

Should you? Could you?

Feeding with CPAP in the NICU

June 2025

District VIII, Boise

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Calgary, Alberta

Disclosures

None!



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Learning Objectives

- At the end of this session, participants will be able to:
 - Incorporate the concept of eating as a neurodevelopmental task.
 - Describe the relationship between breathing and eating.
 - Critically analyze strengths and challenges within the SINC program

Setting the Stage

Calgary, Alberta



5 NICUs

129 Beds

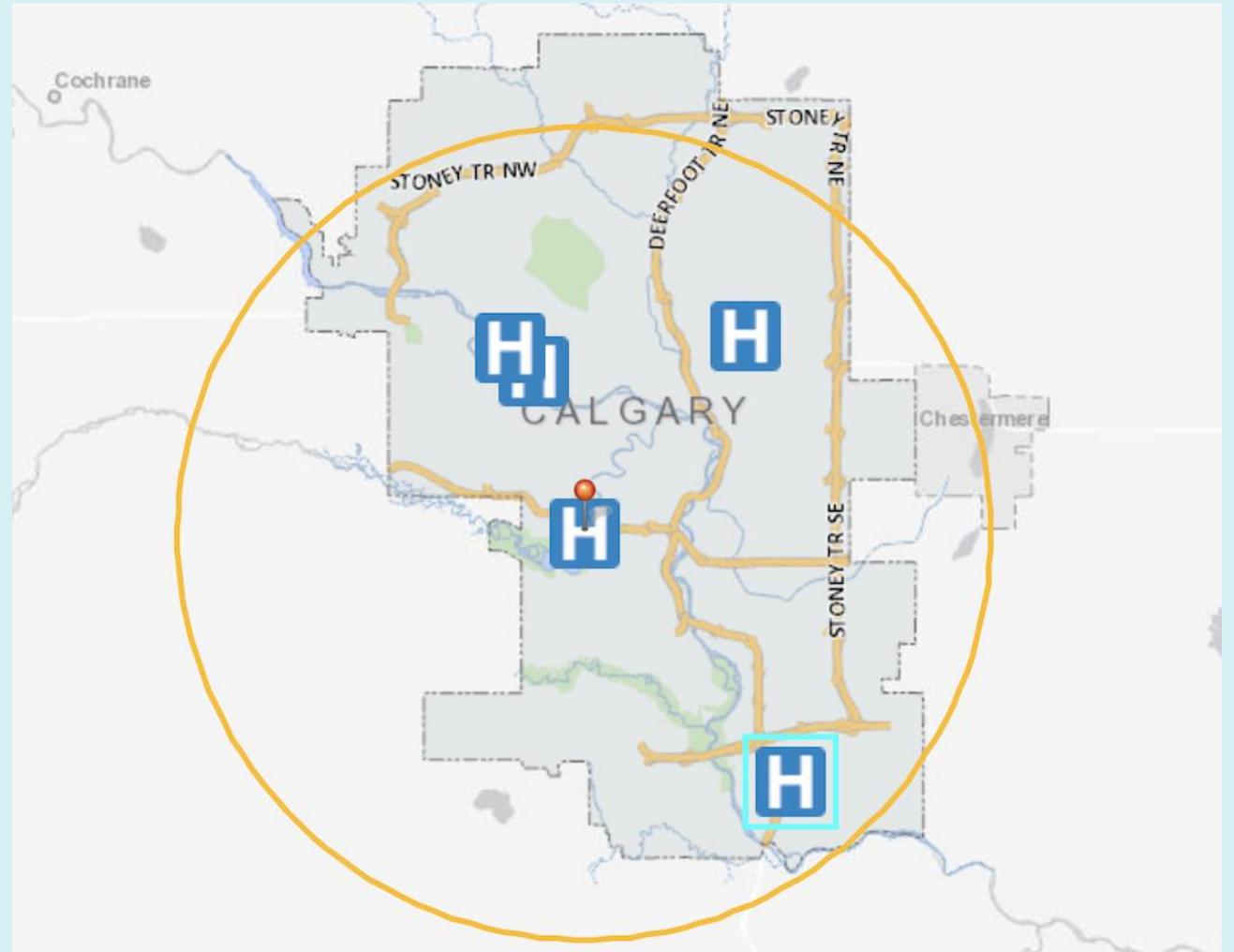
2800 admits

650 Nurses

8 NNPs

28 Neonatologists

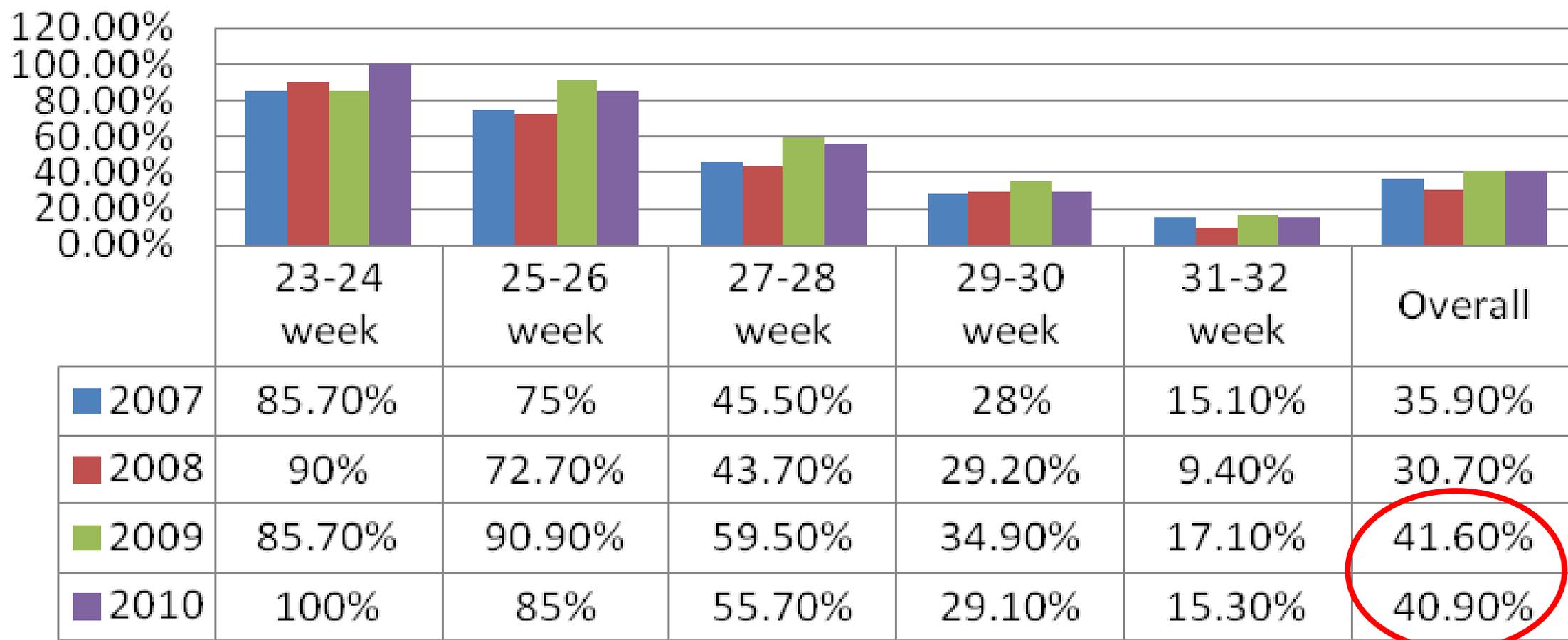
...at least that many
opinions



Incidence of BPD for infants < 33 weeks in Calgary as reported to CNN from 2007 to 2010 - overall and by gestation

Incidence of Bronchopulmonary Dysplasia

(%)



Dr. Wendy Yee



In Our Efforts...

- Extended duration of CPAP
 - Weeks/months
 - Histogram/algorithm
- CPAP implications for eating
 - Suck, swallow, breathe
 - Deprivation ?
 - Overwhelming?
 - Evidence?



Trials of Feeding without CPAP

Rapid PDSA Cycles (Spring 2013)

- Remove CPAP for feeding practice
- CPAP cycling
- High Flow NP
- D/C CPAP at 36 weeks

All unsuccessful:

Loss of FRC, no endurance

NO feeding success

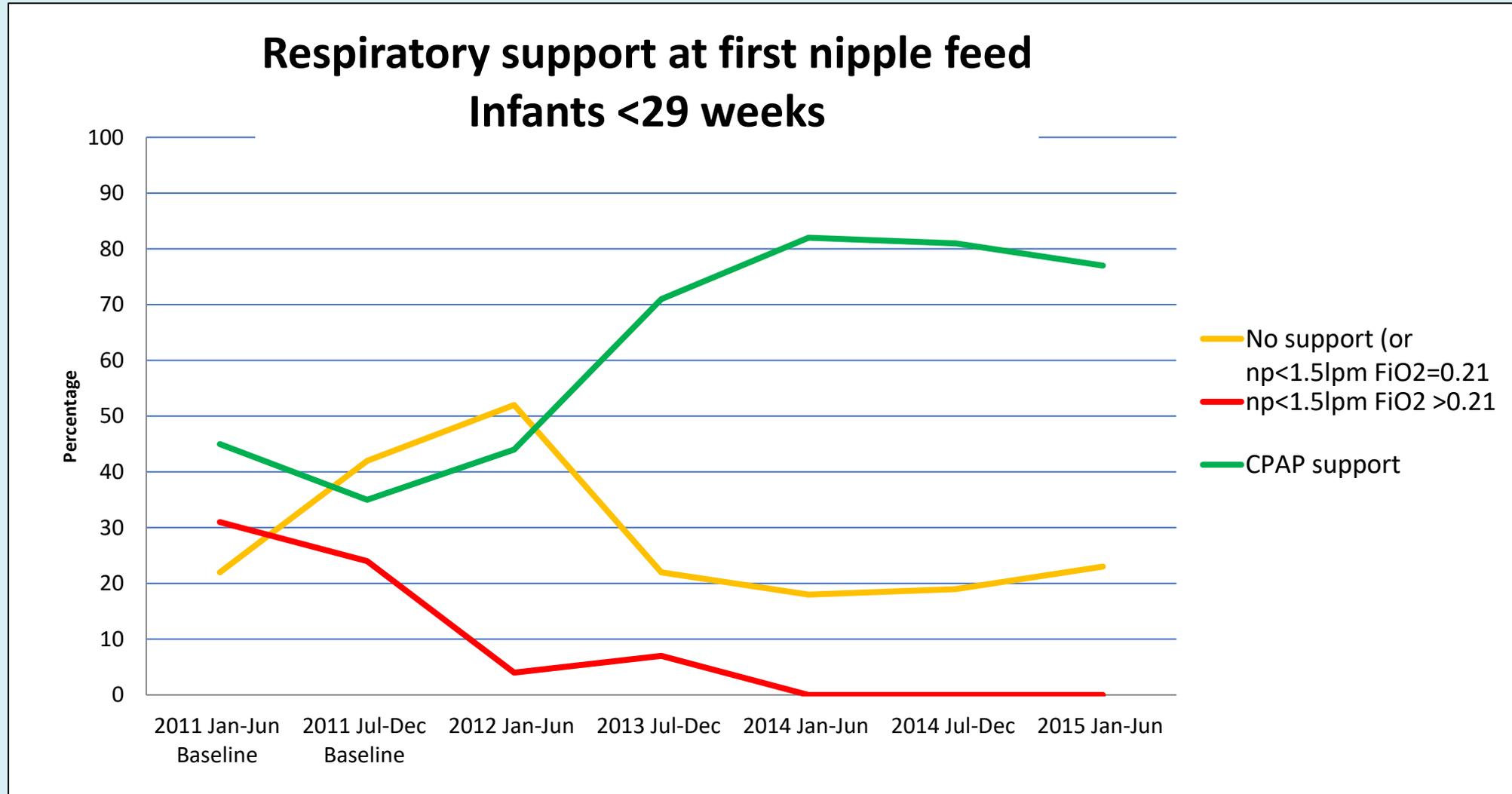


Eating (nipple feeding) on CPAP

- Already tried it? (SINC or something like it is happening in my unit)
- Open mind? (This might be interesting)
- Not happening in MY Unit!



Covert Activity in your NICU?



CPAP for Canadian Lambs

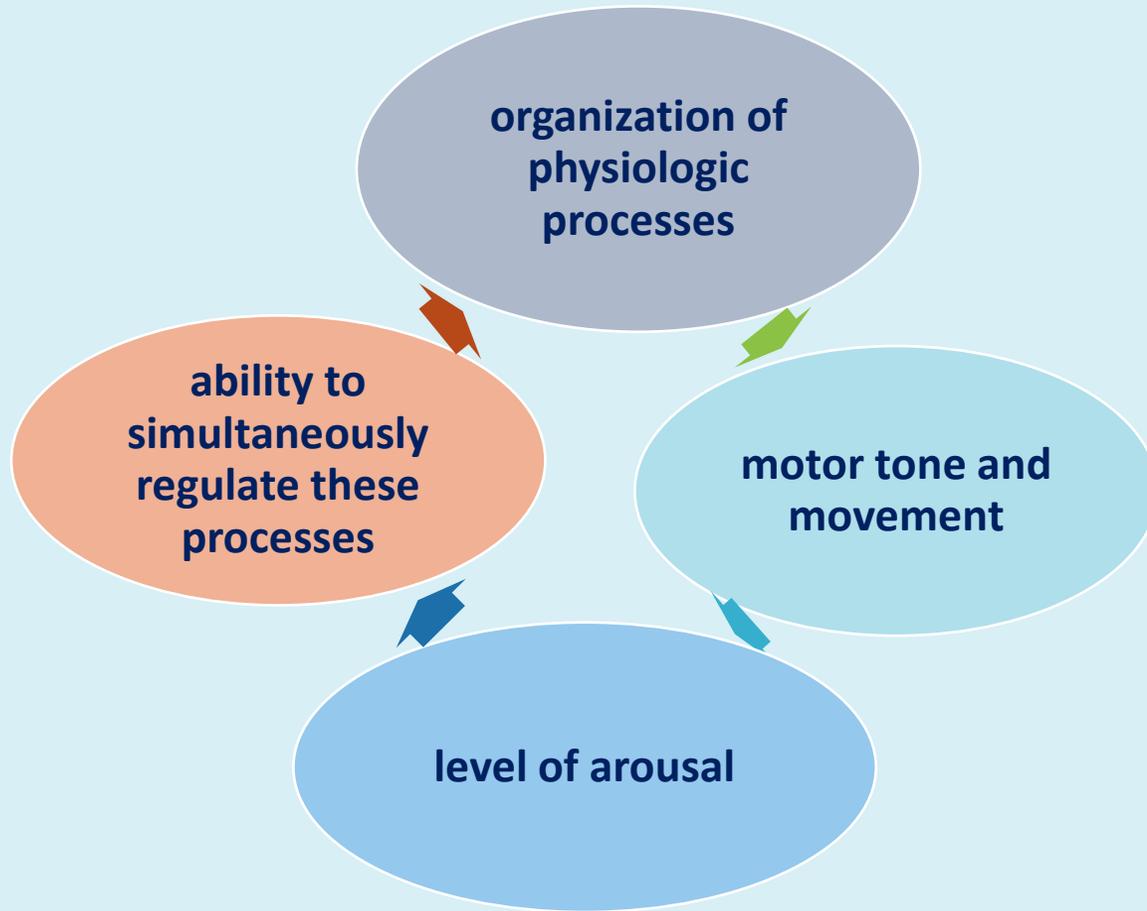


- NNS and CPAP
- Nutritive sucking and CPAP
 - Esophageal multichannel intra-luminal impedance pH monitoring: CPAP +6
 - Measured with impedance for safe swallowing and GER during bottling
 - Multiple studies supported safety of practice
- Praud and associates
 - Journal of applied physiology, 2005, 2012
 - Journal of pediatric gastroenterology and nutrition, 2013

Safe Individualized Nipple feeding Competence (SINC)

- QI, Longitudinal observational study
- Target of preterm infants whose requirement for CPAP coincided with their developmental readiness for oral feeding.
 - Extend CPAP as medically required
 - Support emerging oral feeding skills
- Initial pilot of infants born <32 wks, on CPAP at 32 wks

Predictable Neurodevelopmental Process



- GRADUAL oral motor maturation process
- Correlates with the emergence of motor pathways, maturation of the CNS
- NOT a “light bulb phenomenon”

NANN, 2013

As With Other Milestones...

- Infant paced, NOT prescribed
 - Individual timelines, the infant is the guide
- Performance is dependent upon
 - Medical complexity
 - Co-morbidities such as BPD
 - Jadcherla, 2010, J Perinatol, milestones
- Feeding techniques
 - Concept of co-regulated or relationship based

Every Feed Contributes

- Skill rather than stamina is the key factor in feeding development
 - Eliminate defensive, nonfunctional, uncoordinated practice
- Eating skill acquisition is best achieved by:
 - Gently offering feeds with frequency
 - On the basis of cardio-resp stability and behavioral responses
 - Sooner to fully orally fed, diminished LOS

Nursing Research, 2007, Howe, et al.

J Perinatol, 2009, Pickler.

Neonatal Intensive Care, 2012. Shaker.

Nursing Research, 2012, Thoyre.

Clin Perinat, 2011, Browne, Ross.

Journal of perinatal and neonatal nursing, 2011, Ross, Philbin.

Feeding is an Expert Skill Set

- Feeding is within the nursing domain of knowledge and skill
 - Build capacity in nurses
- 8 or 12 feeds every day, = 56– 84 OPPORTUNITIES to work with the infant and family
 - Recognize cues
 - Respond to cues
 - Develop care plan that encompasses successes
- Multi-disciplinary team approach and involvement
- Consultation with experts as required – SLP, OT, ENT

Eating in S.I.N.C. ©

Safe Individualized Nipple-feeding Competence

SINC 18 Stages

- A
 - NNS, OIT?
- B-C
 - Maximum 5% volume, maximum 5 minutes
 - Drops with a pacifier
- D - L:
 - Closed bottle
 - Increasing time, increasing amount
- Breast feeding at every stage
 - Maximum volume and time
 - Notes re endurance, distress

SINC is for all infants born at less than 33 weeks OR other fragile feeders. Look for hunger cues, physiologic stability, swallowing.

SINC B and C. Plain or fresh EBM if possible.

Prior to advancing stages B to L, the infant must successfully complete:

*9 out of 12 feeds if Q2H

* 6 out of 8 feeds if Q3H

Advancement likely to be successful if volume is taken in less than max time allowed.

Advance incrementally within a stage and moving to a new stage.

Slow to progress in Later Stages?

*decrease TFI

*decrease pump time for gavage

*offer less top up after breast feeding

*only 2 modes of feeding at any session

*Consult OT/SLP

A. Offer NNS with a pumped breast or pacifier. Awake, physiologic stability

B. Max 5% enteral feed volume. Max 10 min breast or max 5 min drops beside a pacifier.

C. Max 10% enteral feed volume. Max 10 min breast or max 5 min drops beside a pacifier.

D. Max 15% enteral feed volume. Max 15 min by breast or max 10 min by bottle.

E. Max 20% enteral feed volume. Max 15 min by breast or max 10 min by bottle.

F. Max 30% enteral feed volume. Max 20 min by breast or max 5 min by bottle.

G. Max 40% enteral feed volume. Max 25 min by breast or max 15 min by bottle.

H. Max 50% enteral feed volume. Max 30 min by breast or max 20 min by bottle.

I. Max 60% enteral feed volume. Max 30 min by breast or max 20 min by bottle.

J. Make 70% enteral feed volume. Max 30 min by breast or max 20 min by bottle.

K. Max 85% enteral feed volume. Max 30 min by breast or max 20 min by bottle.

L. Transition to semi-demand feeds. Max 30 min feed time Q 2.5 – 3.5 hours (breast or bottle)

Eating is a Neurodevelopmental Task.
Support the fragile feeder.

- Postural stability
- Calm environment
- Oral organization prior to the feed
- Slow flow nipple
- Careful observation

If the Infant has:

- *decompensation
- *disinterest
- *disengagement
- *disorganization
- Stop** the feed and finish by gavage.

Not successful in a SINC stage?

- *move back to an earlier stage
- *give more time to consolidate skill
- *does the infant have enough respiratory support?

At every stage, encourage direct breast feeding from an appropriately pumped breast. The SINC stage for bottle and breast may be different.

Theoretical Baby Z

- 27 weeks, skin to skin from birth
- Competent with a soother = **SINC A**
 - Take OIT as drops with the soother.
- Advance to **SINC B**
 - Q2H feeds of 8 mL (TFI 140, 1500 grams)
 - SINC B = 5% = Maximum 0.4mL every time cuing OR BF
 - Maximum time 5 minutes
 - Competence to advance:
 - stable and taking 9/12 feeds for at least 24-48 hrs



Engagement and Disengagement





Next Steps

- **SINC C**

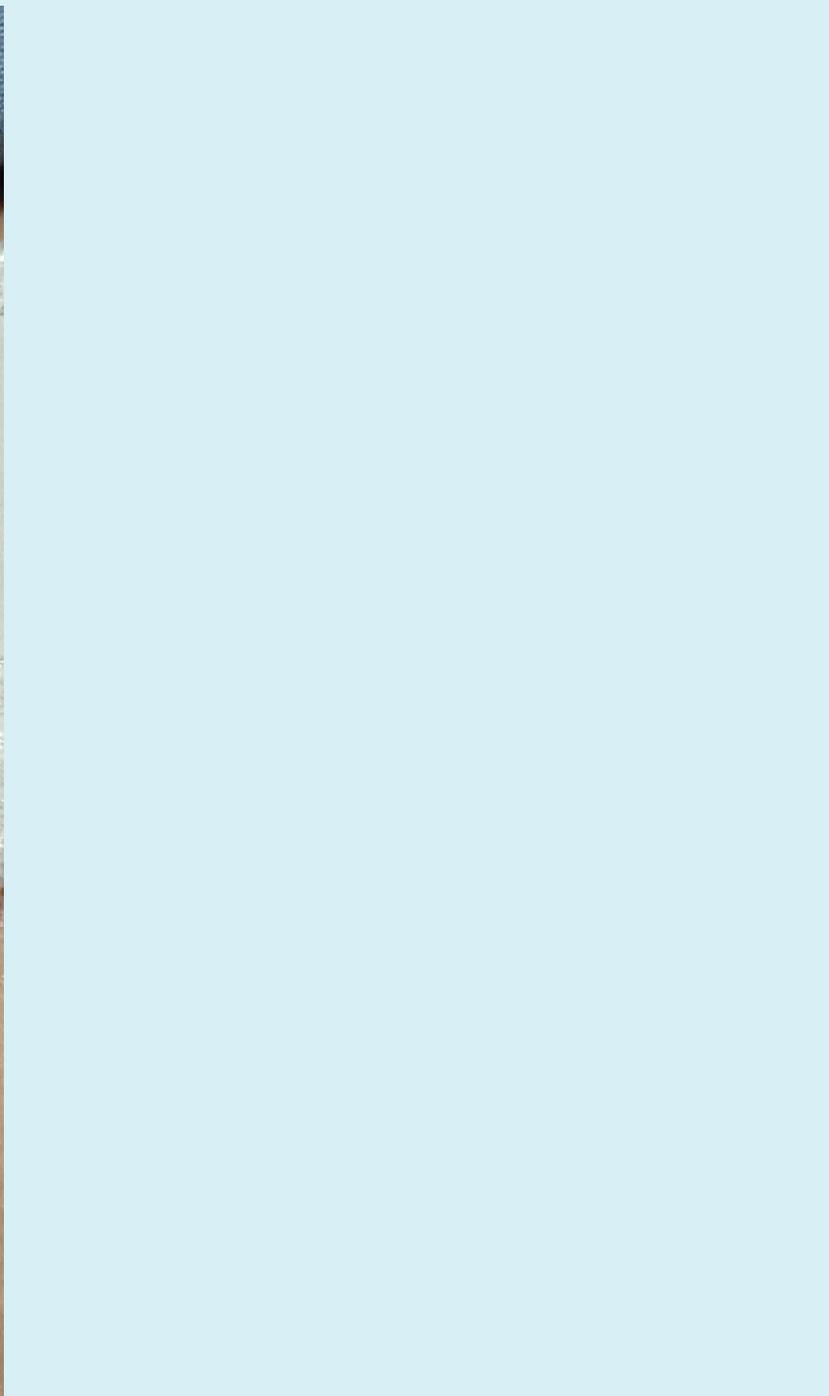
- Now Q3H feeds, 1800 grams, 31 mL
 - Maximum time, maximum volume 10% or 3 mL
 - Slowly increase by 0.5 - 1 mL every other feed?
 - 6 out of 8 feeds for at least 24 hrs, otherwise stable,

- **SINC D (15%)**

- **SINC E → L (20% - 100%)**

SINC B, CPAP 7







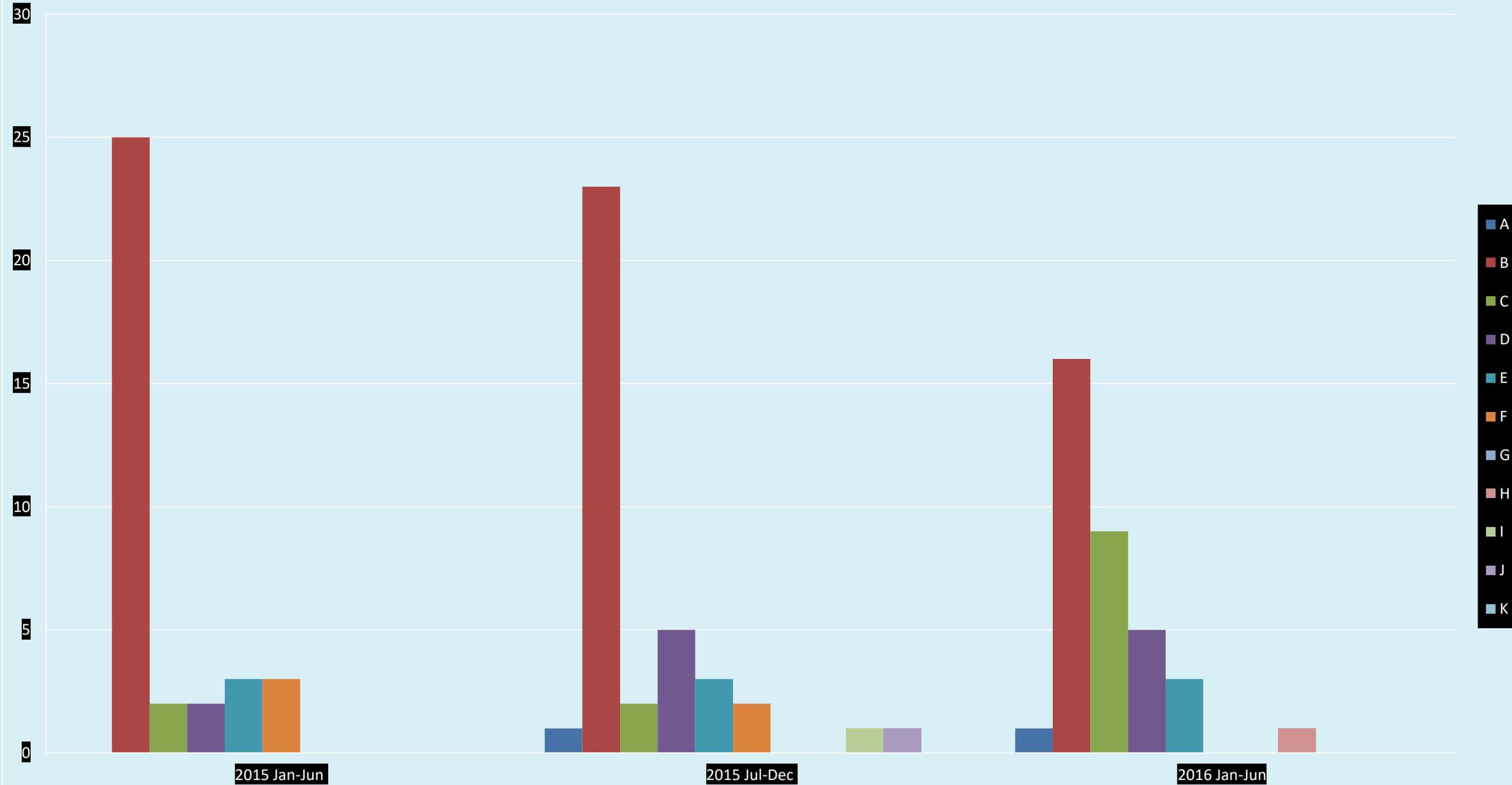
Eating in “SINC”: Safe Individualized
Nipple-Feeding Competence,
a Quality Improvement Project to
Explore Infant-Driven Oral Feeding
for Very Premature Infants Requiring
Noninvasive Respiratory Support

Stacey R. Dagleish, MN, NP

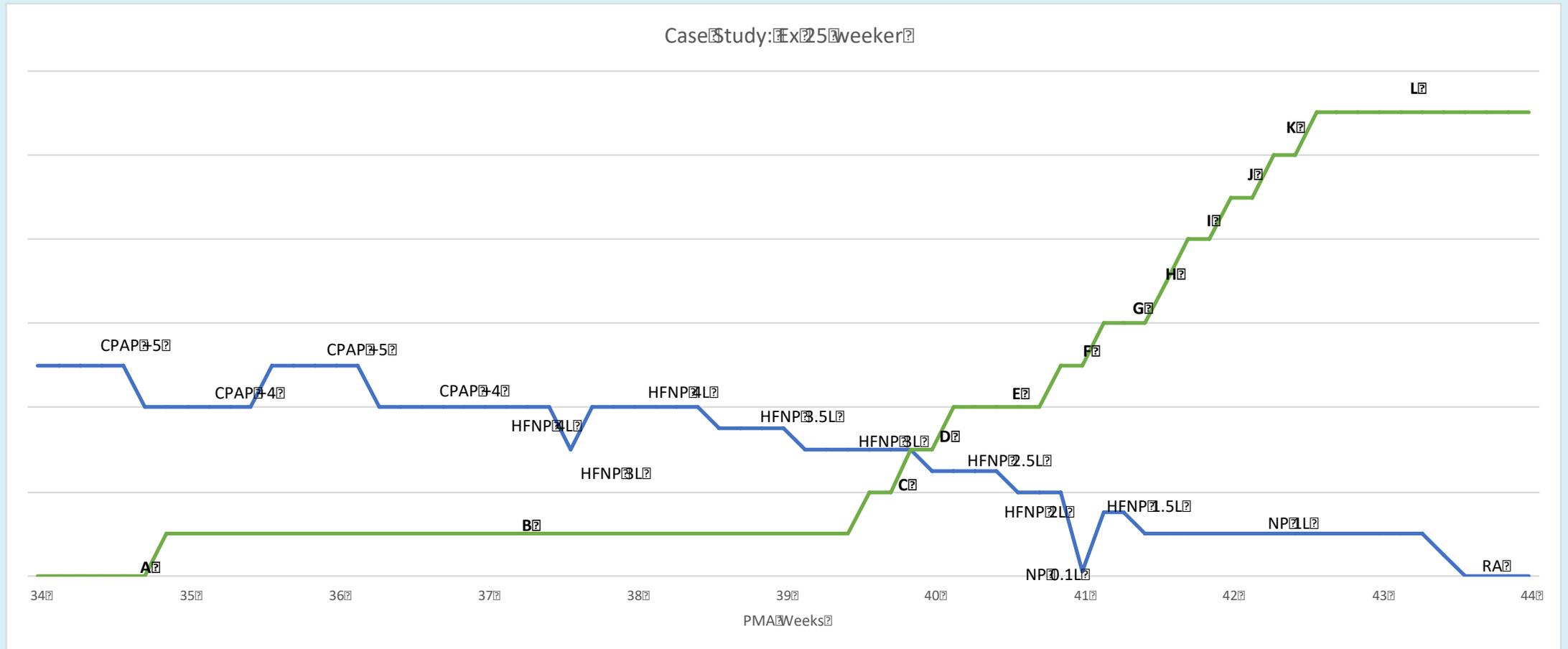
Linda L. Kostecky, RN, BN

Noreen Blachly, IBCLC, RN, BN

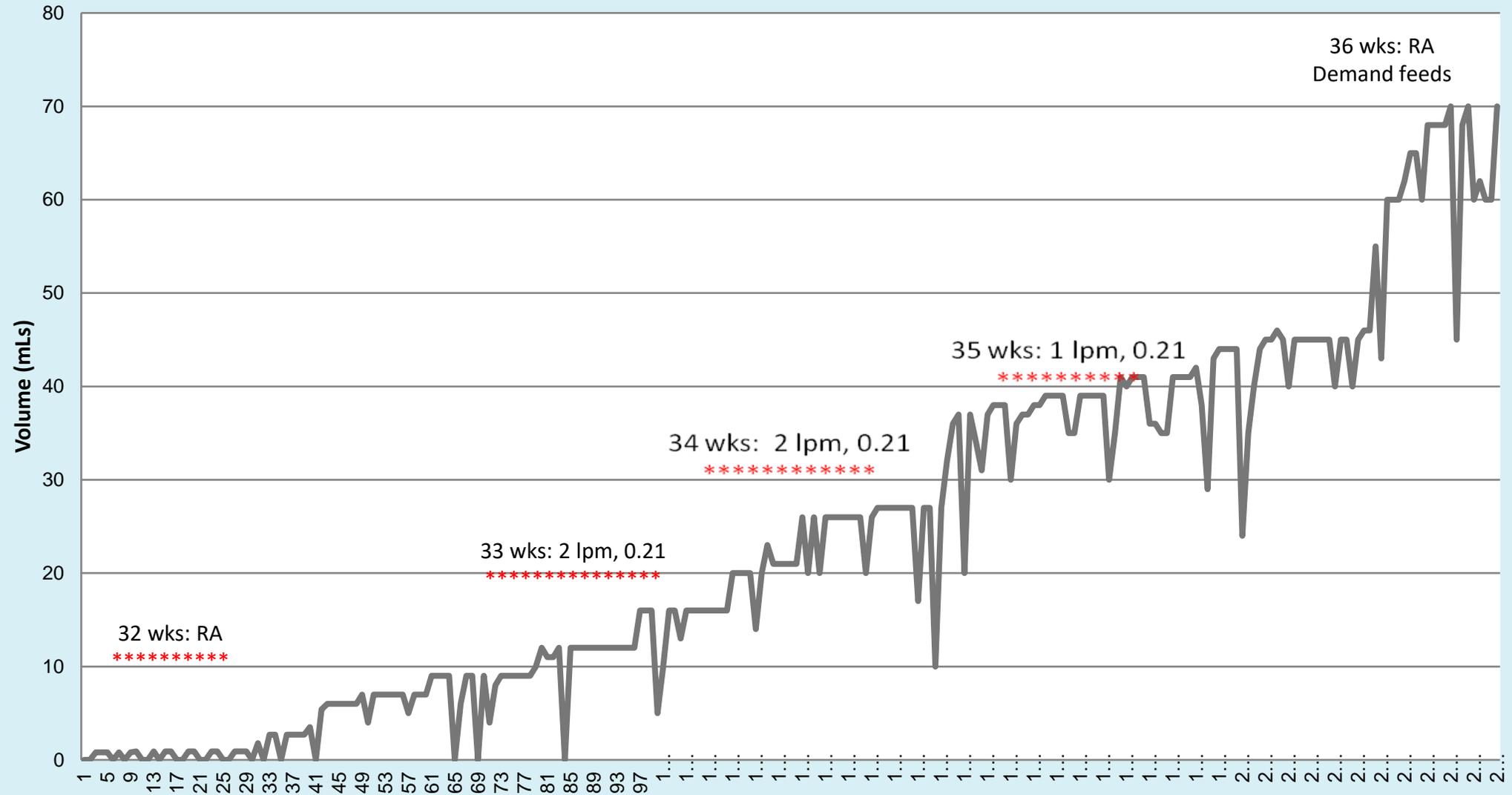
Maximum SINC on CPAP < 29 weeks



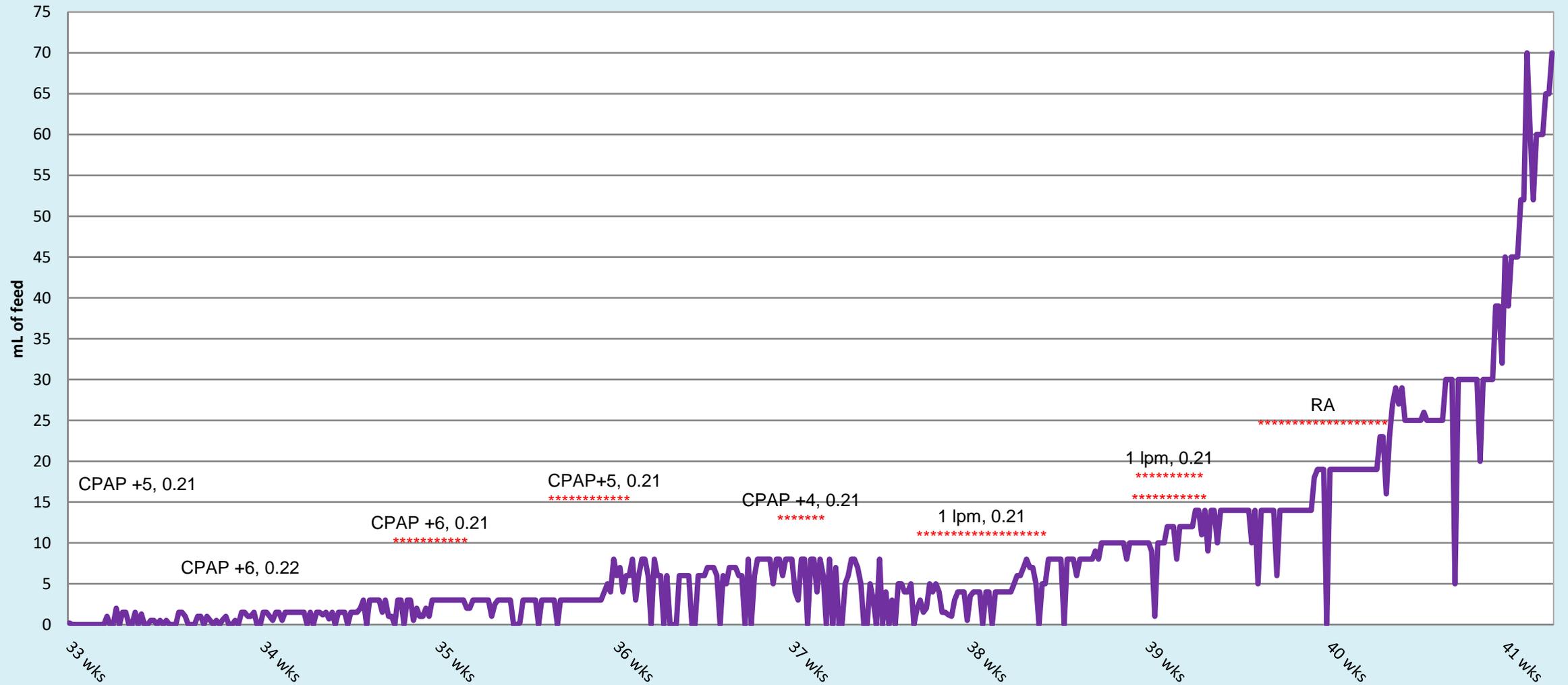
Relationship Between Breathing and Eating



Baby T. 29 1/7 weeks (2015)



Baby S. 24 weeks



SINC L (former 23 weeks)



Regionally, Nationally, Internationally



Paediatrics & Child Health, 2022, 27, 129
<https://doi.org/10.1093/pch/pxac001>
Position Statement



OXFORD

Position Statement

Discharge planning of the preterm infant

Nicole Anderson, Michael Narvey

Canadian Paediatric Society, Fetus and Newborn Committee, Ottawa, Ontario, Canada

Original Communication



Effect of SINC Feeding Protocol on Weight Gain, Transition to Oral Feeding, and the Length of Hospitalization in Preterm Infants: A Randomized Controlled Trial

Journal of Parenteral and Enteral Nutrition
Volume 45 Number 3
March 2021 567–577
© 2020 American Society for Parenteral and Enteral Nutrition
DOI: 10.1002/jpen.2049
wileyonlinelibrary.com

WILEY

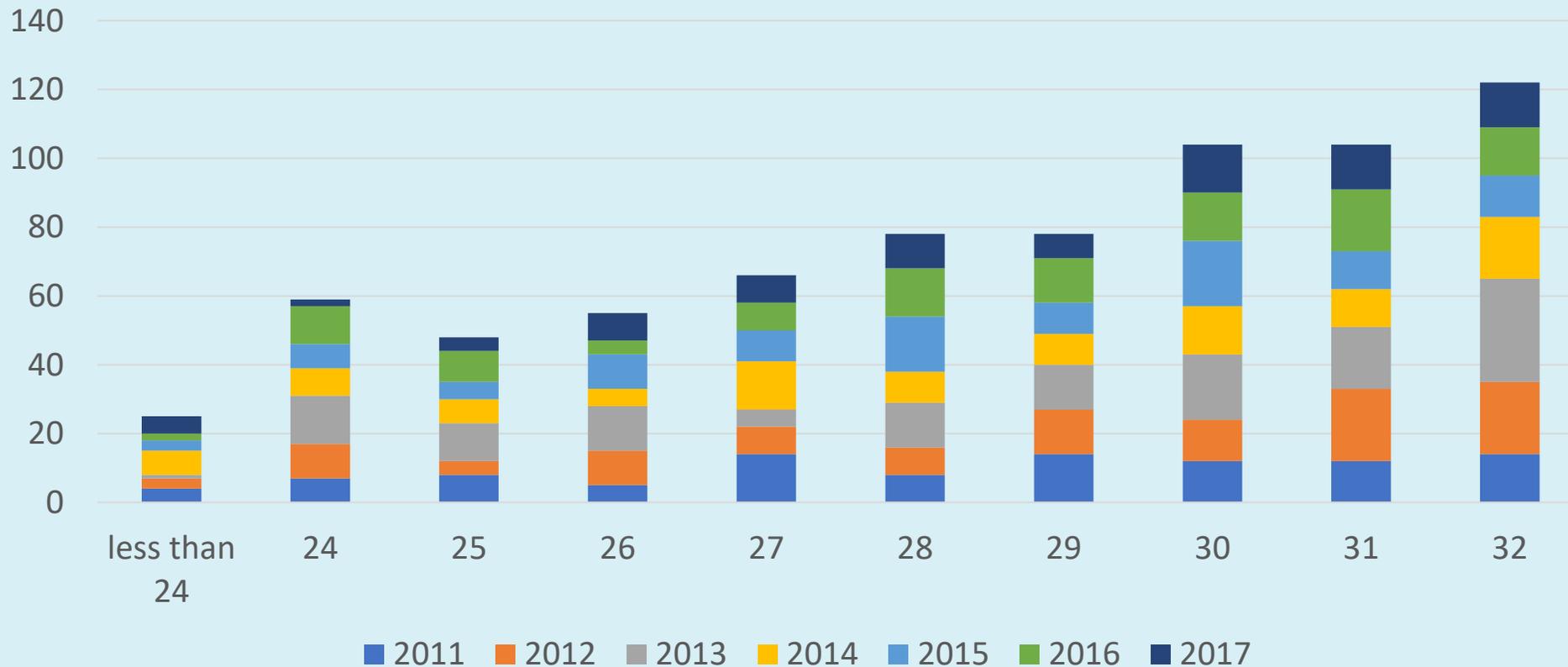
Raziye Celen, PhD¹ ; Fatma Tas Arslan, PhD¹ ; and Hanifi Soylu, PhD² 

All Infants < 33 wks
 admitted to CZ NICUs (2011-2017)
 n = 2511

SINC Exclusions

Exclusions = 739

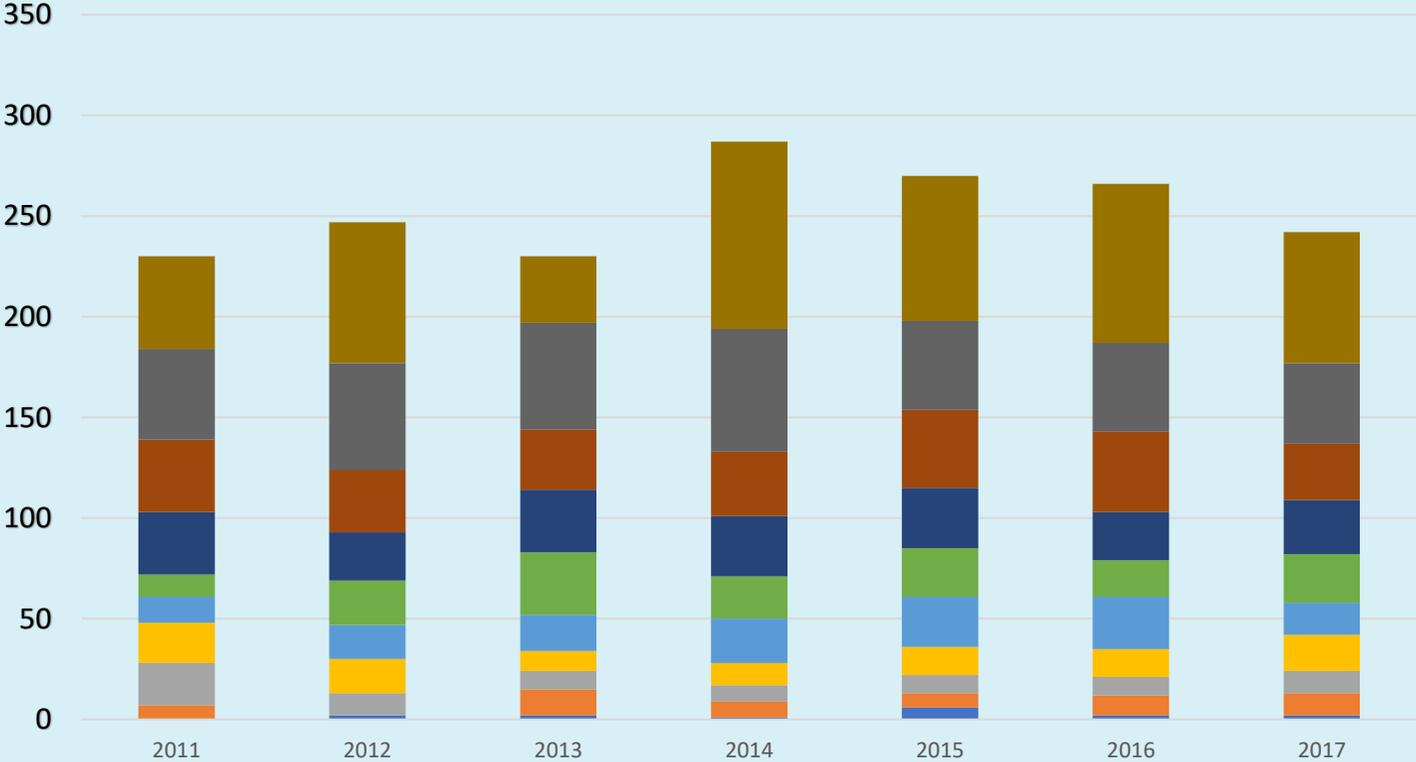
demise 100,
 transferred out of zone 333,
 incomplete charting 30,
 late admissions 25,
 congenital anomalies 106,
 surgery 107,
 severe outcomes precluding
 oral feeding 38



SINC Inclusions by Gestational Age (2011-2017)

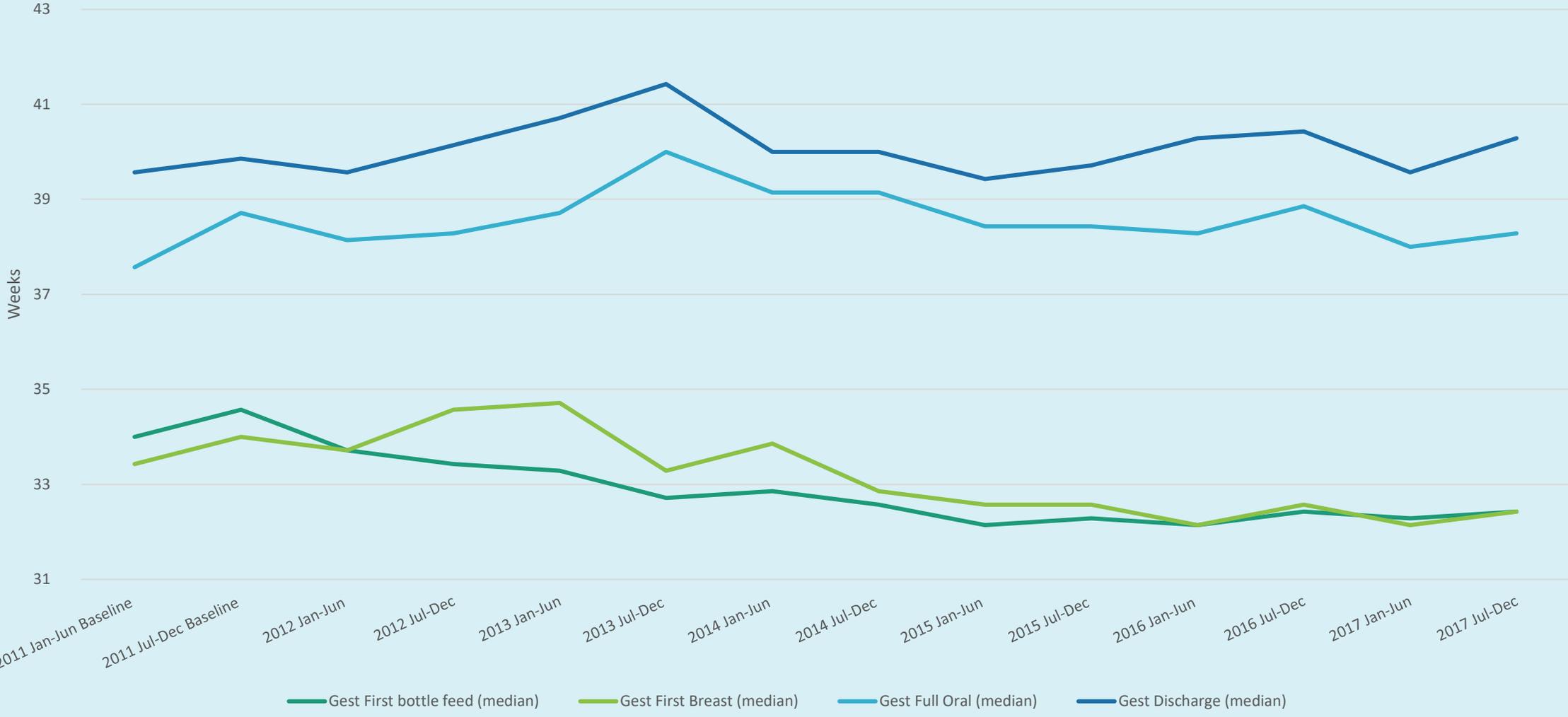
n= 1772

SINC Inclusions



less than 24 wks 24 wks 25 wks 26 wks 27 wks 28 wks 29 wks 30 wks 31 wks 32 wks

Longitudinal: Infants born <29 weeks gestation

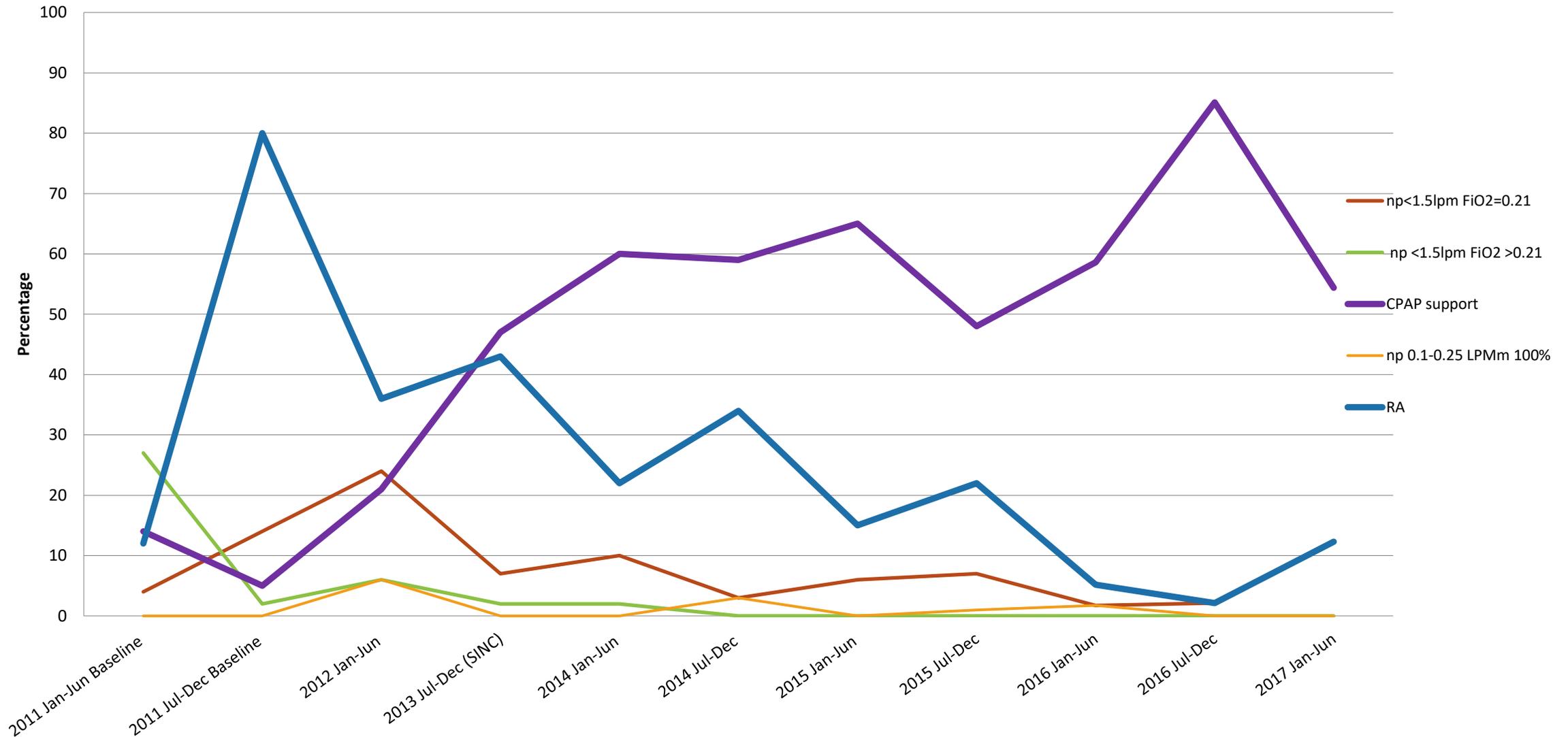




She's latched perfect



Respiratory support at first breast feed Infants <29 weeks



Twelve years later

- Countless nurses, NPs, OTs and SLPs, physicians and families have informed PDSA cycles
- No longer just about starting feeds on CPAP
 - SINC is an algorithm that may be modified and followed for all fragile feeders
 - Continues to support direct breast feeding in the NICU
- Provides common goals and understanding for the entire team including the family
 - Easy to see progress or more time required for skill consolidation
 - Transparent goals
 - Possibility for continuity of care

Oral Feeding Matters

- Delayed achievement of oral feeding and ND outcomes

Jadcherla, 2017. J Ped

Lainwala, 2019. American J Perinatology

- Language acquisition

Adams-Chapman, 2013. J Ped



No Means NO

LOW tolerance for

- stopping the feed or
- decreasing the SINC stage

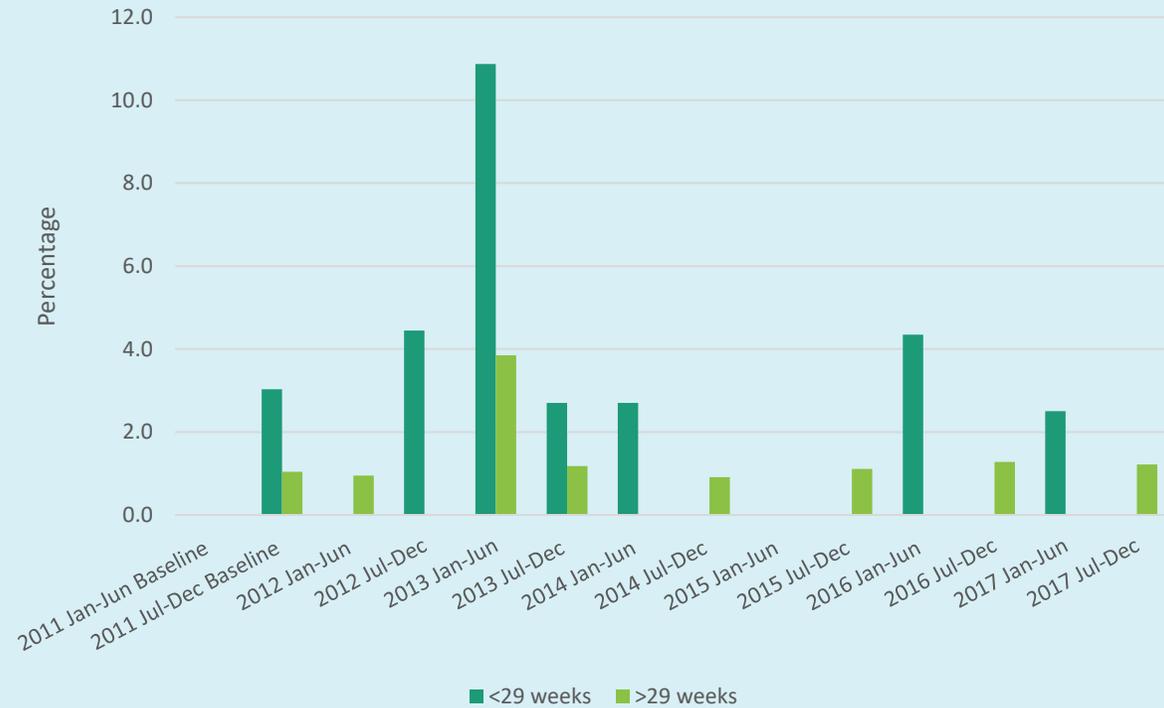


Feeding experiences should be positive

- Building neural connections
 - Goal is to hard-wire food = pleasure
 - Converse is food = choking, fear, pain, air hunger, etc etc.

At Discharge Home

Home on Gavage Feeds



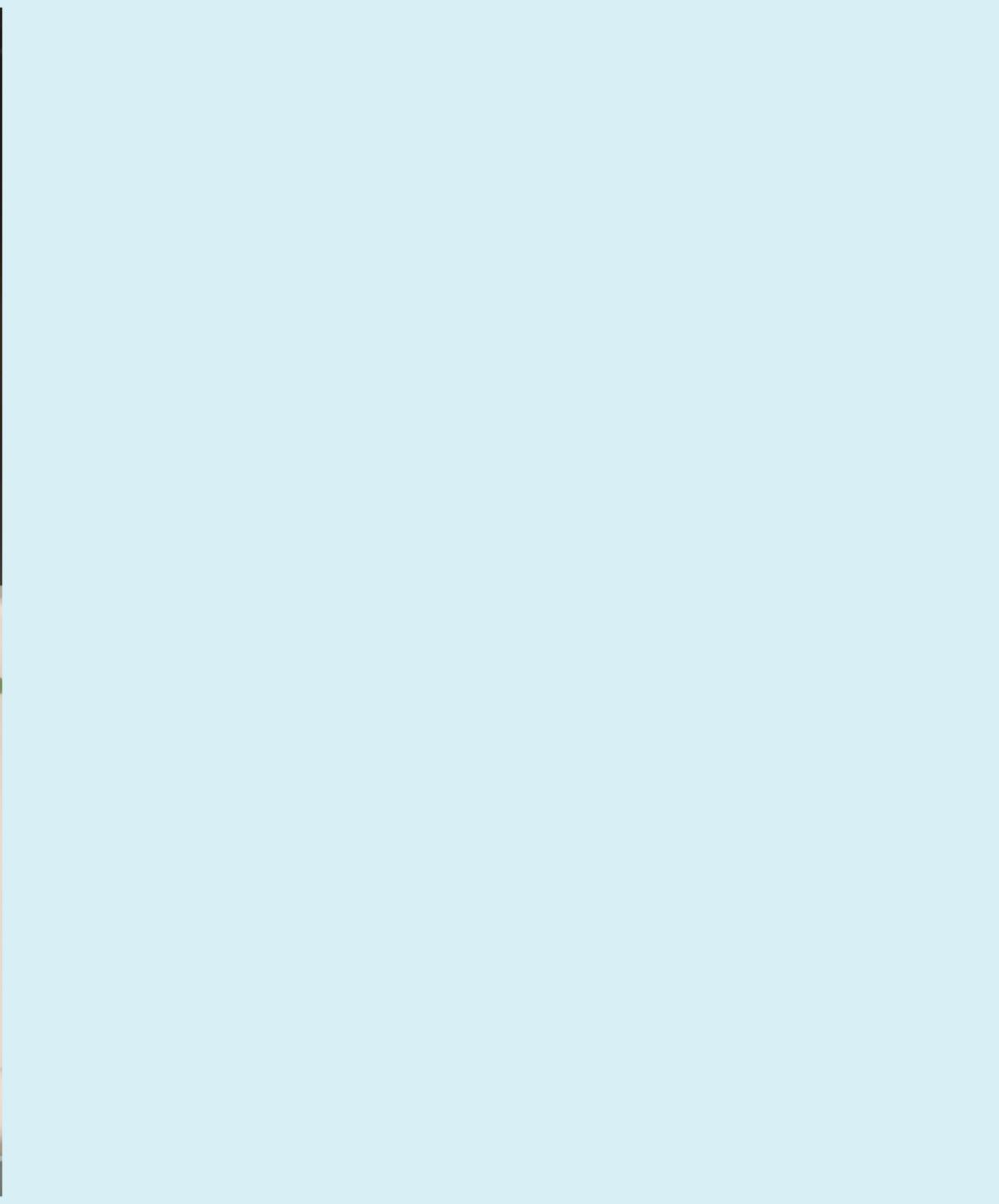
Home on Oxygen



Median # of Breast Feeds in Last 7 Days







nicu studies

	Positive Outcomes	Neutral	Negative
CPAP	Hanin, 2015 Jadcherla, 2016 Bapat, 2019	LaTuga, 2019 ^ Dumpa, 2020	Ferrara, 2017
HHHNP	Leder, 2016 Shetty, 2016	Shimizu, 2019	
Both	Dalgleish, 2016 Glackin, 2017	*Leibel, 2020 (taken off CPAP to feed)	

- Canning (2021) BMC Pediatrics

SINC is evidence informed

- The literature advanced and supports principles within SINC
 - Physiologic stability
 - Frequent opportunities
 - Consistent practice
 - Time and volume limits to prevent disengagement cues, fatigued practice
 - Many co-regulation strategies - fragile feeding is a highly skilled activity

In Summary

- Feeding Preterm Infants on CPAP is
 - A complex, multi-disciplinary undertaking
 - Possible
 - Safe when executed carefully
 - Helps to identify infants who need more screening, services
 - Leads to improved parent satisfaction, nursing satisfaction, “better feeders”

Questions?



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