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*School of Occupational Therapy*

Implementation of a Developmental Skills Fair in a Neonatal Intensive Care Unit

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Under the direction of the faculty capstone advisor:

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# A Capstone Project Entitled

Implementation of a Developmental Skills Fair in a Neonatal Intensive Care Unit

Submitted to the School of Occupational Therapy at University of Indianapolis in partial fulfillment for the requirements of the Doctor of Occupational Therapy degree.

By

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### Abstract

The Doctoral Capstone Experience encapsulated integrating evidence, clinical skills, and occupational theory into an interprofessional education session to set a standard of practice in the Neonatal Intensive Care Unit (NICU) at Eskenazi Health. The purpose of the Developmental Skills Fair was to collaboratively provide education on developmentally supportive care to the NICU nursing staff of Eskenazi Health to promote an evidence-based standard of practice. Research was gathered on the seven Core Measures of Developmental Care and the neuroprotective interventions of family-centered care, positioning, cycled lighting, safe sleep, noise/sound control, infant-driven feeding, kangaroo mother care, and infant massage into daily practice. Education was provided via poster sessions and a positioning in-service was held by a representative from Dandle Lion Medical. Nurses completed a pre-/post-test survey to assess knowledge on developmental care and measure effectiveness and nursing perceptions of the Developmental Skills Fair. There was an improvement in knowledge on developmentally supportive care following the education session, noted by an overall increase in post-test survey scores. The majority of nurses also strongly agreed that they had gained knowledge and the standard of practice would improve due to the Developmental Skills Fair. The information gathered will be used to provide further education and continue to improve the standard of practice in the NICU.

### Implementation of a Developmental Skills Fair in the Neonatal Intensive Care Unit

In 2015, approximately 10% of infants in the United States were born prematurely, many of them being treated by physicians, nurses, and therapists within a Neonatal Intensive Care Unit (NICU) (Martin, Hamilton, Osterman, Driscoll, & Mathews, 2015). While the focus of the infants' care is typically on physical and motor delays, it is also important to consider and treat their developing sensory systems. Altimier and Phillips (2016) stated that a large portion of neurodevelopment occurs within the third trimester of gestation; however, premature infants typically spend this critical period of development in a NICU, a significantly different environment than the uterus. When infants experience stimulation that is inappropriate for their gestational age, it has the ability to alter the course of their brain and sensory development (Altimier & Phillips, 2016). Therefore, it is imperative that healthcare professionals within the NICU protect and support the neurodevelopment of premature infants. The Neonatal Integrative Developmental Care Model (Altimier & Phillips, 2016) aims to improve the care and experience infants receive while in the NICU by promoting neuroprotective and family-centered care. Neuroprotective care incorporates strategies that prevent cell death and harm to the infant's developing central nervous system (Altimier & Phillips, 2016). There are seven core measures that outline evidence-based and developmentally supportive protocols: healing environment, partnering with families, positioning and handling, safeguarding sleep, minimizing stress and pain, protecting skin, and optimizing nutrition (Altimier & Phillips, 2016). The earlier an infant is born, the more vulnerable its central nervous system is, and the more crucial it is to invoke effective and consistent developmentally supportive and neuroprotective care.

Occupational therapists can implement the seven core measures of developmental care under the theory of Occupational Adaptation, originally published by Janet Schkade and Sally

Shultz in 1992. The focus of this theory is the person and his or her relationship with their occupational environment (Cole & Tufano, 2008), and therefore the premature infant in the NICU. Occupational Adaptation has four guiding constructs: occupations, adaptive capacity, relative mastery, and occupational adaptation process (Cole & Tufano, 2008). The occupations of an infant are to sleep, eat, and engage in play as to develop their sensory organization, fine and gross motor skills, cognition, and social skills (Case-Smith & O'Brien, 2015). When an infant is born prematurely, they miss the rapid-brain growth that occurs within the third trimester (Madlinger-Lewis et al., 2014; Waitzman, 2007) and the proprioceptive feedback from the uterus that promotes physiological flexion (flexion of the shoulders, hips, and knees, scapular protraction, and posterior pelvic tilt) (Madlinger-Lewis et al., 2014). Infants are driven toward mastery of their occupations, but if they are in an unsupportive and overstimulating environment, their capacity for adaptation is notably limited. Occupational therapists can create a supportive environment by using the Neonatal Integrative Developmental Care Model to formulate neuroprotective interventions and encourage the adaptive processes of the infant. Occupational therapists can also provide education on these developmentally supportive interventions to the health care professionals that care for infants in a NICU for consistent neuroprotective care. Implementing developmental care within the NICU allows the infant to grow, develop, and focus on their engagement and mastery of desired occupations.

Occupational therapy's role within the NICU is to focus on, "the interaction among the biological, developmental, and social-emotional aspects of human function as expressed in daily activities and occupations" (Vergara et al., 2006). Developmentally supportive techniques can be implemented by therapists as well as the nurses who are with the infants every hour of each day. Promoting the coordination of care across all NICU disciplines ensures consistent

developmentally supportive care. Research suggests that team training, collaboration, and communication are necessary to achieve common goals (Smith & Cole, 2009). Hospitals around the nation have been implementing educational programs that focus on the seven core measures of neurodevelopment in their NICUs with success (Altimier, Kenner, & Damus, 2015; Mosqueda-Pena et al., 2016). To create a standard of practice that reflects the Neonatal Integrative Developmental Care Model, the developmental care team at Eskenazi Health implemented a Developmental Skills Fair. Evidence-based principles and protocols were presented with the purpose of educating NICU staff on neuroprotective and developmentally supportive interventions to create a standardization of practice.

### **Background & Significance**

Current research supports the implementation of developmentally supportive interventions including family-centered care (Coughlin, Gibbins, & Hoath, 2009; Lester et al., 2011; McGrath & Samra, 2011; Ramezani, Shirazi, Sarvestani, & Moattari, 2014; Trajkovski, Schmied, Vickers, & Jackson, 2012; Vohr et al., 2006), positioning (Altimier & Phillips, 2016; Hartley, Miller, & Gephart, 2015; Hill, Engle, Jorgensen, Kralik, & Whitman, 2005; Madlinger-Lewis et al., 2014; Sweeney & Gutierrez, 2002), cycled lighting (Guyer et al., 2012; Morag & Ohlsson, 2013; Vasquez-Ruiz et al., 2014), safe sleep (Altimier & Phillips, 2016; Dufer & Godfrey, 2017; Moon, 2017), noise and sound control (Almadhoob & Ohlsson, 2015; American Academy of Pediatrics, 1997; Graven & Brown, 2008; Lahav & Skoe, 2014; Parra, deSuremain, Audeoud, Ego, & Debillon, 2017; Wachman & Lahav, 2011), infant-driven feeding (Foster, Psaila, & Patterson, 2016; Gewolb, Vice, Schwietzer-Kennedy, Tociak, & Bosma, 2001; Wellington & Perlman, 2015), kangaroo mother care (Altimier & Phillips, 2016; Athanasopoulou & Fox, 2014; Boundy et al., 2017; Clark-Gambelunghe & Clark, 2015;

Cleveland et al., 2017; Feldman, Eidelman, Sirota & Weller, 2002; Feldman, Rosenthal & Eidelman, 2014; Gianni et al., 2016; Lawn, Mwansa-Kambafwile, Horta, Barros & Cousnes, 2010; Ludington-Hoe, Anderson, Swinth, Thompson & Hadeed, 2004), and infant massage (Cooke, 2015; Diego, Field, & Hernandez-Reif, 2014; Field, Diego, & Hernandez-Reif, 2010; Beachy, 2003; Kulkarni, Kaushik, Gupta, Sharma, & Agrawal, 2010). These interventions, individually and collectively, provide a premature infant with the adaptive capacity to overcome the physiological barriers impeding their occupational performance.

### **Family-Centered Care**

Family-centered care (FCC) promotes developmentally supportive care by educating and engaging parents in neuroprotective practices while their infant is in the NICU. Medical staff, including nurses, therapists, and physicians, can implement FCC into their daily practice through equal family participation, maintenance of respect and dignity, and knowledge transformation. Equal family participation considers family members to be an active participant in the daily care of the infant, collaborating on the planning, regulating, and implementation of care (McGrath & Samra, 2011). Maintaining respect and dignity requires medical staff to view and treat the family with the understanding that they have the most significant role in providing for the infant's current and future developmental and societal needs (Ramezani et al., 2014). Knowledge transformation between healthcare professionals and family is required for optimal care of the infant. Education to families should be provided in accordance with the family's level of education and in a variety of learning styles, including visually, orally, and through demonstration (Trajkovski et al., 2012). Research suggests that these examples of FCC may decrease length of stay (Coughlin, Gibbins, & Hoath, 2009) and improve family perception of responsibility and capability of care towards the infant (McGrath & Samra, 2011), maternal

mental health (Lester et al., 2011), family satisfaction (Lester et al., 2011), parent-infant attachment (Ramezani et al., 2014), well-being of the infant (Ramezani et al., 2014), and opportunities for breast feeding and skin-to-skin contact (Vohr et al., 2006). Research also suggests that the first step toward implementing FCC is to provide education and support to nursing staff for improved perception and effectiveness of incorporating FCC into daily practice (Trajkovski et al., 2012). Client-centered care is a cornerstone of occupational therapy practice and involving parents in the everyday care of their infant will enable them to assist with the infant's occupations and their adaptation of performance long after they leave the NICU.

### **Positioning**

Positioning aides provide proprioception and comfort to the infant by simulating the borders of a uterine wall (Altimier & Phillips, 2016). Placing the infant in physiological flexion promotes proper joint alignment, bone density, neuromuscular development, brain development, and organization for state control (Altimier & Phillips, 2016; Madlinger-Lewis et al., 2014). An infant left in an extension pattern is at risk for a disruption in the development of motor skills, state control (Hill et al., 2005), and oral motor skills (Madlinger-Lewis et al., 2014). Offering facilitated tuck into a position of physiological flexion has also shown to reduce the expression of pain in premature infants (Hartley, Miller, & Gephart, 2015). Supportive positioning also improves symmetrical development, which is crucial for early development, reflex and motor responses (Madlinger-Lewis et al., 2014), and shaping the musculoskeletal system (Sweeney & Gutierrez, 2002). An example of a positioning aide is the Dandle-Roo, which is “a structured blanket made of stretchable, organic cotton with adjustable straps for the upper extremities, a pouch for the lower extremities, and a head boundary” (Dandle Lion Medical, 2012, August 8). Madlinger-Lewis et al. (2014) supported the use of the Dandle-Roo to increase symmetry of



reflexes and motor responses with preterm infants. The core measure of supportive positioning with a swaddle or positional aides enables an infant to feel organized. It teaches them an adaptive process of self-soothing by bringing their hands to midline, up to the mouth, and into the other hand. This teaches the infant sensory organization needed to engage in a variety of occupations.

### **Cycled Lighting**

Cycled lighting is the adjustment of lighting throughout the day to imitate a typical environment, with the goal of decreasing overstimulation of the infant's developing visual system. When implementing cycled lighting, the lights are on for approximately 12 hours during the day with a three-hour period of dim lighting to encourage rest. After the 12-hour day period, the lights are off and blinds are down throughout the night. Research suggests that cycled lighting promotes weight gain (Guyer et al., 2017; Vasquez-Ruiz et al, 2012), stabilization of heart rate (Vasquez-Ruiz et al., 2012), and maturation of behavioral state regulation (Guyer et al., 2017). Guyer et al. (2017) also found that cycled lighting elicited a significant decrease in fussing and crying behavior. Morag & Ohlsson (2013) found that cycled lighting on dimmers trended towards more favorable outcomes than constant darkness or brightness in a NICU. Implementing cycled lighting coincides with the core measures of creating a healing environment and protecting sleep. An increase in weight gain and an improvement in state control sets the infant up for success when learning how to adapt to their sensory environment and perform meaningful occupations.

### **Safe Sleep**

Sleep is a time for brain growth, and premature infants require this time for the development of neurological pathways. Sleep deprivation can affect behavior and brain function in the long-term, because of a reduction in brain plasticity (Altimier & Phillips, 2016). Therefore,

it is important that infants are not awakened unless necessary. It is also imperative that the safe sleep protocol is implemented for developmentally appropriate infants. The American Academy of Pediatrics recommends that infants sleep on their backs up until their first birthday, on a firm surface such as a safety approved crib, in the same room as their parents for the first six months of life, and without any soft objects or loose bedding in the crib (Moon, 2017). It is important to model safe sleep within the NICU as well as educate parents before infant discharge. Dufer & Godfrey (2017) found that a safe sleep handout and educational session increased parental knowledge of the safe sleep recommendations and significantly improved compliance after the infant was discharged home. Allowing an infant to rest, modeling safe sleep, and providing parents with education in the NICU follows the core measure of safeguarding sleep and partnering with families. It also allows for optimal brain development that infants need to focus on their occupations and adapt to the demand for mastery.

### **Noise and Sound Control**

Auditory overstimulation of the infant can impair the development of their immature auditory system and may contribute to the development of language and attention disorders (Lahav & Skoe, 2014). A functional vestibular system completes formation at approximately 25-29 weeks gestation and the hair cells of the ear can lose their sensitivity to pitch if exposed to sound levels of 60 decibels (dBA) or greater (AAP, 1997; Graven & Brown, 2008). The American Academy of Pediatrics (1997) recommended that sound levels in the room of an infant in a NICU remain under 45 dBA. For comparison, 40 dBA is the quiet noise in a typical home, whereas 60 dBA is the moderate noise of a normal conversation (AAP, 1997). Inside an incubator, less than 30 dBA is required for maintaining a sleep state (AAP, 1997), which is necessary for growth (Altimier & Phillips, 2016). Parra et al. (2017) reported that the noise of

conversation and device alarms are the two main sources of increased noise that can be controlled. Preterm infants typically have decreased autonomic and self-regulatory control due to their immaturity, which is why loud sounds and higher frequencies can affect their physiological stability (Wachman & Lahav, 2011). More specifically, those noises can increase the stress on the infant, which causes an increase in metabolic rate and therefore expending calories needed for optimal growth (Almadhoob & Ohlsson, 2015). Managing the auditory stimulation within an infant's room supports the core measures of creating a healing environment and minimizing stress. This encourages the brain development and adaptive properties crucial for mastery of occupations.

### **Infant-Driven Feeding**

Preterm infants are at an increased risk for feeding difficulties due to possible poor suck, swallow, and breathe reflex coordination; autonomic instability; and less organized sleep-wake cycles (Gewolb et al., 2001). Therefore, the developmentally supportive practice of cue-based, or infant-driven, feeding has been implemented in NICUs with research suggesting overall benefits for infants and their providers (Wellington & Perlman, 2015). Emphasis is placed on quality of feeding with an infant-driven feeding protocol, allowing the infant to determine when they feed and the amount they consume orally (Wellington & Perlman, 2015). When non-nutritive sucking on a pacifier was used in coordination with gavage feedings, Foster, Psaila, and Patterson (2016) found significant improvements in transitions from gavage to full oral feedings and a decrease in hospital length of stay. Wellington & Perlman (2015) found that when waiting for infants to demonstrate cuing and readiness, they quickly advanced to full feeds, were discharged earlier, and nurses recorded less time spent feeding. Following an infant-driven feeding protocol follows the core measure of optimizing nutrition and ensures that the occupation of feeding and eating

remains positive and pleasurable. This takes away environmental pressures, supporting the infant's learning of adaptive processes.

### **Kangaroo Mother Care**

At the foundation of the Neonatal Integrative Developmental Care Model is Kangaroo Mother Care (KMC) because skin-to-skin contact (SSC) is the most normal environment for newborns (Altimier & Phillips, 2016). KMC is defined by the World Health Organization (2017) as a method that involves early, continuous, and prolonged skin-to-skin contact between an infant and their mother or father. At birth, the tactile senses of the infant are the most developed of the sensory pathways (Clark-Gambelunghe & Clark, 2015), which correlates with the research that states KMC can be significantly beneficial for an infant as well as its mother (Athanasopoulou & Fox, 2014; Boundy et al., 2017; Cleveland et al., 2017; Feldman et al., 2002; Feldman, Rosenthal & Eidelman, 2014; Lawn et al., 2010; Ludington-Hoe et al., 2004). Feldman, Rosenthal, and Eidelman (2014) found that KMC increased autonomic functioning and enhanced the infant's cognitive development, executive functioning, organized sleep, and stress response from six months to 10 years of age. Maternal attachment behavior and a reduction in maternal anxiety were also noted (Feldman, Rosenthal & Eidelman, 2014). Research has shown that KMC decreases infant infection rates (Lawn et al., 2010), mortality, risk of sepsis, hypothermia, hypoglycemia, pain measures, and hospital readmission (Boundy et al., 2017). KMC also improves cardiorespiratory and thermal stability (Boundy et al., 2017), duration of breastfeeding and milk production (Gianni et al., 2016), infant to parent interactions (Athanasopoulou & Fox, 2014), neurodevelopmental outcomes (Feldman et al., 2002; Feldman, Rosenthal & Eidelman, 2014), head-circumference growth (Boundy et al., 2017), and sleep patterns (Ludington-Hoe et al., 2004). KMC embodies each of the seven core principles by

providing a safe and supportive environment, keeping the family as active participants, facilitating supportive positioning, contributing to regulation of the sleep cycle, minimizing stress and pain, supporting thermoregulation, and improving the mother's milk supply (Altimier & Phillips, 2016). Skin-to-skin contact provides an infant with the skills to adapt to their new environment and master their desired occupations.

### **Infant Massage**

The skin is the largest organ in the human body, and at birth, the tactile sense of an infant is the most developed sensory system (Clark-Gambelunghe & Clark, 2015). Reportedly 95% of touch experienced by an infant in a NICU is not intentionally comforting (Smith, 2012), which is why providing intervention specifically for infant comfort is so important. Research suggests that infant massage with oil promotes weight gain (Beachy, 2003; Cooke, 2015; Diego, Field, & Hernandez-Reif, 2014; Field, Diego, & Hernandez-Reif, 2010; Kulkarni et al., 2010), improves sleep-wake patterns (Kulkarni et al., 2010), enhances neuromotor development (Kulkarni et al., 2010), facilitates parent-infant bonding (Cooke, 2015; Field, Diego, & Hernandez-Reif, 2010; Kulkarni et al., 2010), and reduces hospital length of stay (Beachy, 2003; Field, Diego, & Hernandez-Reif, 2010; Kulkarni et al., 2010). Field, Diego, and Hernandez-Reif (2010) found that using coconut oil during an infant massage was significantly more effective than mineral oil or powder in infant weight gain and decreasing hospital length of stay. Promoting infant massage in the NICU facilitates the core measures of partnering with families, minimizing stress and pain, and protecting skin. Infant massage improves the infant's weight gain and body awareness, which is crucial for the adaptive skills required for optimal performance in desired occupations.

### **Summary of Literature**

The literature supports a collaborative education session to implement a neuroprotective and developmentally supportive standard of practice based on the Seven Core Measures of Developmental Care (Smith & Cole, 2009; Altimier, Kenner, & Damus, 2015; Mosqueda-Pena et al., 2016). Therefore, with the Neonatal Integrative Developmental Care Model as a guide, the developmental team at Eskenazi Health developed seven stations led by the occupational and speech therapy team members. The therapy-driven portion of the skills fair focused on the following developmental care target areas: family-centered care, positioning, cycled lighting, safe sleep, noise and sound control, infant-driven feeding, kangaroo mother care, and infant massage. The purpose of the therapy-driven portion of the developmental skills fair was to provide education on neuroprotective and developmentally supportive protocols to create a standardized practice within the NICU. It is important to continuously consider the infant's developing occupations and the developmentally supportive ways that caregivers in the NICU can use the Occupational Adaptation theory to enable infants for occupational adaptation and eventual mastery of their occupations.

### **Screening and Evaluation**

The concept of implementing a therapy-based portion within the Developmental Skills Fair was originally introduced in the fall of 2017 by members of the Developmental Care Committee. The developmental care team consists of representatives from nursing management, nursing staff, occupational therapy, and speech therapy who meet once a month to discuss the status of the NICU with an interdisciplinary approach. The developmental care team collaboratively discussed the concept of holding educational sessions for the staff to address issues mentioned by team members. To achieve a better understanding of the issues that led to

the formation of a developmental skills fair, I interviewed members of the developmental care team via email. While I was not an original member of the developmental care team, it was crucial to understand the complexity of care within the NICU and the roles each member plays. Two members of nursing management and four members of the therapy department were interviewed on their view of the necessity for a developmental skills fair, the issues seen in everyday practice, and their goals for the fair.

One member stated that many nurses and other staff members turn to therapists to deliver developmental supportive care (T. Rexroat, personal communication, February 12, 2018) and although other members stated that the level of care in the NICU had increasingly become developmentally driven, daily practice could continue to improve (D. Tingley, personal communication, February 9, 2018; K. Panther, personal communication, February 6, 2018; T. Galyan, personal communication, January 30, 2018). Members stated that there needed to be a shift in practice to become more developmentally based and infant-driven (K. Panther, personal communication, February 6, 2018) and that our therapy expertise in developmentally supportive and neuroprotective protocols could assist the nurses in their everyday care of infants (D. Tingley, personal communication, February 9, 2018). One member stated that the nurses felt as though they needed more training and many new nurses were interested in more education (D. Arnold, personal communication, February 6, 2018). Members felt that a group-based education session would be an effective method to get a single message of developmental care across to all members of the nursing staff while offering an opportunity for discussion (D. Arnold, personal communication, February 6, 2018; T. Galyan, personal communication, January 30, 2018; T. Rexroat, personal communication, February 12, 2018).

Members noted inconsistencies both at the individual (D. Tingley, personal communication, February 9, 2018, K. Panther, personal communication, February 6, 2018) and organizational level (D. Arnold, personal communication, February 6, 2018; T. Galyan, personal communication, January 30, 2018), as well as a desire from all disciplines for more education (D. Arnold, personal communication, February 6, 2018; D. Tingley, personal communication, February 9, 2018; K. Panther, personal communication, February 6, 2018; S. Felker, personal communication, February 10, 2018; T. Galyan, personal communication, January 30, 2018; T. Rexroat, personal communication, February 12, 2018). There are many members of the nursing staff that do not directly work with either occupational or speech therapists due to only working night shifts or weekend shifts, so it is more difficult for those nurses to understand the role of therapy, the purpose of developmentally supportive recommendations, and how to implement the level of neuroprotective care required (T. Rexroat, personal communication, February 12, 2018).

Compared to other areas of practice, the specialized knowledge required to work in a NICU is vast, which requires time dedicated to continuing education and advancing skills (Vergara et al., 2006). Experience in pediatric care is important for NICU practice because an understanding of typical and atypical development is required. In addition to standard education and pediatric experience, advanced clinical reasoning and skills are required due to the fragility and immaturity of many of the infants (Vergara et al., 2006). A standard of neuroprotective and developmentally supportive care would ensure best practice as Eskenazi Health plans to transition to a Level III NICU, where more advanced skills are required (D. Tingley, personal communication, February 9, 2018, K. Panther, personal communication, February 6, 2018; S. Felker, personal communication, February 10, 2018). In contrast to other NICUs in the area, members stated that the developmental care team at Eskenazi Health continuously strive toward



improving their evidence-based level of care (D. Tingley, personal communication, February 9, 2018) and supported advancing standards of developmental based care (S. Felker, personal communication, February 10, 2018) with continuous, daily support from therapists (T. Rexroat, personal communication, February 12, 2018).

To address the needs delineated by the developmental care team, an interdisciplinary approach was necessary for a successful education session (Petri, 2010). Therefore, the team scheduled the developmental skills fair to coincide with a mandatory skills fair for all NICU nursing staff. Goals for this educational session were to increase a consistency of developmentally based care (K. Panther, personal communication, February 6, 2018, T. Galyan, personal communication, January 30, 2018), provide an opportunity for the nurses to ask questions and improve skills (D. Arnold, personal communication, February 6, 2018; T. Rexroat, personal communication, February 12, 2018), initiate a shift in everyday practice to become more infant-driven (S. Felker, personal communication, February 10, 2018) and developmentally supportive (D. Tingley, personal communication, February 9, 2018), and to test the effectiveness of the therapy portion of the developmental skills fair (S. Felker, personal communication, February 10, 2018). Using evidence-based research to structure the fair, the developmental care team created education sessions that covered family-centered care, cycled lighting, noise and sound control, safe sleep, kangaroo mother care, infant-driven feeding, positioning, and infant massage as well as coordinated with a representative from Dandle Lion Medical for a positioning in-service.

### **Implementation**

Planning for the developmental skills fair included monthly meetings with the entire developmental care committee and continuous communication with the therapy team members

and nursing management, either in person or through email. Planning also required obtaining research and feedback from the therapy team members to provide evidence-based and developmentally supportive information. The research and feedback were used to create questions for a pre-/post-test survey (Appendix A; Appendix B) as well as the posters for the session (Appendix C). All of the information shared at the developmental skills fair was checked to ensure compliance of Eskenazi Health's NICU policies and procedures.

The Developmental Skills Fair session dates and times were confirmed and shared with all of the nursing staff, including a letter that explained our purpose, goals, and appreciation. The dates and times for the fair were spread over five days at different times of day to offer a session for all nursing staff, including those who typically work the day shift, night shift, weekend shift, or are contracted PRN. Prior to arriving at the fair, the nurses were sent an email containing a Google Forms link to sign up for a session and completed the pre-test survey. The nurses completed multiple stations during the session, including hospital-wide skills tests, therapy-based poster sessions, and a positioning in-service hosted by a representative from Dandle Lion Medical. The pre-/post-test survey and the therapy-based poster sessions covered the following topics of developmental care: family-centered care, positioning, cycled lighting, safe sleep, noise and sound control, infant-driven feeding, kangaroo mother care, and infant massage. Two therapists covered the poster sessions at the fair by introducing the topic, the evidence that supports it, and how to best implement it into everyday practice. A handout with the evidence was available for each poster session upon request. The therapists were available to answer questions as well as converse with nursing staff on the covered topics. After the completion of the therapy-based portion of the fair, it was required that the nurses complete a paper form of the post-test survey before leaving. The pre-/post-test survey included two questions covering basics

of developmental care, two questions on cycled lighting protocols, one question on noise levels in the NICU, two questions on infant-driven feeding, one question on safe sleep protocol, three questions regarding positioning, two questions on KMC, one question on infant massage, and one question on family-centered care in the NICU. The post-test survey included two additional questions on a likert scale regarding perception and successfulness of the therapy-driven portion of the fair. The post-test survey questions were compared and analyzed with the corresponding pre-test survey questions.

### **Leadership Skills & Promotion of Staff Development**

I demonstrated leadership skills by taking the initiative to communicate with each member of the developmental care team either in person, during developmental care committee meetings, or via email. A specific strategy that I implemented was a pre-/post-test questionnaire administered to understand the knowledge learned on developmentally based care as well as successfulness of the therapy portion of the developmental skills fair. The pre-/post-test focused on professional skills and competencies required for optimal and evidence-based care within the NICU. Issuing a pre-/post-test ensured that staff had the opportunity to improve their professional skills and competencies within the NICU. I also demonstrated leadership skills by organizing the sessions' posters, handouts, questions, and themes. I attended and led each poster session throughout the developmental skills fair. I also coordinated with the Dandle Lion Medical representative for each in-service session to assist with set-up and clean-up as well as troubleshoot any issues. I demonstrated leadership skills and professionalism throughout the planning, implementation, and discontinuation of the project by being available for anyone with questions, open to feedback, prepared for each session and in-service, and independent with all tasks associated with the skills fair.

The main goal of the developmental skills fair was to educate nursing staff on developmentally supportive care to ensure an evidence-based and neuroprotective standard of care. The sessions on family-centered care, cycled lighting, safe sleep, noise/sound control, infant-driven feeding, KMC, and infant massage are interventions specifically aimed to shift everyday practice towards developmentally focused. The education provided directly relates to the nurse's everyday roles and responsibilities in the NICU and will promote standardized practice. The developmental skills fair offered nursing staff the opportunity to advance their knowledge and skills, ask questions, and improve their overall understanding of developmentally supportive care.

### **Discontinuation & Outcome**

A strategy identified and developed to enable occupational therapy's future education efforts in the NICU was the implementation of a pre-/post-test survey (Appendix A; Appendix B). The purpose of the survey was to measure nursing knowledge on developmentally based care. A total of 54 nurses took the pre-test survey to the implementation of the developmental skills fair. The scores ranged from 6 to 14 points with an average of 11.41 out of a total possible score of 14 points. The most frequently missed question was one that asked to select one picture of four options in which demonstrated the incorrect use of a positioning aide. Half of the nurses (27 nurses) answered this question incorrectly. Other frequently missed questions concerned safe sleep, with 32% answering incorrectly, and appropriate sound levels, with 30% answering incorrectly. After the completion of the developmental skills fair, the 54 post-test survey scores were analyzed and compared with the pre-test survey scores. The post-test survey scores ranged from 12 to 14 points and averaged 13.63 out of a total 14 possible points. The average improvement from pre-test survey score was 2.15 points. The improvement in scores indicates

that the educational poster session was successful in improving the overall knowledge of the nursing staff. The survey also offered an insight into the areas in which the therapists in the NICU should focus on for future nursing education. As previously stated, the questions covering positioning, safe sleep, and noise/sound control were the most frequently missed. Therefore, future education could continue to focus on these topics of developmentally support care to ensure neuroprotective care in the NICU.

A quality improvement measure that was put into place was asking for nursing perception of the developmental skills fair. Questions were asked using a Likert scale, with answer options ranging from strongly agree to strongly disagree. The majority of the nurses (74%) strongly agreed that they gained knowledge from the educational session and thought the education provided at the session would improve standard of practice in the NICU. Feedback and barriers to practice were also verbally received from nurses during the poster session, documented, and shared with the therapy team. Feedback from the therapy team was also gathered to measure perception of success, areas for improvement, and ideas for future plans. Future education will be provided by the therapy team members and will include the use of the posters and information handouts created for the developmental skills fair. One poster used for the education session could be displayed each month in the NICU, for not only nurses to see but also physicians, medical students, respiratory therapists, and parents. The poster of the month can also include an email update on current or new research, answers to questions gathered during the skills fair, or other information pertaining to the topic of the month. The therapy team and developmental care team can coordinate this monthly education in the future.

Future program changes or advancements could also include a follow-up with nursing staff during daily care to ensure developmentally supportive care. Therapists could also select

Positioning Champions, members of the nursing staff who are competent in developmentally supportive positioning and can advocate and ensure proper positioning. The Positioning Champions could collaborate with therapy team leaders to then create a competency check-off on positioning for new nurses working in the NICU. The therapy team could also extend developmentally supportive care education to the respiratory therapists, residents, and medical students rotating through the NICU. A continuation of the program can include handouts made from the posters and evidence for future nurses or residents who join the NICU care team.

The developmental skills fair, as well as future education and programs, respond to society's need of developmentally supportive care for infants in the NICU. Nursing staff, as demonstrated through the pre-/post-test survey, gained knowledge on developmentally supportive care that will improve the standard of practice in their NICU. Those improvements in care will benefit infants and their families for years to come. A high standard of practice is also necessary as Eskenazi plans to transition to a Level III NICU. Treating younger and sicker infants demands consistent developmentally support care, and the developmental skills fair helps answer the need for that level of care.

### **Overall Learning**

The Doctoral Capstone Experience advanced my clinical practice skills by implementing a project that required collecting evidence, collaborating with both occupational and speech therapists, evaluating and treating NICU infants independently, and educating other health professionals. The time I spent working alongside another occupational therapist in the NICU enhanced my clinical skills and decision making when evaluating and planning interventions for infants. I gained incredible amounts of knowledge in occupational therapy practice in the NICU, as well as the best ways to collaborate with other health professionals and advocate for the role

of occupational therapy. The project required me to work collaboratively with four other therapists, while representing their roles in the NICU. I was required to be sensitive to and respectful of their goals for the fair, requests for information on the posters, needs regarding presenting at the fair, and their individual schedules. The education portion of the Doctoral Capstone Experience required the utmost professionalism, as I had to provide evidence-based information to many nurses that have been working for many years, as well as those not familiar with the role of occupational therapists in the NICU. I had to ensure effective and respectful communication when delivering the education on developmental based care. I explained my role in and the purpose of the Developmental Skills Fair and the pre-/post-test survey. I provided education in an informative, yet engaging and respectful manner to all of the nurses. The interaction with these healthcare professionals was an integral part of the experience.

The skills that I gained while working with a variety of healthcare professionals and implementing an education session surpassed the knowledge and experience that I gained in previous fieldwork rotations. The Doctoral Capstone Experience and Project not only required the skills of an entry-level occupational therapy practitioner, but the professionalism and independence of a doctoral-level occupational therapist.

The Doctoral Capstone Experience and Project, among many things, has prepared me for a more advanced and well-rounded role as an occupational therapy practitioner. Similar to many other entry-level graduates, I will enter into my first career feeling comfortable and competent in my clinical and decision-making skills. Although in contrast with other entry-level graduates, I will be interested in and capable of implementing evidence-based practice, engaging with other professionals in collaborative care, advocating for my role as an occupational therapist, and creating projects that respond to society's need and advance the level of care in the area I work.

### References

- Almadhoob, A., & Ohlsson, A. (2015). Sound reduction management in the neonatal intensive care unit for preterm or very low birth weight infants. *The Cochrane Database of Systematic Reviews*, 1. doi: 10.1002/14651858.CD010333.pub2
- Altimier, L., Kenner, C., & Damus, K. (2015). The Wee Care Neuroprotective NICU Program (Wee Care): The effect of a comprehensive developmental care training program on seven neuroprotective core measures for family-centered developmental care of premature neonates. *Newborn & Infant Nursing Reviews* 15, 6-16.
- Altimier, L., & Phillips, R. M. (2016). The neonatal integrative developmental care model: Seven neuroprotective core measures for family-centered developmental care. *Newborn & Infant Nursing Reviews*, 16, 230-244.
- Athanasopoulou, E., & Fox, J. R. (2014). Effects of kangaroo mother care on maternal mood and interaction patterns between parents and their preterm, low birth weight infants: A systematic review. *Infant Mental Health Journal*, 35(3), 245-262.
- American Academy of Pediatrics. (1997). Noise: A hazard for the fetus and newborn. *Pediatrics*, 100(4). doi: 10.1542/peds.100.4.724
- Beachy, J. (2003). Premature Infant Massage in the NICU. *Neonatal Network*, 3(7), 39-45. doi: 10.1891/0730-0832.22.3.39
- Boundy, E. O. Dastjerdi, R., Spiegelman, D., Fawzi, W. W., Missmer, S. A., Lieberman, E., ... & Chan, G. J. (2017). Kangaroo mother care and neonatal outcomes: A meta-analysis. *Pediatrics*, 137(1).
- Case-Smith, J., & O'Brien, J. C. (2015). *Occupational therapy for children and adolescents*. St. Louis, MO: Elsevier.



- Clark-Gambelunghe, M. B., & Clark, D. A. (2015). Sensory development. *Pediatrics of North America*, 62(2), 367-384.
- Cleveland, L. Hill, C. M., Pulse, W. S., DiCioccio, H. C., Field, T., & White-Traut, R. (2017). Systematic review of skin-to-skin care for full-term, health newborns. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 46(6), 857-869. doi: 10.1016/j.jogn.2017.08.005.
- Cole, M. B., & Tufano, R. (2008). *Applied theory in occupational therapy: A practical approach*. Thorofare, New Jersey: SLACK Incorporated.
- Cooke, A. (2015). Infant massage: The practice and evidence-base to support it. *British Journal of Midwifery*, 23(3). doi: 10.12968/bjom.2015.23.3.166
- Coughlin, M., Gibbins, S., & Hoath, S. (2009). Core measures for developmentally supportive care in neonatal intensive care units: theory, precedence and practice. *Journal of Advanced Nursing*, 65(10), 2239-2248. doi: 10.1111/j.1365-2648.2009.05052.x
- Dandle Lion Medical (2012, August 8). Dandle Roo.
- Dufer, H., & Godfrey, K. (2017). Integration of safe sleep and Sudden Infant Death Syndrome (SIDS) education among parents of preterm infants in the Neonatal Intensive Care Unit (NICU). *Journal Of Neonatal Nursing*, 23(2), 103-108. doi:10.1016/j.jnn.2016.09.001
- Diego, M. A., Field, T., & Hernandez-Reif, M. (2014). Preterm infant weight gain is increased by massage therapy and exercise via different underlying mechanisms. *Early Human Development*, 90(3), 137-140. doi: 10.1016/j.earlhumdev.2014.01.009
- Feldman, R., Eidelman, A. I., Sirota, L., & Weller, A. (2002). Comparison of skin-to-skin (kangaroo) and traditional care: Parenting outcomes and preterm infant development. *Pediatrics* 110(1), 16-26.

- Feldman, R., Rosenthal, Z., & Eidelman, A. I. (2014). Maternal-preterm skin-to-skin contact enhances child physiological organization and cognitive control across the first 10 years of life. *Biological Psychology*, 75, 56-64
- Field, T., Diego, M., & Hernandez-Reif, M. (2010). Preterm infant massage therapy research: A review. *Infant Behavior and Development*, 33(2), 115-124. doi: 10.1016/j.infbeh.2009.12.004
- Foster, J. P., Psaila, K., & Patterson, T. (2016). Non-nutritive sucking for increasing physiological stability and nutrition in preterm infants. *Cochrane Database of Systematic Reviews*, 10. doi: 10.1002/14651858.CD001071.pub3.
- Gewolb, I. H., Vice, F. L., Schwietzer-Kennedy, E. L., Tociak, V. L., & Bosma, J. F. (2001). Developmental patterns of rhythmic suck and swallow in preterm infants. *Developmental Medicine and Child Neurology*, 43, 22-27.
- Gianni, M. L., Bezze, E., Sannino, P., Stori, E., Pievani, L., Roggero, P., ... & Mosca, F. (2016). Facilitators and barriers of breastfeeding late preterm infants according to mothers' experiences. *Biomed Central Pediatrics*, 16(1), 179.
- Graven, S. N., & Browne, J. V. (2008). Auditory development in the fetus and infant. *Newborn & Infant Nursing Reviews*, 8(4), 187-193
- Guyer, C. Huber, R., Fontijn J., Bucher, H. U., Nicolai, H., Werner, H., ... & Jenni, O. G. (2012). Cycled light exposure reduces fussing and crying in very preterm infants. *Pediatrics*, 30(1). doi: 10.1542/peds.2011-2671
- Hartley K. A., Miller, C. S., & Gephart, S. M. (2015) Facilitated tucking to reduce pain in neonates evidence for best practice. *Advances in Neonatal Care*, 15(3), 201-08.

- Hill, S., Engle, S., Jorgensen, J., Kralik, A., & Whitman, K. (2005). Effects of facilitated tucking during routine care of infants born preterm. *Pediatric Physical Therapy, 17*(2), 158-163
- Kulkarni, A., Kaushik, J. S., Gupta, P., Sharma, H., & Agrawal, R. K. (2010). Massage and touch therapy in neonates: The current evidence. *Indian Pediatrics, 47*(9), 771-776.
- Lahav, A. & Skoe, E. (2014) An acoustic gap between the NICU and womb: A potential risk for compromised neuroplasticity of the auditory system in preterm infants. *Frontiers in Neuroscience, 8*, 381.
- Lawn, J. E., Mwansa-Kambafwile, J., Horta, B. L., Barros, F. C., & Cousnes, S. (2010). Kangaroo care to prevent neonatal deaths to due preterm birth complications. *International Journal of Epidemiology, 39*(1), 144-145.
- Lester, B. M., Miller, R. J., Hawes, K., Salisbury, A., Bigsby, R., Sullivan, M. C., & Padbury, J. F. (2011). Infant neurobehavioral development. *Seminars in Perinatology, 35*(1), 8-19. doi: 10.1053/j.semperi.2010.10.003
- Ludington-Hoe, S. M., Anderson, G. C., Swinth, J. Y., Thompson, C., & Hadeed, A. J. (2004). Randomized controlled trial of kangaroo care: Cardiorespiratory and thermal effects on healthy preterm infants. *Neonatal Network, 23*(3), 39-48.
- Madlinger-Lewis, L., Reynolds L., Zarem, C., Crapnell, T., Inder, T., & Pineda, R. (2014). The effects of alternative positioning on preterm infants in the neonatal intensive care unit: A randomized clinical trial. *Research in Developmental Disabilities, 35*(2), 490-497. doi: 10.1016/j.ridd.2013.11.019
- Martin, J. A., Hamilton, B. E., Osterman, M. J. K., Driscoll, A. K., & Mathews, T. J. (2015). Births: Final for 2015. *National Vital Statistics Reports, 66*(1), 1-3.

- McGrath, J. M., Samra, H. A., & Kenner, C. (2011). Family-centered developmental care  
practicers and research: what will the next century bring?. *Journal of Perinatal &  
Neonatal Nursing*, 25(2), 165-170. doi: 10.1097/JPN.0b013e31821a6706
- Moon, R. Y. (2017, January 12). How to Keep Your Sleeping Baby Safe: AAP Policy Explained.  
Retrieved from: [https://www.healthychildren.org/English/ages-  
stages/baby/sleep/Pages/A-Parents-Guide-to-Safe-Sleep.aspx](https://www.healthychildren.org/English/ages-stages/baby/sleep/Pages/A-Parents-Guide-to-Safe-Sleep.aspx)
- Morag, I. & Ohlsson, A. (2013). Cycled light in the intensive care unit for preterm and low  
birth weight infants. *The Cochrane Database of Systematic Reviews*, 1. doi:  
10.1002/14651858.CD006982.pub2
- Mosqueda-Pena, R., Lora-Pablos, D., Pavo'n-Mun'oz, A., Ureta-Velasco, N., Moral-Pumarega,  
M. T., & Palla's-Alonso, C. R. (2016). Impact of a developmental care training course on  
the knowledge and satisfaction of health care professionals in neonatal units: A  
multicenter study. *Pediatrics and Neonatology* 57, 97-104.
- Parra, J., deSuremain, A., Audeoud, B., Ego, A., & Debillon, T. (2017). Sound levels in a  
neonatal intensive care unit significantly exceeded recommendations, especially inside  
incubators. *Acta Paediatrica*, 106, 1909-1914. doi: 10.1111/apa.13906
- Petri, L. (2010). Concept analysis of interdisciplinary collaboration. *Nursing Forum*, 45(2), 73-  
82. doi: 10.1111/j.1744-6198.2010.00167.x
- Ramezani, T., Shirazi, Z. H., Sarvestani, R. S., & Moattari, M. (2014). Family-centered care in  
neonatal intensive care unit: A concept analysis. *International Journal of Community  
Based Nursing and Midwifery*, 2(4), 268-278.
- Smith, J. R., & Cole, F. S. (2009). Patient safety: Effective interdisciplinary teamwork through

- simulation and debriefing in the neonatal ICU. *Critical Care Nursing Clinics of North America*, 21(2), 163-179.
- Smith, J. R. (2012). Comforting touch in the very preterm hospitalized infant: an integrative review. *Advances in Neonatal Care*, 12(6), 349-365. doi: 10.1097/ANC.0b013e31826093ee
- Sweeney, J. K., & Gutierrez, T. (2002). Musculoskeletal implications of preterm infant positioning in the NICU. *Journal of Perinatal & Neonatal Nursing*, 16(1), 58-70.
- Trajkovski, S., Schmied, V., Vickers, M., & Jackson, D. (2012). Neonatal nurses' perspectives of family-centered care: A qualitative study. *Journal of Clinical Nursing*, 21(17-18), 2477-2487. doi: 10.1111/j.1365-2702.2012.04138.x
- Vasquez-Ruiz, S., Maya-Barrios, J. A., Torres-Narvaez, P., Vega-Martinez, B. R., Rojas-Granados, A., Escobar, C., & Angeles-Castellanos, M. (2014). A light/dark cycle in the NICU accelerates body weight gain and shortens time to discharge in preterm infants. *Early Human Development*, 40, 535-540.
- Vergara, E., Anzalone, M., Bigsby, R., Gorga, D., Holloway, E., Hunter, J., ... & Strzyzewski, S. (2006). Specialized knowledge and skills for occupational therapy practice in the neonatal intensive care unit. *American Journal of Occupational Therapy*, 60(6), 659-668.
- Vohr, B. R., Poindexter, B. B., Dusick, A. M., McKinley, L. T., Wright, L. L., Langer, J. C., & Poole, K. (2006). Beneficial effects of breast milk in the neonatal intensive care unit on the developmental outcome of extremely low birth weight infants at 18 months age. *Journal of the American Academy of Pediatrics*, 118(1).
- Wachman, E. M., & Lahav, A. (2011). The effects of noise on preterm infants in the NICU. *Archives of Disease in Childhood. Fetal and Neonatal Edition*, 96, 305-309.

- Waitzman, K. A. (2007). The importance of positioning the near-term infant for sleep, play, and development. *Newborn and Infant Nursing Reviews*, 7(2), 76-81.
- Wellington, A., & Perlman, J. M. (2015). Infant-driven feeding in premature infants: A quality improvement project. *Archives of Disease in Childhood. Fetal and Neonatal Edition*, 100(6), 495-500. doi: 10.1136/archdischild-2015-308296
- World Health Organization. (2017, November 17). Care of the preterm and low-birth-weight newborn. Retrieved from [http://www.who.int/maternal\\_child\\_adolescent/newborns/prematurity/en/](http://www.who.int/maternal_child_adolescent/newborns/prematurity/en/)

## Appendix A

**Developmental Care Pre-Test Survey**

Thank you for taking this pre-test survey and signing up for a Positioning Session!  
We appreciate your time!

\* Required

1. Email address \*

2. Name \*

3. Developmental care is an overall approach to infants, including the environment around them and our interactions with them that are dependent upon their gestational age only. \*

Mark only one oval.

- ☐ True  
☐ False

4. The earlier an infant is born, the more vulnerable its central nervous system is, and the more crucial it is to invoke effective and consistent developmentally supportive and neuro-protective care. Select the interventions that are congruent with developmentally supportive and neuro-protective care. \*

Mark only one oval.

- ☐ Healing Environment  
☐ Supportive positioning and Developmental Handling  
☐ Safe Sleep Protocol  
☐ Infant-Driven Feeding  
☐ Kangaroo Care  
☐ All of the above

5. If an infant is appropriate for cycled lighting, during the hours of 2:00 - 5:00 PM, the light in an infant's room should be set to which parameter: \*

Mark only one oval.

- ☐ Daylight - isolette cover off, lights on in room, window blinds open  
☐ Dim Light - lights dim, dim shade pulled  
☐ Dark Light - isolette cover on, lights off  
☐ Midday Light - isolette cover off, lights off, window blinds open

6. Cycled lighting is applicable for which of the following recently admitted infants? \*

Mark only one oval.

- ☐ 34-week baby boy who is IDM  
☐ 37-week baby girl with NAS  
☐ 31-week baby boy in an isolette  
☐ 35-week baby girl on a ventilator

7. The American Academy of Pediatrics (1997) recommends that sound levels in the room of an infant in a NICU remain under 45 decibels. Which of the following is under the recommended sound level? \*

Mark only one oval.

- ☐ Normal conversation  
☐ Telephone ringing  
☐ Whisper  
☐ Power mower





8. The goal of infant-driven feeding is to ensure a positive, quality-driven feeding experience in hopes of achieving full oral nutrition in a safe and pleasurable way. \*

Mark only one oval.

- ☐ True  
☐ False

9. Which of the following infants meet the feeding readiness criteria to PO feed? \*

Mark only one oval.

- ☐ A 37-week-old baby girl who is IDM, rarely wakes up or cues hunger, and is occasionally tachypnic at rest.  
☐ A 36-week-old baby boy with NAS, has fair coordination of NNS, and wakes every three to four hours  
☐ A 35-week-old baby boy who was recently weaned from Vapotherm, has stridor sounds, and is unable to maintain a flexed and midline position  
☐ A 33-week-old baby girl, has hyperbilirubinemia on lights, and is SGA

10. Which of the following is NOT a recommendation of Safe Sleep? \*

Mark only one oval.

- ☐ Infants older than 36 weeks should be placed on their backs to sleep  
☐ Infants should only sleep in a crib or bassinet  
☐ Infants should sleep on their backs for the first year of life  
☐ Infants should have nothing in their crib besides a blanket or small toy

11. The goals of Developmental Positioning include... \*

Mark only one oval.

- ☐ Flexion, Alignment, Asymmetry, and Proper head positioning  
☐ Flexion, Alignment, Containment, and Comfort  
☐ Flexion, Extension, Asymmetry, and Comfort  
☐ Alignment, Containment, Extension, and Proper head positioning

12. Which of the following is an INCORRECT use of a positional aide? \*

Mark only one oval.



☐ A



☐ B



☐ C



☐ D

13. Which of the following is a CORRECT use of a positional aide? \*

Mark only one oval.



☐ A



☐ B



☐ C



☐ D

14. Which of the following is a contraindication to Kangaroo Care? \*

Mark only one oval.

- ☐ An infant is < 1500 grams
- ☐ An infant with supplemental oxygen such as Vapotherm or CPAP
- ☐ An infant that is medically unstable
- ☐ An infant with an IV in place

15. Infant massage with oil improves weight gain, enhances development, and is associated with shorter hospital stays. \*

Mark only one oval.

- ☐ True
- ☐ False

16. Family centered care as a paradigm, consisting of unrestricted parental presence in the NICU, parental involvement in infant caregiving, and open communication with parents has been shown to: \*

Mark only one oval.

- ☐ Decrease length of stay
- ☐ Enhance parent infant attachment & bonding
- ☐ Improve well-being of preterm infants
- ☐ Support better mental health outcomes
- ☐ Promote greater patient and family satisfaction
- ☐ All of the above

### Sign-Up for Positioning Session (1-hour) Please choose 1 Session

Cammie from Dandle-Lion Medical will be here to train everyone on using the Dandle-Roo, Dandle-Wrap, and other products for developmentally supportive positioning! Each session has a limited number of spaces, so please attend the session you select. There will be a sign-in and sign-out sheet present at each session. You will be sent an email with the date, time, and location of the session you have selected. Thank you for your participation!

**17. Thursday April 19th***Mark only one oval.*

- ☐ Session 1 = 5:00 - 6:00 PM [2 Spots Available]
- ☐ Session 2 = 6:15 - 7:15 PM [5 Spots Available]

**18. Friday April 20th***Mark only one oval.*

- ☐ Session 1 = 11:00 AM - 12:00 PM [7 Spots Available]
- ☐ Session 2 = 12:15 - 1:15 PM [6 Spots Available]

**19. Saturday April 21st***Mark only one oval.*

- ☐ Session 1 = 8:00 - 9:00 AM [3 Spots Available]
- ☐ Session 2 = 9:15 - 10:15 AM [4 Spots Available]

**20. Sunday April 22nd***Mark only one oval.*

- ☐ Session 1 = 1:00 - 2:00 PM [9 Spots Available]
- ☐ Session 2 = 2:15 - 3:15 PM [10 Spots Available]

**21. If you are unable to attend any of the above sessions, there will be two additional sessions on Monday April 23rd that will be held by Teri. Please only choose these sessions if absolutely necessary.***Mark only one oval.*

- ☐ Session 1 = 7:30 - 8:30 AM [1 Spot Available]
- ☐ Session 2 = 5:00 - 6:00 PM [6 Spots Available]

## Appendix B

**Developmental Care Post-Test Survey**

1. Name

---

2. Date

---

*Example: December 15, 2012*

3. Employee ID Number

---

4. Pre-Test Survey Score

---

5. Post-Test Survey Score

---

6. Developmental care is an overall approach to infants, including the environment around them and our interactions with them that are dependent upon their gestational age only.

*Mark only one oval.*

- ☐ True  
☐ False

7. The earlier an infant is born, the more vulnerable its central nervous system is, and the more crucial it is to invoke effective and consistent developmentally supportive and neuro-protective care. Select the interventions that are congruent with developmentally supportive and neuro-protective care.

*Mark only one oval.*

- ☐ Healing Environment  
☐ Supportive Positioning and Development Handling  
☐ Safe Sleep Protocol  
☐ Infant-Driven Feeding  
☐ Kangaroo Care  
☐ All of the above

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*Mark only one oval.*

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☐ 35-week baby girl on a ventilator

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☐ Telephone ringing  
☐ Whisper  
☐ Power mower

11. The goal of infant-driven feeding is to ensure a positive, quality-driven feeding experience in hopes of achieving full oral nutrition in a safe and pleasurable way.

Mark only one oval.

- ☐ True  
☐ False

12. Which of the following infants meet the feeding readiness criteria to PO feed?

Mark only one oval.

- ☐ A 37-week-old baby girl who is IDM, rarely wakes up or cues hunger, and is occasionally tachypnic at rest.  
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Mark only one oval.

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Mark only one oval.

- ☐ Flexion, Alignment, Asymmetry, and Proper head positioning  
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☐ Flexion, Extension, Asymmetry, and Comfort  
☐ Alignment, Containment, Extension, and Proper head positioning

15. Which of the following is an **INCORRECT** use of a positional aide?  
Mark only one oval.



☐ A



☐ B



☐ C



☐ D

16. Which of the following is a **CORRECT** use of a positional aide?  
Mark only one oval.



☐ A



☐ B



☐ C



☐ D

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Mark only one oval.

- ☐ An infant is < 1500 grams
- ☐ An infant with supplemental oxygen such as Vapotherm or CPAP
- ☐ An infant that is medically unstable
- ☐ An infant with an IV in place

18. Infant massage with oil improves weight gain, enhances development, and is associated with shorter hospital stays.

Mark only one oval.

- ☐ True
- ☐ False

19. Family centered care as a paradigm, consisting of unrestricted parental presence in the NICU, parental involvement in infant caregiving, and open communication with parents has been shown to:

Mark only one oval.

- ☐ Decrease length of stay
- ☐ Enhance parent-infant attachment & bonding
- ☐ Improve well-being of preterm infants
- ☐ Support better mental health outcomes
- ☐ Promote greater patient and family satisfaction
- ☐ All of the above

#### Feedback on the Developmental Care Poster Session:

20. I gained knowledge on developmentally supportive care during this poster session.

Mark only one oval.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

21. Education provided during this poster session will improve standard of practice in the NICU.

Mark only one oval.

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly disagree

## Appendix C

## DEVELOPMENTAL CARE

The Neonatal Integrative Developmental Care Model aims to improve the care and experience infants receive while in the NICU by promoting neuro-protective, neuro-supportive, and family-centered care. Neuro-protective care incorporates strategies that prevent cell death and harm to the infant's developing central nervous system. Neuro-supportive care facilitates the continuation of typical infant development through proactive and purposeful strategies. Developmental care is the provision of individualized, developmentally appropriate care of the infant to maximize neurological development and reduce long-term cognitive and behavioral problems.

How to implement developmentally supportive care:

- Establish a healing environment through **Cycled Lighting** and **Noise Control**
- Partner with families to provide **Family-Centered Care**
- **Position and Handle** in a developmentally supportive manner
- Safeguard Sleep by implementing **Safe Sleep** Protocol
- Minimize stress and pain by creating a healing environment and encouraging parent participation in **Kangaroo Care** and **Infant Massage**
- Optimize nutrition through **Infant-Driven Feeding**

Family-Centered Care has been shown to decrease length of stay, enhance parent-infant attachment and bonding, improve well-being of preterm infants, support better mental health outcomes, and promote greater patient and family satisfaction.

#### How to Implement Family-Centered Care:

- Allow family members to have an active role in planning, regulating, and implementing care
- Maintain family respect and dignity
- Transfer knowledge to family members in accordance with the family's level of education and with a variety of learning styles (verbal, written, demonstration)
- Encourage parent-infant interaction: breastfeeding, Kangaroo Care, diaper/clothing change, etc.



#### Understanding Infant Stress Cues can assist with ensuring Developmental Care

- |               |                 |                  |
|---------------|-----------------|------------------|
| o Gag/Spit Up | o Gasp          | o Salute         |
| o Hiccup      | o Tongue Thrust | o Fuss           |
| o Burp        | o Pass Gas      | o Stretch        |
| o Yawn        | o Gape Face     | o Arch           |
| o Sneeze      | o Eye Floating  | o Finger Splay   |
| o Frown       | o Gaze Aversion | o Airplane       |
| o Whimper     | o Grimace       | o Sitting on Air |

## CYCLED LIGHTING

Cycled lighting is the adjustment of lighting throughout the day to imitate a typical intra-uterine environment, with the goal of decreasing overstimulation of the infant's developing visual system. When implementing cycled lighting, the lights are on for approximately 12 hours with a three-hour period of lights down to encourage rest. After 12 hours, the lights are off and blinds are down.

Research suggests that cycled lighting promotes:

- Weight gain
- Stabilization of heart rate
- Maturation of behavioral state regulation
- Significant decrease in fussing and crying behavior

#### How to implement Cycled Lighting:

8:00 AM - 2:00 PM = Daylight (isolette cover off, lights on in room, window blinds open)

2:00 PM - 5:00 PM = Dim Light (lights dim in room, dim shades pulled)

5:00 PM - 8:00 PM = Daylight (isolette cover off, lights on in room, window blinds open)

8:00 PM - 8:00 AM = Dark Light (isolette cover on, lights off)

DIM LIGHT



DAYLIGHT



DARK LIGHT



#### Who is appropriate for Cycled Lighting?

- Infants who are medically stable
- Infants 32 weeks and older

#### Who is NOT appropriate for Cycled Lighting?

- Infants who are NOT medically stable
- Infants younger than 32 weeks
- Infants who are on a ventilator
- Infants with NAS until properly medicated and/or signs and symptoms are at a minimum



## NOISE & SOUND CONTROL

Auditory overstimulation of the infant can impair the development of their immature auditory system and may contribute to the development of language and attention disorders. A functional vestibular system completes formation at approximately 25-29 weeks gestation and the hair cells of the ear can lose their sensitivity to pitch if exposed to sound levels of 60 decibels (dBA) or greater. Preterm infants typically have decreased autonomic and self-regulatory control due to their immaturity, which is why loud sounds and higher frequencies can affect their physiological stability. More specifically, those noises can increase the stress on the infant, which causes an increase in metabolic rate, thus expending calories that they need for optimal growth.

**The American Academy of Pediatrics recommends that sound levels in the room of an infant in a NICU remain under 45 dBA.**

- o 20-30 dBA is the very quiet noise of a whisper
- o 40 dBA is the quiet noise in a typical home
- o 53 dBA is the noise inside a room with a radio on
- o 60 dBA is the moderate noise of a normal conversation
- o 73 dBA is the sound level of a cardiorespiratory alarm
- o 83 dBA is the sound level of a telephone ringing

**Inside an incubator, less than 30 dBA is required for maintaining a sleep state, which is necessary for growth.**

- o 59 dBA is the sound level when the cardiorespiratory alarms go off
- o 73 dBA is the sound level of closing portholes of an incubator



Exposure to appropriate levels of voice, music, and meaningful sounds between 30 to 40 weeks gestation is needed for continued development of the auditory system. Music can be used for infant neurological development or soothing.

Quiet talking, singing, reading, and music is appropriate for infants that are:

- 32 weeks and older
- Medically stable
- Neurologically healthy

## SAFE SLEEP

Sleep is a time for brain growth and premature infants require this time for the development of neurological pathways. Sleep deprivation can affect behavior and brain function in the long-term because of a reduction in brain plasticity. Therefore, it is important that infants are not awakened unless necessary. All infants 36 weeks and older should be placed on their backs to sleep unless otherwise ordered by a physician.

### ABCs of Safe Sleep

- o Alone: Not with parents, without any soft objects or loose bedding in the crib
- o Back: Sleep on their backs until their first birthday
- o Crib: Sleep on a firm surface such as a safety approved crib or bassinet in their parents room for at least six months



### The American Academy of Pediatrics Recommendations for Infant Sleep Safety:

- Infants should sleep on their backs for all sleep times, including naps, until their 1<sup>st</sup> birthday
- If the infant falls asleep in a car seat, stroller, swing, or infant carrier, they should be moved into their crib or bassinet as soon as possible
- Infants should sleep on a firm sleep surface that meets the safety standards of the Consumer Product Safety Commission (CPSC) with a tightly fitted sheet
- Soft objects, loose bedding, or any objects that could increase the risk of entrapment, suffocation, or strangulation should be kept out of the infant's sleep area
- Infant's sleep area should be in the same room where parents sleep for the first 6 months – 1 year
- Infant's should only be brought into the parents' bed to feed or comfort and should be returned to their crib when the parent is ready to sleep
- Never place an infant to sleep on a couch, sofa, or armchair
- Bed-sharing is not recommended for any infants
- It is fine to swaddle the infant. Once the infant demonstrates learning to roll onto their side or back, keep arms out of swaddle or stop swaddling
- Try giving a pacifier at nap time and bedtime

## KANGAROO CARE

Kangaroo Care (KC) is defined by the World Health Organization as a method that involves early, continuous, and prolonged skin-to-skin contact between an infant and their mother or father. At birth, the tactile senses of the infant are the most developed of the sensory pathways, which correlates with the research that states KC can be significantly beneficial for an infant as well as their parent.

**Research suggests that KC (skin-to-skin) has many benefits, including:**

- Increasing autonomic functioning and enhancing cognitive development, executive functioning, organized sleep, and stress responses through 10 years of age
- Enhancing maternal attachment and infant-parent interactions
- Reducing maternal anxiety
- Decreasing infant infection rates, mortality, risk of sepsis, hypothermia, hypoglycemia, pain, and hospital readmission
- Improving cardiorespiratory and thermal stability
- Increasing duration of breastfeeding and milk production

### How to assist with Kangaroo Care:

1. Gather diaper, hat, blanket, recliner/rocker, footstool, gown or button down shirt for parent
2. Ensure parent understanding of kangaroo care/skin-to-skin and all questions are answered
3. If possible, perform any needed procedure that may later interrupt KC
4. Wash hands and have parents wash hands
5. Secure all tubes and lines
6. Set up rocker/recliner and privacy screen
7. Remove infant's clothing except diaper. If <1000g or is within 1 hour of birth, dress in diaper and hat. If >1000g and not within 1st hour of life, dress in diaper. Hat may produce over-warming of infant
8. Infant should be chest-to-chest, upright, and inclined at approximately 30-40 degrees horizontal with legs and arms in flexed position.
9. Blanket should be placed over infant once in the proper position
10. Check HR, RR, temperature, O2 saturations, and pain score before and 15 minutes after transfer
11. Initially, KC should be done for at least 1 hour for infant to achieve one full sleep cycle after the transfer



### Who is NOT appropriate for Kangaroo Care?

- Infant with a chest tube, intracardiac line, or arterial line
- Infant being actively weaned from a ventilator
- Infant having apnea and bradycardia that requires stimulation
- Infant who has had an acute deterioration within the past 24 hours
- Infant that is medically unstable

## INFANT-DRIVEN FEEDING

Preterm infants are at an increased risk for feeding difficulties due to possible poor suck, swallow, and breathe reflex coordination; autonomic instability; and less organized sleep-wake cycles.

Emphasis is placed on **quality of feeding** with an infant-driven feeding protocol, allowing the infant to determine when they feed and the amount they consume orally. The overall goal of PO feeding is to be an organized, coordinated, positive, comforting, safe, and pleasant experience that requires little to no intervention by the feeder.

**SES** = Is the swallow **SAFE**? Is the infant **EFFICIENT**? Is the amount **SUFFICIENT**?

Feeding Readiness Criteria			
Autonomic	Motor	State	Attention / Interaction
<ul style="list-style-type: none"> <li>• Steady breathing</li> <li>• Steady heart rate</li> <li>• Oxygen saturation well held</li> </ul>	<ul style="list-style-type: none"> <li>• Rooting</li> <li>• Hands to mouth</li> </ul>	<ul style="list-style-type: none"> <li>• Wakes on own</li> <li>• Maintains quiet alert state</li> </ul>	<ul style="list-style-type: none"> <li>• Engages with care – shifts gaze towards caregiver</li> </ul>
<ul style="list-style-type: none"> <li>• Breathing &lt;70 breaths/minute with care</li> </ul>	<ul style="list-style-type: none"> <li>• Sucking on hands and/or pacifier</li> </ul>	<ul style="list-style-type: none"> <li>• Wakes 50% of caregiving times</li> <li>• Stays awake 5-10 minutes</li> </ul>	<ul style="list-style-type: none"> <li>• Energy observed</li> </ul>
<ul style="list-style-type: none"> <li>• Breathing &lt;70 breaths/minute and oxygen saturation is in desired range with NNS</li> </ul>	<ul style="list-style-type: none"> <li>• Active tucking of arms and legs</li> </ul>		

### When is it NOT safe to PO feed?

- If Feeding Readiness Criteria has not been met
- Unstable medical condition
- Mechanical ventilation, Vapotherm, CPAP, BIPAP, chronic tachypnea, severe airway obstruction
- Poor secretion management or aversive behaviors to oral stimulation present
- Craniofacial dysmorphism

### Pre-Feeding Experiences to implement for the non-oral feeder:

- Skin-to-skin with parent
- Held by caregiver
- Bringing their hands to face and mouth
- Milk on cloth near baby to smell
- Nuzzling at pumped breast or NNS on pacifier
- Milk on pacifier or on infant's fingers with hands to mouth

### Diagnoses or Situations with potential difficulty to feed:

- Persistent tachypnea or other airway issues (ex. requires NC, stridor, required deep or multiple suctioning at delivery)
- If infant requires pump for NG feedings
- NAS infants (if have not been captured or having high scores)
- Infant with decreased tone (IDM; Trisomy 21)
- Premature infants, especially those born before 35 weeks
- Neurological deficits/findings
- If PO is pushed and/or many negative quality feeding behaviors have been documented

## INFANT MASSAGE

The skin is the largest organ in a human body and at birth, the tactile sense of an infant is the most developed sensory system. Reportedly 95% of touch experienced by an infant in a NICU is not intentionally comforting, which is why providing intervention for infant comfort is so important. To relieve some of the stress produced by the NICU environment, infant massage can be performed by a trained therapist, nurse, or parent.

**Research suggests many benefits to Infant Massage with oil, including:**

- Promoting weight gain
- Improving sleep-wake patterns
- Enhancing neuromotor development
- Facilitating parent-infant bonding
- Decreasing hospital length of stay



**How to implement Infant Massage:**

**Set Up:** Create a calm and healing environment by lowering lights and making sure the room is warm enough for the infant to be comfortable without clothes. If desired, quiet and soothing music can be on in the background. Wash hands and set up a clean, warm area for the massage. Remove infant's clothes, diaper, and blankets. Place the infant on their tummy, with arms and legs tucked under their body with their head turned to one side.

**Step 1:** With coconut oil (or another natural oil such as sunflower or grapeseed) on your hands, place one hand gently and firmly at the base of the infant's neck and the other hand on their bottom. Begin to move your hand from their neck slowly down to meet your hand at their bottom. Move your hand from their bottom to the base of their neck and continue gently and firmly stroking their back approximately 10-15 times.

**Step 2:** Turn the infant onto their side while keeping their head stable and their arms and legs close to their body. Place one hand on the infant's shoulder and the other holding their hand. Gently and firmly pull your hand down around their arm in a circular pattern all the way through their hand. Repeat 10-15 times.

**Step 3:** Place one hand on the infant's thigh/bottom and the other holding their foot. Gently and firmly bring your hand down around their leg in a circular pattern all the way over their foot. Repeat 10-15 times.

**Step 4:** With one hand still gently holding onto the infant's thigh/bottom, use your pointer finger and thumb to massage the infant's heel.

**Step 5:** Turn the infant onto their back and into one of your arms while keeping their head supported and their arms and legs close to their body. If the infant has not eaten within the last hour, massage their stomach in the following "I Love yoU" pattern: Place 2-3 fingers on the left side of the stomach under the rib cage, move your fingers in a downward progression toward the groin making the letter "I". Place your fingers on the right side under the rib cage and slowly glide them across to the other side as you then move them down towards the groin to make an upside-down "L". Place your fingers on the bottom right side of the stomach and make an upside-down "U" as you move your fingers up to the top of the stomach, across, and down towards the groin.

**Step 6:** Give the infant a clean diaper and clean clothes and swaddle them comfortably.