



Evidence Based Feeding Practices in the NICU

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INTRODUCTION

Feeding in the NICU is a crucial piece in the development and growth of each infant in the NICU. In order for an infant to be sent home from the NICU he or she must be at the appropriate birth weight and maintaining their nutrition in some way. Because infants in the NICU often are born prematurely, their ability to orally feed may be impacted. One primary feeding issue in the NICU is choking. If an episode of coughing or choking occurs during or immediately after a swallow, it may indicate aspiration (Ashland, 2008). Premature infants can be vulnerable to silent aspiration and micro aspiration (Ashland, 2008). Indicators of swallowing coordination difficulties may include oxygen desaturation, color changes, and a gurgly or wet voice quality (Ashland, 2008). If a concern for aspiration arises, an otolaryngologist is consulted to rule out any contributing upper airway abnormalities in either structure or function. If aspiration is happening, then nonoral feeding should be considered (Ashland, 2008). Other issues that may affect premature infants are sucking and feeding difficulties. These may include disorganized sucking, prolonged feeding times, low volume intake, and unstable vital signs during feeding (Ashland, 2008). If these signs are noticed, it is up to the multidisciplinary team to determine the cause. It also is important to determine if recommendations for other consultations are needed. This paper will critically evaluate and discuss evidence-based feeding practices in the NICU. It is important to consider feeding practices in the NICU so that parents, health care providers, and caregivers can ensure that the infant is safely orally feeding. Safe oral feeding is crucial for the infant to be discharged and for the infant's overall development, growth, and health.

OVERVIEW OF NICU

The NICU is a special area of a hospital where babies born needing intensive medical care post birth are placed. It is filled with advanced technology and highly skilled nurses who care for these small and fragile patients (Stanford Children's Health, 2019). The majority of the NICU population is comprised of premature babies born before 37 weeks gestation and weighing below 5.5 pounds (Stanford Children's Health, 2019). The NICU is staffed with healthcare providers specifically trained to care for each baby. A neonatologist is a pediatrician with additional training in the care of sick and premature babies (Stanford Children's Health, 2019). Other medical professionals caring for babies in the NICU may include a respiratory therapist, physical therapist, occupational therapist, dietitian, lactation consultant, social worker, and speech-language pathologist (SLP) (Stanford Children's Health, 2019). The primary role of the speech-language pathologist (SLP) is to help the babies learn to feed orally (Stanford Children's Health, 2019). Oral feeding is one of the key components in the decision to send an infant home from the NICU (Whetten, 2016). In the NICU a multidisciplinary approach is used to assess and treat premature babies. The guidelines used to determine the start of an oral feeding vary across medical settings. Typically, gestational age and infant weight paired with developmental readiness are the indicators of when to begin oral feeding (Ashland, 2008). Additionally, infant feeding behaviors have been used to indicate readiness to start an oral feed. The suck-swallow-breathe (SSB) sequence also is essential for safe feeding because it shows that the infant is able to orally feed appropriately. (Ashland, 2008).

OVERVIEW OF SLP'S ROLE IN THE NICU

In the NICU the role of the SLP is determined by the needs of the infants. The SLP uses a team-based approach to interact with people from multiple disciplines in order to develop the best plan of care and to make ethical decisions for each infant (Knowledge, 2004). SLPs in the NICU also have specialized knowledge regarding its staffing patterns, ecology, and advice for parenting (Knowledge, 2004). The primary roles of the neonatal SLP are to evaluate and treat infants with feeding and swallowing difficulties and to be an advocate for preterm neonatal communication (Shaker, 2017). In order to carry out communication and feeding/swallowing evaluations and to determine safe feeding for each baby (Knowledge, 2004). Additionally, it is the role of the SLP to provide parent/caregiver education and counseling and staff education, including the importance of collaboration among parents and trained healthcare professionals (Knowledge, 2004).

FEEDING PRACTICES IN THE NICU

Researchers found that, in the past two decades, studies that looked at the development of infant oral feeding skills have focused primarily on the major concerns of oral feeding issues in the NICU, mainly the infant's ability to suck, swallow, and breathe. It is crucial for infants to coordinate their suck, swallow and breathe patterns in order to orally feed successfully. Infants need to be able to successfully coordinate their suck swallow breath pattern to orally feed successfully. Healthcare providers in the NICU determine this by looking at the infant's alertness, oral, and physical behaviors. These include open eyes, tonguing, rooting, focused attention, etc. to name a few. Below is a chart describing each feeding practice that is commonly used in the NICU to feed a premature infant safely and successfully.

Feeding Practice	Description
Cue-based	Cue-based feeding encourages the infant to feed orally when able to do so. The feeding is stopped when an infant is unable to coordinate the suck, swallow, and breathe cycle needed for safe and effective swallowing (Whetten, 2016). Kirk, Alder, and King (2007) designed a clinical pathway for initiation of oral feeding that was contingent on readiness behaviors of the premature infant. The clinical pathway allowed bedside nurses to advance oral feeding through specific milestones using infant behavioral feeding readiness signs including the infant's alter state and physical status and hunger cues, such as puckering his or her lips when swiped by a finger rather than daily physician orders (Kirk et al., 2007). This study showed that researchers could apply infant behavioral readiness signs and hunger cues to a more general population of premature infants compared to infants in the NICU with more difficult abilities (Kirk et al., 2007).
Volume-based	The purpose of this model is to feed a required amount of milk or other nutrients to the infant at scheduled times, even if the infant is not willing to participate (Whetten, 2016). The goal is for infants to reach full oral feeds as quickly as possible so they can be discharged. Oral feeding is currently recognized as a more complex task than what was originally thought. The volume-driven model involves orally feeding an infant, even when the infant is unstable or developmentally immature (Whetten, 2016).
Cup Feeding	The researchers conducted an integrative literature review that looked at systematic reviews and meta-analyses of the safety and efficacy of cup-feeding. Results of a study by Yilmaz (2014) showed an increase in breastfeeding rates for cup fed infants. Based on the results of these two studies, one can summarize that the use of cup feeding for preterm infants is an important alternative feeding technique for preterm infants who are not able to fully breastfeed (Penny, et al., 2018).
Slow Flow Nipples	A common intervention used to facilitate the preterm infant's attainment of oral nutrition without cardiopulmonary compromise is slow-flow (SF) bottle nipples. The results indicated that the prefeeding minutes of ventilation decreased significantly during suck bursts and returned to baseline values during suck burst breaks across both slow-flow and standard-flow nipples (McGrattan, et al., 2017). No differences were noted in minutes of ventilation or overall milk transfer between slow-flow and standard-flow nipples (McGrattan, et al., 2017). Both of these findings were consistent with past studies that have looked at the effect of clinically available bottle nipples on preterm feeding performance (McGrattan, et al., 2017).
Pacifier Activated Lullaby (PAL)	Disenza (2013) discussed a study by Stanley who looked at a Pacifier Activated Lullaby (PAL) to be used as a potential therapy technique to improve feeding. He explained the science behind his research, indicating that premature infants are capable of simple cause and effect learning, and listen attentively to music. The PAL research indicated that music reinforces and increases the frequency of nonnutritive sucking (Disenza, 2013). Additionally, premature infants can discriminate the relationship between sucking and music within 2.5 minutes of starting (Disenza, 2013). During that time, they will learn to suck frequently enough to prevent the music from cutting off and at a paced rate that promotes endurance for oral feeding (Disenza, 2013). Infants using PAL were discharged 5 days sooner than infants not having PAL therapy during their stay in the NICU (Disenza, 2013).

DISCUSSION

Upon critically evaluating various evidenced-based feeding practices, it is evident that some seem to have a more positive effect on successful oral feeding achievement compared to others. Cue-based feeding showed positive effects on the infant's ability to safely orally feed in the NICU. When feeding an infant, it is important for the health care provider or parent to be aware of the infant's cues, such as respiration, body tone, and alertness when feeding. If any of these seem to be disrupted, then a safe oral feeding will not be achieved. Typically in the NICU, research found that volume-driven feeding was being used. Volume-driven feeding does not consider the infants' readiness to feed cues (Shaker, 2010). The downside to volume-driven feeding is that infants are being fed in distress and naturally burning more calories than they are intaking, causing difficulty in gaining weight (Shaker, 2010). Volume-driven is one of the most common feeding practices used in the NICU for the past few years (Shaker, 2010). During volume driven feeding, the focus is to ensure that the infant gets the specified amount of food without taking into consideration readiness to feed behaviors, including breathing rate, alertness, and ability to suck properly (Shaker, 2010). If infants are fussy, exhibits increased heart rate, and decreased alertness, they may be working harder to feed orally; Therefore, the infant may be burning more calories than what is consumed (Shaker, 2010). It is for this reason that a new feeding practice was introduced. Cue-based feeding allows the infant to feed when calm, therefore burning less calories and maintaining the nutrients they were being fed (Kirk et al., 2007). This allows for more increased weight gain which ultimately leads to a safe oral feed and earlier discharge from the NICU (Kirk et al., 2007). Cue-based feeding is quality driven and focuses on the infant's behaviors indicative of readiness to feed orally (i.e., alertness, breathing) (Whetten, 2016). It is important to consider these alert behaviors in infants in order to determine their readiness and safety to feed. An infant in the readiness and alert feeding stage will eat successfully and will absorb more nutrients and calories compared to an infant trying to feed in a decreased alertness or readiness stage (Kirk et al., 2007). Cup feeding is another feeding practice used in the NICU. It shows limited promising outcomes on decreasing the infant's length of stay in the NICU. Cup feeding did show promising outcomes regarding decreasing the infant's heart rate during feeding and breathing typically remained stable during cup feeding. As stated, maintaining a stable heart rate and breathing pattern is crucial in a successful feed for the infant, but it does not promote shorter length of NICU stays compared to cue-based feeding did. Slow flow nipples on respiration is still an area with need for future research at this time as it did not show promising evidence as compared to cup feeding. As for feeding infants with NAS the outcomes were promising. When feeding infants with NAS it is important to remember to nurture the relationship between infants and their caregiver. Nurses can encourage and support caregivers to be present as much as possible so that they can learn their infants' cues (Maguire et al., 2018). It is also important to be sure the medication the infant is receiving is consistent and that there are supported in a calm environment to foster safe oral feeding (Maguire et al., 2018). Another feeding practice reviewed was the use of slow flow nipples and their effectiveness. It was found that future research with a larger sample size is necessary to explore further the role of internal flow regulation, neurodevelopmental maturation, and feeding practices to establish safe and independent oral feeding routines for the premature infant (McGrattan, et al., 2017). Furthermore, the use of music therapy in children is 98% effective on the first try and reduces the child's trauma and fear of the medical treatment (Disenza, 2013). Further information is needed in order to determine if this is a therapeutic technique that will increase successful oral feedings among infants in the NICU. On the other hand, the use of kangaroo care did have promising effects. Those who practiced KC, regardless of their group assignment, were more likely to provide their milk to their infants than mothers who did not perform KC (Tully et al., 2016). With this being said it is also important to consider the parental experiences within the NICU. Supporting the parents and caregivers can provide them with the necessary skills they need to nurture their child in a positive way to foster safe oral feeding. Upon completion of the study three common themes were obtained. The three primary themes, as indicated by Stevens et al. (2014) included an "emotional experience," "learn as you go", and "it is technical". Findings indicated that overall this was an emotional experience for all parents, but the nurses played a crucial role in counseling and supporting them (Stevens et al., 2014).



CONCLUSION

Based on the feeding methods discussed, cue-based feeding seemed to be the best feeding practice used in the NICU. It promotes both shorter length of hospital stay for the preterm infants and increases in healthy weight in order to be discharged from the NICU (Whetten, 2016). It also promotes effective feedings for the infant and the bond that occurs between the infant and the mother during a feeding (Whetten, 2016). Additionally, the use of cue-based feeding promotes the development of infant oral feeding skills, and it allows the parent or caregiver feeding the infant to be in tune with the child's readiness and alertness to feed (Lau, 2016).

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