Cue-based Co-regulated Feeding in the Neonatal Intensive Care Unit: Supporting Parents in Learning to Feed Their Preterm Infant

Catherine S. Shaker, MS/CCC-SLP, BRS-S

Florida Hospital for Children-NICU, Orlando, FL

ABSTRACT

Feeding preterm infants may be considered by some a routine task rather than a critical component of neonatal intensive care unit care. The technology of the neonatal intensive care unit, attention to numbers rather than infant behaviors, and nonindividualized ways in which care may be delivered can affect the culture of feeding. The importance of the feeding relationship and the infant's positive learning experiences may get lost in “the numbers” when the parents’ focus is primarily on “emptying the bottle” to get the infant home. The developmental nature of learning to feed may be overshadowed by well-intentioned professional caregivers who describe feeding as a “light bulb phenomenon” (the infant all of a sudden “figures it out” and therefore “knows how to feed”) vs a developmental process that requires carefully titrated support. Providing parents with skills to co-regulate with their infant during feeding can support parent-infant attachment, reduce stress, and improve intake.

© 2013 Elsevier Inc. All rights reserved.

Advances in neonatal care have led to significant changes in the survival rates of preterm infants. However, persistence of feeding issues in neonates often prolongs hospitalization and increases health care costs. Multiple factors contribute to the difficulties with acquiring the skills to feed efficiently and safely enough to be discharged to home. However, recent trends in neonatal intensive care units (NICUs) toward more infant-guided care, most notably “cue-based” feeding, have resulted in earlier achievement of full oral feeding and a growing recognition of the need to move away from a focus on volume-driven feeding. In a volume-driven culture, there is pressure on professional caregivers to “get infants to eat,” with a well-intentioned goal of getting them home. In that task-driven model, however, professional caregivers have been known to do whatever might be necessary to empty the bottle. That may have included, for example, manipulating the bottle or nipple, “encouraging” sucking if the infant paused, or continuing the feeding when the infant is no longer awake, all with good intentions. This can result in both physiologic stress and negative feeding behaviors for the preterm infant, who may struggle to breathe when swallowing and breathing compete. The infant may also develop refusal behaviors to signal the inability to continue to feed, which can lead to feeding aversions. If the focus is primarily on intake, the infant’s behaviors may take on a different meaning or not be understood. Well-intentioned caregivers in a volume-driven culture are likely to “feed past” the infant’s stop signs.

During the period when most preterm infants are learning to feed in the NICU, they are in the process of developing motor and sensory neuropathways. Stressful experiences during feeding may establish altered sensory-motor pathways in the brain that guide the infant away from feeding and adversely affect the ability and desire to feed both in the NICU and after discharge. The combination of physiologic instability during feeding and a sensory-motor system that is undergoing rapid development in an unpredictable and often overwhelming environment may be a potential risk factor for feeding problems that endure. Increased exposure to stressors in the NICU has been associated with alterations in brain structure and in neurobehavior at term equivalent. Caregiving experiences, especially those during feeding, may also affect developing brain structure. It is critical to appreciate that preterm infants are establishing their learned experiences with feeding; therefore, every feeding experience must be as positive as possible. Undue stress during feeding may predispose the infant not only to safety issues but also to long-term learned refusals. Repeated negative experiences during feeding may lead to maladaptive feeding behaviors and aversions because neuronal mapping is occurring rapidly during the time when preterm infants are learning to feed. The importance of successful oral feeding, and how it is best supported in the NICU, is therefore a critical and central issue for all members of the NICU team. Supporting parents in learning to feed their preterm infant involves realigning the culture of feeding in the NICU. This may include...
moving away from volume-driven feeding and providing individualized learning opportunities for parents that promote the parent-infant relationship.

**Family Centered Care and the Feeding Relationship**

Despite the evolution in NICUs away from volume-driven toward infant-guided feeding, feeding preterm infants may still be viewed by some professionals as a routine task rather than a critical element of care. Feeding may be perceived as the least complex of many highly skilled interventions in the NICU. It may be delegated to the least experienced professional caregiver, such as a new nurse or patient care assistant, or in many settings to a volunteer. The importance of the feeding relationship and the infant’s positive learning experiences may be inadvertently overlooked.

The role of professional caregivers in the NICU, especially neonatal nurses, is critical in fostering the parent-infant relationship through supporting and guiding positive feeding experiences for the infant. Research has shown that both short-term and long-term feeding problems in former preterm infants adversely affect how they are parented. Facilitating the formation of attachments between parents and their infant is a primary goal of neonatal nursing.5

Family-centered care has been an integral part of the NICU for almost two decades. The goal is to enhance the attachment between the infant and family, which improves the long-term physical, emotional, psychological, and feeding outcomes of the preterm infant. Family-centered care also seeks to empower parents to be involved in all aspects of care. Professional caregivers provide relationship-based support to ensure parents develop competence and security in their role as primary nurturers, as partners with staff in the infant’s care. This supports parent-infant interaction and attachment.

Interaction between infant and parent is the mechanism through which the infant’s development ultimately occurs. Feeding is not solely a task of nutritional intake, but also has many social correlates in infancy and throughout the life span. Interaction during infant feeding aids the development of social interaction, communication, and being responsive to others among both parents and the infant. Parents of healthy term infants regulate the environment and any stressful events for the infant through bonding and attachment. This “dance of attachment” between parents and the infant creates a blueprint for the infant’s future well-being, including brain development, nervous system regulation, ability to manage stress, and sense of security. In the NICU, however, parents may experience the loss of their own homeostasis due to the stress of having a preterm infant. Parental anxiety, depression, and the sense of a loss of autonomy are common. The dissonance between the parents’ expectations and the reality of parenting an infant born early is often particularly stressful. Parents may perceive themselves as outsiders in the NICU, and there may be difficulties for parents in developing relationships with their infant and staff. Therefore, empowering parents in the NICU is very important.

Although the ability to empower parents is considered crucial in the NICU, there are few empirically based guidelines about how this might be done. Theorists have proposed that when the parent is supported in understanding the infant’s behaviors and responding promptly and appropriately, trust is established and the parent-infant relationship thrives. Infant feeding, associated with nurturing, development, and growth, offers one of the earliest opportunities to support this connection between parent and infant.

The NICU experience can either jeopardize or enhance the parents’ ability to understand, support, and parent their preterm infant. With respect to feeding, the parent-infant interaction can be adversely affected by a lack of consistency in information provided to parents or a lack of continuity in the approach to feeding advocated by professional caregivers. This can be further compounded by the premature infant’s difficulty in handling environmental stressors and behaviors commonly observed among preterm infants, including motor stress signs, gaze aversion, and shutdown. This can then interfere with the development of parental competence and confidence. The preterm infant’s health care team must communicate well about feeding so that information from various disciplines will not differ substantially, which has the potential to confuse or worry parents. When asked what would help them with parenting in the NICU, mothers’ overwhelming response was receiving information and learning how to take care of their infant.

Professional caregivers in the NICU who feed infants, including nurses, developmental specialists, and neonatal therapists, can promote development and parent-infant attachment by modeling and supporting consistent quality feeding experiences.

The relationship established between a caring, sensitive professional caregiver and an infant’s family can have a compelling influence on family coping and effective parenting. Communication about and respect for the parents’ role in fostering the feeding ability of their infant will empower families to nurture and continue to support development beyond the NICU. Parents’ confidence in caring for their infant has been shown to improve parental attachment. Parenting behaviors, especially parent-infant synchrony achieved through co-regulation, have been shown to improve neurodevelopmental outcomes for former preterm children (born at less than 30 weeks).

**Learning to Feed in the NICU**

Challenges with learning to feed successfully and safely are known to result in a delay in discharge to home. Parents often evaluate their own competency as parents before discharge by their ability to feed their infant. Parents learn by observing, and they develop their internal working model about feeding by watching professional caregivers in the NICU. Therefore, parents’ experiences in the NICU may either constrain or support the emergence of their ability to safely and confidently feed their preterm infant.

The importance of the feeding relationship and the infant’s positive experience may get lost in the “numbers” (intake) when the focus is on emptying the bottle. Ideally, parents should be supported while in the NICU to modify their own expectations of successful feeding away from a sole focus on the amount the infant feeds, to the quality of the feeding as well. Depending on the culture of feeding in each NICU, this may or may not happen, or may happen inconsistently. Providing parents with the skills to know their infant and co-regulate with their infant during feeding, as contrasted with showing them how to empty the bottle, is more likely to support improved neurodevelopmental and feeding outcomes. For this reason, supporting parents in learning to feed their vulnerable infant is a key role for all professional caregivers in the NICU.

Critical to supporting parents is the concept of relationship-based care. Research has shown that the ability to feed well is closely related to the caregiver’s ability to understand and sensitively respond to the infant’s physiology and behavioral communication. Depending on the perspective of the professional caregiver, however, feeding may be viewed as either supporting the infant in a positive learning opportunity or as emptying the bottle. Infant cues of stress may not be recognized by professional caregivers who remain focused on “getting it in” the infant. They may feed past the infant’s “stop signs” in an effort to ensure that volume is ingested using well-intentioned strategies that actually result in stress for the infant and, often, incoordination. These volume-driven strategies may include the following: increasing the flow rate to empty the bottle, which can cause the infant to “fight the flow” to breathe; prodding the infant, which takes away the infant’s active sensory-motor control over feeding and delivers unanticipated flow into the infant’s oral cavity and/or pharynx; putting the infant’s head back to use gravity to help
empty the bottle, which increases risk for bolus misdirection and airway compromise; and unswalloding the infant to “keep him awake,” which actually takes away critical postural support for the swallowing mechanism. The infant may be expected to continue feeding despite subtle signs of physiologic instability and behaviors that suggest swallowing and breathing are starting to uncouple, for example, drooling, gulping, nasal flaring and blanching, the lack of a regular series of deep breaths, chin tugging, and changes in eye gaze pattern. Signs of disengagement may not be given meaning. These signs may include pushing the nipple out, pulling off the nipple, no active rooting or sucking, arching, shutting down/inability to realert, or purposeful use of a weak suck on the infant’s part to signal a preference for return to only pacifier sucking.

If the role model provided for parents is volume driven, parents may see their role as emptying the bottle or “getting it in” the infant. They may not correlate feeding behaviors with co-occurring physiologic instability, may not identify adverse events as problematic, and may not recognize and respond to infant “stop signs” during feeding. They may learn to view feeding a something they do “to their infant” not “with their infant.”

If professional caregivers conceptualize and describe learning to feed as a “light bulb phenomenon” (the infant will all of a sudden “figure it out” and therefore “knows how to feed”), parents will not appreciate that variability in performance is to be expected when one is learning any new skill. Variability in early feeding skills may then be viewed as a failure or an indication that the infant is a “poor feeder,” rather than a sign that feeding skills are in the process of emerging. This can lead to parental anxiety, depression, and a sense of failure on the parents’ part.

Dynamic Systems Theory and Co-regulated Feeding

Feeding safely and achieving adequate intake for growth require the dynamic integration, maturation, and coordination of multiple subsystems. In a dynamic systems model, physiologic stability is considered as the foundation for organizing movement, behavioral state, attention/interaction, and self-regulation. These systems support safe and efficient feeding via the infant’s posture, oral structures, upper airway, arousal, and physiologic regulation, and suck-swallow-breath patterns. For the preterm infant, these subsystems are in the process of maturing along convergent, but not always synchronous, time lines. As a result, careful moment-to-moment responsiveness to the infant’s competencies, vulnerabilities, and thresholds is critical.

The assumption is that preterm infants actively communicate through their behavior. The infant’s responses and behaviors guide the caregiver in understanding their thresholds of stress vs stability. Interventions contingent on the preterm infant’s communicative behaviors are then used within a problem-solving framework to enhance self-regulation, development, and coping skills. This co-regulation between caregiver and infant forms the foundation for a positive infant-guided feeding experience. This approach to feeding as described by Shaker30 includes (1) observing the infant from moment to moment during feeding for cues of stress vs stability specific to swallowing, breathing, physiologic stability, postural control, and state regulation and (2) modifying the feeding approach through individualized interventions contingent on the infant’s cues to help the infant maintain or regain stability.

All caregivers involved in feeding must be knowledgeable about the communication cues of preterm infants during feeding to provide true “cue-based” feeding. When interventions are neither cue based nor individualized to the infant’s continuous feedback, the approach to feeding will be task oriented vs relationship based. Because the preterm infant’s behavior is the main channel of communication, it is critical that caregivers appreciate its central importance. This requires both sensitivity and watchful vigilance during feeding to recognize and appreciate the infant’s clear, though sometimes subtle, communication. Through appreciating the meaningfulness of preterm infant behavior, a traditional task-oriented model of feeding can be transformed into one in which the infant guides caregivers, with the infant as an active participant in the feeding experience. This is the difference between the infant “being fed” and the infant being “supported to feed” through co-regulation.

Fostering Co-regulated Feeding

When professional caregivers in the NICU move away from a volume-driven culture, they become partners with the infant and then model this co-regulated feeding approach for parents throughout all feeding interactions. When the parents observe professional caregivers in the NICU who provide an interactive fit with their infant during feeding, known as co-regulation,31 parents will more likely embrace their infant as an active participant in the feeding experience. Parents observe and learn that they can communicate back and forth with their infant during feeding and that this conversation allows their infant to guide them. This co-regulated approach to feeding recognizes the impact of the caregiver on the infant’s experience of feeding34 and views the infant as a co-regulatory partner with his own agenda and emerging feeding skills. This co-regulation between parent and preterm becomes the foundation for strong parent-infant attachment and is formed most often during feeding experiences in the NICU.35 When the unique behavior of an infant is understood as a communicative attempt and parents know how to respond to it effectively, feeding is both more successful and less stressful; and the attachment relationship tends to strengthen, whereas parental anxiety tends to diminish.

This change in the culture of feeding then impacts multiple aspects of care. Swallowing safety and infant experiences drive conversations at the bedside and during medical rounds. When parents call to ask about how the feeding went, the conversation includes how the infant fed and the infant’s emerging skills, as well as how much the infant fed. Feedings are purposefully designed by all caregivers to be nurturing and relationship based. Feeding is stopped when the infant communicates being done, or the inability to continue, for whatever reason, in lieu of the caregiver’s doing whatever is necessary to empty the bottle. Co-regulation during feeding is the focus, such that the infant’s communication from moment to moment guides the caregiver. Intake is then viewed within the context of the infant’s developmental strivings and as the byproduct of a quality feeding interaction, not as the only goal of the feeding.

During co-regulated feeding,34 the caregiver provides opportunities for breathing and for rest periods, decreases the flow of milk by adjusting the sucking burst length, responds to loss of flow at the lips with rest periods that allow for reorganization of infant swallowing function, and decreases feeding demands at the early signs of disengagement. There is contingent support for the infant’s self-regulation efforts through steering away from encouraging sucking, thus helping the infant to pace his or her energy expenditure, engage in sufficient breathing, and protect his or her airway. This co-regulated approach can be used to facilitate parental competence and confidence in feeding their infant.

Facilitating Competence and Confidence of Parents With Feeding

Professional caregivers in the NICU can successfully use a process known as anticipatory guidance38 to teach parents to identify the infant’s behaviors or cues and use those cues as a guide during feeding. The professional NICU caregiver begins this teaching process early on when feeding by bottle is first initiated. This involves feeding the infant while observing infant behavior along with the parents. The caregiver helps parents interpret infant cues, problem-solve potential
reasons for the behavior, and then explore interventions that might help the infant self-regulate throughout the feeding. Using anticipatory guidance, the nurse who is feeding the infant models problem-solving, for example, “Let’s watch to see what Selena tells us during feeding. Notice how her mouth did not open when I gently stroked her lips with the nipple. Selena might be telling us she needs more time for breathing, or maybe she has a burp or she needs help to re-adjust. Let’s first see what happens if we give just her time to breathe. Then if she doesn’t root, we’ll see if she has a burp. Maybe that is why she is choosing not to open her mouth.”

In this guided problem-solving context, parents can learn about interventions that support safety and success, and how to titrate these interventions based on the infant’s responses. An example of an infant-guided intervention would be offering a slow-flow nipple so the infant can modulate flow when the infant finds it necessary; a medium-flow nipple is more likely to override the infant’s attempts to modify flow rate and bolus size. Other interventions include considering a side-lying position; providing supportive swaddling to optimize postural stability and control; providing co-regulated pacing during feeding based on the infant’s behaviors from moment to moment, to avoid uncoupling of swallowing and breathing; providing state regulation through gentle thoughtful re-rousing or calming; avoiding prodding; and using a developmentally supportive approach to feeding with preterms and their families.

In the next phase of teaching parents, the parent feeds with guidance. The professional caregiver is there to help provide guided participation or coaching, to reinforce offering of contingent interventions, and then to help parents assess the infant’s response to the intervention. This progression from observing and learning along with the professional caregiver to then feeding their infant with guidance builds competence. Coaching from the professional caregiver might sound something like this: “I notice that you gave Ryan a brief break from sucking. That’s just what he needed. How did Ryan let you know a break was needed?” Parents have remarked that when they learn how to understand what their infant is saying during feeding, they no longer feel as if they are feeding their infant “blindfolded” or waiting for their infant to “choke or turn blue.”

Learning to listen to their infant during feeding from moment to moment and having confidence to know when the infant needs support and what to do to help build a trusting relationship between parent and infant and build confidence. Feeding becomes a pleasurable experience for both infant and parent. It often helps parents of the problem-solving to help them take the perspective of the infant at the conclusion of a feeding. An example might be: “If your baby could talk, what would your baby say about this feeding?” One might then explore the positive impacts of the parents’ good problem-solving that occurred. When parents are learning to feed, experienced professionals model this problem-solving approach. Parental skill then develops with guided experiences. This dialogue or “conversa- tion” during feeding becomes the basis for co-regulation between parent and infant.

Each infant’s health care team can provide a common and consistent feeding approach for professional caregivers and parents alike by creating bedside feeding care plans. These plans then act as a guide to the infant’s typical communicative cues during feeding and what is currently working best to support the infant’s emerging competence and safety. Having a feeding care plan that all caregivers refer to most importantly reduces variation. Feeding the preterm infant differently from feeding to feeding, whether it is a change in the nipple or the feeding position or the co-regulatory effort provided, interferes with learning to feed. Alternatively, consistency allows for building of skill and predictability and avoids the need for the infant to “start over” in the learning process with each feeding attempt. Mothers of term infants intuitively typically select a position and nipple that appear to be a “fit” for their infant. For the preterm infant, whose immaturity and comorbidities bring added challenges in learning to feed, consistency of feeding approach is critical.

Conclusion

Successful parenting is based on relationships, which can be compromised after preterm birth. Reciprocity between infants and parents has long been recognized as a critical underpinning for growth, development, and parenting skills. The experience of feeding, both for the preterm infant and for parents, is strongly influenced by the assessments, decisions, and actions of NICU professional caregivers. In many NICUs, the feeding relationship is often overshadowed by pressure for professional caregivers to “get it in” the infant. This pressure is passed along to parents, for whom feeding becomes something they do “to” their infant, not a nurturing experience “with” their infant as an active participant and guide. A successful feeding is often represented by an empty bottle, no matter what that required by the caregiver, regardless of the infant’s perspective. This paradigm is changing, and must, if we are to improve long-term feeding outcomes and support the preterm infant’s and family’s long-term well-being.

Through embracing, modeling, and coaching co-regulated feeding interactions, NICU professional caregivers can build confidence and competence for parents and establish feeding as a pleasurable relationship-based experience for the preterm infant and the parents. Helping families cue-based feeding in the NICU requires the entire NICU team to move away from a volume-driven to a co-regulated approach. This culture change is under way in NICUs and will require continued introspection, thoughtful reflection, and the interdisciplinary collaboration of neonatologists, nurse practitioners, neonatal nurses, and therapists as they support families and infant.

References

17. Barrack C. A journey of love: the in-utes of neonatologists, nurse practitioners, neonatal nurses, and therapists as they support families and infant.