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Review article

Neonatal family-centered care: evidence and practice models

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Although advances in neonatology have reduced the mortality rate of high-risk infants, sick newborns or premature infants undergo more intensive monitoring, painful procedures, and lengthy hospitalization, leading to prolonged separation from their parents. In recent decades, the importance of parent-infant closeness early in life has become more apparent, especially in preterm infants who are prone to neurodevelopmental deficits. There is an increasing body of evidence regarding the benefits of family-centered care (FCC) in neonatal intensive care units. Key aspects related to neonatal FCC include the parents' presence in the ward and their participation in infants' daily care and decision-making processes. In addition, an environment that supports a private and comfortable space for each family member and infant, such as a single-family room, should be provided. To successfully implement FCC in neonatal intensive care units, the culture of care and hospital policies should be changed to successfully implement FCC in neonatal intensive care units, and appropriate training for medical staff is also required.

Key words: Family-centered nursing, Newborn infant, Neonatal intensive care unit, Private room

Key message

- Concrete evidence exists of early parent-infant attachment supported by family-centered care (FCC) in the neonatal intensive care unit.
- FCC involves the parents' presence and participation in the infant's care and decision-making.
- A private and comfortable space should be provided. A single-family room is ideal; however, a quiet space with a recliner can be a good alternative.
- Care culture changes and staff training are required.

Introduction

Extensive knowledge already exists on the importance of early parent-infant attachment and how to support it through family-centered care (FCC) in neonatal intensive care units (NICUs).[1-4] Nonseparation of infants and parents has ethical and legal support by the United Nations Convention on the Rights of the Child from 1989, which states "The child ... shall have the right from birth to ... be cared for by his or her parents" in Article 7 and "Parties shall ensure that a child shall not be separated from his or her parents against their will" in Article 9.[5] The American Academy of Pediatrics adopted a list of recommendations to emphasize FCC since 2003[6] and has extended the responsibilities of the health care professionals to ensure implementation of FCC in practice since 2012 (Table 1).[7] According to the European Association for Children in Hospital charter, "Children and young people in hospitals and other healthcare services shall have the right to have their parents or parent substitutes with them anytime, anywhere, any place, 24-hours a day, regardless of the age of the child or young person" in Article 2.[8] However, few NICUs in Korea put the FCC policy in their daily practice.

FCC is a philosophy or paradigm of care that is defined as comprehensive and holistic care of patients and their families with an emphasis on family participation, respect for families' preferences, needs, and differences, as well as transparent communication and knowledge sharing.[9] With respect to high-risk infant hospitalization, the development of FCC models has extensively supported parent-infant closeness during the past 40 years, in which hospital care for infants was executed in mutual relationships. This review summarizes evidence supporting FCC and practice models that promote its implementation in NICUs.

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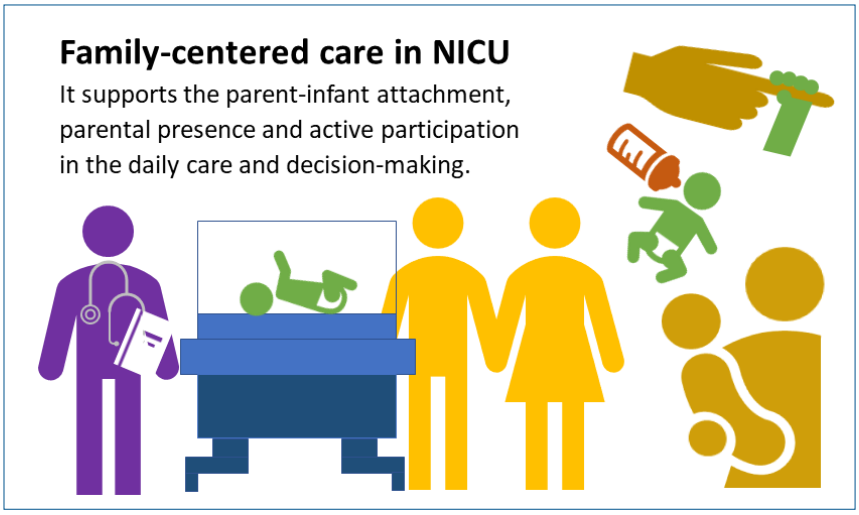

Graphical abstract. NICU, neonatal intensive care units.

Table 1. Policy statement regarding family-centered care by American Academy of Pediatrics, 2012[7]

Value	Statement
Attitude	1. Pediatricians should ensure that true collaborative relationships with families. 2. Pediatricians should unequivocally convey respect for families' unique insights into the care plan.
Collaboration	3. Conducting attending physician rounds in the patient's rooms with nursing staff and the family present should be standard practice. 4. Parents should be offered the option to be present with their child during medical procedures and offered support before, during and after the procedure. 8. Pediatricians should share medical information with families in ways that are useful and affirming.
Administrative	5. Pediatricians should advocate for improved employer recognition of the importance of family presence during hospitalization. 13. The design of health care facilities should promote the philosophy of family-centered care, such as including single-room care, family sleeping areas, and availability of kitchen and laundry areas and other areas supportive of families.
Education/study	14. Education and training in family-centered care should be provided to all trainees, students and residents as well as all staff members. 16. Pediatricians should advocate for and participate in research on outcomes and implementation of family-centered care in all venues of care.
Cost	17. Payment for time spent with the family should be appropriate and paid to pediatricians without undue administrative complexities.

Parent-infant closeness

1. Neurobiology of parent-infant closeness

The primary function of early caregiver recognition and attachment is ensuring newborn infant closeness and survival.[10] The newly born infants experience a burst of norepinephrine during the birth process that facilitates learning their mother's odor and approaching their mothers.[10,11] In addition, many hormonal and neurotransmitter mechanisms have been developed to draw parents and their babies into close proximity and emotional closeness with each other.[11,12] Therefore, disturbances in these regulations may have various effects on the infant's cognitive and emotional development.[10] Nurtured attachment from parents plays an important role in the infant's stress regulation.[13]

Oxytocin is a well-known hormone that plays an important role in the formation of a close mother-infant relationship. A great amount of oxytocin is secreted in pulsatile releases at birth.[14] The mother's closeness and caring actions after birth increase this pulsatile secretion of oxytocin.[14] Oxytocin is known to enhance hypothalamus-pituitary-adrenal axis function to regulate the infant's fear and stress behaviors.[15] Early sensory functions affect which part of the brain undergoes enhancement of the oxytocin "pathway" and how the brain reacts during human interactions later in life.[15]

Dopamine is another well-known neurotransmitter involved in fundamental bonding. Dopamine-producing neurons are close to oxytocin receptor neurons in the striatum and ventral tegmentum, enabling oxytocin bursts produced by closeness and caretaking actions to activate the brain's reward processes.[16] Through complicated neural networks and integration mechanisms, the oxytocin and dopamine systems participate in and perform many different actions and influences, including the neuromodulation of social behavior, stress regulation, and associative learning.[14-16]

2. Infant's developing brain

During the third trimester, the fetal brain grows fourfold, accompanied by a marked increase in brain surface area, resulting in the emergence of sulci and gyri.[17] While

significant changes occur in a very short period of time, many neuronal connections develop by the mid-gestation, for which environmental factors are essential.[17,18] The most important neural pathways, the thalamocortical and corticothalamic, are involved in sensorimotor information.[18] Thalamocortical pathways relay sensory and motor information from sensory receptors in the body through the thalamus to the sensorimotor area of the neocortex; the corticothalamic pathway transmits information generated in the cortex back to the thalamus.[17,18] Because these essential pathways develop from 26 weeks of gestation,[18] preterm infants are at high risk for motor, cognitive, and behavioral deficits that become evident in childhood.[19]

The NICU environment exposed to preterm infants, including bright lights, high levels of noise, and frequent noxious interventions, may have detrimental effects on the immature brain that alter its subsequent development.[20,21] Imaging studies reported that preterm infants have smaller cortical surface areas and lower volumes of gray matter, white matter, basal ganglia, and cerebellum than term infants.[22–24] A functional magnetic resonance imaging study showed that the most extensively affected brain areas in premature infants were short-range connections in the frontal, parietal, and occipital regions, which are linked to cognitive efficiency, social cognition, emotion, and language development.[19]

The earliest noted fetal sensory response involves the movement of the extremities, head, or mouth or changes in heart rate in response to external stimulation by 21–23 weeks of gestation.[25] This early development of tactile sense suggests the importance of skin-to-skin contact (SSC) in parent-infant closeness among preterm infants during NICU hospitalization. Moreover, the sense of taste develops by 16–18 weeks of gestation, while the olfactory sense develops by 28–32 weeks.[26,27] SSC is now a proven primary recommended care practice that has clear positive effects for both parents and infants.[3,28] Moreover, a parent's presence is a prerequisite for SSC and any other forms of physical parent-infant closeness.

Parent participation in infant care

1. Parental role in FCC

The first primitive model of FCC and its effectiveness in the care of preterm infants was introduced in the mid-1980s in response to medical staff and equipment shortages.[29,30] As increasing numbers of reports on the positive effects of physical closeness between parents and infants, many Western countries started loosening the visitation restrictions for parents from the late 1990s to the early 2000s.[31] The parent's presence can be supported by the creation of a meaningful role for them in the care of their infant during hospitalization.[32] Nowadays, in most Western NICUs, parents actively care for their infants by providing SCC, taking parts in their infant's pain management, managing the infant's daily care routines, and participating in medical decision-making, thus being an important part of the care team.[33,34]

The term FCC has been used to represent various family-focused and -partnered care models. The components of a neonatal FCC model are imprecisely defined, presenting a challenge when evaluating research on FCC.[35] A fundamental aspect of FCC in the NICU context is that the infant should never be cared for without considering the whole family and partnership with the parents. Families are acknowledged as integral members of the care team and considered the primary decision-makers for their infants.[36] In 2005, the European Science Foundation suggested 8 principles for neonatal FCC (Table 2), and a more recent study announced that the implementation of these principles does not require additional research due to the concrete body of evidence.[37]

Beyond understanding the principles of care, implementing FCC knowledge in everyday practice and guiding parents to participate in neonatal care is challenging. Many different FCC intervention models have been developed and studied that benefit infant development (Table 3). In particular, the Infant Behavioral Assessment and Intervention Program, Mother Infant Transaction Program, and

Table 2. Eight principles of neonatal family-centered care[37]

No.	Standard	Nature of evidences	Examples for NICUs of Korea
1	Free 24 hours a day parental access with no limitations due to staff shift or medical round	Human rights, policy statements	Step-by-step expansion of visitation time, eventually unlimited parental visitation
2	Psychological support for parents	Meta-analysis	Focused parental interviews with psychologists
3	Neonatal pain management by parental holding	Meta-analysis	Parental bracing the infant during heel stick puncture
4	Controlling the quality of NICU environment (lighting and sound levels)	Meta-analysis	Use indirect lighting with a light regulator and noise decibel monitors
5	Neonatal postural support by parents	Meta-analysis	Educate parents how to hold, flex and calm the infant to a tucked position
6	Skin-to-skin contact	Meta-analysis	Kangaroo care from mother or father
7	Lactation and breastfeeding support for mothers	Meta-analysis	Lactation consultation to support mothers' breastfeeding
8	Neonatal sleep protection	Animal studies	Flexible feeding schedule depends on neonatal awakened states

NICU, neonatal intensive care unit.

Table 3. Summary of representative family-centered care practice model in the NICU setting

Practice model	To whom	Purpose	Who delivers	When/how long	Material	Origin	Year[a]
Infant Behavioral Assessment and Intervention Program[39]	Parents	To interact with their baby effectively and responsively, using natural observations	Trained interventionists	Home visits after discharge, monthly x 6–8	IBA tools	WA, USA	1989
Mother Infant Transaction Program[38]	Parents	To enhance interaction between more confident parents and their responsive infants	Intervention nurses	1 Hour daily for 7 days (after PMA 34 weeks) + 4 home visits after discharge (during the first 3 months)	Tutoring material	NY, USA	1990
Guided Participation[40]	Parents, less skilled nurses	To develop competencies in parenting	Nurse/expert practitioners	45 Minutes, weekly x 6	Problem-solving domains	WI, USA	1998
Parent Baby Interaction Program[4]	Parents	To enhance their observation ability and sensitivity to babies' cues	Research nurses	1 Hour, weekly up to 6 weeks after discharge	Program manual	Bristol, UK	1998
Creating Opportunities for Parent Empowerment (COPE)[41]	Parents	To understand their roles	COPE director or assistants	4 Phases	Education material (booklets)	NY, USA	2004
Family Nurture Intervention[43]	Parents	To provide calming nurturing activities and interactions to their baby	Trained nurture specialists	1 Hour, at least 4 sessions/wk	Calming cycle manual, baby front carrier	NY, USA	2012
Positive Parenting Program (triple P)[42]	Parents	To enhance parenting capacity	Trained triple P provider	2 Hours, x4 sessions	17 Parenting strategies	Brisbane, Australia	2013
Family Integrated Care (FICare)[44]	Parents, NICU Staff, hospital managers	To integrate families as partners in the NICU care team	Self-learning from tools and information provided at websites	Various depending the subjects (e.g., a 4-hour course for NICU staff)	FiCare Toolkit & e-resources	Toronto, Canada	2013
Close Collaboration with Parents[46]	NICU Staff	To improve staff skills in collaborating with parents and promote FCC	Trained mentors	4 Phases for 18 months	Bedside practice tools, e-learning	Turku, Finland	2014
Early Collaborative Intervention[45]	Parents	To develop an early parent infant interaction	NIDCAP-certified nurses	3 Sessions: within 72 hours after birth, within 48 hours before discharge, and when full-term	Hands-on guidance	Linköping, Sweden	2021

NICU, neonatal intensive care unit; IBA, infant behavioral assessment; PMA, postmenstrual age; FCC, family-centered care; NIDCAP, Newborn Individualized Developmental Care and Assessment Program.
[a]First published in a peer-reviewed journal.

Parent Baby Interaction Program aimed to help parents interpret their infants' behavioral cues and sensitize them to how their infants handle environmental information to enhance confident and coregulatory interactions.[4,38,39] The Guided Participation, Creating Opportunities for Parent Empowerment, and Positive Parenting Program are supporting parents to interpret their infants' cues and to enhance their parenting ability.[40-42] By using standardized information material, the parents are prepared by learning about infant behavior and reactions, and become informed about how they can support their infants in such situations. The Family Nurture Intervention and Family Integrated Care focus on integrating parents and family members as partners in the infant's care, including daily calming, nurturing, and interaction activities in NICUs.[43,44] Most recently, a Swedish group developed the Early Collaborative Intervention program to facilitate early parent-infant interactions that start within the first days of the infant's life.[45]

While most of these FCC models have focused on educating or supporting parents to enhance their coping skills and parenting capacity, the Close Collaboration with Parents (CCP) program developed in Finland aims to train NICU staff to improve their skills in collaboration with parents and promote FCC.[46] Historically, many NICUs have failed to recognize parents as partners, and parents have reported that they are insufficiently included in their infants' care.[46] To ensure FCC success, it is necessary to develop a new relationship with parents, including mutual respect, cooperation, and support for parents in every aspect of daily care among NICU staff. The implementation of FCC in NICUs requires new role definitions among healthcare professionals to involve parents more in their infants' care. In addition, informational support from doctors as well as nurses must be incorporated to make FCC successful. This educational intervention for neonatal staff succeeded in improving the quality of FCC and changed the care culture in NICUs throughout Finland.[47,48] In this regard, the CCP program has the potential to offer a breakthrough model in Korea for training healthcare teams to

facilitate communication and collaborative skills and support parental participation.[48]

2. Single-family room

The concept of individual rooms for NICU patients was first proposed in the early 1990s.[30] The rationale for building single-family rooms (SFRs) was to provide a calmer and more private environment for parents and their infants.[49] In the SFR, the infant is less frequently exposed to noise and artificial light from the NICU setting.[50] A more home-like and peaceful atmosphere for the family supports the 24-hour presence of parents, privacy for pumping and breastfeeding, and SSC.

SFRs have been shown to enhance not only enteral nutrition, breastfeeding, and growth, but also neurobehavioral function.[51] They also reduce infections, apnea, the risk of bronchopulmonary dysplasia, and length of hospitalization compared to open-bay units.[51-53] However, the greatest benefit is the development of a close parent-infant relationship and nurturing parental psychological well-being, which can improve preterm infants' long-term outcomes. Although concerns have been raised regarding infant safety and staff stress, studies have revealed that SFRs decrease adverse physiological events such as apnea, bradycardia, and desaturation.[54] Neonatal care in SFRs is also reportedly associated with lower stress and improved work satisfaction among nurses.[55] This might be related to the fact that they can focus more on their own professional role while letting parents perform infant care routines. Although the cost per incubator is reportedly greater in the SFR than open-bay model, the total cost of care was significantly reduced in an adjusted analysis that included admission variables, treatment variables, respiratory variables, and length of hospitalization.[56]

Beyond providing separate private spaces, the SFR model means that the infant and family should be major considerations in the design of the NICU architecture.[57] The SFR is generally equipped with an appropriate headwall for power, gas, and suction; an area for the incubator; and family accommodations such as a fold-out couch, bed, recliner, closet, a refrigerator for storing breastmilk or formula, a sink, and storage cabinets.[50] In addition, materials used for facilities should be selected to control the environment, such as sound-dampening walls and ceiling tiles that reduce ambient noise, as well as indirect overhead lights that can be fully regulated to meet the infant's needs.[50] Along with SFRs, space for families to congregate and interact with their own and other infants' family members also should be incorporated.[57] These may include a lounge, dining area, waiting area, and facilities for bathing, laundry, computer, and internet access.

Conclusion

The basis of the FCC is the recognition that newborn infants are human beings with their own right to be close to their parents despite being sick or born prematurely. In addition, as they have a rapidly growing, immature central nervous system, providing the best possible conditions through bonding and attachment between parents and infants is vital for the neonates' proper development and better outcomes. The key components of FCC are the presence of the parents in the ward and their participation in their infants' daily care and decision-making.

Until recently, most NICUs in Korea have been closed to the infants' families or parents, and the parents were merely passive visitors. In addition, Korea has a unique culture that separates the baby from the mother immediately after delivery to facilitate the mother's rest and recovery. This culture may have hindered the introduction of neonatal FCC in Korea. Changing the culture of care in NICUs is challenging. However, it is evident that a new paradigm empowering parents in infant care in the NICU is valuable. Considering these benefits, now, it's time to put FCC to standard practice in Korea for all sick infants in NICUs. In addition, adequate facilities providing private spaces for families and a hospital policy founded on a family-friendly approach should be included.[35] All such changes must be combined with staff training to enhance their skills to collaborate with parents in NICUs.

Footnotes

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