

Protecting, Promoting, and Supporting Breastfeeding in the Intensive Care Nursery

The *Art and Science* of Tube to Breast

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The Art of “Tube to Breast” Breastfeeding Support

Learning Objectives:

- Describe the physiology of breast milk production and how to support the breastfeeding mother of a hospitalized infant
- Describe the oral-motor assessment of an infant at breast
- Describe the steps to exclusive breastfeeding for the preterm or hospitalized infant

I have no conflicts of interest to report,
but... I would like to say...



A special thank you to
the mothers in the
Intensive
Care
Nursery...



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Is Breastfeeding Important in the Intensive Care Nursery?



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32 ½ weeks, transferred to HH 34 4/7



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Breastfeeding 4-5 x/day

Benefits of Breast*milk* feeding in the Intensive Care Nursery

- Reduces the risk of *Necrotizing Enterocolitis*
- Reduces the risk of Nosocomial Infections
- Reduces incidence of Chronic Lung Disease
- Improves eye and brain development, particularly for preterm infants
- Reduces incidence of respiratory illness: RSV
- Improved neurodevelopmental outcomes

Callen J, Pinelli J. A review of the literature examining the benefits and challenges, incidence and duration, and barriers to breastfeeding in preterm infants. *Adv Neonatal Care* 2005; 5(2): 72–88; quiz 89–92.

Direct Breastfeeding in the Intensive Care Nursery...

Is it important?

AAP Statement 2005:

“Hospitals and physicians should recommend human milk for premature and other high-risk infants either by direct breastfeeding and/or using the mother’s own expressed milk. Maternal support and education on breastfeeding and milk expression should be provided from the earliest possible time. Mother-infant skin-to-skin contact and direct breastfeeding should be encouraged as early as feasible.”

Gartner LM, Morton J, Lawrence RA, Naylor AJ, O’Hare D, Schanler RJ *et al*. Breastfeeding and the use of human milk. *Pediatrics* 2005; 115 (2): 496-506.

Direct Breastfeeding in the Intensive Care Nursery...

Is it important?

AAP Recommends... GLOBAL VIEW

- Exclusive breastmilk feeding for at least six months
- Fortification of maternal breastmilk for ELBW and VLBW infants
- Continued breastmilk feedings for at least one year “and beyond if mutually desired by mother and child.”

Benefits of Long Term Breastfeeding

- Lower rates of respiratory and GI illness
- Lower rates of Otitis Media
- Lower rates of Obesity
- Lower rates of Diabetes I and II
(Infant and Mother)
- Lower rates of Allergies and Asthma
- Lower rates of Childhood Leukemia
- Lower rates of Crohn's
- Decreased incidence of SIDS

Ip S, Chung M, Raman G, et al. Breastfeeding and maternal and infant health outcomes in developed countries. Rockville, MD: Agency for Healthcare Research and Quality, US Department of Health and Human Services 2007, Evidence Report/Technology Assessment No. 153.

Horta BL, Bahl R, Martines JC, et al. Evidence on the long term effects of breastfeeding: systematic review and meta-analysis. Geneva: World Health Organization, Development Department of Child and Adolescent Health and Development , 2007.

Direct Breastfeeding in the Intensive Care Nursery...

Is it important?

- Rates of breastmilk feeding at hospital discharge are low....why?
 - Medically compromised infants
 - Maternal challenges establishing and maintaining breastmilk supply
 - Health care provider attitudes/misinformation
 - Transitions from NG tube feedings to full oral feedings can be slow
 - Poor infant oral skills
 - Inefficient feeding

The Reality is...

- Providing breastmilk for 6-12 months is very difficult if not impossible for mothers who *exclusively* **PUMP**
- Providing breastmilk even to discharge from NICU/ICN is extremely difficult if **there is no direct breastfeeding**

Pineda R. Direct breastfeeding in the neonatal intensive care unit. *Journal of Perinatology*, 2011: 1-6.

Meier P. The management of breastfeeding: breastfeeding in the special care nursery: prematures and infants with medical problems. *Pediatric Clinics of North America*. 2005; 48(2): 425-442.

Direct Breastfeeding in the Intensive Care Nursery... Is it important?

When a successful breastfeeding pattern is established before discharge, long - term breastfeeding success is more likely.



Photography by Sandra Morelli

Kliethermes Study

Compare NG tube feedings with bottle feeding as two means to transition infants to breastfeeding

- Prospective, randomized controlled trial
- Metropolitan 40 bed Intensive Care Nursery
- N= 84 preterm infants 1000-2500 grams
- Outcome Measures
 - Rates of exclusive and partial breastfeeding at discharge from ICN
 - Rates of exclusive breastfeeding day 3 post discharge
 - Rates of exclusive breastfeeding @ 3 months post discharge
 - Rates of exclusive breastfeeding @ 6 months post discharge

Kliethermes PA, Cross ML, Lanese MG, Johnson KM, Simon SD, Transitioning preterm infants with nasogastric tube supplementation: increased likelihood of breastfeeding. *JOGNN* 1999; 28, (3): 264-73.

Maternal Demographics

Parameters	Group 1 Bottle (n=46)	Group 2 NG (n=38)	
Maternal age (years)	25 (16-42)	30 (18-44)	
Gravida	1.8 (1-5)	2.6 (1-10)	
Para	1.7 (1-4)	2.3 (1-5)	
Single Mothers	15% (7)	18% (7)	
Miles from hospital	34 (7-100)	33 (3-90)	
Wage Earners	80% (36)	89% (34)	
Plan to Work	52% (23)	51% (19)	
Employed	55% (24)	51% (19)	
Previous breastfeeding experience	27% (12)	56% (20)	
Unsuccessful breastfeeding	4.4% (2)	14.3% (5)	
Smoker	15% (7)	17% (6)	

Kliethermes PA, Cross ML, Lanese MG, Johnson KM, Simon SD, Transitioning preterm infants with nasogastric tube supplementation: increased likelihood of breastfeeding. *JOGNN* 1999; 28, (3): 264-73.

Infant Characteristics

Parameter	Group 1 (Bottle) N= 46	Group 2 (NG) N= 38
Gestational age (wks)	32 (28-35)	32 (26-35)
Birth weight (kgs)	1.64 (1.00-2.35)	1.73 (1.05-2.43)
Apgar @ 1 minute	6.7 (1-9)	6.6 (1-9)
Apgar @ 5 minutes	8.1 (1-9)	8.2 (6-9)
Phototherapy (days)	3.3 (0-9)	3.7 (0-9)
Age @ first brfdg	11 days (1-40)	16 days (9-77)
Weight @ first brfdg	1.66 kgs (1.25-2.14)	1.8 kgs (1.16-2.36)
Discharge Weight	2.1 kgs (1.71-2.70)	2.2 kgs (1.84-2.65)
Twin Birth	35% (16)	21% (8)
SGA	22% (10)	3% (1)
Vaginal Deliveries	54% (28)	47% (30)
RDS	61% (28)	79% (30)
IVH	22% (10)	21% (8)
Sepsis	9%(4)	9% (3)

Kliethermes PA, Cross ML, Lanese MG, Johnson KM, Simon SD, Transitioning preterm infants with nasogastric tube supplementation: increased likelihood of breastfeeding. *JOGNN* 1999; 28, (3): 264-73

Interesting findings...

Parameters	Group I (bottle)	Group II (NG)	P value
Total apnea/bradycardia Events	136	127	.0006
Apnea/bradycardia requiring stimulation	23.3	32.7	.0001
Total days NG tube	22	29	.036
Length of hospital stay	33	34.6	.068
Infant weight @ D/C	2.10 kgs	2.17 kgs	0.13

Kliethermes PA, Cross ML, Lanese MG, Johnson KM, Simon SD. Transitioning preterm infants with nasogastric tube supplementation: increased likelihood of breastfeeding. *JOGNN* 1999; 28, (3): 264-73.

Kliethermes Study : Outcomes

Compare NG tube feedings with bottle feeding as two means to transition infants to breastfeeding

- **Group II** had higher rates of breastfeeding at all points
- Method of supplementation was predictive of continued breastfeeding. The infants who were supplemented via NG were:
 - **9.4 times more likely to be fully breastfed** ($p= .0001$)
@ discharge
 - **6.4 times more likely to fully breastfeed** ($p= .0001$)
3 days post DC
 - **3.8 times more likely to fully breastfeed** ($p= .0006$)
3 months post DC

The effect of NG supplementation was statistically significant at all time points, even after adjusting for confounding variables.

Kliethermes PA, Cross ML, Lanese MG, Johnson KM, Simon SD. Transitioning preterm infants with nasogastric tube supplementation: increased likelihood of breastfeeding. *JOGNN* 1999; 28, (3): 264-73.

Direct Breastfeeding in the Intensive Care Nursery...

Is it important?

- Washington University School of Medicine
- Retrospective Cohort Study
- N=66 infants gestational age at birth 24-35 weeks
- Mean age 28 ± 2.7 weeks
- Birth weight : 550-1485 grams
- Hospital length of stay 10-108 days
- Infants first put to breast 30-37 weeks gestation
- Duration of breastmilk feedings were 12-108 days

Effect of direct breastfeeding

		Duration of breastmilk feeds (days)	P- value	Breastmilk at discharge	P-value
First Oral Feedings at Breast	No	38 \pm 27.6	0.0108	30%	0.0697
	Yes	63 \pm 27.7		70%	
Ever breastfed in the hospital	No	34.0 \pm 19.0	0.0463	3%	<0.0001
	Yes	52.5 \pm 22.7		62%	

Bold values signifies P<0.05

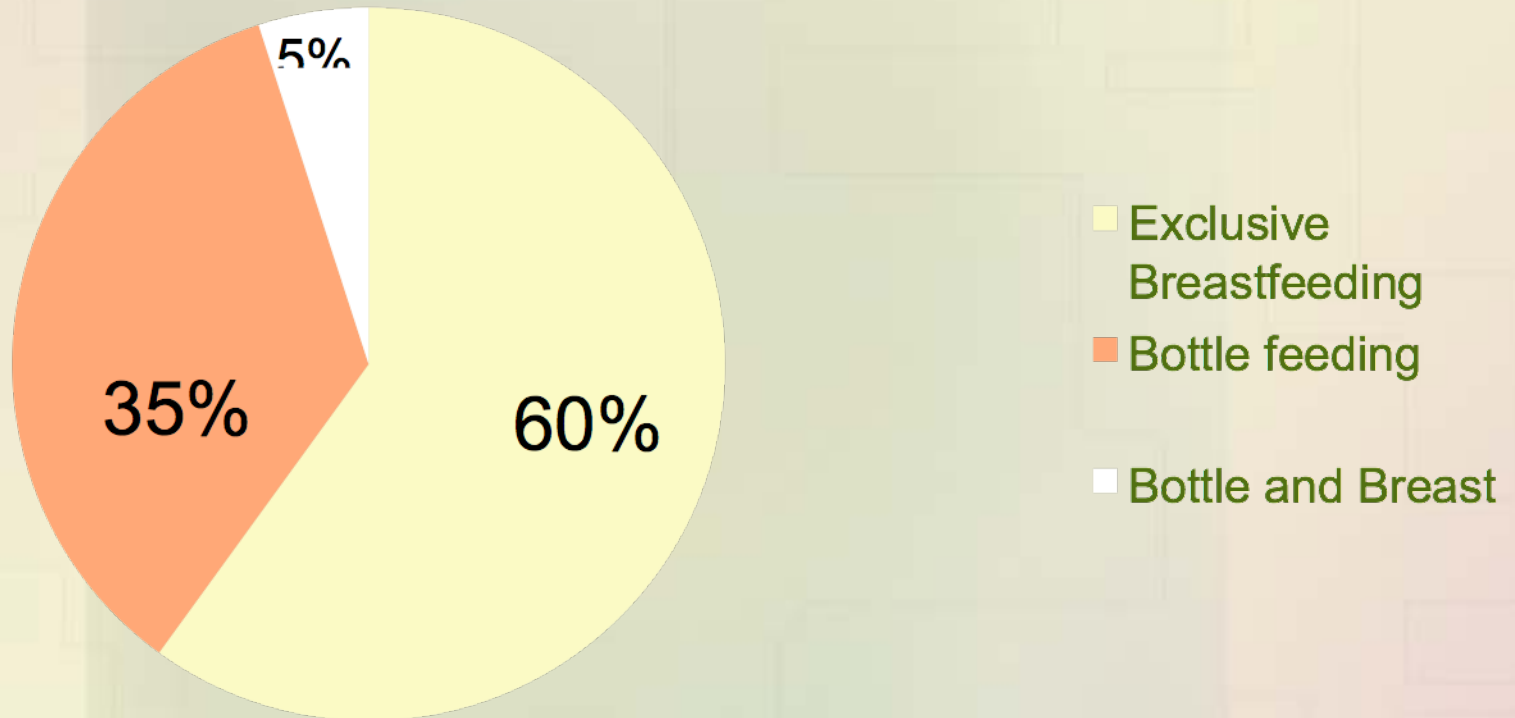
Pineda R. Direct breast-feeding in the neonatal intensive care unit *Journal of Perinatology* 2011: 1-6.

Direct Breastfeeding in the Intensive Care Nursery... Is it important?

- Denmark Study: All breastfeeding infants were supported by NG feedings while transitioning to the breast
- Infants were only bottle fed when
 - Breastmilk pumping or breastfeeding was discontinued by mother
 - Mother experience low milk production
- Multicenter trial (Four NICUs) N= 478
- Gestational age 24 – 32 weeks
- Discharge mean 37 +2 days \pm 12 days

Breastfeeding Rates : Denmark Study

Rates of Feeding at Discharge



Zachariassen G, Faerk J, Crytter C, Esberg B.H., Juvonen P, Halken S. Factors associated with successful establishment of breastfeeding in very preterm infants. *Acta Paediatrica*, 2010; 99,1000-1004.

Benefits of Direct Breastfeeding

- Breastmilk expression via pump differs from the infant at breast
 - Pulsatile oxytocin release
 - Increased prolactin release
 - Improved milk production
- Maternal psychological well being
 - Decreases stress
 - Improved milk ejection reflex response
 - Empowerment as a parent
 - Improved milk production

Yokoyama Y, Ueda T, Irahara M, Aono T. Release of oxytocin and prolactin during breast massage and suckling in puerperal women. *Eur J Obstet Gynecol Reprod Biol* 1994; 53 (1): 17-20.

McNeilly AS, Robinson IC, Houston MJ, Howie PW. Release of oxytocin and prolactin in response to suckling. *Br Med J (Clin Res Ed)* 1983; 286(6361): 257-259.

Ueda T, Yokoyama Y, Irahara M, Aono T. Influence of psychological stress on suckling-induced pulsatile oxytocin release. *Obstet Gynecol* 1994; 84(2): 259-262.

Benefits of Direct Breastfeeding

- Maternal-Infant skin to skin contact
 - Infant receives great physical benefit
 - Comforts and consoles infant
 - Stabilizes temperature, heart rate, respiratory rate
 - Improved oxygen saturation
 - Tasty treats
- Improved maternal-infant bonding
- Allows mother to be exposed to infant's flora
 - Maternal response with immunities in breastmilk

Heinrichs M, Meinlschmidt G, Neumann I, Wagner S, Kirschbaum C, Ehlert U *et al.* Effects of suckling on hypothalamic-pituitary-adrenal axis responses to psychological stress in post partum lactating women. *J Clin Endocrinol Metab* 2001; 86(10): 4798-4804.

Keys for Success...

- Maternal Support
- Family and Partner Support
- Establish Lactogenesis II
- Breastfeeding Assessment
 - Milk supply
 - Milk transfer
- Nurse Support
- Community Support



Photography by Sandra Morelli

Lactation Support

- IBCLC
- Pumping guidelines
 - 8-10 times/24 hours
 - “Hands on” pumping
- Monitor milk volumes
 - 500 mls/24 hours by day seven
 - 720-1000 mls/24 by day fourteen
- Assess feedings
- Teach Parents how to assess feedings
- Resource for nurses, care providers

LOTS
OF
MILK!!



Maternal Support

- Emotional Support
- Physical Support
- Monitor through stages of Lactogenesis
- Direct breastfeeding assessment
- Referrals



Photography by Lisa Lamadriz

Family and Partner Support

- Establish relationship with partner
- Give partner tasks
 - Clean pump equipment
 - Document pumped milk volumes
 - Hold infant while mom pumps
- Make partner feel important and part of the TEAM

Lactogenesis II

- Onset of copious milk production
- Usually occurs 30-40 hours post partum
- Progesterone withdrawal physiological trigger
- Adequate plasma levels of prolactin necessary
- Adequate levels of cortisol & glucocorticoids required
- Insulin (metabolic balance allowing flux of nutrition to mammary glands)
- Early removal of colostrum from the breast
 - Sodium and Chloride levels fall
 - Lactose concentrations increase
 - Secretory immunoglobulin A and lactoferrin increase dramatically
 - Oligosaccharide concentrations high

Delays in Lactogenesis II

- Poorly controlled diabetes
 - Correlates with high serum glucose levels
- Stress
 - Correlates with high cortisol levels
- Inadequate milk removal
 - High milk sodium levels reported prior to lactation failure in mothers whose infants were not latching well and removing milk adequately

Establish Lactogenesis II

- Hospital-Grade Double Electric Breastpump
- Pump 8-10 times per 24 hours
- Breast massage and Hand Expression
- Frequent and Prolonged Maternal Infant skin to skin contact
- Lactation Consultant
- Bedside Nurse

Assess Infant Readiness

- A. Feeding readiness scale
 - 1) Drowsy, alert, or fussy before care/ Rooting and/or bringing of hands to mouth/taking of pacifier. Good tone (presupposes autonomic stability)
 - 2) Drowsy or alert once handled. Some rooting or taking of pacifier. Adequate tone.
 - 3) Briefly alert with care. No hunger behaviors. No change in tone. ****Kangaroo Care****
 - 4) Sleeps throughout care. No hunger cues. No change in tone. ****Kangaroo Care****
 - 5) Needs increased oxygen with care. Apnea and/or bradycardia with care. Tachypnea greater than baseline with care. ****Kangaroo Care****

Assess Quality of Suck

- B. Quality of nipple scale
 1. Strong coordinated suck throughout
 2. Strong coordinated suck initially but fatigues with progression
 3. Consistent suck but has difficulty coordinating swallow, some loss of liquid or difficulty in pacing. Benefits from external pacing
 4. Weak/inconsistent suck. Little to no rhythm, may require some rest breaks
 5. Unable to coordinate suck-swallow-breathe pattern despite pacing, may result in frequent or significant *A/Bs* or large amounts of liquid loss and/or tachypnea significantly greater than baseline with feeding

Assess Feeding Supports

- C. Caregiver technique scale

- A. External pacing

- B. Modified side-lying

- C. Chin support

- D. Cheek support

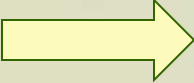
- E. Oral stimulation

- Tickle nose to chin

- Tickle around mouth

- Entice infant to suck

Breastfeeding Journey

- Kangaroo Care
- Nuzzle at breast
- Latch briefly, few sucks
- Latch and Re-latch
- Latch, maintain latch  suck and swallow
- Immature sucking bursts (partial feed)
- Mature sucking bursts (full feed)
- Ad lib, monitor endurance



Photography by Sandra Morelli

Breastfeeding Assessment

- Sucking bursts

- Non-nutritive

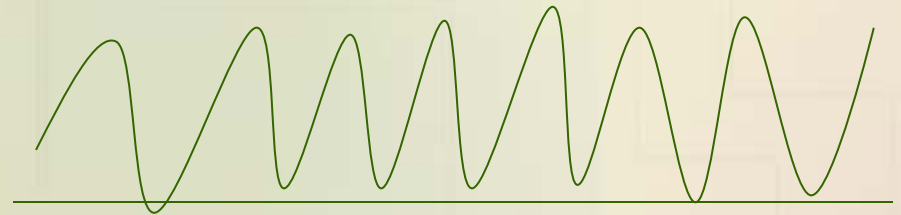


Rapid, shallow, flutter suck

Elicits maternal milk ejection reflex

- Nutritive

Slow, rhythmic suck



Deep jaw movements

- Immature: Less than 10 per burst

- Mature: greater than 10 sucks per burst

common 15-30 sucks per burst

Breastfeeding Assessment

- Suck: Swallow Ratios
 - Auscultation: Watch suck, listen for swallowing
 - Auscultate just below ear or mid-neck
 - Colostral phase normal: 4:1- 6:1
 - Full milk production: Goal is 1:1 - 2:1
- Supplementation Guidelines
 - Full milk production necessary
 - Infant feeding endurance must meet or exceed 10-15 minutes of **drinking time** at breast
 - Suck bursts 5-9 (reduce ng supplement by 1/2)
 - Suck bursts > 10 no supplementation needed
 - Monitor output and daily weight

Pre and Post Feeding Weights

- Complex infants
 - Infants requiring oxygen supplementation (BPD)
 - Cleft Palate
 - Cardiac
 - Neurological deficits
- Borderline milk production
- Test weights
- Maternal reassurance
- Significant infant weight loss during ad lib feeding trial

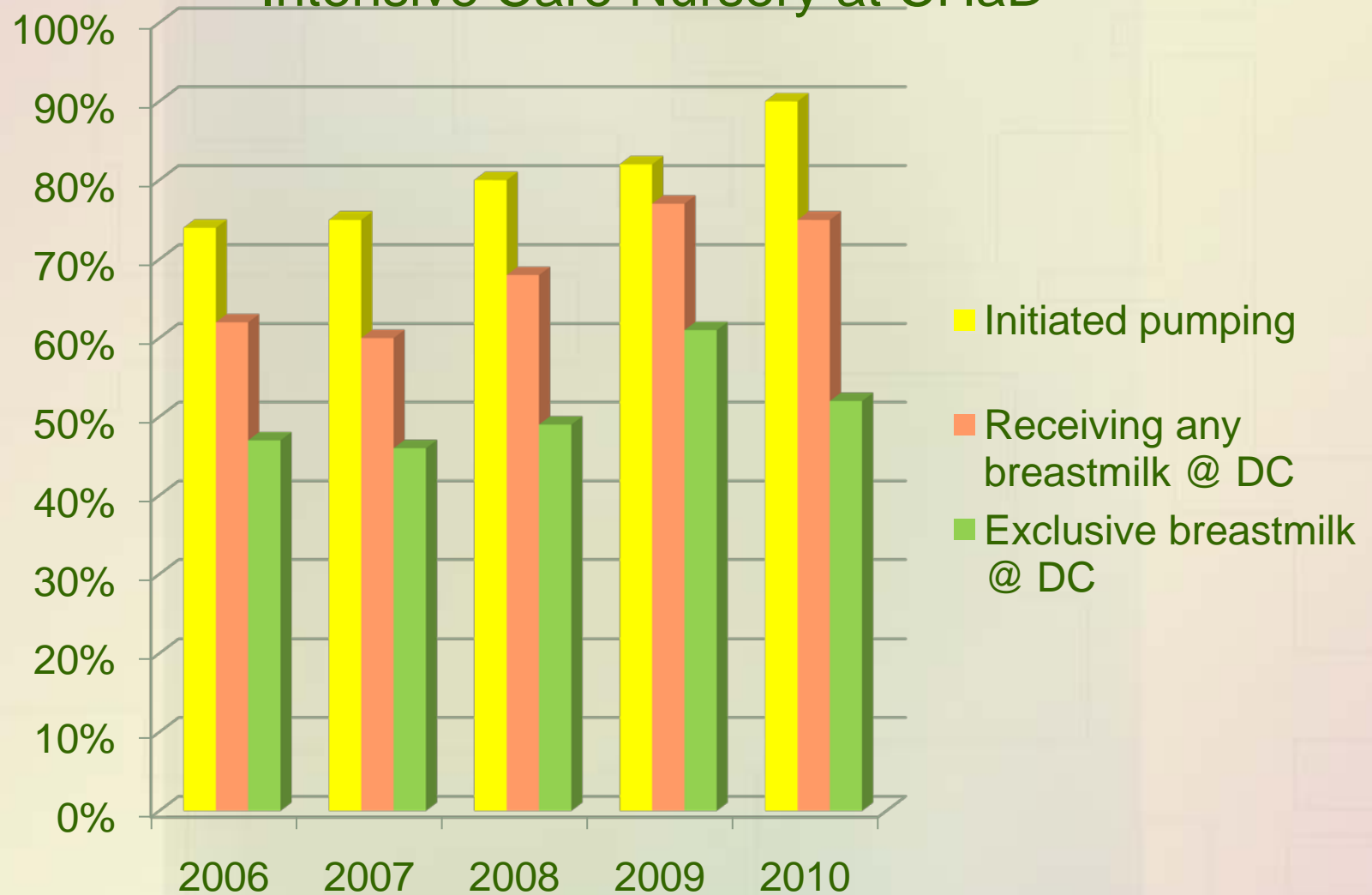
Nyqvist KH, Sjöden, Ewald U. The development of preterm infants' breastfeeding behavior. *Early Human Development*. 1999; 55: 247-264.

Nyqvist KH and Ewald, U. Infant and maternal factors in the development of breastfeeding behaviour and breastfeeding outcome in preterm infants. *Acta Paediatr*; 88: 1194-1203.

Breastmilk Feeding Rates Infants <1500 grams in the ICN



Breastmilk Feeding Rates All Infants in the Intensive Care Nursery at CHaD



References

- American Academy of Pediatrics. Red Book: 2003 Report of the Committee on Infectious Diseases. Pickering LK, ed. 26th ed. Elk Grove Village, IL:American Academy of Pediatrics; 2003.
- Callen J, Pinelli J. A review of the literature examining the benefits and challenges, incidence and duration, and barriers to breastfeeding in preterm infants. *Adv Neonatal Care* 2005; 5(2): 72–88; quiz 89–92.
- Gartner LM, Morton J, Lawrence RA, Naylor AJ, O'Hare D, Schanler RJ *et al*. Breastfeeding and the use of human milk. *Pediatrics* 2005; 115 (2): 496-506.
- Heinrichs M, Meinlschmidt G, Neumann I, Wagner S, Kirschbaum C, Ehlert U *et al*. Effects of suckling on hypothalamic-pituitary-adrenal axis responses to psychological stress in post partum lactating women. *J Clin Endocrinol Metab* 2001; 86(10): 4798-4804.
- Horta BL, Bahl R, Martines JC, *et al*. Evidence on the long term effects of breastfeeding: systematic review and meta-analysis. Geneva: World Health Organization, Development Department of Child and Adolescent Health and Development , 2007
- Ip S, Chung M, Raman G, *et al*. Breastfeeding and maternal and infant health outcomes in developed countries. Rockville, MD: Agency for Healthcare Research and Quality, US Department of Health and Human Services 2007, Evidence Report/Technology Assessment No. 153.
- Kliethermes PA, Cross ML, Lanese MG, Johnson KM, Simon SD: Transitioning preterm infants with nasogastric tube supplementation: increased likelihood of breastfeeding. *JOGNN* 1999; 28, (3):264-73.
- McCain GC, An evidence-based guideline for introducing oral feeding to healthy preterm infants, *Neonatal Netw* 22 (2003), pp. 45–50.
- McGrath JM and Braescu AV, Feeding readiness in the preterm infant, *J Perinat Neonatal Nurs* 18 (2004), pp. 353–368.
- McNeilly AS, Robinson IC, Houston MJ, Howie PW, Release of oxytocin and prolactin in response to suckling. *Br Med J (Clin Res Ed)* 1983; 286(6361): 257-259.

Neville, M.C. and Morton, J : Physiology and Endocrine Changes Underlying Human Lactogenesis II *J. Nutr.* 2001 131: 11-16.

Pineda R, Direct breast-feeding in the neonatal intensive care unit *Journal of Perinatology* 2011: 1-6.

Thoyre SM, Shaker CS and Pridham KF, The early feeding skills assessment for preterm infants, *Neonatal Netw* 24 (2005), pp. 7–16.

Ueda T, Yokoyama Y, Irahara M, Aono T. Influence of psychological stress on suckling-induced pulsatile oxytocin release. *Obstet Gynecol* 1994; 84(2): 259-262.

Yokoyama Y, Ueda T, Irahara M, Aono T. Release of oxytocin and prolactin during breast massage and suckling in puerperal women. *Eur J Obstet Gynecol Reprod Biol* 1994; 53 (1): 17-20.

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