

## Proposal for Early Intervention in Premature Children in NICU

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**Received:** February 13, 2020; **Published:** March 14, 2020

### Abstract

Practices in the neonatal intensive care unit (NICU) that reduce infant stress and respond to behavioral cues positively influence developmental outcomes. Proactive developmental surveillance and timely introduction of early intervention services improve outcomes for premature infants. A model that emphasizes infant development and a continuum of care beginning in the NICU with transition to outpatient monitoring and provision of early intervention services is hypothesized to support the most optimal outcomes for premature infants.

**Keywords:** Neonatal Intensive Care Unit (NICU); Early Intervention; Premature Children

### Introduction

The development of the human brain is characterized by a significant extension in postnatal life and lasts much longer than in other mammals, including our closest relatives, chimpanzees, gorillas and orangutans. In humans, the synaptic density in the prefrontal cortex peaks at 3 years and 6 months at 10 years of age, in the auditory cortex at 5 months and 3 years and 6 months and in the primary visual cortex around 3 months old.

The analysis of gene expression has supported that synaptic growth and plasticity continue to increase in humans for at least the first decade. It seems reasonable to relate this continuous formation of postnatal synapses and the plastic molding of neuronal circuits in the brain with prolonged motor and cognitive development in infants, children and young adults compared to other species.

Development-centered care represents a new approach in the management of children in the neonatology units aimed at improving the neurological development of the newborn and promoting a better establishment of the bond with the family. Passive stimulation in the neonatal intensive care unit has been seen as insufficient: learning requires active participation. Since Donald Hebb presented his theory of the neural basis of learning, popularized as "what triggers, connects", it has been a fundamental idea that learning requires a coordinated activity in the neural circuits.

From a development perspective, this also relates to the notion that "successful" neural circuits, which produce an adequate model of the environment or proper behavior, survive, while eliminating less successful circuits. Early identification of babies with signs of neurodevelopmental disturbance is necessary.

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**Citation:** Alejandra Itzel Contreras Rivas and Gastón Eduardo Estudillo Jiménez. "Proposal for Early Intervention in Premature Children in NICU". *EC Paediatrics* 9.4 (2020): 60-64.

### Development

According to our knowledge of neuroplasticity and sensitive periods, it seems clear that early intervention should benefit babies with brain damage during development. However, from the large amount of literature on the subject, it is difficult to determine whether early intervention is effective or not. Several reasons for this can be proposed. As already mentioned, one is the question of defining "early". Another problem is that it is difficult to compare the studies, since innumerable diverse "early interventions" have been applied. Researchers have tried everything from teaching parents how to handle their premature baby, improving the father-baby relationship, staff with special education, physiotherapeutic approaches.

Practices in the neonatal intensive care unit (NICU) that reduce childhood stress and respond to behavioral signals positively influence developmental outcomes. Proactive development surveillance and timely introduction of early intervention services improve outcomes for premature babies. In this work, a model was carried out that emphasizes the development of children and the continuity of the care that begins in the NICU with the transition to outpatient monitoring and the provision of early intervention services to support the most optimal results for premature babies.

There are currently no interventions that address the rehabilitation of sensory function in the neonatal period, not forgetting that premature birth can precipitate maternal psychological morbidities. Secondary outcomes include sensory adaptation, tactile processing, speech sound differentiation, motor and language function, measured at the corrected gestational age of one and two years.

The attention of neurological alterations, as well as the intervention of the NICU is performed to improve the outcome of neurological development, includes: the design of the NICU, nursing routines, nursing care plans, pain management, methods feeding and, most importantly, encourage parental involvement with your NICU baby.

### Design of the NICU

The recognition that sensory stimulation can overwhelm premature newborns and increase physiological signs of stress led to attempts to reduce sensory information.

The most recent approaches judiciously add relaxing sensory information. Another important aspect to consider with this type of patients is their limited ability to organize their behavior and adapt to the environment. One of the most important environmental aspects facing premature or sick infants is the force of gravity.

The Neonatology Assistance Units must guarantee the control of the position of the newborn, in flexion, with adequate limb supports, facilitating the encounter with the midline, helping the child to be more organized and facilitating self-comfort. An environment as close as possible to the mother's womb should be provided to the newborn, in order to provide them with safety and comfort and help them to organize themselves. Likewise, these postural measures can reduce neonatal pain indirectly, by decreasing the amount of stimuli perceived by the neonate and which, due to its characteristics, cannot be rejected. Among the external stimuli that can overestimate the newborn, given its immaturity, there is also light and noise, whose perception was minimized while the child was inside the womb of his mother. Control and attenuation mechanisms of external stimuli, such as light and noise, must be established.

**Nursing routines:** Therapeutic touch, soft music, circadian cycles of light/dark and physical activity improve premature growth. Attention to child positioning and management affects physiological variables and joint mobility, and therefore functional motor skills. So, every neonatal intensive care unit should have a highly organized system of care for babies, that is, each intensive care unit is required to have a Neonatal Individualized Development Evaluation and Care Program.

### Pain management

There is sufficient data to state that, before 28 weeks of gestation, the fetus has developed the anatomical, neurophysiological and hormonal components necessary for pain perception. The pain negatively affects the development of the brain, so it is necessary to establish control measures, some of them already specified previously. Mechanisms should be established to reduce the stress and physiological reactions of the newborn to painful procedures: a) Non-pharmacological analgesia. b) Breastfeeding. c) Kangaroo care d) Containment of the newborn. Years ago it was thought that the inability of children to express their feelings and their pain meant their inability to experience and remember it. The number of painful procedures to which these patients are subjected (mainly invasive procedures), together with a lower pain threshold at a lower gestational age and negative consequences on brain development, make it essential to use tools that decrease this perception.

As well as the proper and correct use of narcotics when necessary, however always taking into account the consequences of sedation and dependence. Other analgesic and calming measures for infants with acute pain may be the application of gentle massage, the use of soft vocalizations, the establishment of eye contact and the use of pleasant odors.

### Feeding methods

Enteral feeding is the usual way of incorporating food into humans and involves the entire digestive system together with the contribution of other systems such as endocrine and nervous. From the nutritional point of view, enteral feeding allows obtaining energy to carry out all vital processes. It is the starting point of the transformation of a food into usable substances for the organism. In the initial stages of life, enteral feeding involves a series of processes that involve the newborn and the primary caregiver who provides the food: the mother. In special situations, infants admitted to the Neonatal Intensive Care Unit (NICU) are not in a clinical condition to feed by suction and there is a need to modify natural processes, incorporating other nutrition alternatives and involving other actors: nurses. From the complex interaction between the multiple aspects that imply nurturing a premature or sick infant, this chapter aims to specifically address the care of newborns with enteral feeding.

The first necessary condition for a newborn to feed is coordinated suck-swallowing. Although the sucking reflex is present from very early stages in fetal life, only around week 34, it reaches a degree of maturation consistent with efficient performance during feeding, which allows the intake, swallowing and breathing together without the presence of adverse events. Suction to the mother's breast favors physiological stability, given that it produces fewer alterations in heart rate, respiratory rate, oxygenation and fewer episodes of apnea and bradycardia than the use of a bottle 1 - 3. Suction plays a fundamental role in the implementation of the mechanisms of digestion, favoring the functionality of the digestive tract and optimizing multiple aspects of neonatal life, which exceed the diet, such as favoring aspects of neurodevelopment: self-regulation, development of orality and knowledge of the outside world.

### Parent involvement

The main challenge for NICUs remains the deprivation of parental rights. The opening of the units to the fathers and mothers, the involvement of the parents in the care of their children, the promotion of breastfeeding, observing better results in monitoring the development of the children who have remained entered into these units; However, much work is needed to identify and demonstrate the effectiveness of specific interventions and changes that humanize the NICU, encourage parental involvement, support child development and optimize the results of premature neurological development.

Kangaroo method care is recommended for all stable children older than 28 weeks or with birth weight greater than 600 g. Kangaroo care is considered an essential part of neonatal care. Whenever possible, skin contact with mother or father-child skin should occur immediately after birth or in the first hour of life of the newborn. The skin-to-skin contact of the neonate with their parents should be favored (minimum of one hour), especially in times of greatest need of the newborn, and specifically in a way that promotes breastfeeding.

Mother-kangaroo care basically consists of skin contact with early, continuous and prolonged skin between the mother and her child. These cares have multiple advantages, both for the RN and for the mother. Some of them are: a) Weight gain and increased physiological stability of the RN. b) Reduction of the response to acute pain of the NB, thus avoiding the unwanted effects that pain has on developing brains. c) Increased sleep period, being deeper and more stable. d) Promotes breastfeeding, increasing its duration and even the milk production of mothers. e) Reduction of nosocomial infections and the severity of diseases that may occur during the admission of premature children. f) Decrease in the level of anxiety and increase in the level of confidence of parents who have their children admitted to the NICU. g) Improvement of neonates' ties with their parents. However, keep in mind that infants are very vulnerable and fragile patients, especially when their birth has occurred prematurely or they are sick. For this reason, care should be taken at the time of manipulation, ensuring its stability beforehand, that is, that it does not present alterations of its vital signs or episodes of apnea. The following recommendation becomes especially important: 2. Have a written protocol on kangaroo mother care. It would be advisable for this protocol to include: a) criteria of birth weight and gestational age, b) the clinical conditions of the newborn that discourage the application of the kangaroo method, c) inform parents and family members about the kangaroo method and the guidelines and standards concrete of each unit, and d) the system that guarantees a safe transfer of the newborn to the arms of their parents for the performance of kangaroo care [1-16].

### Conclusion

Although systematic reviews have struggled to show lasting benefits from early intervention, this evidence is not sufficient to exclude the value of early intervention.

The main reasons for this are the lack of precision in the identification of newborns who need this type of intervention. Therefore, we propose a research agenda aimed at the large-scale identification of babies with early signs of alterations in neurodevelopment and evidence of early interventions of high intensity in which the infant actively participates from his stay in intensive care units.

### Annexes



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Volume 9 Issue 4 April 2020

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