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# Using Developmental Care to Improve Long-Term Development in Premature Infants in the Neonatal Intensive Care Unit

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USING DEVELOPMENTAL CARE TO IMPROVE LONG-TERM DEVELOPMENT IN  
PREMATURE INFANTS IN THE NEONATAL INTENSIVE CARE UNIT

by

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## Introduction

Current long term development in individuals that were once patients in neonatal intensive care units (NICU) is not ideal. Vandenberg stated that individuals that were preterm with low birth weight may have a series of long-term disabilities that arise as they continue to develop (2007). These problems include: learning disabilities, below average IQ scores, attention deficit hyperactivity disorder (ADHD), neuropsychological deficits, visual motor integration, executive function, temperament difficulties, language delays, and emotional regulation difficulties. Research also indicates that “more than one half of low birth weight preterm children will have need of special education services with more than twenty percent necessitating self-contained disabilities management” (Vandenberg, 2007, p.434).

The synactive theory of development aids in understanding reasons for the long term developmental disabilities infants in the NICU face. The theory offers a neurobehavioral approach to understand the premature infant’s development and interaction with their environment. It provides an outline to conceptualize the organization of the neurobehavioral abilities in the early development of the fetus, newborn and young infant. The infant's ability to regulate and control behavior emerges through continued interaction with the environment and is expressed through five systems: autonomic/physiology, motor, state, interaction and self-regulation (Vandenberg, 2007). The five systems are interdependent and interrelated, with each system laying the framework for another system; therefore the loss of integrity in one system impacts the other systems and the infant’s ability to manage the environment surrounding them (Vandenberg, 2007). Heidelise described the systems as follows: The autonomic/physiology subsystem is the first to develop. It allows the infant to maintain functions such as adequate respirations, heart rate, and skin color (1982). This lays the framework for the following subsystems. The motor system is the second to develop and allows the infant to move

and position itself with smooth and controlled movements. The motor system requires a stable autonomic system in order to develop. The state system is stated to be the third system to develop and allows the infant to control and maintain sleep/wake cycles and move between the two states of being. In the fourth developing system, interaction, the child is able to look at and listen to things in their environment. When the infant is able to maintain the previous stated four systems in a balanced manner, it has reached self-regulation (Heidelise, 1982). “In the healthy full term newborn the five subsystems are mature, integrated, synchronized and managed smoothly”(Vandenberg, 2007, p. 436). However, these systems are often disrupted and not fully matured in the preterm infant, so the infant has stress responses and does not maintain a state of equilibrium with even minimal input from the environment (Vandenberg, 2007).

Developmental care is a method of controlling physical and relational characteristics of the environment to optimize infant success. Developmental care was developed with the framework of the synactive theory and is one way we can combat the challenge of long term developmental outcome. It is the viewpoint that entails reconsidering the associations between infants, families, and healthcare staff (Byers, 2003). Developmental care comprises actions intended to modify the environment, for the better, and individualize the attention of the infants based on interactive observations. The goal is to encourage a stable, well-organized infant who can conserve energy for growth and development (Byers, 2003). As communication specialists, developmental care becomes important to the role of the speech-language pathologist (SLP) providing services in the Neonatal Intensive Care Unit (NICU). This role is emerging and changing rapidly. Developmental care is one area where our field will continue to grow. Developmental care is now considered the “benchmark” method of care for premature, ill, and low birth weight infants (Vandenberg, 2007). The neonatal intensive care unit (NICU) is ever

changing with the newest advancements in medical technology, but the incidence of disabilities and neurodevelopmental problems among infants is still elevated (Vandenberg, 2007).

### **Conditions in the Neonatal Intensive Care Unit**

Vandenberg stated the high incidence in long term disabilities in premature infants post NICU stay (2007). One study found that family involvement and bonding between the mother and child was minimal. The lack of bonding between child/parent lead to the parent feeling unsafe and ill-equipped to handle their baby. Parents were known to comment that they truly don't feel as though the baby is "theirs" (Aucott, Donohue, Atkins & Allen, 2002). Studies such as these prompted the birth of developmental care. Now, family centered approaches in the NICU environment is becoming increasingly used and emphasized.

### **Physical Design of Environment**

The very basis and structure of NICU units are not set up for comfort and ease of access. Architecture of the units is designed for medical necessity without taking into consideration the physiological needs of the infant and mother. For a mother that is staying in the hospital as well as having a child in the NICU, access to her child does not come easily (Thompson, Beaman & Sears & Heflin, 2010). The two units that house the individuals are not designed for easy transfer from one to the other. Though labor units have come a long way to make the mother, and family unit, feel as though she is at home during her stay, the very appearance of an open bay NICU could be described as harsh and unwelcoming, further making the mother and family at unease when entering (Thompson et al., 2010).

To enhance the physical design of the NICU, architecture can be used to create a 'home-like' environment and ease of access for mothers to their infant. The very design of the NICU unit can change the initial outlook that a person feels upon entering. Just as delivery units

provide a family-centered, home-like, experience in order to lure expecting mothers to their facilities, the idea of the hybrid postpartum room would maintain this type of environment even for mothers requiring longer lengths of stay (Thompson et al., 2010). This room would include the characteristic amenities needed for postpartum care, such as a private patient room, a patient bathroom, a personal storage area, space for visitors, a pull-out bed so a family member can remain in the hospital, and a lactation area within the room. The distinctive feature of this room is that it would open to the private NICU room of the mother's baby. There would be a window, allowing the mother to see the infant from her bed and a scrub room between the two rooms so parents can sterilize before entering the NICU room. This arrangement would also include a pass-through window between the rooms to allow the mother to easily transfer breast milk into the NICU room (Thompson et al., 2010).

Merely re-designing the NICU to move from a strictly open bay environment to a unit that offers open bay as well as single family rooms is a movement towards developmental care. This design not only benefits the parents, helping them to feel at ease, it allows the therapists and nurses to work with the infant in a more private environment with fewer distractions. The design was perceived by staff as a higher quality work environment for the infants and their families compared to the open-bay unit. Staff reported that ambient conditions (noise and lighting) are better as well as parental privacy and encouragement of parents to become involved in the care of their infants (Bosch, Bledsoe, & Jenzarli, 2012). Ideally, having single family rooms allows the staff to enter the room and directly control any distraction they encounter that will hinder the treatment of the infant (light, noise, temperature) without affecting the other infants in the unit. Meanwhile, having the parents in this environment is less intimidating, allowing you to work with them one-on-one to teach and encourage participation in the care of their infant. Having the

parent in an open bay facility, meanwhile trying to teach them about their infant can be challenging. You have the distraction of all the other nearby infants as well as numerous staff and other family members around. Making the interaction more personal and private can have a positive impact on their willingness and confidence to engage in the care and treatment of their child, reinforcing the mother-infant bond.

Changing the simple physical relationship of the parent's room to the baby's nursery to a more private and natural context incorporating single family rooms, from an open bay setting, would help to feel more similar to the home environment while giving the mother a sense of closeness and ease of access to her child. When provided with more private accommodations, in a more relaxed environment, caregivers and infants are able to develop a sense of equalization and balance with one another, enabling the mother to hold her infant more easily. This allows the caregiver to care for his/her infant and soothe it, when the infant is not yet able to self-regulate. Carrying over the same home-like, family-centered, approach to care from the labor and delivery unit to the NICU can help caregivers to feel further at ease participating in the care for their child (Thompson et al., 2010).

### **Positioning and Handling**

Allowing the parent(s) to assist in appropriate positioning and handling works to support caregiving, which is important for developing synchrony between the caregiver and child. Touch is an important and early sense to develop, this sense remains important throughout one's life. Premature infants may require special care and consideration when being handled. If not handled properly, with adequate considerations and accommodations, handling can become an adverse feeling for them, decreasing its comforting abilities and increasing to a level of discomfort and fear. The earlier in development a child is born, more modifications to handling

will be necessary. The supine position is the predominant position of infants in the NICU units. However, Aucott stated preterm infants positioned largely in supine demonstrated 1) a preference for turning to the right and keeping their head on the right, 2) an asymmetric posture, 3) asymmetrical occipital skull flattening, 4) an asymmetrical trunk, 5) early right hand preference, and 6) asymmetrical gait with a gait disturbance (2002).

Aucott stated that positioning and handling of infants has been discouraged for parents, and the obligation of staff, nurses, due to their instability (2002). For many years, NICU units have implemented a minimal handling approach to the patients (Aucott et al., 2002). These leaves parent's feeling inadequate to care for their own child, and deprives the child of the important sense of touch. To minimize the effects of the commonly practiced supine position, infants should be placed in the prone position, when being held. The prone position improves head control and gives infants the opportunity to strengthen muscles, develop balancing skills when lifting their heads, enable upper body control, trunk and shoulder steadiness, and fine motor skills (Aucott et al., 2002). Swaddling is a common practice when holding an infant. Blackburn suggests that preterm infants in isolette, that are unable to be held, be allowed to experience the benefit that swaddling provides, through positioning aids such as blankets and support wedges. It is important to remember the infant should be moved as a whole, keeping in midline, to reduce stress levels and make handling a pleasant experience.

### **Lighting**

Vision is the last of the senses to develop, and is not yet matured at full term birth of forty weeks. Therefore, vision is even more sensitive and immature in the preterm infant. "The amount of light received by any infant varies from 15 to 2500 lux (foot candles) or from 1.5 to 250 lux, depending on his or her location in the nursery, the time of day, and the amount of

sunlight present” (Ludington-Hoe & Abouelfetoh, 2013, p. 1). However, the amount of lighting found to be suitable for nurses to evaluate infants, while remaining safe for the infant, is still a controversial topic. Research states that 9-10 luxes are needed to permit assessment of infant skin pigmentation and perfusion; however, most recent Illuminating Engineering Society recommendations propose ambient light levels of 1-2 luxes (10–20•ftc) (Ludington-Hoe & Abouelfetoh, 2013). The amount of light an infant is exposed to at any given time is much greater than the amount that is recommended to infant exposure. This could create a decreased amount of input of visual stimuli from the environment; due to the longer length of periods their eyes are closed to attempt to prevent the intense light exposure.

Harsh lighting effects more than just vision. A previous study found that overhead fluorescent lamps cause immediate change in oxygen saturation (SpO<sub>2</sub>). The levels decreased from 97% at baseline to 95.9% upon presentation of increased level of light (Shogan & Schumann, 1993). A newer study conducted supported this and also found that the rapid increase in illumination not only decreased SpO<sub>2</sub> but it also suppresses respiratory rate in pre-term infants (Ozawa, Sasaki, & Kanda, 2010). This proves to be a challenge under procedure lighting and other fluorescent lighting often found in hospitals. These studies suggest that beyond the effects of the harsh lighting in itself, rapid change from dark or dim environment to an illuminated one is overwhelming on a pre-term infant that is unable to self-regulate. The study also found that only the infants that were in the group where illumination was slow to increase did not experience the change in SpO<sub>2</sub> and respiratory rate when change from dark to light environment was present. “Oxygen saturation remained stable with light reduction from 100□ftc to 5□ftc, and 22% of infants experienced a significant oxygen saturation decrease when light was increased from 5□ftc to 100□ftc” (Ludington-Hoe and Abouelfetoh, 2013, p. 2). The authors

suggest that transition from dark or dim to illumination be a gradual shift, allowing the pre-term infant time to adapt and regulate, without causing decreased respiratory rate and oxygen saturation (Ozawa et al., 2010).

Lighting in the units can be made more natural through various strategies. Staff should evaluate levels of exposure to each infant, from their equipment and the equipment of nearby infants. All lighting should be diffused and adjustable to meet individual needs. Omit any practice that requires direct exposure to lights on the face or eyes, without use of eye shields. All incubators, warmers, and cribs should be dressed with covers. These covers should be pulled in a full position during sleep and a partial to full position, depending on individual sensitivity of infant, at other times (Blackburn, 1998). Reducing the harsh, typically florescent, lighting in the unit will allow the infant to open their eyes for longer periods of time and interact with the visual stimuli in their environment. Also, more natural lighting and scheduling a dark lighting period will model the routine of a natural home environment. Moving from a dark or dim to an illuminated environment should be a gradual shift. Timers on lights that slowly increase the level of illumination should be implemented in order to allow the infant to adapt and self-regulate to the shift (Ozawa et al., 2010).

### **Nutritional Intake**

Feeding, or alternate means of nutrition, are a main priority in the NICU. “Feeding and swallowing disorders are common in early infancy and have severe health implications” (Rogers & Arvedson, 2005, p. 74). Rogers and Averdson go on to say there is significant correlation between gestational age and the level of development in the neonates’ sucking, feeding ability, and oral feeding skills (2005). Goals for premature infants’ nutrition are set up to meet the growth velocity they would have met intrauterine during the third trimester (Martin et al., 2009).

Preterm infants often do not meet their goals for growth velocity and have a weight deficit (Martin et al., 2009). Therefore, feeding is a sensitive and stressful area that is often made undesirable, which can have lasting consequences. “Coordination between the muscles in the trunk, tongue, and pharynx are required to initiate a proper suck pattern. Infants use what is known as a suck/swallow/breathe pattern which develops and matures with age” (Ross & Browne, 2002, p. 471).

To understand the nature of feeding and swallowing disorders in pre-term infants, we must look into the development of the infant, from utero. During the embryonic period (weeks 1-8) the most critical aspects of development take place. The anatomy of the oral cavity, pharynx, larynx, and esophagus begin (Delaney & Arvedson, 2008). Following the embryonic period, week nine marks the start of the fetal period, which continues through birth. During this period, the oral cavity, pharynx, and esophagus become three distinct areas. This allows the fetus to experience vast development of swallowing, sucking, and oral sensorimotor function (Delaney & Arvedson, 2008). Brainstem myelination relevant to swallowing takes place in weeks 18-24. The myelination allows for opening and closing of the jaw, anterior tongue movements, and suckling. Sensory systems important for swallowing begin in week 11 with the formation of taste buds on the dorsal side of the tongue (Delaney & Arvedson, 2008). The first motor response in the swallowing process is the pharyngeal swallow, which takes place in the 11<sup>th</sup> week. By 15 weeks gestation, non-nutritive sucking and swallowing takes place, seen on ultrasound studies. Tongue thrusting is developed by 21 weeks, and tongue cupping is seen at 28 weeks gestation. The infant had consistent swallowing by 22-24 weeks gestation (Miller, Sonies, and Macedonia, 2003). Though the infant is consistently swallowing by 22-24 weeks, the swallowing does not maintain an adequate coordinated suck/swallow/breathe pattern which necessary for safe and

successful oral intake. This coordinated pattern is often not seen until 37 weeks gestation (Ross & Browne, 2002).

Therefore, many pre-term infants have what is considered to be an uncoordinated swallow and are placed NPO (i.e. Nil per os, nothing by mouth). Infants with an inappropriate suck/swallow/breathe pattern can be placed on alternate means of nutrition, while working toward their oral goals. One way to work toward oral feeding and assess oral feeding readiness is to obtain an adequate non-nutritive suck pattern. This pattern is often obtained using a pacifier. The pacifier allows the pre-term infant to learn the proper suck/swallow/breathe pattern while simultaneously receiving oral stimulation. This pairing in non-nutritive sucking has been shown to have a positive clinical outcome on performance of bottle feeding, especially when transitioning the neonate from tube feedings to oral bottle feedings (Delaney & Arvedson, 2008).

Transition can be a time of great stress for the infant, staff, and parents. However, if not careful, creating an unpleasant oral feeding experience can create oral aversions in the infant, resulting in undesirable long-term effects. When too concentrated on the transition or amount of liquid consumed orally, the focus shifts away from the psychological needs of the infant and turns into seeing a target that must be reached. Careful consideration should be made when designing oral intake goals.

Ensuring the pre-term infant will have a successful feeding experience in the NICU entails achievable and attainable oral tolerance and oral motor goals. These goals should be set and worked with from birth, while maintaining a positive emotional state in the infant.

This includes facilitating stability of the physiologic system, as well as offering the infant a pacifier or his or her fingers to orally explore. Additionally, providing tastes of breastmilk or formula to the infant on a pacifier or on his/her fingers, depending on the

mother's choice of feeding, facilitates the infant's acquisition of new sensory stimuli during the feeding experience, prior to the start of nipple feedings (Ross & Browne, 2002, p. 472).

When transitioning to oral feeding keeping the infant calm and receptive during the feeding should be the priority, in order to ensure long-term success. Identifying that effective feeding for pre-term infants is reliant on the acquisition and stabilization of the physiologic system will permit both staff and mothers to recognize the difficulties for each infant, therefore developing an individualized and supportive intervention (Ross & Browne, 2002). Focus should be on the parent and working through them to teach the infant desired skills, rather than the medical model approach of focusing on the obtainment of the skill in the infant, then teaching the parent to continue the technique. Small steps should be made when working toward oral feeding. First, the goal should be for the infant to tolerate touch to the outside of the oral cavity, working your way inside. Once the presentation of stimuli is tolerated, introduce the infant to the taste of liquids. The goal should be for the infant to tolerate and enjoy the presentation, not to see how much liquid the infant will obtain. Working to introduce liquids in this manner, while simultaneously teaching the infant developmentally appropriate oral motor skills will enhance the success of the feedings.

Once orally feeding, an infant should tolerate feedings for twenty to thirty minutes, without signs or symptoms of stress, in order to consume an adequate amount of liquid to facilitate weight gain. Infants are expected to feed at intervals of two to three hours. This interval is measured by the start of one feeding to the start of the next feeding. This allows for the facilitation of hunger, satiation, digestion, and promotion of the next cycle (Delaney & Arvedson, 2008).

If the infant is experiencing strong negative reactions to the oral presentations, then no longer make that a priority, and decrease the demand of oral presentation on them. Ultimately, you want the infant to enjoy the feedings. If the child is on bolus feedings via alternate means, then work your feedings and oral presentations around that schedule, using it to your benefit. Present liquid and oral intake prior to bolus feed, when you know the infant will be hungry, increasing chances for infant toleration of presentations.

### **Noise Levels**

Noise in the NICU is a prominent challenge that will prove hard to eliminate. From the vast amount of machines required to ensure an infant's health, to the alarms to sound danger, and the phones at the nurses' station constantly ringing for worried loved ones to check on an infant's condition. It has been proven for some time now that the exposure to noise levels infants endure in the NICU is above the level approved. The infants in the unit do not have the level of self-regulation that full-term infants or older individuals have that allow them to filter out stimuli. These adverse effects can result in damage to the cardiovascular system, respiratory system, sleep, brain perfusion, and long-term neurodevelopment (Wachman & Lahav, 2011). These effects range from immediate damage to the infants system, to long-term negative outcomes.

Noise can be reduced to more appropriate, natural, exposure levels through monitoring the sound levels permitted in the NICU. In order to do this, the equipment must be evaluated and sound levels reduced. When possible, place the machine generating the signal as far away from infant as possible. The more sensitive infants in the unit should be placed in areas that are away from the sources of noise and activity, which would be furthest from the nurses' station. Background noise can be minimized by implementing soundproof covers over incubators, muffle tape recorders, eliminate radios, only permit soft spoken conversation among staff and visitors

and initiate “quiet times.” To reduce sudden startle noises place easy-shut hinges on all cabinets and drawers to prevent slamming, use pads to set equipment on, remove alarm volumes by replacing with visual and vibrating alarms, implement light signals on telephones, and use vibrating pagers to contact staff (Blackburn, 1998). Implementing these strategies allows the infants to be exposed to the speech signals important for early speech and language abilities, as well as minimizing their risk for hearing loss and health related illnesses due to stress and startle of high sound levels.

### **Family-Centered Relationship**

Relationship between mother and caregivers can easily become strained in the NICU. Mothers are at a sensitive point in their life, they have a sick child in which they can easily feel that they are unable to care for. They have a plethora of employees telling them how to handle, feed, and care for their baby. This goes against the very grain of “a mother knows best.” This can leave mothers feeling disconnected to their infants or easily agitated with employees of the NICU. The education that SLPs and other professionals give to the mother and family needs to be done in a way that does not appear abrasive. Care-givers must be sensitive to the method in which they are treating the infant and educating the family. The NICU and infant care should not become a power struggle between the parent and care-giver, nor a place to suppress the power of the family. However, often that is exactly what the environment becomes.

With all of the attention on the pre-term infant, needs of the mother often go unaddressed and are foreseen as less important than the medical necessities of the infant. However, there is still need from the mothers to feel a reassurance that someone cares about her health and comfort post-delivery (Bialoskurski, Cox, & Wiggins 2002). The mother has to deal her pre-term delivery, resulting in a sick infant she is unable to fully care for, being away from her home and

comfortable environment, as well as the loss of her long hoped for ideal delivery. All of these factors can be very taxing on a person's wellbeing. When you pair these emotions with the overload of information they are receiving, it creates even more stress and potential depression. Neonatal staff should make a deliberate effort to control the personal interactions with the mother as well as the presentation of information, to see that it is presented in a way that can be easily perceived, in manageable doses. Support, encouragement, and reassurance are needed from family, friends, and staff to ensure that successful mother- infant bonding occurs (Bialoskurski et al., 2002). In doing this, NICUs should not permit the family from seeing the infant, unless it is during a quiet period, where they should be encouraged to wait. Support groups on site can be offered, staff should encourage parents to speak of the infant as "their baby," calling him/her by name. Schedules for feeding, bathing, and kangaroo care should be accommodated as much as possible to meet the parent's availability. And, if the parent is willing, beyond basic nurturing care, they should be a part of daily care, such as giving medications and changing any dressings (Aucott, et al., 2002). In order for this partnership between employed caregivers and families to truly work both parties must realize that every child and family is different and what works for one may not work for another. This individualization of care is the only way for a family-centered developmental care approach to succeed (Aucott et al., 2002).

### **Discharge Planning**

Leaving the NICU can be stressful and scary for families and care-givers of the pre-term baby. Though the NICU presented with its own set of challenges for the family, it also provides a sense of safety to the parents, feeling that the staff have the knowledge and skill set to ensure safety of their infant. Taking home a pre-term infant that spent a substantial amount of time in the NICU is very different than taking home a full-term healthy baby. There is an elevated sense

of worry that accompanies this discharge (Schlittenhart et al., 2011). Aside from the daily care the infants will require, the mother or primary care-giver will be required to facilitate and manage medical care for the child that will be needed on a daily, weekly, or monthly basis. This includes many doctor appointments and/or therapy appointments that the child will need as it ages (Schlittenhart et al., 2011). The stress of managing this medically fragile baby can quickly take a toll on a marriage and relationship with any existing kids the family may have. Therefore, discharge planning should be implemented throughout the stay of the infant and mother, in order to ensure you are providing her with the best knowledge and skillset possible to take over the primary caregiver role in the home environment, without the constant support of trained staff (Schlittenhart et al., 2011) Even the most involved mother during the NICU stay can feel anxiety when the “safety net” of the hospital is removed.

Staff should implement daily teaching into their routines when caring for the infant. It is important for the mother to be involved in what the infant needs on a daily basis, from the beginning. Keeping the mother involved and educated works to increase confidence in her ability to care for the infant upon release from the hospital. Too often staff will enter the room and begin their treatment regimen. Instead, if possible, ask the mother “would you like to try?” This simple question doesn’t put too much stress on the parent to feel obligated if they aren’t ready, yet gives the willing parents an opportunity to be involved as much as possible. Realizing you are a temporary figure in the infant’s life is crucial. The mother will be the long-term primary caregiver and needs the education, skillset, and confidence to be able to provide her child with the same “best of care” treatment that the hospital environment offers.

Staff can supplement the daily teaching that occurs during frequent interactions with the family by offerings additional learning tools such as classes or educational DVDs. Schlittenhart, found that many adolescent parents and parents of advanced age were not attending discharge planning classes that NICU's provided (2011). These two groups felt as if the material and method of teaching was not intended to target them as an audience, therefore the material would not apply. They looked into developing an evidenced-based DVD program to teach the material in an ethical and comprehensive manner, which would be easy to understand and access to increase parent's exposure to knowledge. Schlittenhart established six general discharge teaching topics: safety; hygiene; signs and symptoms of illness; exercise and development; and parent care (2011). The DVD allowed parents to gain to the same knowledge as the face-to-face classes in a more convenient manner. Implementing technology to supplement daily education allows parents to revisit information at any moment and in a convenient manner, without the staff to parent power struggle or intimidation.

### **Long-term Outcomes**

Westrup, Bohm and Stjernqvist studied the long term outcomes of preschool children that received developmental care in the NICU through the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) (2004). The study looked into the following areas: cognition; behavior and disability; and survival and positive outcome. When measuring cognition using the Bayley Mental Developmental Index most children who were in the NIDCAP group increased their overall level of cognitive ability and was noted to have a "catch-up" phase (Westrup et al., 2004). The behavior and disability of children was assessed in areas of gross and fine motor movements and attention and hyperactivity. Attention and hyperactivity were measured using A Developmental Neuropsychological Assessment (NEPSY). The

assessment found that children in the NIDCAP group had higher levels of attention and lower distractibility. When following the guidelines set by the World Health Organization, sixty percent of the children who received NIDCAP continued without moderate to severe disability, compared to just forty percent of the children in the conventional medical model group (Westrup et al., 2004). This study's findings are promising for supporters in the implementation of developmental care in the NICU to decrease the long-term morbidity post discharge in children.

Through implementation of developmental care in the NICU, enhancements can be made to combat the challenge of long-term development outcome in patients. These changes will require changing the environment through outlook, behavioral interactions, and the direct physical environment. We can give our NICU graduates a better chance to have increased long-term developmental outcomes when we look to the core of the care and expand it from a holistic standpoint. Tuning in to the pre-term infant's sensory needs, as well as their medical needs, allows us to offer the best care possible.

When we encourage and incorporate the mother into the daily roles of infant care, and overcome the staff-mother power struggle, we can increase the confidence in the mother's skill set. Providing supplemental care to the parents is important, as well as addressing their personal needs. We must realize that we are temporary figures in the infant's life. Our role is not only to nurture them to health, but to ensure their mother or caregiver has the confidence and skillset necessary to continue that care upon discharge.

Vandenberg suggests implementing The Newborn Individualized Developmental Care and Assessment Program (NIDCAP) (2007). It is a comprehensive program which includes a behavioral observation methodology and creation of individual family centered developmental caregiving support of the infant's own developmental goals. The NIDCAP approach seeks to

support the infant's stabilization and organization of the autonomic, motor, and state systems at each level of maturation, while minimizing stressful events (Vandenberg, 2007).

As the role of SLPs in the NICU continues to grow and change, the responsibility for us to advocate the importance of an environment that enhances long-term development is gravely necessary. We as communication, cognition, and swallowing experts have a vital role in the habilitation of the infant from birth. We need to continue to grow and learn to use our knowledge not only to treat the pre-term infant, but to ensure that the infant and parents are involved in a developmental care program and environment that optimizes success upon discharge. We should also aid in discharge planning and education with the parents, not only on how to carry out the therapy techniques implemented upon stay, but to educate them on resources available to aid in meeting their needs. The implementation of developmental care is not an instant process, but one that develops over time, requiring major changes in the physical and relational environment in the NICU. However, long-term developmental outcome of premature infants can be greatly increased, reducing the morbidity and increasing the overall quality of life as the child grows.

### **Future Research**

Current research indicates high morbidity later in life, when looking at pre-term infants that graduate from a long-term stays in the NICU. Through controlling physical and relational aspects of care in the NICU with developmental care we hope to reduce the morbidity in NICU graduates. As developmental care becomes more widespread and is implemented over time, new research must be conducted. It is now important for us to watch and monitor the NICU graduates, from developmental care programs, in the previously stated deficit areas: learning disabilities, below average IQ scores, attention deficit hyperactivity disorder (ADHD), neuropsychological deficits, visual motor integration, executive function, temperament

difficulties, language delays, and emotional regulation difficulties. Taking a longitudinal research approach to the developmental care NICU graduates will give us the best comparison for correlational outcomes in order to measure the success of the program.

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