

Fragile Infant Forums for Implementation of IFCDC Standards: Insights from the 37th Annual Gravens Meeting

Joy V. Browne, Ph.D., PCNS, IMH-E



Background:

Medical and caregiving approaches have increased survival rates of young and vulnerable infants in neonatal intensive care units (NICUs), but neurologic, social, emotional, and behavioral outcomes continue to be of concern (1) even into adulthood (2-4). Developmental care practices were initiated early on to provide environmental protection and caregiving based on babies' perceived developmental needs and optimize developmental outcomes (5-7). Many programs, interventions, and environmental adaptations have been initiated to address the needs of babies and families in intensive care and to affect short-term developmental outcomes. (8-14).

Most developmental assessments in NICUs include growth, motor, neurologic, feeding, and behavioral organization and screening for parental stress and adaptation. Often, the emotional aspects of medically fragile infants in intensive care include reactivity to pain and stress and behavior such as self-soothing. As the baby grows, evaluations typically focus on cognitive, communication, and motor skills and academic performance (15, 16). Research now identifies the ability to engage in social relationships and to feel and react appropriately to emotional experiences as foundational to other areas of development. Studies of the brain that contribute to the understanding of emotion and affect are ongoing in older infants and are now emerging in research with preterm and medically vulnerable babies in intensive care.

Infant and Family-Centered Developmental Care Standards

Based on a significant increase in developmental and family interventions in the NICU, the Infant and Family-Centered Developmental Care (IFCDC) Consensus Panel has developed evidence-

based standards, competencies, and best practice guidelines for IFCDC. <https://nicudesign.nd.edu/nicu-care-standards/>.

The model developed by the panel includes "the baby as an effective communicator" (17), who needs an individualized understanding of and responsiveness to the baby's behavioral communication, including emotions and affective responsiveness. (Figure 1) A recent addition to the IFCDC model is the infusion of infant mental health (IMH) principles, including preventative and protective strategies to promote the baby's social and emotional development (18, 19). Support for early social and emotional development in the context of relationships is central to infant mental health (IMH).

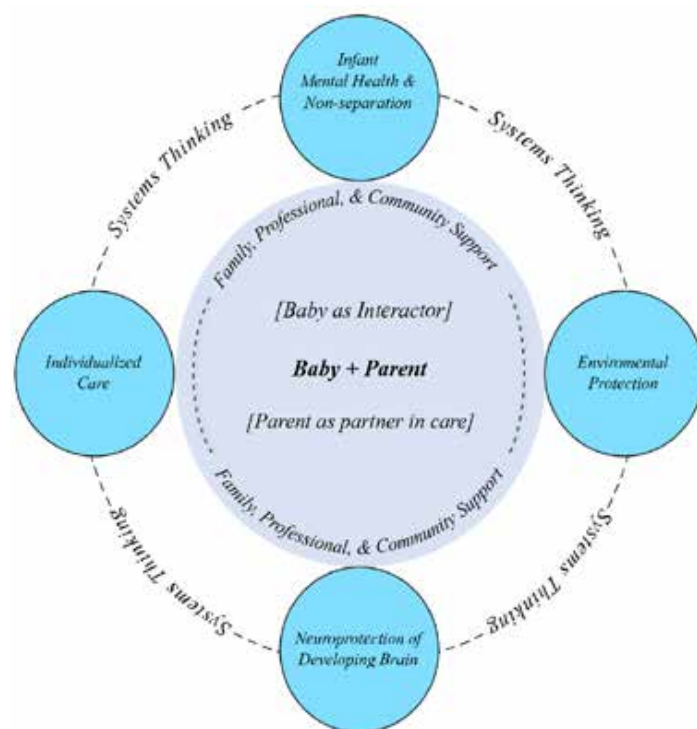


Figure 1 IFCDC Model 2024

Although many clinical approaches in the NICU look to the mental health needs of parents, IMH principles emphasize attention to the baby's ability to engage as an equal partner in relationships with their caregivers. "But what about the baby?" is a typical question asked in the context of IMH practice. In asking that question, attention is directed to the baby's behavioral communication, preferences, social bids, and emotional expression. The NIDCAP model (13, 20) provides extensive training in observation techniques to "interpret" the behavioral communication of the baby in order to provide "individualized and goal-inferred" caregiving. It uses systematic observation and interpretation of the baby's behavioral communication, *including affective expression*, to address the question, "What about the baby?" Caregiving is then guided by the baby's indicated needs and the parent's preferences.

“Although many clinical approaches in the NICU look to the mental health needs of parents, IMH principles emphasize attention to the baby’s ability to engage as an equal partner in relationships with their caregivers. ‘But what about the baby?’ is a typical question asked in the context of IMH practice. In asking that question, attention is directed to the baby’s behavioral communication, preferences, social bids, and emotional expression.”

Insights from the Gravens Annual Meeting 2024: The baby’s social and emotional development

The IFCDC field has benefitted from research on the impact of the environment of care on structural change, neuronal connectivity, and sensory influences on brain organization and maturation. Brain imaging techniques continue to reveal how babies’ brains develop and can inform clinical intervention. Several speakers at the 37th Annual Gravens meeting (March 2024) provided insights into how the newborn brain develops in the environment of the NICU. Dr. Elizabeth Rogers reminded us that “All Care is Brain Care” and offered strategies for implementing clinical practices related to brain protection (21).

Striking findings presented by other Gravens speakers indicate that care practices play a role in areas of the brain that are important for emotional development. Dr. Petra Huppi and her team have studied the influence of maternal voice and music on the preterm brain (22-24). They have found that specific elements of the caregiving environment significantly influence areas responsible for emotional and affect development. Dr. Nathalie Maitre and her team provided research indicating that infant-directed speech, particularly by the mother, plays a role in developing emotional areas in the brain (25, 26). Dr. Jeff Alberts described a new understanding of tactile communications networks, including two kinds of touch with separable neural pathways. Discriminative touch is the area typically used to describe tactile perception and understanding. However, another type of touch is sensed through the other neural pathways. Both individuals perceive affective touch in socially and emotionally rich physical interactions (27-29).

“Striking findings presented by other Gravens speakers indicate that care practices play a role in areas of the brain that are important for emotional development.”

Gravens speakers provided new ways of thinking about babies’ care to support their emotional development. Attention to understanding the baby’s affective experience, including their attempts to attend socially, can provide for rich emotional exchange and lay a foundation for optimal social and emotional development. Asking the question, “What is the experience of the baby?” should

be included in each interaction as babies have individual communication, needs, temperament, development, and emotional expressiveness.

Non-separation of the baby and parent, including skin-to-skin care opportunities, infers emotional advantages for both. Welch and colleagues have designed an approach that facilitates the emotional connectedness of mothers and babies during skin-to-skin care (14, 30). Their studies have revealed significant positive outcomes for the mother’s mental health and the baby’s development (31-33).

Although not reported at the 2024 Gravens conference, recent research into neurohormonal responsiveness during caregiving relates to this discussion. It sheds light on the biophysiological exchanges between parents and their babies that enhance bidirectional emotional responsiveness. Mounting evidence for the importance of early emotional development supports the need for caregiving to be sensitive to both babies’ and parents’ emotional needs (34-36). Hopefully, future studies will further prove the importance of emotional and affective brain and behavioral development.

“The implications for caring for babies’ emotional development in intensive care are significant and should help to expand thinking about how infant developmental and family-centered care is provided.”

The implications for caring for babies’ emotional development in intensive care are significant and should help to expand thinking about how infant developmental and family-centered care is provided. It adds a new dimension to our work with babies and is consistent with both IMH principles as well as the IFCDC model, including the understanding that:

1. There are emotional and affective regions of the baby’s developing brain that are sensitive to their environment of care and could impact later developmental outcomes.
2. Babies respond to infant-directed speech, which has implications for emotional and social recognition and relationships.
3. Babies respond preferentially to their mother’s infant-directed speech
4. The kinds of touch provided to the baby during caregiving communicate emotional and social information as well as sensory perception, which are essential for the baby’s development.
5. Babies effectively receive emotional input and can communicate their emotional responsiveness in behavioral interactions.
6. In addition to cognitive, motor, and communication development, the foundation for later social and emotional development is likely influenced by the early NICU environment of care.
7. Babies need constant and familiar physical closeness and intimate interactions with their parents in order to support attachment relationships and further their emotional and affective development.
8. Professional caregivers may need additional training in interpreting the behavioral communication of babies in order to interpret the affective and emotional expressiveness of the baby.
9. Parents may need support to understand and respond to the affective behavioral communication of their baby.

Conclusion:

Emerging evidence for emotional and affective brain and behavioral organization indicates that intensive care for babies should include caregiving interactions that enhance bi-directional emotional exchange. The IFCDC model aims to infuse infant mental health perspectives into all standards and competencies to promote social and emotional well-being. Parents should be encouraged to engage in social touch and affective infant-directed speech. Opportunities for close physical contact can facilitate those exchanges. Professional staff should recognize the baby's individual communication during caregiving, including emotional expression, and provide vocal and handling communication that includes affective richness. Intensive care that includes attention to the affective, emotional, and social environment of vulnerable babies will lay a foundation for the infant's long-term neurodevelopmental and mental health outcomes.

References:

1. Inder TE, Volpe JJ, Anderson PJ. Defining the Neurologic Consequences of Preterm Birth. *N Engl J Med*. 2023;389(5):441-53. doi: 10.1056/NEJMra2303347. PubMed PMID: 37530825.
2. Wolke D. Early term, preterm and post-term gestation births increase the risk of special educational needs during schooling. *Evid Based Ment Health*. 2010. doi: 10.1136/ebmh1120. PubMed PMID: 21109674.
3. Raju TN, Buist AS, Blaisdell CJ, Moxey-Mims M, Saigal S. Adults born preterm: a review of general health and system-specific outcomes. *Acta Paediatrica*. 2017;106(9):1409-37.
4. Breeman LD, Jaekel J, Baumann N, Bartmann P, Wolke D. Preterm Cognitive Function Into Adulthood. *Pediatrics*. 2015;136(3):415-23. Epub 20150810. doi: 10.1542/peds.2015-0608. PubMed PMID: 26260714.
5. Als H. Developmental care in the newborn intensive care unit. *Curr Opin Pediatr*. 1998;10(2):138-42. PubMed PMID: 9608890.
6. Als H. Reading the premature infant. In: Goldson E, editor. *Nurturing the premature infant : developmental interventions in the neonatal intensive care nursery*. New York: Oxford University Press; 1999. p. 18-85.
7. Graven SN, Bowen FW, Jr., Brooten D, Eaton A, Graven MN, Hack M, et al. The high-risk infant environment. Part 2. The role of caregiving and the social environment. *Journal of perinatology : official journal of the California Perinatal Association*. 1992;12(3):267-75. Epub 1992/09/11. PubMed PMID: 1432286.
8. Ahlqvist-Bjorkroth S, Lehtonen L. Gravens by design: Close collaboration with parents intervention improves family-centered closeness in neonatal intensive care units. *Neonatology Today*. 2023;18(11):66-70.
9. Franck L, O'Brien K. Greavens by Design: Family Integrated Care: an evidence-based and inclusive model for delivering on your NICU's commitment to family centered care. *Neonatology Today*. 2023;18(6):81-5.
10. Johnson L, Bartlett J, Nugent K. Gravens by design: The Newborn Behavioral Observations System to support early parent-infant relationships in the NICU. *Neonatology Today*. 2023;18(9):76-84.
11. Richter M, Kellner P, Pineda R. Gravens by design: Supporting and enhancing NICU sensory experiences program—an evidence-based guideline for daily parent delivered positive multisensory exposures for infants in the NICU. *Neonatology Today*. 2023;18(10):66-74.
12. Saigal S. Gravens by design: Global research on transition to adulthood after preterm birth: Proceedings of the Gravens conference. *Neonatology Today*. 2023;18(7):103-9.
13. Vittner D, Buehler D. Gravens by design: NIDCAP Nursery Program: Implementation of the NIDCAP model of care. *Neonatology Today*. 2023;18(8):70-8.
14. Welch M, Ludwig R, Hane A, Myers M. Gravens by design: Six weeks that changed the preterm infant's brain: Insights from the Family Nurture Intervention (FNI) randomized controlled trials. *Neonatology Today*. 2023;18(5):2160229.
15. Murray J, Palaiologou I. Young children's emotional experiences. *Early Child Development and Care*. 2018;188(7):875-8. doi: 10.1080/03004430.2018.1449839.
16. Tyng CM, Amin HU, Saad MNM, Malik AS. The Influences of Emotion on Learning and Memory. *Frontiers in Psychology*. 2017;8. doi: 10.3389/fpsyg.2017.01454.
17. Browne JV. Fragile Infant Forums for Implementation of IF-CDC Standards: The Baby as a Competent Interactor. *Neonatology Today*. 2023;18(3):66-72.
18. Three Zt. Definition of infant mental health [www.zerotothree.org]. Arlington, VA,: Zero to Three; 2001 [cited 2016 August 30, 2016].
19. Three Zt. Infant and early childhood Mental health [<https://www.zerotothree.org/espanol/infant-and-early-childhood-mental-health2020>] [August 26, 2020].
20. Als H, Brazelton TB. A new model of assessing the behavioral organization in preterm and fullterm infants: two case studies. *J Am Acad Child Psychiatry*. 1981;20(2):239-63. PubMed PMID: 7196421.
21. Liebowitz M, Kramer KP, Rogers EE. All Care is Brain Care: Neuro-Focused Quality Improvement in the Neonatal Intensive Care Unit. *Clinics in perinatology*. 2023;50(2):399-420. Epub 20230309. doi: 10.1016/j.clp.2023.01.004. PubMed PMID: 37201988.
22. Loukas S, Lordier L, Meskaldji DE, Filippa M, Sa de Almeida J, Van De Ville D, et al. Musical memories in newborns: A resting-state functional connectivity study. *Hum Brain Mapp*. 2022;43(2):647-64. Epub 20211105. doi: 10.1002/hbm.25677. PubMed PMID: 34738276; PubMed Central PMCID: PMC8720188.
23. Chorna O, Filippa M, De Almeida JS, Lordier L, Monaci MG, Hüppi P, et al. Neuroprocessing Mechanisms of Music during Fetal and Neonatal Development: A Role in Neuroplasticity and Neurodevelopment. *Neural Plast*. 2019;2019:3972918. Epub 20190320. doi: 10.1155/2019/3972918. PubMed PMID: 31015828; PubMed Central PMCID: PMC6446122.
24. Sa de Almeida J, Baud O, Fau S, Barcos-Munoz F, Courvoisier S, Lordier L, et al. Music impacts brain cortical microstructural maturation in very preterm infants: A longitudinal diffusion MR imaging study. *Dev Cogn Neurosci*. 2023;61:101254. Epub

20230511. doi: 10.1016/j.dcn.2023.101254. PubMed PMID: 37182337; PubMed Central PMCID: PMC6838998.

25. Richard C, Jeanvoine A, Stark AR, Hague K, Kjeldsen C, Maitre NL. Randomized Trial to Increase Speech Sound Differentiation in Infants Born Preterm. *J Pediatr*. 2022;241:103-8.e3. Epub 20211025. doi: 10.1016/j.jpeds.2021.10.035. PubMed PMID: 34710395.
26. Hamm EL, Chorna OD, Flanery A, Maitre NL. A parent-infant music therapy intervention to improve neurodevelopment after neonatal intensive care. *Acta Paediatr*. 2017;106(10):1703-4. Epub 20170725. doi: 10.1111/apa.13952. PubMed PMID: 28631850.
27. Jönsson EH, Kotilahti K, Heiskala J, Wasling HB, Olausson H, Croy I, et al. Affective and non-affective touch evoke differential brain responses in 2-month-old infants. *Neuroimage*. 2018;169:162-71. Epub 20171211. doi: 10.1016/j.neuroimage.2017.12.024. PubMed PMID: 29242105.
28. Manzotti A, Cerritelli F, Esteves JE, Lista G, Lombardi E, La Rocca S, et al. Dynamic touch reduces physiological arousal in preterm infants: A role for c-tactile afferents? *Dev Cogn Neurosci*. 2019;39:100703. Epub 20190821. doi: 10.1016/j.dcn.2019.100703. PubMed PMID: 31487608; PubMed Central PMCID: PMC6969366.
29. Manzotti A, Cerritelli F, Monzani E, Savioli L, Esteves JE, Lista G, et al. Dynamic touch induces autonomic changes in preterm infants as measured by changes in heart rate variability. *Brain Res*. 2023;1799:148169. Epub 20221121. doi: 10.1016/j.brainres.2022.148169. PubMed PMID: 36410429.
30. Welch MG, Hofer MA, Brunelli SA, Stark RI, Andrews HF, Austin J, et al. Family nurture intervention (FNI): methods and treatment protocol of a randomized controlled trial in the NICU. *BMC Pediatr*. 2012;12:14. doi: 10.1186/1471-2431-12-14. PubMed PMID: 22314029; PubMed Central PMCID: PMC3394087.
31. Welch MG, Barone JL, Porges SW, Hane AA, Kwon KY, Ludwig RJ, et al. Family nurture intervention in the NICU increases autonomic regulation in mothers and children at 4-5 years of age: Follow-up results from a randomized controlled trial. *PloS one*. 2020;15(8):e0236930. Epub 2020/08/05. doi: 10.1371/journal.pone.0236930. PubMed PMID: 32750063; PubMed Central PMCID: PMC7402490.
32. Welch MG, Firestein MR, Austin J, Hane AA, Stark RI, Hofer MA, et al. Family Nurture Intervention in the Neonatal Intensive Care Unit improves social-relatedness, attention, and neurodevelopment of preterm infants at 18 months in a randomized controlled trial. *Journal of child psychology and psychiatry, and allied disciplines*. 2015;56(11):1202-11. doi: 10.1111/jcpp.12405. PubMed PMID: 25763525.
33. Welch MG, Halperin MS, Austin J, Stark RI, Hofer MA, Hane AA, et al. Depression and anxiety symptoms of mothers of preterm infants are decreased at 4 months corrected age with Family Nurture Intervention in the NICU. *Arch Womens Ment Health*. 2016;19(1):51-61. doi: 10.1007/s00737-015-0502-7. PubMed PMID: 25724391.
34. Scatliffe N, Casavant S, Vittner D, Cong X. Oxytocin and early parent-infant interactions: A systematic review. *Int J*

Nurs Sci. 2019;6(4):445-53. Epub 20190912. doi: 10.1016/j.ijnss.2019.09.009. PubMed PMID: 31728399; PubMed Central PMCID: PMC6838998.

35. Vittner D, McGrath J, Robinson J, Lawhon G, Cusson R, Eisenfeld L, et al. Increase in Oxytocin From Skin-to-Skin Contact Enhances Development of Parent-Infant Relationship. *Biol Res Nurs*. 2018;20(1):54-62. Epub 20171011. doi: 10.1177/1099800417735633. PubMed PMID: 29017336.
36. Uvnas-Moberg K. Oxytocin may mediate the benefits of positive social interaction and emotions. *Psychoneuroendocrinology*. 1998;23(8):819-35. PubMed PMID: 9924739.

Disclosure: The author has no conflicts of interests to disclose.

NT

Corresponding Author



Joy Browne, Ph.D., PCNS, IMH-E(IV)
Clinical Professor of Pediatrics and Psychiatry
University of Colorado School of Medicine
Aurora, Colorado
Telephone: 303-875-0585
Email: Joy.browne@childrenscolorado.org

