care center and children's hospital. Data was collected about deliveries that occurred from March 2020 through December 2020.

Results:

The racial and ethnic distribution of neonates and mothers during the study period included 55.3% Hispanic/Latino, 15.9% non-Hispanic White, 12.8% non-Hispanic Black, 13.8% Asian or Pacific Islander, and 2.2% other/unknown. Of the five babies who were diagnosed with COVID-19 infection in the first 48 hours of life, 80% (4) were Hispanic/Latino and 20% (1) were non-Hispanic Black. Of 67 mothers who were diagnosed with a COVID-19 infection at the time of delivery, 62.7% (42) were Hispanic/Latino, 7.5% (5) were non-Hispanic White, 9% (6) were non-Hispanic Black, 10.4% (7) were Asian or Pacific Islander, and 10.4% (7) were other/unknown.

Conclusion:

Racial and ethnic disparities exist in many different types of health conditions, but few studies have investigated the rate of COVID-19 infections found in different minority groups during the perinatal period. This study indicates that Hispanic neonates and mothers are more likely to have a COVID-19 infection in the perinatal period compared to other racial and ethnic groups. Understanding the relationship between perinatal COVID-19 infection and race and ethnicity is an important research priority to direct future clinical care and public health measures.

Abstract # 11

Title: Implementation of a Dextrose-Gel Algorithm for Hypoglycemia in a Large Birth Center with a Level III NICU

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Introduction: Hypoglycemia is a common reason for admission to the NICU. Literature (Harris 2013) has shown that the use of a dextrose gel along with breastfeeding is more effective than feeds alone and can be used as a first-line treatment for neonatal hypoglycemia. There is also no difference between glucose gel and placebo with respect to developmental outcomes at two years of age (Harris 2016). Based on this literature, in 2018, we set out to develop a quality improvement project to implement a dextrose-gel-based algorithm to guide the management of hypoglycemia and determine the need for NICU admission. Prior to this, no protocol for hypoglycemia management existed at our institution. The specific aims of our project were to reduce NICU admissions for hypoglycemia, reduce the need for IV dextrose, decrease maternal-infant dyad separation, and increase exclusive breastfeeding rates.

Methods: In August 2018, our protocol was implemented. Education was given to the nursing staff in labor and delivery, postpartum, and the NICU. Neonatologists from the practice group and community pediatricians also received an education. Infants at risk for hypoglycemia (SGA, LGA, IDM, LPTI, and infants with an Apgar less than 7) were screened. Asymptomatic hypoglycemic infants with a gestational age greater than 34 weeks were managed with the protocol. Hypoglycemia was defined as blood glucose less than 40mg/dL. Infants with blood glucoses of 25mg/dL-40mg/dL that were asymptomatic were treated with a buccal

dextrose gel (0.2 g glucose/kg) and fed breastmilk or formula with breastmilk prioritized. This was repeated up to 3 times as long as blood sugar remained in range. Infants requiring more than three dextrose gels were exited from the protocol and admitted to the NICU. Infants deemed symptomatic were automatically admitted to the NICU. Infants with blood glucose less than 25 were also automatically admitted to the NICU. A total of 5 Plan-Do-Study-Act cycles were completed.

Results: 217 infants admitted to the NICU for hypoglycemia from 1/2017-8/2018 were compared to 412 infants admitted to the NICU for hypoglycemia from 8/2018-3/2020. Following the implementation of our protocol, the average number of hypoglycemia admissions per quarter increased from 33.4 to 59.7 (p=0.0016). The proportion of infants admitted to our NICU for hypoglycemia who had documented hypothermia increased from 5.5% to 13.3% (p=0.06). The proportion of infants admitted for symptomatic compared to asymptomatic hypoglycemia increased from 59% to 66.7% (p=0.057). We also saw no change in exclusive breastfeeding rates.

Abstract # 12

RSVH and BH in Children with Higher-Risk CHD Aged ≤24 Months

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Introduction: In 2014, the American Academy of Pediatrics (AAP) revised the recommendations for respiratory syncytial virus (RSV) immunoprophylaxis. Palivizumab was no longer recommended for children with hemodynamically significant congenital heart disease (hs-CHD) in the second year of life (12-24 months) at the start of the RSV season. Herein, we describe a historical, observational cohort study that was conducted to investigate the impact of the 2014 AAP revised guidance on the contemporary burden of RSV hospitalizations (RSVH) and bronchiolitis hospitalizations (BH) in this population.

Methods: Using encounter data from 51 US children's hospitals that comprise the Pediatric Health Information System (PHIS), we studied children with higher-risk CHD aged ≤24 months at the start of the RSV season (assumed November 1) and hospitalized for RSV infection or bronchiolitis from 2010 to 2017 (November-March). Chi-squared tests were used to compare groups before and after the 2014 policy using a p-value to examine statistical significance. Poisson regression models and SAS macro %NLEstimate were used to test the difference in the difference of rates in hospitalizations to quantitatively describe changes in hospitalization rates pre- and post-2014.

Results: The overall cohort of children aged ≤24 months at RSV season start included 104,687 RSVH and 164,055 BH; among RSVH, 3.6% (n=3790) were identified as higher-risk CHD. The RSVH proportion for all children with higher-risk CHD aged ≤24 months increased by 17.5% after the 2014 guidance change (3364 per 100,000 before and 3954 per 100,000 after; *P*<0.0001). Stratified analyses by chronologic age demonstrated increases for children with higher-risk CHD aged ≤11 months (2818 per 100,000 before and 3180 per 100,000 after; *P*=0.001; 12.8% increase) as well as those aged 12 to 24 months (545 per 100,000 before and 774 per 100,000 after; *P*<0.0001; 42.0% increase). The percentage increase was significantly greater in the 12-24 months group than in the ≤11 months group (42% vs. 12.8%; *P*=0.0126). Higher-risk CHD children aged 12-24 months with RSVH also had increased intensive care unit admission rates after 2014 (191 per 100,000 before and 339 per 100,000 after; *P*<0.0001). A similar pattern of results was observed for BH.

Conclusions: This analysis highlights the increase in RSVH, BH, and associated disease severity among children with higher-risk CHD within PHIS after the AAP revised its policy recommendations for palivizumab immunoprophylaxis in this group in 2014.

Funding:

Sobi, Inc., Waltham, MA, USA

Abstract # 13

Patent foramen ovale versus atrial septal defect in extremely low birthweight infants: canthey be differentiated?

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Introduction:

Foramen ovale is a fetal channel that allows large right-to-left (R-L) shunting throughout gestation. It is covered by a flap valve on the left side, which is a remnant of the septum primum that functions to prevent left-to-right (L-R) shunting. After birth, some term infants have minor incompetence of the flap valve, allowing a small L-R shunt which usually resolves by 18 days ofpostnatal life. The incidence and degree of L-R atrial shunt in extremely low birth weight (ELBW) infants is not well known.

Objectives:

(1) To evaluate the change in size of patent foramen ovale (PFO) with rapid growth of the heartand (2) to differentiate between PFO and atrial septal defect (ASD) in ELBW infants.

Methods:

All ELBW infants born at LAC+USC Medical Center from February 2016 to March 2020 who survived to discharge and did not have any other congenital cardiac defects were included in this

retrospective study. Thirty-eight total infants with serial bedside transthoracic echocardiograms (ECHO) were reviewed. Specifically, initial ECHO obtained in the first few days of life and final ECHO obtained just prior to discharge were evaluated. The size of valve-incompetent PFO was determined by measuring the width of L-R color doppler flow in coronal posterior and sagittal subcostal views; the largest measurement was taken as PFO diameter. Infants were divided into two groups according to size of their initial PFO.

Results:

Thirty-five infants (mean gestational age 26 weeks, range 23-30; mean birth weight 748 grams (g), range 500-900) had initial PFO diameter of 1.7mm (0.0-2.7) and final PFO diameter of 1.9mm (0.0-3.8) at postmenstrual age (PMA) 38 weeks (34-51) and weight 2520g (1680-5500).In contrast, three ELBW infants born at 24 weeks (24-25) and 713g (644-760) had initial PFO diameter of 3.5mm (3.1-4.0) that grew into a 6.6mm (6.0-7.5) ASD by 40 weeks (36-45) PMA and weight 3112g (2045-4300).

Conclusion:

In ELBW infants, a PFO with less than 3mm diameter does not change significantly during postnatal growth to term gestation, while a PFO of greater than 3mm diameter shortly after birth suggests presence of ASD and increases in size with advancing postnatal age. This study also suggests that the incidence of secundum ASD may be increased in ELBW infants. However, study of a larger population of ELBW infants is needed to confirm this finding.

Abstract # 14

Thriving in NICU and at 1 Year Post-Discharge

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Background: Premature babies are prone to suffer from growth failure due to inadequate nutrition. The specific nutritional needs are still unknown even though a lot of progress has been made in the last few years. We have a robust home health program that allows for early and safe discharge home of these babies where they continue to thrive.

Objectives: Monitor growth at discharge; and at one year of age for babies born <1500 grams in a large community NICU, in an integrated health care system.

Design: Retrospective, cohort, observational study of 507 babies <1500 gm at birth. The study period was from 2014 to 2019.

Interventions and measurements:

We implemented improved nutrition guidelines in 2017-18, which includes aggressive parenteral (higher proteins, fats, and calories) and enteral nutrition (early and higher fortification to 26 calories before full feeds).

At discharge: Parents are educated with a personalized nutritional plan that includes 22 or 24 calories of breast milk or preterm discharge formula. They are followed by home health, nutrition clinic, and Pediatrics Gastroenterologist with an interest in infant nutrition. This has been our practice since 2016. They are also monitored for readmissions.

Results:

There was a clear separation of growth pre and post interventions.

Growth at discharge: In 2014, adequate growth was 39% for all babies and 26% for <1000 grams. In 2019, it increased to 69% for all babies and 61% for <1000 grams.

Growth at 1-year post-discharge: Adequate growth was 84% for all babies and 81% for <1000 grams for the birth year 2015. It increased to 92% for all babies and 90% for <1000 gm for the birth year 2018.

The readmission rates remain less than 3 % at 1-month post-discharge.

Limitations:

Few babies <5% lost to follow up

Conclusions

Our Quality improvement project shows that even in a busy large NICU (>100 of <1500 gram babies per year) with multiple physicians and the lowest socio-economic group (SPA 6 of Los Angeles County), adequate growth can be achieved with extensive collaboration with Parents, MDs, Nurses, and Nutrition. We also propose that empowering dieticians in the unit helps remove barriers and provides a consistent message across specialties. As a secondary outcome, babies who are severely growth restricted at birth and stay the same at discharge are at high risk for growth failure at one year of age.

Implications: Consistent discharge plan that includes outpatient nutrition and GI follow-up improves growth.

Abstract # 15

Multi-Omics Approach Suggests a Novel Molecular Mechanism of Necrotizing Enterocolitis in the Preterm Infant Gut Microbiome

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Background: Necrotizing enterocolitis (NEC) is an intestinal disease that primarily affects premature infants, causing an inflammatory process that can lead to intestinal tissue damage and death. NEC is a leading cause of overall infant mortality in the United States, affecting 0.1% of newborns per year in North America while reaching treatment costs of up to $200,000 per patient. Although outcomes related to prematurity illness have remarkably improved, the mortality rate for NEC has remained constant at up to 50% or more depending on severity. While the pathogenesis of NEC remains obscure, clinical features are consistent, including intestinal immaturity, increased inflammation and gut dysbiosis.

Objective: The major limitation in NEC prevention dwells in the inability to predict which subset of premature infants is at risk for developing NEC. Recently, gut dysbiosis has emerged as a major trigger in NEC, particularly supported by the fact that NEC cannot be produced in germ-free animals. Here, we present a multi-omics approach combining metagenomics and metabolomics, with functional *in vivo* and *in vitro* assessment of a leading novel molecular

mechanism defining NEC.

Methods: 1,647 publicly available metagenomics datasets were analyzed (NEC=245; healthy =1,402) using artificial intelligence. Metabolomics was used to quantify the concentration of fecal metabolites at NEC onset, during recovery (n=8), and in age matched controls (n=10). Functional toxicity assays of discovered metabolites were performed in vivo in mice and in vitro in human intestinal epithelial cells.

Results: Multi-omics showed significant differences in pyruvate fermentation pathways and associated intermediates. Particularly, formate was elevated in the stool of NEC patients at disease onset compared to recovery (P=0.02) and controls (P=0.005), and was positively correlated with degree of intestinal injury (r2=0.86). *In vitro*, formate caused enterocyte cytotoxicity in human cells through necroptosis (P<0.01). *In vivo*, luminal formate caused significant dose and age dependent NEC-like injury. *Enterobacter cloacae*, *Escherichia coli* and *Klebsiellaa pneumonieae* were the most discriminatory taxa related to dysbiosis and increased formate production.

Conclusions: Multi-omics data suggests a novel mechanism of NEC through the production of abnormal enteric fermentation products. Ongoing efforts to prevent NEC should focus on reducing newborn gut dysbiosis including the reduction of specific risk-associated taxa and providing possible biomarkers for determining the effectiveness of interventions including early-life targeted probiotic feeding.

Keywords: NEC, Microbiome, Metagenomics, Artificial Intelligence

Abstract # 16

TITLE: Biologic Potential of Human Umbilical Cord Mesenchymal Stem Cells Exposed to Antenatal Marijuana

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Background: Human umbilical cord derived mesenchymal stem cells (MSCs) have been extensively studied with therapeutic efficacy in several injury models. Our work has shown therapeutic efficacy of MSCs and their secreted factors in experimental neonatal chronic lung disease and pulmonary hypertension models. Maternal antenatal drugs and disease states can affect the efficacy of MSCs. At present, very limited data are available on maternal marijuana use during pregnancy affecting the MSC biologic potential.

Objective: We hypothesized that human umbilical cord Wharton's jelly MSCs harvested from marijuana exposed cords will lack biologic potential compared with non-exposed cords. Our aims were:

1. To generate human umbilical cord MSCs from marijuana exposed and non-exposed cords.

2. To determine in vitro properties and secreted factors between the two groups.

Design/Methods: Human umbilical cord Wharton's jelly MSCs from marijuana exposed and non-exposed umbilical cords were isolated and cultured according to our modified protocols. Marijuana exposure was considered positive if mothers have smoked marijuana within the prior two weeks before delivery with a positive urine drug test. In vitro growth, differentiation, and secreted factors were analyzed utilizing duplication time, Western immunoblot, and proteomics analysis.

Results: MSCs were harvested from 6 pooled marijuana exposed cords with 6 non-exposed cords as control. Marijuana exposed MSCs had much shorter duplication (8 vs. 11 days) and differentiation time (17 vs. 21) compared to non-exposed MSCs. Proteomic analysis showed marijuana exposed MSCs had lower concentrations of several biologic markers involved in lung injury and repair, including VEGF, Osteopontin, M-CSF1 and KGF.

Conclusion(s): Marijuana exposure during pregnancy leads to a reduction in biologic potential of human umbilical cord MSCs. Further in vitro and in vivo studies are underway to determine the extent of this relationship.

Abstract # 17

Abstract Title: A rare anomaly – Duodenal Dieulafoy's lesion in a preterm baby

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Introduction:

Dieulafoy's lesion is the presence of a histologically normal artery with large diameter which protrude into the gastric lumen through a small mucosal defect. Rupture can result in massive haemorrhage that can be fatal. Dieulafoy's lesions are rare in the neonatal population. Duodenum is an uncommon site. We report a case of duodenal Dieulafoy's lesion in preterm baby who presented with hematemesis and melena. The lesion was successfully treated with endoscopic intervention.

Case:

Baby born at 29 weeks of gestation with weight of 1.2 Kg, delivered by caesarean section in view of preeclampsia to 26 years old primigravida mother with negative serology. His birth was uneventful and received vitamin K. He reached to full feeds by day 18 of life. He developed sepsis with meningitis on day 20 with elevated C-reactive protein (167 mg/L) and 500 WBCs in cerebrospinal fluid (CSF). Blood culture grew Serratia marcescens, however, CSF culture was negative. He received antibiotics for 21 days.

Four weeks onwards had repeated episodes of melena and blood-stained aspirates in the orogastric tube. The haemoglobin dropped to 5 g/dl requiring normal saline bolus and packed red blood cell transfusion. His coagulation profile and platelet counts were normal. He was treated conservatively for necrotizing enterocolitis and transfer to our hospital for further evaluation.

His Sepsis screen was normal. X ray abdomen showed distension of bowel loops and abdominal ultrasound was normal. Upper Gastrointestinal endoscopy revealed duodenal ulcer with pulsatile artery protruding into the lumen of 1st part of duodenum. Epinephrine was injected locally which reduced the acute bleeding. Underwent second endoscopy with Argon Plasma coagulation (APC). No recurrence of gastrointestinal bleed occurred. Baby was transferred back to the referring hospital on full feeds, in room air within a week.

Discussion:

Dieulafoy's lesion accounts for 0.3% to 6.7% of the upper gastrointestinal (GI) tract bleeding cases in adults. The prevalence in paediatric population is unknown with very few cases reported in the literature. It typically presents as sudden massive haemorrhage which is often recurrent. Differential diagnosis for gastrointestinal bleed includes necrotizing enterocolitis, vitamin K deficiency, deranged coagulation, Meckel's diverticulum, volvulus, intraoral or intranasal injury and gastric perforation. Dieulafoy's lesion should be considered in the differential diagnosis of gastrointestinal bleed.

Dieulafoy's lesions are managed with endoscopic interventions, with high success rates reported with various modalities such as thermocoagulation, band ligation, administration of sclerosants and hemoclip application, thereby limiting the need for surgical intervention.

Abstract # 18

Clinical outcome of newborns born to mothers infected with SARS-CoV-2 during pregnancy:A Prospective cohort study

Authors: *Jegatheesan, Priya; Narasimhan, Sudha Rani; Huang, Angela; Flores, Claudia V.;Rai, Daljeet; Anderson, Christina; Misra, Sonya; Stemmle, Monica; Cortes, Maria E.; McAuley, Jennifer; Patel, Rupalee; Menge, Elona; Arain, Yassar H.; Song, Dongli.

Introduction: At the beginning of the COVID-19 pandemic in March 2020, we developed astandardized clinical care guideline for newborns exposed to SARS-CoV-2 based on CDC, AAP, and WHO recommendations.

Objective: To describe the clinical outcomes of newborns born to mothers positive for Sars-Cov-2 during this pregnancy.

Methods: This is a prospective study of newborns born between April and December 2020,to mothers who had recent and resolved (<2weeks and >2weeks before delivery) SARS- CoV-2 infection during pregnancy.

The standardized mother-baby care for recent infection included pre-delivery counselling onthe risk and benefits of mother and baby rooming in together and breastfeeding vs. separating mother and baby; delayed cord clamping; skin to skin in delivery room with maternal hand hygiene and wearing a mask. The mother-baby dyad roomed in together ina post-partum room with airborne isolation precautions and the newborn stayed in an isolette. A Neonatal nasopharyngeal swab for SARS-CoV-2 was performed at 24 hours of life. Post-discharge follow-up included phone calls, surveys, and in-person clinic visits.

Mothers were instructed to wear a mask when breastfeeding or holding the newborn duringher self-isolation period. Routine standard of care was followed for newborns when mothershad resolved infection. Screening laboratory tests were done (CBC, LFT, Panel 7, CRP) for all enrolled newborns during the first 6 months of the pandemic. The demographics and neonatal outcomes are summarized for the recent vs. resolved maternal infection.

Results: 120 newborns were born to 118 mothers with SARS-CoV-2 infection (Table 1, 2). Only one 31-weeks premature infant was positive for SARS-CoV-2. This infant had a typical NICU course for the gestational age. Twelve newborns were admitted to the NICU (4- prematurity, 1-jejunal atresia, 7-respiratory distress). One term infant had unexplained diarrhea in the first week of life but tested negative for SARS-CoV-2 at 24 and 72 hours. Six newborns were readmitted within 2-weeks post-discharge, and all retested negative for SARS-CoV-2.

Conclusion: In our cohort, the majority of the mothers were not severely ill, and their newborns had a stable clinical course in the first 2-weeks of life. The positive rate of SARS-CoV-2 in neonates was 1%.

Table 1: Maternal Demographics

	Overall Cohort	Maternal SARS-CoV-2 infection <2w prior to delivery	Maternal SARS-CoV-2 infection >2w prior to deliver
Maternal Demographics	N=118	N=72	N=46
Mother symptomatic at the time of diagnosis, %	47	25	83
Symptomatic at the time of delivery, %	14	24	0
Asymptomatic, %	51	72	17
Mild to moderate symptomatic, %	44	26	72
Severe symptomatic, %	5	1	11
Maternal age, years, median (range)	26.5 (16, 42)	27 (17, 42)	25.5 (16, 37)
Gravida, median (range)	3 (1, 12)	3 (1, 12)	2 (1, 6)
Para, median (range)	1 (0, 9)	2 (0, 9)	1 (0, 5)
Hispanic, %	92	92	91
Race, %			
White	94	94	93
Black	2	3	0
Asian	4	3	7
C/Section, %	31	28	35
Multiple pregnancies, %	2	3	0
Maternal Diabetes, %	20	18	24
Maternal Hypertension, %	22	18	28
Maternal obesity, %	26	24	30

Table 2: Neonatal Demographics and Outcomes

	Overall Cohort	Maternal SARS-CoV-2 infection < 2w prior to delivery	Maternal SARS-CoV-2 infection >2w prior to delivery
Neonatal Demographics	N=120	N=74	N=46
Gestational Age, (Median, range)	39.1 (31.7, 41.6)	39.2 (31.7, 41.3)	39.1 (31.7, 41.6)
Birth weight, (Median, range)	3362 (1250, 4560)	3225 (1855, 4405)	3475 (1250, 4560)
Prematurity <37w, %	9	12	4
Male sex, %	45	42	50
Neonatal Outcomes			
Breastfeeding in the hospital, %	96	95	98
Exclusive breastfeeding in the hospital, %	58	54	65
Rooming in with mother, %	92	92	91
NICU admission, %	10	9	11
*WBC, median (range)	16520 (4150, 42100)	16065 (4150, 29890)	19160 (7810, 42100)
*Lymphocyte count, median (range)	4590 (1500, 9470)	4245 (1590, 9310)	5000 (1500, 9470)
*Neutrophil count, median (range)	10570 (1600, 26100)	10195 (1600, 16290)	12390 (2600, 26100)
*C reactive protein, mg/dL, median (range)	0.3 (0.1, 7.4)	0.5 (0.1, 7.4)	0.3 (0.1, 6.6)
*CRP >2, %	12	9	21
*Creatinine, mg/dL, median (range)	0.8 (0.4, 1)	0.8 (0.4, 1)	0.8 (0.5, 0.9)
*ALT, U/L, median (range)	16 (5, 37)	16 (5, 33)	17 (8, 37)
*AST, U/L, median (range)	70 (5, 125)	69 (33, 125)	73 (5, 111)
*Bicarbonate, mmol/L, median (range)	18 (13, 27)	19 (13, 27)	18 (15, 25)
**SARS-CoV-2 NP swab positive, %	1	1	0
Hospital length of stay, median range	2 (1, 29)	2 (1, 29)	2 (1, 10)
Readmission <2weeks, %	5	5	4

*Screening labs were performed in 48 (65%) and 21 (46%) newborns with maternal infection <2weeks and >2weeks prior to delivery, respectively. ** SARS CoV-2 pcr swab was performed in 73 (99%) and 14 (30%) newborns with maternal infection <2weeks and >2weeks prior to delivery, respectively.

Abstract # 19

Title: Improving Placental Transfusion Rates at UCSD

Authors: Meghana Karmarkar, MD*; Dora Melber, MD; Karen Perdion, MSN, CNM; Sharon McMahon, CNS RNC-NIC, Melissa Niman, MA MEd; Lani Lee, RN BSN; Shannon Beaupre, MSN RNC; Erika Fernandez, MD.

Introduction: Placental transfusion by delayed cord clamping (DCC) has significant benefits over immediate cord clamping in newborn infants. However, there is less information known about risks and benefits of cord milking. A recent study found an increased risk of intraventricular hemorrhage (IVH) in preterm infants who received cord milking. Due to the multidisciplinary involvement around placental transfusion, targeted actions to improve this metric without adverse events can be complex.

Objective: Our objectives are to increase the overall placental transfusion rates from 81% to 90% in all infants born at UCSD and to decrease cord milking in infants born <28 weeks from 46% to 10% at UCSD by June 2021.

Methods: A multidisciplinary QI team was developed at UCSD to increase the rate of DCC in all infants and to decrease the rate of cord milking in preterm infants <28 weeks. Multiple interdisciplinary meetings were held to design a hospital policy on DCC, which included inclusion criteria, methods of DCC, documentation requirements, and specific communication templates for the delivery room. Education was provided to NICU/Newborn/OB/L&D staff to ensure consistency in resuscitation care and to ensure accuracy in documentation in the electronic medical record. Balancing measures planned are frequency of phototherapy, exchange transfusion and IVH. The first PDSA cycle was initiated in January 2020 with the implementation of the first formal QI meeting and data from 2019 was analyzed. The committee finalized the policy in September 2020 after the policy was submitted for review by multiple disciplines.

Results: Baseline data from 2019 showed 81% of all infants born at UCSD received DCC; 51% in preterm infants and 84% in infants >36 weeks. Results from our PDSA cycles in 2020 showed increasing trends with an average DCC rate for all infants of 85%; 48% in preterm infants and 88% in infants >36 weeks (Fig 1-3). For infants <28 weeks, the percent cord milking decreased from 46% to 17% (Fig 4).

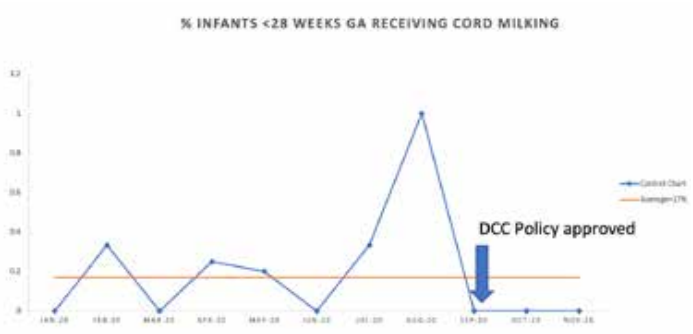
Conclusion: The rate of placental transfusion improved in infants overall while cord milking was reduced in infants <28 weeks just by implementing the first step of constructing a multidisciplinary committee to produce a well-aligned policy. No improvement in DCC rates for preterm infants was noted so far, although ongoing data collection is needed to determine any significance. The next step is to provide continued education to providers to further increase the rates of DCC in preterm infants.

Fig 1. Percent of all infants who received delayed cord clamping in 2020 (Average 85%).

Fig 2. Percent of all infants <36 weeks who received delayed cord clamping in 2020 (Average 48%).

Fig 3. Percent of all infants >36 weeks who received delayed cord clamping in 2020 (Average 88%). Note the increasing trend after implementation of the policy.

Fig 4. Percent of infants <28 weeks receiving cord milking in 2020 (Average 17%).



Abstract # 20

Title: Trends in Risk of Respiratory Syncytial Virus Hospitalizations in Preterm Infants Over a 10-Year Period

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Disclosure: This work was previously presented at IDWeek 2020.

Background: The American Academy of Pediatrics (AAP) recommended respiratory syncytial virus (RSV) immunoprophylaxis (RSV-IP) to reduce the risk of severe RSV hospitalization (RSVH) for certain infants <35 weeks gestational age (wGA) until 2014, when the AAP no longer recommended use among infants born >29 wGA without other medical conditions. Studies have shown that RSV-IP subsequently decreased among these infants, as well as among infants born <29 wGA for whom RSV-IP is still currently recommended. We described RSVH rates among preterm (PT) infants <35 wGA compared to term infants from 2008-2019.

Methods: We identified infants born between 7/1/2008-7/30/2019 in the MarketScan® Commercial and Medicaid claims databases. Infants with a code for birth at <35 wGA were classified by wGA. Those with a code for full-term without major health problems were classified as term. Infants contributed follow-up time during the RSV season (November to March) while <6 months old, summarized as infant-seasons (days of follow-up during the RSV season divided by 151 [number of days in an RSV season]). Using diagnoses codes, we identified RSVH during each RSV season for infants <6 months. Unadjusted rate ratios (RR) comparing PT infants to term infants were calculated to account for seasonal variation in virus circulation. The RR for PT vs. term after the guidance change was divided by the RR for PT vs. term before the guidance change to assess the increase in risk for PT infants relative to term.

Results: Over 1 million infants were identified in each database. There were 796 RSVH among Commercial PT infants, 6,486 RSVH among Commercial term infants, 2,501 RSVH among Medicaid PT infants, and 13,962 RSVH among Medicaid term infants during the 10 seasons in the databases. RSVH rates for PT infants tended to increase over time. RR comparing PT to term infants increased after the guidance change. The risk for 29-34 wGA infants compared to term infants approximately doubled in the 5 years after the guidance change (ratio of RR for PT vs. term after vs. before the guidance change = 2.0 for Commercial and 2.2 for Medicaid). The magnitudes were smaller for <29 wGA infants but an increase was found (ratio of RR=1.7 for Commercial and 1.4 for Medicaid).

Conclusions: After the change in recommendations for RSV-IP, increases in RSVH rates for infants born at 29-34 wGA compared to term were found. This was also true for <29 wGA infants for whom RSV-IP is recommended.

Abstract # 21

COVID-19 UPDATE

1/17/2021

Hi All: As you'all know, I am a firm believer in the power of music and especially in a "song with great meaning". This past week will be etched in my memory (and yours as well) forever for many reasons. Consider the following well known song written by Fredrick Lowe and Allan Lerner- The song is "ALMOST LIKE BEING IN LOVE"- I have modified the lyrics to keep current:

The song originally from the show Brigadoon on 1947.

A great rendition of this tune was delivered by Ella Fitzgerald, Gene Kelly, Natalie Cole and Diana Krall to name a few. I was hoping for a version from Menasha Skulnick (look him up if you must) but thus far…..none have appeared.

What a week this has been,

What a rare mood I'm in,

Is our Democracy Falling Apart?

The mob and the crowd,

Were often too loud,

Will we accept the new group when they start?

All the music of life seems to be,

Like an accordion that is bellowing to me.

I will sing out a note,

As Congress ponders the vote,

I would swear I was falling,

I would swear I was falling,

Its time to embrace this new start!

As the number of Covid cases escalates, there was more press concerning political issues rather than the need for testing, therapy and meaningful follow up. Tommy Lasorda looking down or up from his resting place and seeing lines around his beloved Dodger Stadium must be thinking: I bet the Bums are playing the Giants.

More cases. More hospitalizations. More deaths. And empty spaces where there was life. Our morgue is full. The joy of a new birth often mitigating bad news is stifled without grandparents and family. In spite of precautions and promises of fist-bumps instead of a hug and an affectionate pat on the back,

I cannot hold back consoling my colleagues and embrace anyway although it feels weird " wearing gloves". I have SOLASTALGIA – You probably do as well. LOOK UP THE WORD.

The following are the latest evidence-based factual material

1. It is important to remember that the two most utilized vaccines, The Pfizer-BioNTech vaccine (30 ug, 0.3ml) two doses, 21 days apart; and the Moderna vaccine (100ug, 0.5ml) 2 doses 28 days apart are not interchangeable with each other. In theory, since they are both formulated along the same lines, you would believe that they could be interchangeable. However, the safety and efficacy of a mixed-product series have not been evaluated.
2. It is interesting that the Moderna Vaccine uses three times as much dosage. Yet the results of the Moderna studies are no better than the Pfizer preparation as far as infectivity and protection.
3. There have however been several instances where different products were inadvertently administered. As of today, if this does occur with dose #1 and dose #2 administered with different products, no additional doses should be given of either vaccine. Further recommendations will be forthcoming as patients who received these products are being followed.
4. Recommendation: No other vaccines should be given 14 days before and 14 days after the vaccine is given. But…..that said….. if the benefits of another vaccine (Tetanus Toxoid for example in A WOUND MANAGEMENT PATIENT;, AN INFLUENZA VACCINE IN A LONG-TERM CARE FACILITY)) THIS IS A SITUATION WHERE THE BENEFITS OF THIS VACCINE OUTWEIGH THE POTENTIAL UNKNOWN RISKS.
5. The need for "booster" doses is not known at this time. Stay Tuned.
6. The vaccine should be given to individuals who have evidence of a prior SARS-CoV-2 infection whether symptomatic or asymptomatic.
7. Vaccination of an individual who currently has the Covid-19 infection should be deferred until the patient has recovered from the illness and criteria have been met to discontinue isolation. Current evidence suggest that re infection is uncommon in the 90 days after the initial infection. It therefore is best to wait until these 90 periods is completed before receiving the vaccine. However, I believe that we will know much more about antibody levels and protective levels in the next several months and therefore, the above guidance may change.
8. If a vaccinated person subsequently develops Covid-19, treatment decision regarding monoclonal antibodies, convalescent plasma, other antiviral therapies or steroid administration should remain the same.
9. Using the same 90-day deferral plan is the most prudent course in those patients who have received monoclonal antibodies for example.
10. If a person is exposed for example today, the mean incubation period is 5-6 days and therefore giving a first dose of the vaccine would not provide an adequate immune response within this incubation period. These individuals who have been exposed should not seek vaccination until the quarantine period (14 days) has passed to avoid exposing others, especially healthcare personnel to Covid during the vaccination visit.
11. MASKING: If the viral inoculum matters in determining the severity of the COVID-19 infection then masking Is appropriate for the mask will filter out some virus-containing droplets and will make these patients less symptomatic. Countries that have adopted population-wide masking have less severe Covid infection, less hospitalizations, and fewer deaths.
12. In patients with autoimmune disease, who have not had any previous contraindication to vaccination may receive the m-RNA vaccine.
13. Pregnancy and breast feeding in not a contraindication for getting the vaccine. Since Covid does lead to a higher incidence of preterm birth, it is prudent to administer the vaccine to women that are pregnant. There have been no concerns regarding teratogenicity in women receiving the vaccine early in pregnancy. Do not forget, these vaccines (Pfizer and Moderna) are not live virus vaccines.
14. What are the contraindications:
    - Anaphylaxis after a previous dose of the mRNA Vaccine.
    - Immediate allergic reaction of any severity to a previous dose of the vaccine or any of its components (especially propylene glycol)
    - If any of the above are present, the vaccine should be given in a setting where advanced medical care is available.
    - If a vasovagal reaction has occurred previously (sudden drop in heart rate, blood pressure and even fainting) the vaccine can be given but in a more controlled environment.
15. In an individual has a history of a previous infection with Covid-19, reinfection is rare at the end of 90 days following the infection, the patient should defer vaccination until at least the 90 day period has passed.

16. Allergies to food, pets, environment, peanuts, latex, eggs or gelatin is not a contraindication for getting the vaccine. If a patient has a history of allergic reactions, giving an antihistamine is not recommended as their use may mask cutaneous symptoms which can lead to a delay in the diagnosis and treatment of anaphylaxis.
17. Current antibody tests assess immunoglobins IgM and IgG. A positive tests indicates either a previous infection or vaccination. The antibodies are produced in reaction to either the "spike protein" or the "nucleocapsid" protein. Currently, antibody testing is not recommended to assess immunity.
18. If the Pfizer vaccine is given there are protective antibodies produced 12 days after the first dose and 7 days after the second dose. If the Moderna vaccine is used, there is protection 90 days after the second dose.
19. I am asked often, how does the vaccine work to prevent infection and especially if infection occurs to produce a milder illness. When exposed to covid-19, our body produces white blood cells which basically fight infection. There are three types of white blood cells:
    - Macrophages- These are white blood cells that ingest the virus and leave behind parts of the cell called "antigens". The body believes these antigens are dangerous and produces substances) called antibodies) to attack these antigens.
    - B-Lymphocytes- consider these "defensive" white blood cells which produce antibodies which are left behind by the macrophages.
    - T-Lymphocytes- this is another type of white blood cell which attack the cells in the body that have already been infected. These T-lymphocytes are also called "memory cells" that go into action quickly if the body once-again is exposed to the virus. These cells (memory cells" remember what it has learned previously. THE QUESTION: How long does this protection last?
20. Remember, it takes a few weeks for the body to produce enough B and T Lymphocytes after vaccination. An individual can become infected and sick if there is not enough time to produce antibody protection.
21. Handwashing- an integral part of the preventive process. Since often times after sneezing we touch our face, nose and the virus can be inhaled an infect the respiratory tract. The recommendation is to wet your hands, use soap and washing actively for 20 seconds. HOW AND WHY DOES THIS HANDWASHING WORK AND WHY IS 20 SECONDS RECOMMENDED?????
22. In soap lather, the molecules from the soap and water form into bubble like structures, called "micelles" These micelles trap viral matter and other material (grease, dirt etc.). The soaps we use contain a class of compounds called "surfactants" which neutralize the outer membrane of the coronavirus which is made of lipid particles. The 20 seconds (measured in laboratory studies) allows these molecules to interact with water and also allows the surfactant in the micelles to carry viral debris away from out hands. Soap and water washing for 20 seconds is preferable to using a hand-sanitizer (must have at last 60% alcohol) for rubbing your hand with a sanitizer does not get to all the surface area. Since 20 seconds is the ideal time, use a timer for the process. Or……. you might try singing Happy Birthday twice, or your ABCs- It takes about 20 seconds.
23. There has now been some meaningful data regarding long term consequences of patients who have had Covid-19 and were hospitalized. At 6 months, 33-40% of this large group (1733 patients) complained about fatigue, muscle aches and pains, and a perceived decrement in mental health. Women were affected more than men and also complained about alopecia (loss of hair). In addition, there were persistent pulmonary diffusion abnormalities.
24. Now that restrictions may be easing all over the world in in some parts of the United States as well, there is concern again about air travel. These concerns are real for the CDC has opined that there is genomic evidence of in-flight transmission of SARS-CoV-2 despite predeparture testing. Remember that 15- 20% of negative tests are false negatives and in fact these individuals are truly positive. So therefore, the best we can do is to follow accepted guidelines (MSWAC- masks, sanitizing, washing, avoid crowds)
25. I have spent a great deal of time discussing the Pfizer and Moderna Vaccines. However, the other important vaccine is the Oxford-AstraZeneca Vaccine (see previous updates concerning details on this vaccine). However, briefly, the other vaccines store the instructions concerning the spike protein in single-stranded RNS (hence m-RNA). The Oxford vaccine uses double-stranded DNA. Simply, the gene for the coronavirus spike protein is added to another virus (the adenovirus-responsible for the common cold) . The Oxford virus uses a modified version of the chimpanzee adenovirus (ChAdOx1). This combination enters the cell but can't replicate. This technique is not new and it has been used for Eboli and now for HIV and Zika virus.
26. There are many advantages to this vaccine as DNA is not as fragile as RNA and the adenovirus virus it is combined with has a protein coat that protects the genetic material inside. In addition, it does not need to be frozen.
27. So……The vaccine is injected…..the adenovirus latch onto the protein of your cells on the outer surface…..the cell engulfs the virus into a type of bubble…..this bubble is pulled inside the cell…..the adenovirus escapes from the bubble (a lot like the movie- the great Escape)….. the adenovirus travels to the nucleus where the DNA is stored…..this combination (spike protein and adenovirus) is read by the cell and…..messenger RNA (mRNA) is produced…..the mRNA stimulates production of the

immune system. This appears to be a stronger signal to the immune system since the adenovirus is included (see # 19 of this update)

28. We continually are bombarded with the terms, mutation, variant and strain." Mutation" refers to the actual change in sequence of the amino acids. With Covid, the mutation is a change in the sequence of the amino acids where there is an aspartic-acid-to-glycine substitution at position 614 of the spike glycoprotein (I apologize for the organic chemistry additions but I am trying to be complete). The term "variant" is used to describe these genomes which differ in the sequence I have described. Variants can differ by one mutation or many mutations). If this variant presents a difference in transmission or virulence it is called a "strain"
29. The variant we are talking about is labeled B.1.1.7 (also called 501Y.V1). It has achieved dominance outcompeting the many other variants.
30. I had commented in an earlier update about Vitamin D and the thoughts that higher levels of Vitamin D offered a greater amount of protection. Remember your biology and realize that Vitamin D is provided from sunlight and various foods (milk, orange juice, fish, breakfast cereals) Suggested intake is 600-1000IU/day) A multivitamin daily along with good nutrition will provide enough Vit D. But Vitamin D pundits are saying that with the lockdown we do not venture outside enough and lose the benefit of the beneficial effects of sunlight. So…..bottom line…..If you are living in Greenland, during its no sunlight gray period, or in Santa Monica with the sky overcast from the ash from the fires or prefer the curtains drawn all the time------ keep taking your Vitamin D…….BUT NOT TOO MUCH. Stay away from too much ZINC as well.
31. I finally need to comment regarding my thoughts on reopening schools as many states remained closed to in person instruction. We all understand that in person teaching is certainly the best type of education. In addition to the educational benefits, the social aspects remain essential. So…..what to do? I am in favor of re-opining schools when it is safe in your community. That is for some reason, if your small area is a particular "hot spot" then wait until numbers decrease. I am not as concerned for the children as much as I am the effect on teachers and ancillary staff. A New ACRONYM for you …..and get used to it…..OLS (On-Line-Society). An on-line Zoom call provides family togetherness and is adequate (not ideal) for meetings and conferences…..but…..in my opinion this type of education is better than nothing…..but still not ideal.

REMEMBER PLEASE:

MSWAC: MASKING

SANITIZING

WASHING HANDS

AVOIDING CROWDS

GIL MARTIN

Abstract # 22

Preventing Bronchopulmonary Dysplasia (BPD): Evidence-Based Bundle and Multidisciplinary Team Approach

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Background: BPD is the most common complication of prematurity with short and long-term consequences. A review of 3 years' baseline data revealed areas for improvement in adherence to evidence-based practices known to reduce BPD.

Objective: We set a global aim to decrease BPD rate in infants born < 30 weeks gestational age (GA) admitted to our NICU within the first 28 days of life (DOL). Project SMART aims and drivers of change addressed five areas for improvement as detailed in the key driver diagram (Fig 1): to improve compliance with the "Golden Hour" goals of care, to administer surfactant within 2 hours of life for patients intubated in the delivery room, to implement the newly developed algorithm for less invasive surfactant administration (LISA) for eligible patients, to improve compliance with a risk-stratified postnatal steroid administration algorithm for evolving BPD, and to perform an oxygen challenge test at 36 weeks postmenstrual age.

Patients and Setting: Infants <30 weeks GA admitted <28 DOL to a level IV NICU in a free- standing children's hospital**.**

Interventions: The team operationalized evidence-based interventions focusing on revising current processes, establishing new guidelines with illustrative bedside decision aids, enhanced education with video and simulation training, monitoring compliance, and encouraging multidisciplinary engagement (Fig 1).

Results: So far, 63 patients were included starting January 2020. In comparison to historical baseline data, there were no differences in birth weight, GA, sex, or age upon admission to the NICU (Table 1). Measures for each SMART aim are monitored and analyzed using statistical process control. Overall compliance with the bundle reached the target with special cause found for surfactant administration time, which decreased from 120 minutes to 36 minutes (Fig 2). AnyBPD rate decreased by one third from 44% to 32%, and severe BPD rates remained the same at 19% (Fig 3).

Conclusion: We have improved the delivery of evidence-based practice to decrease BPD in a busy Level 4 referral NICU. This was possible with a multi-prong bundle implementation and multidisciplinary team approach, to spread changes that would improve short and long-term outcomes of the very preterm infants. BPD rate was reduced by one third as compared to baseline data. We anticipate this will reach statistical significance soon as the team continues to utilize PDSA methodology to identify areas for continuous learning and improvement.

Figure 1

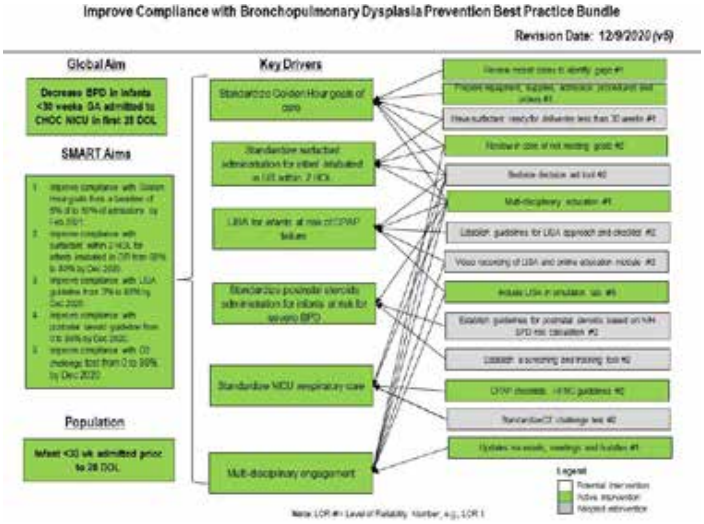


Table 1

	Baseline (N = 159) 2017-2019	BPD bundle (N=63) 2020-present	p-value
Birth weight, mean ± SD (g)	1015±290	956±267	0.16
Gestational age, mean ± SD (weeks)	26.7 ± 1.8	26.7± 2	0.7
Male sex, n (%)	83 (52)	37 (58)	0.3
Age at admission, mean ± SD (days)	5 ± 7	4 ± 7	0.26
Admitted immediately after birth, n (%)	103 (65)	43 (68)	0.6

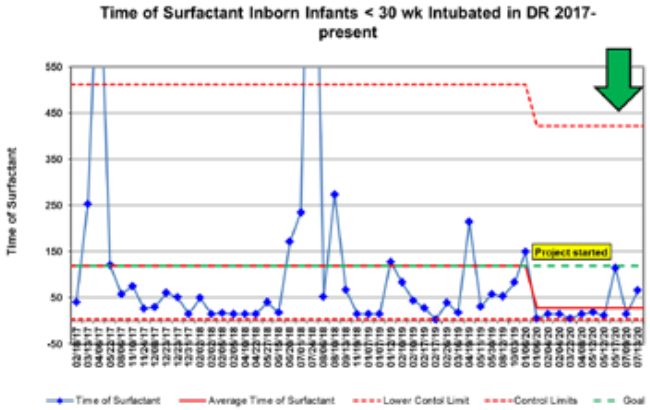
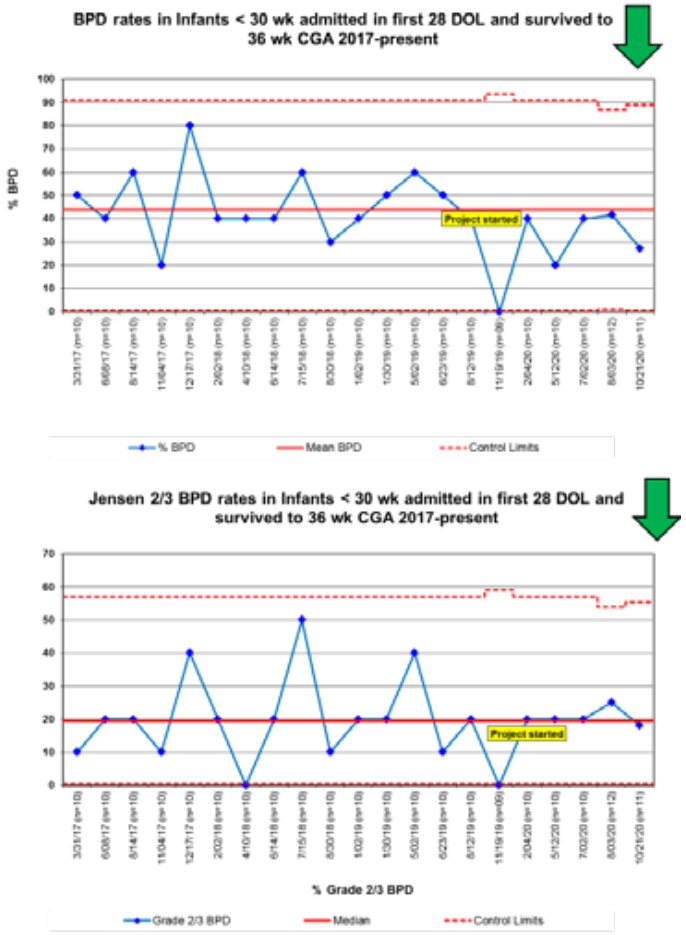


Figure 3



Abstract # 23

Impact of activated *Bifidobacterium longum* subsp. *infantis* EVC001 probiotic feeding on preterm patient outcomes

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1. Division of Neonatology, Kaiser Permanente Southern California-Orange County

Background: Recent literature shows that preterm infants are rapidly colonized by nosocomial bacteria that are often pathogenic. These bacteria are associated with negative impacts on neonatal growth and development, and an increased risk of serious infection, including necrotizing enterocolitis (NEC) and late onset sepsis (LOS). Here we evaluate the use of a single strain probiotic containing either activated *Bifidobacterium longum* subsp. *infantis* EVC001 (EVC001) in medium chain triglyceride oil or *L. reuteri* DSM17938 (DSM17938) on NEC and LOS incidence compared to infants not fed probiotics in a neonatal intensive care unit (NICU) setting. We hypothesized that the ability of EVC001 to utilize human milk oligosaccharides, colonize the infant gut, and resolve dysbiosis would be associated with improved clinical outcomes.

Methods: Deidentified medical records were examined from premature infants (n = 971) born in NICUs within a single health

care system in Southern California from three consecutive time periods, including (1) a period where no probiotics were used, (2) DSM17938 was used, or (3) EVC001 was used. Data were analyzed using a mixed modelling approach to disentangle potentially influential clinical variables (e.g. gestational age, antibiotic use, probiotic feeding, delivery mode, race, length of stay adjusted weight gain, antibiotic days) to determine if probiotic feeding affected NEC and LOS incidence.

Results: Among infants born at less than 32 weeks gestational age, those fed EVC001 had significantly lower risk of NEC incidence (69% lower) compared to infants not fed a probiotic (*P* = 0.015; OR 0.31, 95% CI 0.122, 0.804). Conversely, feeding DSM17938 did not significantly reduce NEC incidence compared to infants not fed a probiotic. Similarly, no significant reduction in LOS was observed with DSM17938 usage; however, a significant reduction in LOS was observed after feeding protocols were changed to include EVC001 (*P* < 0.05; OR 0.52, 95% CI 0.027, 0.99).

Conclusion: This mixed model analysis showed significantly reduced NEC and LOS incidence in a preterm population fed *B. infantis* EVC001. Conversely, these data showed feeding *L. reuteri* DSM17938 did not significantly reduce NEC or LOS incidence. Future analyses evaluating other outcomes, including length of stay and changes in anthropometric measures will provide additional insight into the impact EVC001 has on improving preterm infant health during their NICU stay.

Abstract # 24

Neuroprotective Guidelines (NPGs) for the Prevention of Intraventricular Hemorrhage (IVH) in Extremely Premature Infants

Nina Nosavan, MD* and Guadalupe Padilla MD, Harbor UCLA Medical Center (HUMC), David Geffen School of Medicine, University of California, Los Angeles.

Background: Extremely premature infants account for a substantial portion of perinatal morbidity and mortality. Survival of these infants has dramatically increased over the past two decades, but 20-25% develop IVH. The Neonatal Intensive Care QI Collaborative (2003) developed 10 potentially better practices (PBPs) for prevention of IVH in very low birth weight infants. These PBPs stimulated the development of our NPGs at HUMC.

Objective: Maintain a low incidence of IVH and achieve 85% compliance with NPGs

Design: Data were obtained from the medical record of eligible infants. Using the PDSA model, we measured compliance to NPGs.

Setting: HUMC

Patients: Infants ≤ 28 weeks gestation and ≤ 7days old

Interventions: NPGs were developed, staff champions identified, multidisciplinary learning sessions held on 06/11 and 6/18 2019 and placards with NPGs placed on isolettes of eligible infants. New "NICU ≤28 weeks Admit" order set incorporated the NPGs. NPGs were later amended to include 2-person handling for intubated infants only.

Measurement: Patient information included: gestational age, birth weight, sex, birth hospital, IVH grade, during day of life 3-7, time in neutral head position, head of bed (HOB) elevated, 2-person handling and procedures (lab draws, central catheter (PICC), lumbar puncture), number of times, infant was weighed, suctioned, bathed, and abdominal girth were measured.

Results: Pre- [1/2018-6/2019 (N=17)] and post- [7/2019-5/2020 (N=12)] intervention data were collected. Pre vs post-intervention results were: severe IVH rate: 17.6% (3/17) vs 9.1% (1/11), time in neutral head position: 61.4% vs 97.5%, time HOB elevated 100% (both), number of weights: 4.8 vs 1.1, abdominal girths: 6.2 vs 1.9, baths: 1.6 vs 0 and times suctioned: 12.9 vs 9.3, PICC line insertion before first 7 days: 12 vs 6. Despite excluding 2 outliers on insulin drips, the average number of labs in the first 7 days increased: 17.8 vs 25 (heel sticks: 11.5 vs 13.1). One infant had lumbar puncture pre-intervention, none post-intervention. Two-person handling was inconsistently documented, which increased from 81.4% to 91%.

Limitations: Inconsistent documentation and lower census associated with the pandemic posed challenges during Cycle 1.

Conclusion: The low incidence of IVH was maintained and improvement in all parameters with the exception of lab draws reflected compliance with NPGs. We elected to begin Cycle 2, the sustainability phase, June- December 2020, however, the number of extremely preterm infants has remained low, therefore cycle 2 has been extended for an additional 6 months.

Abstract # 25

The Neuroprotection of Oral Enjoyment by Offering Milk Drops

Barbara O'Rourke RN, Lucinda Butler RN MSN

Introduction: Medical advances have resulted in a survival rate of greater than 85% of very premature infants. Although outcomes continue to improve, approximately 80% of premature infants will have difficulty with oral feeding. A major reason for this increased risk is the structural differentiation of the brain is occurring rapidly between 23-32 weeks. As the brain is developing and making connections, the necessity of normal NICU care which includes suctioning, insertion of tubes, taping, and even oral care may have a negative effect on the infant's ability and desire to eat. The transition from gavage feedings is often challenging, with many infants staying longer in the NICU to achieve oral feeding competence.

Research question: "Would premature infants who received milk drops with gavage feedings have a shorter length of stay (LOS) than infants who did not receive milk drops?"

Methods: A literature review, using multiple databases including CINAHL and MEDLINE, provided evidence that giving milk drops to premature infants was not only safe but also produced a positive immune response. No research was found regarding offering milk drops orally with the purpose of providing enjoyable oral enjoyment.

The Unity Point Health Institutional Review Board, of Des Moines, IA, approved the quasi-experimental design study which included 99 convenience subject premature infants born at 24 to 33+6 weeks' gestation and admitted to their Level III 42 NICU. The subject infants received the intervention of offering milk drops orally with gavage feedings from the 3rd day of life to full oral feeding. The subjects were matched on gender and gestational age alone with 99 control premature infants who did not receive milk drops

orally with gavage feedings. Both sets of infants received standard NICU care.

Results: The average LOS for the subject infants was 44.11 days versus 49.30 days for the control infants. The most significant difference in LOS was seen in the 24-30 weeks gestational age infants. Assessed hospital savings was over $663,000.00 on these 99 infants.

Abstract # 26

Multidisciplinary Project to Establish and Maintain a Centralized Milk Preparation Room in a Neonatal Intensive Care Unit

Latisha Picard, April Grady, Laura Berritto, Angela Huang, Dongli Song, Priya Jegatheesan, Sudha Rani Narasimhan

Rationale/Background

A centralized milk preparation room creates an aseptic environment that allows dedicated staff to prepare infant feedings. Centralized milk preparation has been shown to optimize patient safety and reduce feeding errors.

SMART Aim

100% of NICU infant feedings, including fortified human breast milk and formula, will be aseptically prepared in a centralized milk preparation room by March 2020.

Setting

AAP level 4 Regional NICU in a public hospital.

Design/Methods

Multidisciplinary collaboration between providers, nurse champions, lactation consultants, dietary technicians, infection control manager, facilities department, environmental services, clerks and supply coordinators set the groundwork for the Milk Room. Milk Room policy, procedures, and workflow were standardized after PDSA cycles. Dietary technicians and nurse champions underwent training and education on aseptic milk handling and mixing. An unused patient care area of the unit was transformed into the designated milk preparation room. The Milk Room Coordinator determined equipment and supply needs.

Methods

All infant feedings, including formula and fortified donor and maternal milk (human based milk fortifier or formula-based fortifier), were aseptically mixed in the Milk Room. Prepared feedings were recorded in logbooks and feeding orders were gathered from electronic medical record system. Data was collected from October to December 2019 to establish baseline, and through June 2020 to monitor process, outcome, and sustainability.

Measures

Outcome: Percentage of fortified NICU infant feedings mixed in Milk Room

Process: Mixing time per feeding in the milk room

Balancing: Milk wastage due to expiration or incorrect mixings

Results

The percentage of feedings prepared in the milk room increased from 50% in October-December 2019 to 100% in March 2020 and sustained throughout 2020. The amount of time to mix feeding for each patient decreased from an average of 36.5 minutes by nurses to of 17.6 minutes of by dietary technicians.

Discussion

100% of infant feedings are aseptically mixed in the Milk Room. Milk preparation time per patient was reduced. Implementing a Milk Room increased supply needs, demand for workspace, dietary technician staffing, and decreased feeding preparation time per patient, and nursing time requirements with cost saving benefits.

Additional challenges faced included initial nursing resistance and supply issues related to an increase in demand and Covid-19 supply chain interruptions.

Abstract # 27

Title: Use of Human Milk-Based Diet in the Late Preterm and Term Infant in the Neonatal Intensive Care Unit: A Pilot Randomized Controlled Trial

Author Information: Neema Pithia, MD*, Meena Garg, MD, Uday Devaskar, MD, Kalpashri Kesavan, MD, Kara Calkins MD

Intro: Breast milk is the optimal nutrition for infants. In very low birth weight infants (VLBWs), a human milk diet is associated with a decreased risk of sepsis and necrotizing enterocolitis and improved neurodevelopment. The American Academy of Pediatrics recommends that VLBWs receive human milk (either mother's milk (MOM) or donor milk). In VLBWs, donor milk is associated with higher breastfeeding (BF) rates. There is no research on donor milk in late preterm and term infants in the neonatal intensive care unit (NICU). Our overall research goal is to determine if providing donor milk to infants >34 weeks gestation (GA) for ≤7 days will increase MOM provisions and BF rates.

Methods: Inclusion criteria for this pilot, non-blinded, randomized control trial (RCT) includes GA >34 weeks, mother's intent to BF, and infants who are predicted to be in the NICU >72 hours. Exclusion criteria include infants with genetic disorders/syndromes, disorders known to affect growth, major congenital malformations, BF contraindications, intrauterine growth restriction, invasive respiratory or vasodilatory support, and futile care. Thirty-two subjects will be randomized to one of two diets: 1. MOM + formula (control arm) or 2. MOM + donor milk (interventional arm). This dietary intervention will last until NICU discharge or 7 days of age, whichever occurs first. The primary outcome is feasibility, which is defined as consent rate, adherence to study diet, and study completion rate. Secondary outcomes include the percentage of MOM consumed, BF rates, growth (change in weight, length, and head circumference z-scores) at NICU discharge and 6-8 weeks of age. An exploratory aim will investigate the intestinal microbiome using 16s RNA gene sequencing.

Results: I have obtained local IRB approval (19-002179). Recruitment began at two NICUs in November 2020. As of January 1, 2021, 5 infants have qualified, 4 have enrolled (GA range 34w0d-35w1d), and 0 have completed the study. NICU length of stay ranged from 6-19 days. Adherence to the study diet is 80%. I anticipate to complete recruitment and enrollment by June 2021.

Conclusion: To date, there is no research on the optimal diet for infants >34 weeks GA. This study's long term goal is to provide data to power a larger RCT that could change the paradigm of feeding late preterm and term infants. My goal is to produce preliminary data for my fellowship project, gain clinical research

experience, and pursue a career in academic neonatology.

Abstract # 28

BRAVE SPACE: A Diversity, Equity, Inclusion (DEI) initiative in the Intensive Care Nursery (ICN); Perspectives from the bedside

M.J Quilatan, MSN, PhM, T. Hatfield, MSN, RNC, N. Lare, MSN, RNC, Rebecca Chigas, MSN, AlissaGumbs, MSN, Tanya Johnston, MSN, RNC

Background: Promoting diverse, equitable, and inclusive healthcare is paramount to providinghigh quality, ethical care to neonates and their families. Acknowledging baseline opinions of staff related to racism, equitable healthcare, and skills in responding to racism is essential to improving outcomes.

Objective: To ascertain the perceptions of staff on neonatal healthcare inequity and howimplicit bias impacts care.

Design: A cross sectional survey was performed by sending an electronic questionnaire to thestaff of the UCSF Benioff Children's Hospital Intensive Care Nursery (ICN). Qualitative and quantitative analysis were performed on the compiled responses.

Setting: This study was conducted in a Level 4 urban, academic, 58-bed intensive care nursery that serves as a regional center with a broad catchment area for a diverse populationof neonates with complex and critical needs.

Patients: ICN patients range from 23 weeks to term gestation with acute and critical diagnoses. Staff are highly skilled and trained for this heterogenous and complex population.

Intervention: Baseline survey was conducted in the initial phase of the initiative. Ongoing interventions included educational programs and trainings. An awareness campaign was created utilizing platforms including e-mails, bulletin boards, and a bimonthly "Brave Space"meeting, allowing participants to share and reflect on stories about racism, implicit bias, andinequitable care in the unit.

Measurements: The perception of nurses working in the ICN was attained within an Adult Learning Theory framework. The method effectively identified their specific learning needs inthis context, demonstrating the utility of transformational learning as a part of a strategic needs analysis.

Results: 76 people completed the survey, representing a 40% response rate . Five themes emerged: "Speak up," "Hear something, say something," "Self-awareness," "Advocating and"Education" stood out from staff perspectives. Targeted interventions for education, awareness, and further research were recognized as key steps to acknowledge and address racial inequities.

Limitations: Participation was voluntary, and no incentive was offered to staff. While diversityis present in the unit, the majority identify as white.

Abstract # 29

Decreasing the Incidence of Intravenous Infiltration Via Quality Improvement Measures

Authors: *Gladys Rojas, Michael Doti, Ting-Yi Lin, Ching Tay and Marie Suffi

Introduction: A quality improvement team at MemorialCare Miller Children & Women's Hospital developed and tested improvement strategies to reduce peripheral intravenousinfiltration and extravasation (PIVIE) injuries in neonates. Intravenous infiltrations are common and the frequency of PIVIE requiring intervention was increasing, averaging 2 per week in 2019. This project aims to create a new practice guideline to prevent infiltration and extravasation events. We aimed to identify infiltration and extravasation injuries in neonates, to develop a protocol and to educate our NICU staff, physiciansand nurses. Our SMART aim is to reduce the ratio of IVI requiring medical interventionto total patient IV days by 25% as of July of 2021.

Methods: A team was formed consisting of 3 physicians and 2 nurses where we identified the factors contributing to PIVIE from 12/2019 to 3/2020. Incidence at Miller Children's NICU tended to have a predominance of higher calcium/osmolarity infusions. Therefore, our first PDSA aimed to reduce the calcium and osmolarity content. We havea standardized method of measuring swelling, using the Cincinnati Children's measurement formula. The key driver was prevention, and the changes that we felt that could lead to improvement were: Keeping mOsm/mL to 800, the calcium concentration of 2mg/mL, RN reports to charge nurse or MD if patient required IV access more than 4 times in last 12 or 24 hours, and central line (CL) criteria for infants <1500g. The first PDSA cycle included prohibiting any IV infusions of fluid with a calcium of 2mg/ml or greater and osmolarity of 900 mOsm/ml or greater and informing the staff.

Results: For outcome measures, we are measuring the rate of all PIVIEs and those that received hyaluronidase and were considered as severe. We are also looking at process measures such as osmolarity and calcium concentration in certain subset of our patients such as 1250-1500g who did not have CL after removal of UVC at 7 days. Balancing measures such as CL utilization rate and CLABSI, growth parameters in the 1250-1500g group for ability to introduce higher protein through CL. We hope to significantly reduce the injury rate immediately following implementation of the clinical practice guideline.

Conclusions: Overall, we are hopeful this will lead to improvements in clinical practice inline with current evidence. Follow-up data analysis allowed us to identify that our next PDSA cycle should focus on creating a clinical practice guideline. Improvement activities included development of the Care and Management for Infiltration/ Extravasation from a Peripheral Intravascular Device in the NICU - Clinical Practice Guideline, and staff education. Our guideline defines 3 grades by signs and symptoms, nursing interventions and medical provider interventions and considerations. This has resulted in enhanced awareness of the risks associated with IV therapy, shared and widespread education among all staff and of measures to prevent an injury occurring in the NICU.

Abstract # 30

Title: **Correlation between Total Serum Bilirubin and Transcutaneous bilirubin levels in extremely preterm infants less than 30 weeks gestation**

Authors & Institutions : CAN Research Committee Investigators

Sankar, Meera N*[1], Joe, Priscilla,[2] Bhatt, Dilip R[3], Villosis, Maria-Fe,[4] Katheria, Anup C,[5] Biniwale, Manoj,[6], Paje, Virna Corazon,[3] Truong,

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Introduction: The utility of Transcutaneous bilirubin (TcB) measurements in the care of term and late preterm infants is well established. TcB has been shown to reduce the need for blood sampling, improve patient safety, decrease resource utilization and is painless. There are no clear recommendations on the use of TcB in extremely preterm (EP) infants.

Objective: The primary objective was to evaluate the correlation between total serum bilirubin (TSB) and TcB levels and determine the reliability of TcB for screening and monitoring jaundice in EP infants.

Design/Methods: This was a prospective multicenter study conducted at seven Level III and IV NICUs in California. EP infants between 22 and 30 weeks of gestation admitted to the NICU without congenital anomalies were included. TcB measurements were performed within 30-60 minutes of TSB measurements during the first 3 weeks of life. Trained NICU staff measured TcB levels by using Drager Jaundice (JM-103 and JM-105) transcutaneous bilirubinometer. Neonates with TSB readings in the phototherapy range received phototherapy as per the standard protocol. We examined the mean and difference between TcB and TSB values, gestational age, birth weight, maternal race/ethnicity and neonatal morbidities. Descriptive statistics were used for entire group using IBM SPSS statistical software version 27. Correlation between TSB and TcB levels was assessed with Pearson's correlation analyses. Bland–Altman analysis was used to show the differences between the mean values of the two methods.

Results: A total of 581 paired TcB and TSB measurements from 116 infants were analyzed. Median gestational age was 27 weeks (IQR 25-28) and postnatal age ranged from 1 to 18 days of life. TSB values ranged from 0 to 12.6 whereas TcB values ranged from 0 to 14.2. Pearson bivariate correlation testing revealed moderate level of correlation between TcB and TSB with a coefficient of 0.782 ($p<0.001$). Bland Altman analysis of data (Figure 1) showed a good agreement at 95 percent limits with mean difference between TcB and TSB was -0.71 (SD +/-1.84). Regression equation predicted TSB= 2.52+0.55(TcB) with r squared of 0.61 suggesting moderate to strong correlation (Figure 2).

Conclusions: TcB levels correlated moderately with TSB levels in this ethnically diverse population of EP babies in California NICUs. TcB may be a useful screening tool for monitoring jaundice in EP newborns.

Figure 1: Bland–Altman plot depicting data showing the difference between Transcutaneous bilirubin (TcB) and Total serum bilirubin (TSB) measurements on Y-axis against the mean of TcB and TSB on X-axis

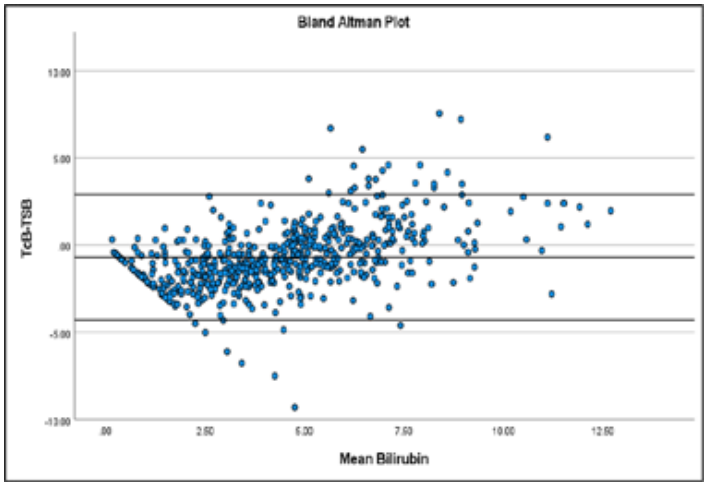
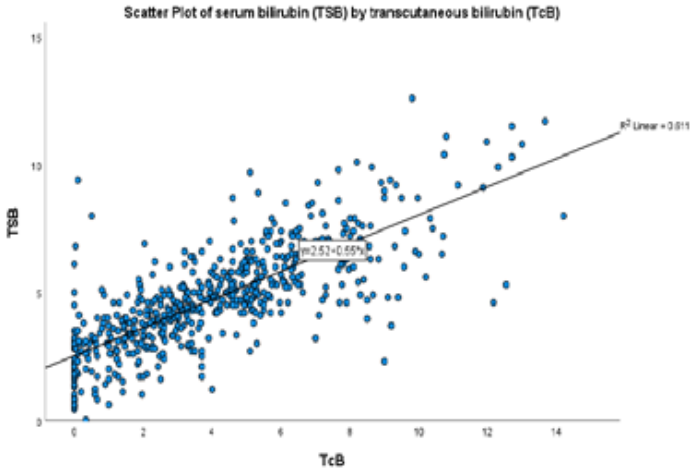


Figure 2: Correlation Graph with R squared fit between Total serum Bilirubin (TSB) and Transcutaneous Bilirubin (TcB) values



Abstract # 31

Title: Transcutaneous bilirubin levels compared to Total Serum Bilirubin levels in extremely preterm infants less than 30 weeks gestation

Authors & Institutions: CAN Research Committee Investigators

Sankar, Meera N*[1], Joe, Priscilla,[2] Cortes, Maria E[3], Villosis, Maria-Fe,[4] Katheria, Anup C,[5] Biniwale, Manoj,[6] Bhatt, Dilip R[7], Paje, Virna Corazon,[7] Truong, Huy A,[7] Tan, Rosemarie,[8] Nguyen, Marielle,[9] Arora, Vasudha N,[10] Ramanathan, Rangasamy[6] Neonatology/Pediatrics, Stanford University, Palo Alto, CA,[1] Neonatology, UCSF Benioff Children's Hospital Oakland, Oakland, CA,[2] Neonatology,

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Neonatology, Kaiser Permanente Orange County, Anaheim, CA,[9] Pediatrics/Neonatology, Kaiser Permanente Southern California, Pasadena, CA.[10]

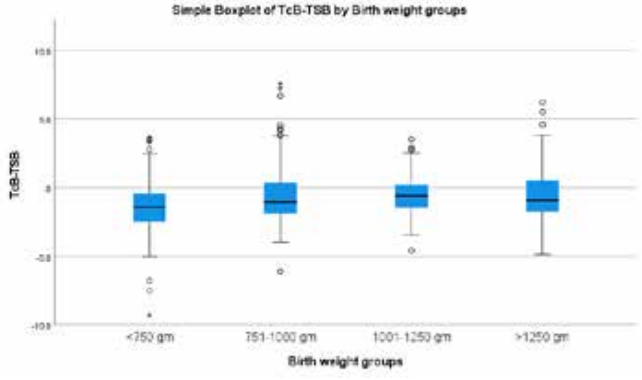
Background: Measurement of Transcutaneous bilirubin (TcB) level is a safe, noninvasive, cost-effective method for screening term infants with hyperbilirubinemia. There is limited data on TcB values in extremely preterm (EP) infants.

Objective: The primary objective was to determine the relationship between TcB levels compared to total serum bilirubin (TSB) in EP infants. In addition, a secondary analysis on variables that influenced over- and under-estimation were performed.

Design/Methods: A prospective multicenter study was conducted at eight Level III and IV NICUs in California. EP infants between 22-30 weeks of gestation admitted to the NICU without congenital anomalies were included. Trained NICU staff measured TcB levels by using Drager Jaundice (JM-103 or JM105) transcutaneous bilirubinometer or BiliChek bilirubinometer. Neonates with TSB readings in the phototherapy range received phototherapy as per the standard protocol. Difference between paired TcB and TSB values were compared to gestational age, birth weight, maternal race/ethnicity and chronological age. Descriptive statistics were performed using IBM SPSS (ver 27). Factors affecting the TcB and TSB correlation were compared using independent sample t test and ANOVA. Multivariate linear regression analysis was performed for significant factors.

Results: There were 755 paired samples from 140 infants. The BiliChek overestimated mean TcB values by 2.85 mg/dL than TSB values. The Drager JM 103 and JM 105 underestimated mean TcB values by 0.71 mg/dL than TSB (P<0.001). A subgroup analysis was done for 581 paired samples (116 infants) obtained using Drager JM103. Infants of 22-24 weeks gestation had TcB values significantly lower than TSB values (-1.15 vs -0.60, p=0.008) compared to older gestation infants. Infants less than 750 gm had mean TcB values 1.45 mg/dL lower than TSB levels compared to larger infants where mean difference was 0.52 (p <0.001) (Figure 1). TSB values were lower in infants > one week of age (p= 0.044). TcB on phototherapy underestimated TSB by approximately 1 mg/dL compared to 0.5 mg/dL (p=0.001) off phototherapy. Regression analysis revealed birth weight, chronological age and phototherapy to be significant.

Conclusions: TcB levels could be affected by the type of bilirubinometer, gestational age, birth weight, chronological age and phototherapy. Interpretation of results should account for these variables.



Abstract # 32

Decreasing Unnecessary Mother-Baby Separation at Birth by Assigning a Designated Location for the Pediatric Provider at Mother's Bedside

Robin Saoud MD, Guadalupe Padilla MD, Virender Rehan MD

Department of Pediatrics and Division of Neonatology, Harbor-UCLA Medical Center(HUMC), David Geffen School of Medicine, University of California, Los Angeles.

Background: Neonatal Resuscitation Program (NRP) recommends that immediately after a baby's birth an assessment be performed to determine if the infant is term gestation, breathing/crying, and has good tone while delayed cord clamping (DCC) is in progress. If all three circumstances are present, then resuscitation continues on the mother; if not, the neonate is taken to the warmer for further assessment. In 08/2018 at HUMC, concern arose regarding the pediatrician's accuracy in assessing newly born infants by observing them a distance, standing at the warmer. This resulted in frequent requests to cease DCC prior to 30 sec and move the infant to the warmer for further evaluation.

Objectives: Reduction in the frequency of unnecessary mother-baby separation to ≤ 20%_and decrease early cord clamping (ECC) by > 90%.

Design: Using the PDSA (Plan-Do-Study-Act) model, we measured the impact of our interventions on unnecessary mother-baby separations and early cord clamping via medical record review of eligible infants.

Setting: Labor and Delivery at HUMC

Patients: Term infants born via spontaneous vaginal delivery with pediatric provider in attendance at time of birth.

Interventions: On 08/28/2018, a designated location was identified for the pediatric provider to perform hands-on assessment of newborn immediately after birth and during DCC. At that time, providers were individually educated and on 10/19/2018, pediatric residents participated in an NRP refresher course; medical record documentation was adjusted reflecting the goal of resuscitating baby on mother.

Measurement: Information gathered included: APGAR Scores, details of resuscitation beyond basic warming, drying, stimulating and bulb suctioning, duration of DCC and reason for separation from mother immediately after birth.

Results: Pre-[05/01/18-08/27/18 (N=71)] and post-[Cycle 1 : 08/28/18-10/18/18 (N=35), Cycle 2: 10/21/18-12/31/18 (N=48), Sustainability (Cycle 3): 08/01/19-10/31/19 (N=75)] intervention data were collected.

Pre-intervention data showed 35% of eligible infants were taken to the warmer despite 1 min APGAR ≥ 7 and requiring only basic resuscitation vs 26% (Cycle 1), 23% (Cycle 2) and 20% (Cycle 3). Pre -intervention data for ECC with 1 min APGAR ≥ 7 and basic resuscitation: 7% vs 3% (Cycle 1), 0% (Cycles 2 and 3). Balancing metric of 1min APGAR <7 with DCC >30s was 0% in pre-intervention, 3% (Cycle 1), 3% (Cycle 2) and 1% (Cycle 3).

Limitations: Some details of the resuscitation were inconsistently documented.

Conclusion: Assigning a designated bedside location for the pediatric provider at vaginal deliveries decreases unnecessary mother-baby separation and ECC.

Abstract # 33

B. infantis EVC001 Feeding in VLBW Infants is Associated with Significant Reduction in Rates of NEC

B. Scottoline

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Introduction: Necrotizing enterocolitis (NEC) is a leading cause of preterm infant morbidity and mortality. Given the evidence for association of gut dysbiosis with NEC pathogenesis, we aimed to quantify the effects of feeding activated *B. infantis* EVC001 to very low birth weight (VLBW) infants in a single level IV NICU at Oregon Health & Science University (OHSU), particularly on NEC rates.

Methods: A retrospective chart review was used to evaluate two VLBW infant cohorts for demographics and NEC (Bell Stage 2 or above) at OHSU between Jan. 2014 and Oct. 2020. The comparison cohort (n=329) did not receive a probiotic, while EVC001 feeding was standard of care from June 2018 onward for the probiotic cohort (n=191).

Results: There were no differences between cohorts regarding major demographic characteristics. Both cohorts were fed a core diet including human milk and a period of trophic feeding; human milk-based fortification was introduced approximately 15 months prior to introduction of EVC001 without discernable effect on NEC. There were 32 cases of NEC (9.7%) in the comparison cohort. After EVC001 introduction, there were 10 cases of NEC, 5 of which had not received EVC001 prior to NEC diagnosis, and 1 whom had 1 serving just prior to NEC diagnosis. Thus, there were 4 cases of NEC in 191 VLBWs given more than one feed of EVC001 (2.1%). This decrease in NEC was significant (9.7% vs 2.1%, p=0.001), with a risk ratio (RR) of 0.215 (95% CI 0.077, 0.60) and a number needed to treat (NNT) of 13. There was no NEC-related mortality in infants who received EVC001 compared to a NEC mortality rate of 25% in the comparison cohort. Infants <1000g at birth (ELBW) given EVC001 also showed a significant reduction in NEC. No adverse effects were associated with EVC001 administration, including no cases of *B. infantis* infection. Analysis is ongoing for rates of late onset sepsis and other secondary outcomes.

Conclusions: *B. infantis* EVC001 feeding was associated with a significant reduction in NEC rate in a single center retrospective observational study of 520 VLBW infants. This magnitude of NEC prevention may not only reduce VLBW morbidity and mortality but may also provide significant savings due to avoided NEC-associated costs and importantly, reduced emotional impact of NEC on parents.

Abstract # 34

CAN 2021 Abstract: Perturbed Gut Microbes and Circulating Cytokines Herald Growth Failure in Preterm Infants

By: Katie M. Strobel M.D.[1*], Giorgia Del Vecchio Ph.D.[1], Fan Li Ph.D.[2], Nicole Tobin M.D.[2], Grace Aldrovandi M.D.[2], Sherin U. Devaskar M.D.[1], and Kara L. Calkins M.D.[1]

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BACKGROUND: Growth failure (GF) is a major problem in premature infants. Fifty percent of very low birth weight (LBW) infants have growth failure by discharge. GF has implications on neurodevelopment, and the mechanism is poorly understood and multifactorial. Intestinal microbes can activate host macrophages releasing cytokines causing poor growth.

The study's objective was to investigate the intestinal microbiome and its association with circulating cytokines in LBWs with GF.

METHODS: This prospective cohort study included infants with a birth weight <2,000 g who required parenteral nutrition >2 weeks. Stool and serum samples were obtained weekly. The cohort was divided between 1) GF, decline of weight or length z-score from discharge to birth >0.8 2) those without GF (CON). The gut microbiome was assessed by 16s rRNA sequencing, and analyses were done with QIIME2 and DESeq2 and adjusted p-values were calculated. Plasma cytokines were measured by a 2-multi-plexed immunometric assay.

RESULTS: 30 infants completed the study. Subject characteristics are displayed **Table 1.** There were no significant differences in Shannon and Bray-Curtis diversity indices. However, specific phyla changes were observed between groups (**Figures 1 and 2**). An increase in Clostridia was observed in GF vs CON in weeks 1-3 (log2-fold change in each week: 4.7, 5.5, 9.6, p<0.01 each). Firmicutes and Actinobacteria increased in GF in week 3 (7.3, 3.8, p<0.001 each), while Bacteroidetes decreased in GF in week 1 and 2 (-6.7, -5.7, p<0.001 each). In general, infants with GF had elevated cytokine levels compared to CON (Table 1.). When compared to CON, GF had a greater rate of change over time for IL-8 (3.4 pg/mL/day vs 1.9 pg/mL/day, p=0.02) and IL-1β (0.1 pg/mL/day vs 0.02 pg/mL/day, p=0.03) than CON. TNFα concentrations were associated with *Enterococcus* (r^2 0.262, p=0.003) and *Enterobacteriaceae* log relative abundance (r^2 0.093, p=0.03).

CONCLUSION: In this study, LBW infants with GF had a unique microbial and inflammatory signature. We suspect that pathogenic bacteria increase intestinal permeability and systemic inflammation, causing GF and other co-morbidities. Because higher amounts of Firmicutes and inflammation are associated with obesity, long-term follow-up may be warranted.

Supported by NIH-NIDDK T32DK007180 (KMS) and NIH HD41230 (SD) and HD089714 (SD)

Table 1. Subject characteristics. Continuous variables are expressed in median and IQR. Change in z-score is from birth to discharge.

	CON (n=14)	GF (n=16)	p-value
Gestational Age (weeks)	29.6 (28.7-31.2)	29.0 (25.3-31.7)	0.53
Sex - Male	42%	50%	0.69
Birth Weight (g)	1278 (1021-1560)	1380 (760-1534)	0.49
Birth Weight Z-score	-0.08 (-0.89-0.38)	0.4 (-0.4-1)	0.13
Birth Length Z-score	-0.06 (-0.8-0.4)	0.5 (-0.7-0.94)	0.20
Small for Gestational Age	14%	19%	0.57
Discharge Weight Z-score	-0.42 (-1.5-0.2)	-1.2 (1.7)	0.47

tive Abundance (%)

Discharge Length Z-Score	0 (-2.2-0.3)	-1.24 (-2.3- -0.3)	0.16
Change in Weight Z-Score	-0.60 (-1.1 – 0.03)	-1.26 (-2.0 - -0.8)	0.01
Change in Length Z-Score	-0.24 (-0.53- -0.04)	-1.58 (-2.1- -0.9)	<0.01
Parenteral Nutrition Days	11 (8-16)	25 (10.2-39)	0.02
Late Onset Sepsis	0%	38%	0.01
Broncho-pulmonary Dysplasia	7%	31%	0.07
Retinopathy of prematurity	7%	25%	0.18
Necrotizing Enterocolitis	7%	19%	0.35
IL-10 (pg/mL)	1.3 (0.9-2.0)	1.6 (1-4.2)	0.05
IL-1B (pg/mL)	0.9 (0.6-1.8)	1.9 (0.9-9.9)	0.001
IL-6 (pg/mL)	7.4 (3.2-15.3)	8.6 (5.2-20)	0.13
IL-8 (pg/mL)	34.8 (24.5-77.2)	112 (46.6-313)	<0.01
TNF-α (pg/mL)	15.9 (13-19.8)	18 (13.7-28.7)	0.06

Figure 1. Heat map of Clostridia, Firmicutes, Actinobacteria, and Bacteroidetes. First bar represents weeks (week 1 green, week 2 magenta, week 3 purple, week 4 cyan). Second bar represents cohorts, blue CON and yellow GF.

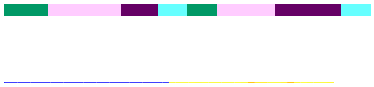

Figure 2. Mean relative abundance (%) of phyla for CON and GF cohorts by week of age. Phyla are represented as follows: Actinobacteria orange, Bacteroidetes green, Firmicutes blue, Proteobacteria purple, and others gray.

Abstract # 35

Reinforcement of Preventive Bundle Led to Low Incidence in Severe Retinopathy of Prematurity in High Risk Premature Infants: A Quality Improvement Study

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Division of Neonatology, Neonatal Intensive Care Unit, Kaiser Foundation Hospital-Panorama City, CA, USA

Background:

Retinopathy of prematurity (ROP) is one of the leading causes of severe visual impairment in childhood. Severe ROP has been shown to be a predictor of death and later neurosensory impairment.

Multicenter groups have reported a highly variable incidence of severe ROP about 3-36% among very low birth weight infants (VLBW) with increased survival of extremely preterm infants. Significant variations in severe ROP rates could be attributed to differences in clinicalpractices.

Objective:

a) To determine the incidence of ROP in our medical center within an 11-year period (2009-2019).
b) To evaluate the implementation of the intervention strategies to decrease ROP rate in ourNICU.

Method:

Data collection on a cohort of 388 VLBW infants admitted to KFH-PC NICU between 2009-2019utilizing Vermont Oxford Network (VON) and California Perinatal Quality Care Collaborative (CPQCC) databases was performed.

Results:

The incidence of ROP among VLBW infants in our NICU dropped significantly after implementation of a prevention care bundle that included optimal oxygen saturation target of 85-95%, minimization of oxygen toxicity, bronchopulmonary dysplasia prevention bundle, and exclusive human milk diet based feeding protocol.

The reinforcement of the ROP prevention bundle at KFH-PC NICU resulted in sustained low rate in severe ROP incidence dropping from baseline 3.6% in 2009 to 0% in 2019 with an average incidence of 3% (range 0-10.7% during the years 2009-2019). There were 259 infantswith gestational age of less than 30 weeks with an overall ROP incidence of 4.2%.

The risk adjusted ROP rate for our center was 1.6% compared to CPQCC median adjusted riskof 5.7% in 401-1500-gram infants or infants born at 22-31 weeks gestation in 2017-2019.

The VON observed: expected ratio in the recent epoch (2017-2019) was 0.6 (5^{th} and 95^{th} confidence limits 0.2 and 1.1, respectively).

Conclusion:

We observed a significant decrease in severe ROP rates in VLBW infants that was associated with reinforcement of the preventive care bundle. The sustained low incidence could be attributed to consistent adherence to the bundle and continuous improvement of quality of careby the multidisciplinary team.

Abstract # 36

TITLE: Improving NICU Nurse's Recognition of Normal and Abnormal Patterns on aEEG Monitoring.

AUTHORS: Diane Vande Pol, RN, CNS; *Samantha Hewitt, RN; Angela Huang, RNC, MPH; Dongli Song, MD, PhD

BACKGROUND: aEEG is a useful bedside monitoring tool to evaluate the infants' neurological status and seizures. Training NICU clinical nurses in aEEG interpretation to recognize normal

and abnormal patterns will promote timely interventions in infants with brain injury, seizures, or other neurological abnormalities.

OBJECTIVE: To increase NICU nurses' proficiency in recognizing normal and abnormal aEEG patterns through staff education and training.

SETTING: **70 NICU clinical nurses in a 40-bed Level III regional NICU in a public hospital.**

METHODS: Education was presented in a series of written modules, as our usual method of classroom training with several nurses at a time was not possible due to the COVID-19 social distancing policy. Five (5) printed modules were presented to the staff over 5 months, covering normal (Part 1), discontinuous (Part 2), burst suppression (Part 3), continuous low voltage and flat/ inactive **(Part 4) patterns, and** seizures and artifact (Part 5). A pre-and post-assessment was conducted via an online Learning Management System, consisting of 27 questions covering these common patterns, various types of seizures, and artifacts. The results were summarized as the percentage of correct answers for each question in the pre- and post-assessment tests.

RESULTS: Sixty-nine (99%) participating nurses completed the pre- and post-assessments. There was an overall increase in the average percentage of correct answers in the post-assessment, 81% (range 51-96%) than the pre-assessment test 52% (range 22-77%). The average improvement in the scores for all 27 questions from pre- to post-assessment scores was 29% (range 13% to 43%)). The three questions that had the most improvement in scores were identifying low voltage pattern, seizure recognition, and identifying artifacts.

CONCLUSIONS: The written module form of education is effective in improving the NICU nurses' proficiency in aEEG interpretation by recognizing normal and abnormal patterns. The high NICU acuity and census during the training period were major challenges, making it difficult for the nurses to complete the learning modules.

Table 1 Pre- Post-Test Results Analysis

QUESTION	PRE-TEST % CORRECT	POST-TEST % CORRECT	%Improvement
1. Upper margin (normal)	68	94	26
2. Lower margin (normal)	55	83	28
3. Identify background pattern (normal)	64	83	19
4. Based on pattern identified, what action should be taken (normal)	68	94	26
5. Identify background pattern (seizure)	52	94	42
6. Based on pattern identified, what action should be taken (seizure)	75	96	21
7. Identify background pattern (artifact)	25	65	40
8. Based on pattern identified, what action should be taken (artifact)	36	65	29
9. Upper margin (discontinuous)	29	52	23
10. Lower margin (discontinuous)	72	94	22
11. Identify background pattern (discontinuous)	29	51	22
12. Identify background pattern (seizure)	38	74	36
13. Based on pattern identified, what action should be taken (seizure)	54	86	32
14. Upper margin (low voltage)	54	74	20
15. Lower margin (low voltage)	77	96	19
16. Identify background pattern (low voltage)	39	78	39
17. Based on pattern identified, what action should be taken (low voltage)	39	83	44
18. Upper margin (inactive flat isoelectric)	59	91	32
19. Lower margin (inactive flat isoelectric)	61	93	32
20. Identify background pattern (inactive flat isoelectric)	46	75	29
21. Based on pattern identified, what action should be taken (inactive flat isoelectric)	57	87	30
22. Upper margin (burst suppression)	54	80	26

23.	Lower margin (burst suppression)	74	87	13
24.	Identify background pattern (burst suppression)	35	70	35
25.	Based on pattern identified, what action should be taken (burst suppression)	45	74	29
26.	Identify background pattern (seizure)	51	87	36
27.	Based on pattern identified, what action should be taken (seizure)	57	93	36

Abstract # 37

Title: Quality improvement initiative to reduce antibiotic exposure of asymptomatic infants born to mothers with intraamniotic infection

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Introduction: Infants born to mothers with intraamniotic infection (IAI) have received antibiotic treatment as per the Centers for Disease Control and Prevention and American Academy of Pediatrics guidelines in our neonatal intensive care unit (NICU) for early-onset bacterial sepsis evaluation. We conducted a quality improvement (QI) project to decrease antibiotic use and NICU admission in infants born to mothers with IAI. Our aim was to decrease antibiotic exposure rate from 100% to 20% for asymptomatic infants born to mothers with IAI in six months. **Methods:** Baseline data on these infants was obtained from January 2018-January 2019 with the intervention starting February 2019. New standardized guidelines to clinically monitor and follow labs on asymptomatic infants in couplet care were created with the help of a multidisciplinary team and implemented after provider education. The team reviewed data monthly and used PDSA cycles to make necessary changes, including updating order sets, more educational handouts, and real-time coaching to both nurses and physicians. **Results:** There was a dramatic decline (93% to 0%) in antibiotic exposure and NICU admission after implementing these guidelines. There was also a decrease in IAI diagnosis. No infants were readmitted for infection within 30 days of discharge and there were no positive blood cultures. **Conclusion:** Implementing best practices through standardized guidelines, testing and implementation of processes, and education by a multidisciplinary team limited the antibiotic exposure and NICU admission for infants born to mothers with IAI with no known increase in readmissions.

Abstract # 38

TITLE: Association Between Umbilical Cord Management and 5 Minute Peripheral Oxygenation In Preterm Infants

AUTHORS: Yim, Rachel Kai-Xin; Wong, Shelby ; Poelter, Debra ; Rich, Wade D. ; Sanjay, Shashank ; Katheria, Anup C.

Introduction: Premature infants are subject to increased risk of death and injuries including intraventricular hemorrhage and hypoxic-ischemic encephalopathy. Therefore, cord treatments which promote placental transfusion, primarily delayed cord clamping (DCC), is recommended for all preterm newborns as it has been shown to reduce these morbidities. Umbilical cord milking (UCM) is another viable option; however, the effects of delaying resuscitation and oxygen administration in non-vigorous and non-breathing resuscitated preterm newborns are largely unknown. A recent post hoc exploratory analysis of the major TO2RPIDO trial done by Kei Lui et. al. found that infants with 80% or less 5-minute mean peripheral arterial oxygenation (SpO2) were more likely to die or have neurodevelopmental impairment. This study aims to determine if resuscitated preterm infants that received DCC had lower 5-minute SpO2 levels compared to those with UCM or early cord clamping (ECC).

Methods: This was a retrospective review of 23 to 31 weeks of gestation resuscitated premature infants born between 2014-present receiving either ECC (N=20), DCC (N=178), or UCM (N=130). Data gathered included SpO2 (measured by pulse oximetry), and various physiologic data including administered inspired fraction of oxygen (FiO2). Each treatment group's mean 5-minute SpO2 and FiO2 levels were compared with 2-sample t tests for continuous variables using a critical alpha level of 0.05.

Results: There were no statistically significant differences between the three groups using ANOVA for continuous measures and Chi square for categorical variables in maternal or neonatal demographics. Mean SpO2 and FiO2 at 5 minutes were compared. FiO2 at 5 min was higher in ECC compared to UCM (p=0.031) and DCC (p=0.025), with no difference found between UCM and DCC. The 5-minute SpO2 was higher in UCM compared to DCC (79.4% vs 74.8%, p= 0.028). There was no difference between mean 5-minute SpO2 of ECC and UCM (P= 0.72) or DCC (p=0.16). ECC and UCM allow for resuscitation to occur quickly and may lead to improvements in oxygenation within 5 minutes of life. However, both have increased risk of mortality or intraventricular hemorrhage. Despite receiving similar amounts of supplemental oxygen, infants receiving DCC had a lower 5- min SpO2 compared to UCM. Providing higher supplemental oxygen during DCC or immediately following clamping and cutting of the umbilical cord may improve 5-minute SpO2 and neonatal outcomes.

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