Family Nurture Intervention Improves the Quality of Maternal Caregiving in the Neonatal Intensive Care Unit: Evidence from a Randomized Controlled Trial

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ABSTRACT: ***Objective:*** **This study assessed the impact of Family Nurture Intervention (FNI) on the quality of maternal caregiving behavior (MCB) while in the neonatal intensive care unit (NICU). FNI is a randomized controlled trial conducted in a high-acuity NICU to facilitate an emotional connection between mothers and their premature infants. FNI begins shortly after birth, continues until discharge, and involves mother/infant calming sessions that include scent cloth exchange, vocal soothing and emotion expression, eye contact, skin-to-skin and clothed holding, and family-based support sessions.** ***Methods:*** **Maternal caregiving behavior was coded during a single holding and feeding session (~30 min) in the NICU before discharge at approximately 36 weeks gestational age (GA). Sixty-five mothers and their premature infants (34 male, 31 female; 26–34 wk GA) were included in these analyses (FNI, n = 35; standard care [SC], n = 30).** ***Results:*** **Relative to mothers in the SC condition, those in the FNI group showed significantly higher quality MCB, which remained significant when controlling for birth order, twin status, maternal depression, and maternal anxiety.** ***Conclusion:*** **This is the first study to demonstrate that in-unit MCB can be enhanced by a hospital-based intervention. FNI provides a new rationale for integrating nurture-based interventions into standard NICU care.**

*(J Dev Behav Pediatr 36:*188–196, 2015) **Index terms:** NICU, intervention, maternal sensitivity, maternal care behavior.

The experience of birthing a healthy full-term infant is traditionally characterized by a nearly immediate onset of mother-infant dyadic interaction, including holding, face-to-face interaction, feeding, and soothing. Premature birth and the ecology of the neonatal intensive care unit (NICU) are significant departures from the normative postnatal environment, presenting monumental barriers to maternal care and hence the establishment of an emotional connection between mother and preterm infant. The violation of the expectancy of a normative birthing experience and the hospitalization of the infant are associated with feelings of grief, loss and maternal helplessness,[1] an elevated risk for anxiety disorders, including posttraumatic stress[2] and persistently high levels of parenting stress.[3] Relative to mothers of full-term infants, mothers of preterm infants are at heightened risk for postpartum depression,[4] which also persists after the infants' discharge.[5] The maternal experience of the NICU itself has been characterized by mothers as disempowering and turbulent.[6] Perhaps most importantly, premature birth and prolonged hospitalization disrupt the stimulation of hormones in both mother and infant, which are critical for the establishment of emotional coregulation and adaptive maternal behavior.[7]

The experience of the NICU represents an interruption of normal development for the preterm infant as well. The complex evolved developmental facilitation normally provided by the intrauterine environment has been withdrawn and replaced by an unnatural sensory surround punctuated by episodes of overwhelming stimulation[8] and painful medical procedures,[9] a set of developmental challenges known to be associated with later neurological changes in the developing infant's brain.[8] During the course of hospitalization, the physiological processes that serve to regulate healthy responses to stress become progressively more dysregulated in preterm infants.[10] Relative to individuals born at full-term, those born prematurely are at elevated risk for the development of autism[11] and other global developmental delays in early childhood[12]; decreased ability to regulate emotions and positive peer play in early childhood[13]; attention deficits and learning difficulties in childhood[14–16]; and difficulties processing emotions in adolescence.[17]

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Received October 2014; accepted January 2015.

Supported by the Einhorn Family Charitable Trust and the Fleur Fairman Family, and Columbia University's CTSA from NCRR/NIH (UL1RR024156).

Disclosure: The authors declare no conflict of interest.

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The acute stress of preterm birth and subsequent prolonged hospitalization places tremendous stress on the mother-infant dyad. Compromised opportunity for a normal mother-infant interaction is perhaps the most salient and fundamental challenge that occurs after premature birth. The quality of maternal care of fragile infants can be further compromised when the infant is not the first born[18] or is one of a twin pair.[19] Maternal depression and anxiety further degrade the quality of mother-infant interaction in preterm infants.[20]

Several intervention studies have focused on improving the quality of interactions between mothers and their preterm infants.[21–23] Collectively, this work shows that intervening during the course of hospitalization or shortly after discharge is associated with improved mother-infant interactions. One study found that increasing sensorimotor stimulation during hospitalization was associated with improved dyadic interactions specifically during feeding before discharge.[23] However, to date, there are no randomized controlled trials of NICU-based interventions assessing global maternal sensitivity during the course of mother-infant interactions while in the NICU. This Family Nurture Intervention (FNI) study examines the quality of maternal sensitivity as assessed by the coding of maternal care behavior (MCB) at gestational age (GA) of 36 weeks in the NICU. Maternal behavior was recorded in the curtained-off pod of the infant's crib and includes a period of maternal holding, followed by a period of maternal bottle feeding.

Rodent models have demonstrated that various components of maternal care promote homeostasis in offspring, including autonomic, thermo, and behavioral regulation.[24] As well, rodent models have demonstrated that early-occurring variation in maternal care is associated with epigenetic changes to the development of the stress response system in adult offspring.[25] In humans, maternal sensitivity during early routine care tasks has shown parallel effects. Maternal insensitivity during early care is associated with behavioral, neuroendocrine, and neurological markers of heightened stress reactivity.[26,27] Such effects persist in humans in their early childhood and affect the quality of social interactions with peers and adults.[28]

Hence, enhancing the quality of maternal care, as early as possible, should serve a clear benefit for mothers and their premature infants. Facilitating emotional coregulation may serve as the foundation for sensitive care before discharge in the context of the ongoing stress of the NICU. It may also serve to buffer against the development of dysregulated stress responses and social-emotional deficits in premature infants and attenuate feelings of helplessness, depression, and anxiety in mothers.

Rationale

Family Nurture Intervention is significantly different from current nurture-based NICU interventions in rationale and overall goals. Our working hypothesis is that socially isolated infants in the NICU are being adversely conditioned by human caretaker interactions, because they are often associated with necessary but unpleasant and painful procedures. Such early adverse conditioning can result in maladaptive responses to social engagement, including with the mother.[29] The theory behind our approach is that FNI offsets the adverse effects of the NICU experience through positive conditioning experiences with the mother. FNI was designed to accomplish this goal by establishing emotional connection and communication between mother and infant by means of repeated experiences with a Calming Cycle routine.[30]

Family Nurture Intervention

Establishing an emotional connection and a Calming Cycle routine between the mother and her premature infant are the central goals of the FNI program in the NICU. FNI provides mothers with regular intensive calming sessions with a nurture specialist throughout the duration of hospitalization (~6 hr/wk). During these calming sessions, nurture specialists facilitate an emotional connection between mother and infant through scent cloth exchange; maternal vocalization, sustained eye contact, frequent and consistent skin-to-skin and clothed holding; and family-based support sessions.[30,31] The intervention begins as soon as possible after birth and continues until discharge.

In the early phases of the intervention, when the infant is still confined to an incubator, the mother-infant connection is repeatedly fostered by FNI calming session activities. When the infant's health improves sufficiently to permit interaction outside the incubator, the mother continues to work with the nurture specialist on an individualized and regular basis (average 3.5 times per wk) during calming sessions focused on emotional communication with her infant.[30,32] This multifaceted intervention hypothetically engages "hidden regulators" embedded within maternal care.[24]

Family Nurture Intervention has been found to be safe and feasible[32] and to increase frontal brain activity during sleep at term age (i.e., ~40 wk postmenstrual age).[33] We have also found that depression and anxiety symptoms are decreased at 4 months corrected age in mothers of preterm infants who participated in the FNI trial.[34]

To evaluate the efficacy of FNI on in-unit MCB, we scored holding and feeding interactions that took place in the NICU at 36 weeks GA. Here, we tested the specific hypothesis that FNI increases quality of MCB during holding and feeding interactions close to discharge at 36 weeks GA. Given the associations between maternal depression and anxiety and quality of mother-infant interactions; as well as associations between maternal experience with older children and twins and quality of mother-infant interactions, we examined whether or not effects of FNI on MCB occurred independently of self-reported maternal depression and/or anxiety, birth order, and twin status and whether or not these factors moderated the effects of the intervention on MCB. We also tested whether the effects of FNI on MCB might be mediated by changes in skin-to-skin care, clothed

holding, breastfeeding, or the amount of feeding with pumped breast milk.

METHODS

Study Design

Data were collected as part of a randomized controlled trial (RCT) of mothers with preterm infants (26–34 wk gestational age [GA]) admitted to the level IV neonatal intensive care unit (NICU) at Morgan Stanley Children's Hospital of New York at Columbia University Medical Center from January 2009 to June 2012. Written informed consent was obtained from mothers for their own and their infants' participation. The study was approved by the Institutional Review Board of the Columbia University Medical Center, overseen by a data safety monitoring board, and registered at ClinicalTrials.gov (NCT01439269).

Participants and Procedure

Mothers who had recently delivered 1 or 2 infants between 26 and 34 weeks GA were recruited for this study. Exclusions were major congenital defects; birth weight below the third percentile; maternal age <18 years; mother was not fluent in English; mother reported current or previous mental illness, addiction, or substance abuse; the mother did not have at least 1 supportive adult in her home.

A total of 115 mothers of 150 infants were enrolled for prospective study through the infant's discharge from the NICU. Across the full sample, mothers were randomized to either of 2 groups, standard care (SC) (n = 56) or Family Nurture Intervention (FNI) (n = 59), using a randomized block design. Six group assignment cards (3 FNI and 3 SC) were numbered, sealed in envelopes, placed in a packet, and shuffled. Each time a family consented to be in the study, a research assistant drew an envelope at random, which determined the family's group assignment.

Mothers were scheduled for a caregiving observation when their infants reached 36 weeks GA (mean = 37.7, SD = 3.5). Observations took place at the curtained site of the infant's crib in the NICU. Mothers were filmed for 15 minutes as they sat holding their infant in a chair adjacent to the crib. Subsequently, bottle feeding was filmed. Mothers were instructed to spend time holding, then feeding their baby as usual, and to feel free to soothe their baby as they saw fit. A research assistant set up a tripod and camera, then left the curtained area.

For 19 mothers (SC, n = 8; FNI, n = 11), films of the caregiving observation were not obtained due to their infant's transferal to a different facility (SC, n = 3; FNI, n = 4), discharge at 35 weeks (SC, n = 1; FNI, n = 1) or frailty (SC, n = 1; FNI, n = 0), their voluntary withdrawal from the study (SC, n = 0; FNI, n = 4) or loss-to-follow-up (SC, n = 3; FNI, n = 2). An additional 31 mothers (SC, n = 18; FNI, n = 13) were not included in the current analyses for 1 or more of the following reasons: They were breastfeeding during the filming (SC, n = 7; FNI n = 8), they were filmed in a different environment and after discharge to home (SC, n = 8; FNI, n = 4), or their films lacked either the feeding or holding segment (SC, n = 3; FNI, n = 1). Thus, this study included a total of 65 mothers (SC, n = 30; FNI, n = 35).

Baseline demographic characteristics of the families and clinical characteristics of the infants are reported in Table 1. At the time of enrollment (before intervention), maternal depressive symptoms were measured using the Center for Epidemiologic Studies Depression Scale (CES-D), and maternal state anxiety was measured using the Spielberger State-Trait Anxiety Inventory (STAI). Mothers of twins are reported here based on their interactions only with 1 twin (n = 14, first twin [A]; n = 3, second twin [B]).

To obtain measures of maternal depression and anxiety close to the time of the in-unit maternal caregiving behavior (MCB) observation, (average time of completion of 35 wk infant GA [SD = 3.76]), maternal depressive symptoms (CES-D; mean = 11.78, SD = 8.25), and state anxiety symptoms (STAI; mean = 32.34, SD = 7.13) were again measured and are used as covariates to rule out the competing hypothesis that FNI effects on MCB are a function of maternal depression or anxiety symptoms.[34]

Intervention

Family Nurture Intervention was developed to enhance the emotional connection and quality of caregiving behavior and also to improve family support through sessions that promoted family cooperation and function. FNI is facilitated by nurture specialists, who were former NICU registered nurses, and trained in the intervention by the principal investigator (PI) of this study, who is a family psychiatrist. Nurture specialists were trained to help mothers establish an emotional connection with their infant, first by bedside observation of the PI interacting with preemies and their mothers and then by supervision of sessions conducted by the trainee. After training, nurture specialists facilitated intervention activities.

Nurture specialists encouraged mother-infant sessions at the earliest possible time point after delivery (mean of 7 d).[32] The initial sessions took place while infants were confined to the isolette. The first FNI activity was the exchange of scent cloths. Mothers exchanged 5 × 7-in cotton cloths with their infants daily. Each mother wore a scent cloth overnight, close to her skin that was then placed with the infant the next day; the infant's scent cloth was placed under the head of the infant for the preceding 24 hours and then given to the mother to take home each day. Nurture specialists instructed mothers to use firm, sustained touch by gently placing both of their hands on the abdomen of the infant or by cupping one hand around the infants' feet and laying the other hand on the torso. While gently calming their infants with touch, mothers were encouraged to speak to their

Table 1. Baseline Family and Infant Characteristics, by Clinical Trial Group

	SC, N = 30		FNI, N = 35			
Family Characteristics	**Mean**	**SD**	**Mean**	**SD**	***t***	***p***
Mothers' age, yr	33.4	5.21	33.4	5.11	−0.026	.979
Fathers' age, yr	35.6	5.89	37.6	7.75	−1.172	.246
Maternal CES-D	13.3	8.2	14.5	9.0	−0.475	.637
Maternal STAI (state)	35.9	11.6	35.3	13.7	0.201	.841

	SC, N = 30	FNI, N = 35		
Family Characteristics	**n (%)**	**n (%)**	χ^2	***p***
Married	20 (66.7)	27 (77.1)	0.885	.347
Mothers' ethnicity				
Black	8 (26.7)	8 (22.9)		
Hispanic	6 (20.0)	11 (31.4)	*	.803
White	13 (43.3)	13 (37.1)		
Other	3 (10.0)	3 (8.6)		
Fathers' ethnicity				
Black	12 (40.0)	9 (25.7)		
Hispanic	5 (16.7)	9 (25.7)	*	.338
White	9 (30.0)	15 (42.9)		
Other	4 (13.3)	2 (5.7)		
Mothers' education				
High school or lower	1 (3.3)	3 (8.6)		
Some college	10 (33.3)	8 (22.9)	*	.596
Graduate or higher	19 (63.3)	24 (68.6)		
Fathers' education				
High school or lower	8 (26.7)	7 (20.0)		
Some college	4 (13.3)	8 (22.9)	*	.582
Graduate or higher	18 (60.0)	20 (57.1)		

	SC, N = 30		FNI, N = 35			
Infant Characteristics	**Mean**	**SD**	**Mean**	**SD**	***t***	***p***
Gestational age, wk	30.4	2.6	30.7	2.1	−0.566	.574
Birth weight, g	1436	431	1407	366	0.296	.768
Length at birth, cm	39.8	3.7	39.7	3.5	0.046	.964
Head circumference, cm	28.1	3.5	28.2	2.5	−0.201	.841

	SC, N = 30	FNI, N = 35		
Infant Characteristics	**n (%)**	**n (%)**	χ^2	***p***
Male	15 (50.0)	19 (54.3)	0.119	.730
Twins	6 (20.0)	11 (31.4)	1.092	.296
First-born	11 (36.7)	14 (40.0)	0.076	.783
Cesarean delivery	23 (76.7)	27 (77.1)	0.002	.964
Resuscitated at birth	11 (36.7)	9 (25.7)	0.910	.340
CPAP at delivery	30 (100)	32 (91.4)	—	—
Apgar scores				
≥7 at 1 min	21 (70.0)	25 (71.4)	0.016	.900

(*Table continues*)

Table 1. Continued

Infant Characteristics	SC, N = 30 n (%)	FNI, N = 35 n (%)	χ^2	*p*
≥4 at 1 min	26 (86.7)	31 (88.6)	**	1.00
≥7 at 5 min	28 (93.3)	33 (94.3)	**	1.00
≥4 at 5 min	30 (100)	34 (97.1)	—	—

Baseline maternal depression and anxiety obtained at time of study enrollment. *The Fisher-Freeman-Halton exact test. **The Fisher exact test. CES-D, Center for Epidemiologic Studies Depression Scale; CPAP, continuous positive airway pressure; FNI, Family Nurture Intervention; SC, Standard care; STAI, Spielberger State-Trait Anxiety Inventory.

infants about their feelings and thoughts in their native language and to engage in as much eye contact as possible. When infants became stable enough to be taken out of the isolette, nurture specialists facilitated calming sessions through skin-to-skin and non-skin-to-skin holding calming sessions.

Nurture specialists met with the FNI mothers an average of 6.4 hr/wk, and mothers were encouraged to use their calming techniques during all visits. Feeding was not one of the activities facilitated by nurture specialists because all mothers in the NICU, regardless of group assignment, had access to a full-time feeding specialist. Feeding specialists educated mothers on infant nutrition and how to use a breast pump and feed infants. Both mothers and fathers, however, were encouraged by nurture specialists to feed, change, and bathe their babies. The amount of intervention received by each family varied depending on the availability of the mother and the medical needs of the infant. For fidelity check, nurture specialists logged intervention activities (i.e., hours of skin-to-skin holding, number of scent cloth exchanges), duration of sessions, and number of sessions. Intervention mothers completed "nurture logs," to self-report visits to the NICU and activities that took place without a nurture specialist present. Before discharge, intervention families received one family support session, conducted by the PI, who is a family psychiatrist. During the support session, the importance of continuing FNI activities was discussed, as well as a plan of postdischarge support.

Mothers assigned to the SC control group received usual NICU care, following hospital protocol. As mentioned earlier, these mothers had the same access as intervention mothers to a full-time feeding specialist in the NICU. SC mothers could practice optional nurturing activities such as skin-to-skin and/or non-skin-to-skin holding, which were facilitated by standard NICU nurses. However, these nurses did not emphasize comfort-touch techniques, vocal soothing, or calming during holding sessions. Control mothers self-reported these activities weekly through questionnaires that asked about visit frequency and duration of various activities. For example, "How long did you hold your baby?" Research assistants from the study met with SC mothers once a week to administer and collect questionnaires. SC mothers did not receive a family support session before discharge.

The RCT protocol used measures to minimize possible effects of FNI being attributable to nonspecific attention paid to the FNI mothers. Both FNI and SC mothers agreed to at least 4 weekly meetings with study staff. During these individual meetings, with the help of study staff, all mothers filled out questionnaires designed to quantify the time spent with their infants in various "nurturing" activities. Explanations and administration of the outcome test procedures were given identically to both groups.

Quality of Maternal Care Behavior

Observations of feeding and holding were coded using a modified version of the Ainsworth System for Rating MCB.[26,27] All scales were rated from 1 (least sensitive) to 9 (most sensitive). Of Ainsworth's original scales, those that were most relevant to the context of sensitive care during structured care tasks were selected. Previous research with this adaptation of the Ainsworth scales has been used in the context of brief feeding and changing episodes in full-term 9 month olds. It showed that higher levels of MCB were associated with a biobehavioral profile of stress reactivity also observed at 9 months[26] and predicted biobehavioral stress reactivity and defensive peer aggression in early childhood.[28] A similar adaptation of the Ainsworth scale to derive a measure of MCB has also been applied to the observation of tub bathing and changing in full-term neonates in the home, with low-quality MCB associated with increased infant cortisol response 15 minutes postbathing.[27]

A holding MCB score was derived by averaging ratings of degree of acceptance (vs rejection) of the infant (i.e., emotional reaction to the caregiving task); consideration (vs intrusiveness) (i.e., mothers' consideration for her infant's perspective and desires); psychological availability (i.e., attentiveness to infant); quality of physical contact (i.e., how the mother physically supports and touches her baby); quality of vocal contact (i.e., how effectively the mother uses her voice appropriately to encourage, soothe, and/or engage her baby); and amount of expressed joy-delight in the infant (i.e., positive feelings and happiness toward infant). A highly sensitive holding session was characterized by care that was attentively attuned to the infant, including high

degrees of skin-to-skin contact, gentle touch, positive affect, and sensitive vocal stimulation.

A feeding MCB composite was derived by averaging the ratings for sensitivity to the infant's pace in nursing (how the mother anticipates, reads, interprets, and ultimately responds to her baby's cues to start and stop feeding), quality of feeding transitions (starting-stopping, wiggling bottle to induce sucking, removal of bottle for positioning or burping), psychological availability (attentiveness to infant), quality of physical contact, and amount of visual contact and quality of vocal contact. A higher score represents a feeding session in which mother was attentive to her infant's feeding behavior; transitioned starts and stops with the bottle gently and appropriately; maintained face-to-face gaze; and positioned the infant gently and with care to maximize infant comfort.

The MCB composites for holding and feeding were significantly and robustly correlated, $r(63) = .57$, $p < .001$. Hence, an overall quality of MCB score was derived by averaging the MCB scores for the holding and feeding episodes, such that a higher MCB score represented more sensitive maternal care during both holding and feeding interactions. The composite is normally distributed (mean = 4.74, SD = 0.91). The normality of the distribution and mean values for MCB in the NICU are comparable with those derived from home-based observations of full-term neonates[27] and healthy 9-month-olds.[26]

The videos obtained were coded by 2 independent raters who had no knowledge of group assignment. Coders were trained using the Maternal Caregiving Coding Manual for use with High-Risk Population of Infants in the NICU created by the first author. For the purposes of training, 7 pilot cases that are not included in the dataset here were used to train coders before advancing to reliability cases. Coding was completed by the first author who is an expert in maternal sensitivity and the adaptation and use of these MCB scales, with more than 15 years experience with this methodology. After initial training of pilot cases, the 2 coders achieved sound interrater reliability across 15 cases (intraclass correlations averaged $r = .89$ [SD = .05] for feeding, and $r = .87$ [SD = .11] for holding).

RESULTS

Baseline Characteristics and Demographics

The Family Nurture Intervention (FNI) and control groups in this subsample did not differ significantly on: gestational age (GA) at birth, birth weight, maternal age, birth order, twin status, or other demographic or infant clinical characteristics (Table 1). Baseline characteristics and demographics for the entire FNI study population have been previously published.[32]

Nurture specialists reported that mothers participated in facilitated calming sessions at an average of 3.5 times per week (median = 3.7; interquartile range = 2.7–4.1) throughout the infant's stay in the neonatal intensive care unit (NICU). Of these sessions, 84% were greater than 1 hour long (mean 1.6 hr per session, 6.4 hr/wk).[32] Standard care (SC) and FNI mothers visited the NICU, on average, nearly the same number of times per week (SC, 3.7 ± 0.3; FNI, 4.0 ± 0.3; $p = .46$).

To assess the comparability of the subjects excluded from video analysis, with the subjects whose videotapes were analyzed and reported above, an analysis of the entire randomized sample was computed. This included all demographic characteristics of families and clinical characteristics of infants who had been excluded from the analyses. This comparison showed no significant differences among the 4 samples, except on one clinical characteristic: the frequency of cesarean delivery. Dyads excluded from videotape analysis in both FNI and SC groups had comparably lower rates of cesarean section delivery than subjects included in the videotape analyses reported in this article ($p = .044$). This pattern of differences between included and excluded dyads on the incidence of cesarean section does not suggest an inadvertent selection bias contributing to the differences found in quality of care between FNI and SC groups.

Family Nurture Intervention Effects on In-Unit Maternal Care

A one-way analysis of variance comparing FNI and SC groups was computed and showed that mothers in the FNI group provided significantly higher quality in-unit maternal care behavior (MCB) compared with those in the SC condition, $F_{(1,63)} = 8.17$, $p = .006$, $\eta_p^2 = .12$ (Fig. 1).

Four analyses of covariance (ANCOVAs) were computed to examine whether the effects of the intervention were statistically significant after controlling for 4 important clinical variables in the 2 groups. MCB remained significantly higher in the FNI group after controlling for maternal depression, $F_{(1,60)} = 9.54$, $p < .003$, $\eta_p^2 = .14$; maternal state anxiety, $F_{(1,61)} = 6.91$, $p = .01$, $\eta_p^2 = .10$;

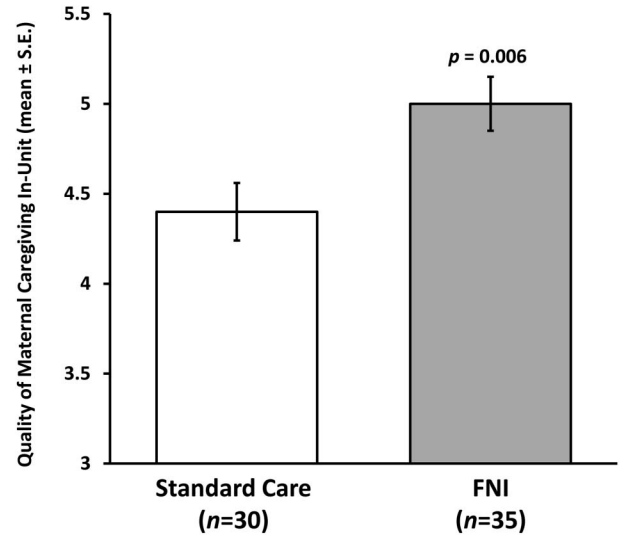

Figure 1. FNI significantly improves quality of maternal caregiving behavior in-unit. FNI, Family Nurture Intervention.

birth order, $F_{(1,62)} = 8.04$, $p = .006$, $\eta_p^2 = .12$; and twin status, $F_{(1,62)} = 7.90$, $p = .007$, $\eta_p^2 = .11$.

In a previous report, we found that FNI significantly increased the amount of skin-to-skin care compared with infants receiving SC.[32] To determine whether the effectiveness of FNI on increasing MCB in this study might depend on this particular dependent variable, we also ran an ANCOVA with average weekly hours of skin-to-skin care as a covariate. The effect of FNI on in-unit MCB remained significant, $F_{(1,62)} = 6.23$, $p = .015$. In addition, the effects of FNI on MCB also remain significant when controlling for key demographic variables, including infant sex ($p < .01$); GA at birth ($p < .01$); maternal education ($p < .01$); and household income ($p = .01$).

DISCUSSION

The results of this study showed that Family Nurture Intervention (FNI) improved the quality of maternal caregiving behavior (MCB) during the time the infant spent in the neonatal intensive care unit (NICU). This is very promising, given all the barriers to MCB within the NICU. Increased maternal sensitivity to her infant as a function of FNI may have important implications for the overall health of the infant. For example, more sensitive maternal behavior during in-unit feeding is associated with improved infant sucking behavior (often a criterion for discharge or improved transfer rates).[35]

Family Nurture Intervention improved MCB regardless of changes in maternal depression and anxiety. This is of particular importance, as depression and anxiety are common in the postpartum period, and even more so for mothers of preterm infants.[4,5] It is well-established that maternal postpartum depression and anxiety are associated with compromised mother-infant interactive quality in full-term[36] as well as in premature[20] infants. In another study, maternal antenatal depression and anxiety, when coupled with low-quality maternal care, were associated with stress dysregulation even in full-term healthy infants; but when antenatally depressed mothers provided high-quality postnatal maternal care, infant stress regulation was not different from infants of nondepressed mothers.[37] Thus, high-quality maternal care may attenuate the risk of stress dysregulation in premature infants of depressed mothers in a similar fashion. Furthermore, enhancing the quality of maternal care, regardless of maternal depression and anxiety, may be critically important during a period in which maternal mental health concerns are overshadowed by concerns for the survival of the infant.

Early higher quality MCB has been associated with improved long-term maternal and infant stress responding,[26–28] suggesting the effects of FNI may be sustained after discharge. Indeed, we have demonstrated that the FNI reduces maternal depression in infants aged 4 months.[34] The emotional rewards and sense of achievement that are derived from establishing an emotional connection and becoming a sensitive caregiver of a preterm infant in the hospital might partially account for the attenuation in symptoms of depression seen in the FNI group. Future studies will explore this connection.

Family Nurture Intervention improved maternal caregiving in the NICU regardless of birth order and twin status. It is noteworthy that FNI improved the quality of maternal care even for mothers of twins because the additional stress of 2 hospitalized infants places an additional burden on mothers and can further compromise the quality of care for both infants.[19] Our findings that the efficacy of the FNI extends to the NICU caregiving behavior of mothers with 2 hospitalized infants is consistent with our previous findings that FNI increases electrocortical power (in specific frequency bands in frontal brain regions) in both twins and singeltons,[33] and aforementioned reductions in maternal depression and anxiety at 4 months occurred regardless of twin status.[34]

Little research has examined the role of maternal parity in the development of premature infants. However, one study found that multiparous mothers were less attentive and less involved with the care of the premature infant than primiparous mothers.[18] No NICU intervention has addressed differential effects of intervention based on maternal parity. However, childhood parenting intervention research has found that primiparous mothers may be more receptive to interventions than multiparas.[38] Given the additional responsibility of managing the care of older siblings at home, it is noteworthy that FNI shows equal efficacy for first- and later-born premature infants on enhancing in-unit MCB. This may be a function of the family component of FNI, which is inclusive of all family members during therapeutic support sessions, as well as in the direct care of the infant while hospitalized.

There are several noteworthy limitations to the present study. Our sample size was too small to rigorously determine the effects of various demographics on the quality of MCB. The control group received standard care (SC) (i.e., usual care) as part of our randomized controlled trial that included holding and skin-to-skin care if the mothers chose to engage in these activities. But, there were not corresponding control conditions for each of the specific activities of FNI. For instance, SC mothers did not exchange sham odor cloths with their infants (cloths that were not exposed to mothers and/or infants). The effectiveness of FNI should thus be interpreted as a function of a comprehensive and integrative intervention, since during this preliminary trial of the intervention control manipulations of FNI activities were not entirely possible. Additionally, though the effects of FNI are shown to be equally effective for primiparous and multiparous in the hospital, MCB may be different once the mother is discharged with her preterm infant. It is possible that when there are other children in the home, the quality of MCB may be changed. Further limitations include the fact that only one feeding and one holding session were coded during the NICU stay.

Because this is only a snapshot of maternal behavior and mother-infant interaction, this may not be generalizable to the usual behavior of the mothers, especially beyond discharge. It is also possible that being video recorded may change typical maternal behavior. However, since every mother in both groups was videotaped during the caregiving observation, we cannot determine any such differences.

This study advances the field of nurture-based interventions by demonstrating that MCB in the NICU can be enhanced by facilitating a positive emotional connection between mother and infant to countercondition adverse experiences of the NICU. Although FNI incorporates some activities that are part of other nurture-based interventions, such as skin-to-skin care and infant touch, this study provides support for integrating these activities into a program of standard NICU care focused on mother-infant connectedness. Future analyses will examine whether improved MCB in the NICU persists postdischarge and whether it is associated with improved long-term infant neurodevelopmental and behavioral outcomes.

ACKNOWLEDGMENTS

We would like to thank the NICU staff at the Morgan Stanley Children's Hospital of New York as well as the participating families for their invaluable assistance to our program of research. We also want to acknowledge and thank our Performance and Safety Monitoring Board for their thoughtful contributions to the conduct of this study (Bruce Levin, PhD, Michael Weitzman, MD, and Deborah E. Campbell, MD).

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Book Review

Child Behavior Assessment & Management in Primary Care: Theory and Practice

William B. Carey, Sean C. McDevitt, Scottsdale, AZ, Behavioral-Developmental Initiatives, 2012, 59 pp, $8.99.

This very compact guide seeks to address the growing concern of many pediatric primary care providers who find themselves ill-prepared at the end of their training to help caregivers with their children's challenging behaviors. It is written for a wide audience including pediatricians, family physicians, nurse practitioners, physician assistants, and other professionals. The authors seek to shed light on how caregivers can address their patients' challenging behaviors before they potentially develop into categorical disorders.

The authors, William B. Carey, MD and Sean C. McDevitt, PhD, are 2 pioneers in the fields of child development and pediatric temperament who have paved the way for a body of research in these areas. They developed the Carey Temperament Scales, which are questionnaires that examine 9 dimensions of temperament in children as defined in the classic *New York Longitudinal Study*. They have also authored several books and many chapters on this topic area in medical texts.

This latest test is drawn from their extensive research and practice focusing on child temperament. It creates an approach for providers at the front line of pediatrics to aid families in managing childhood behavioral concerns. Early on, the authors discuss clinical vignettes of children with difficult behaviors. Chapters address "Obstacles to the Provision of Good Care," "A Clinician's Perspective on Behavioral Issues Presented in Primary care," "Improving Assessment of Child Behavior in Primary Care," and "Better Management in Primary Care." This framework is provided as an approach to these issues, particularly when problems fall somewhere in the grey area between developmental variation and behavioral disorder.

The layout of the book is well done with easy-to-read tables, algorithms, and figures. As expected, there is an excellent section dedicated to discussion of temperament. I found this chapter particularly helpful because not only did it describe the dimensions of temperament, but it also provided strategies for dealing with children when their temperament leads to problem behaviors. For example, if a child has "high adaptability" in his temperamental profile, he may be especially susceptible to "unfavorable pressures from peers" or even the media. Other topics such as the role of medication in management, providing feedback to caregivers, and psychosocial problems in caregivers were only briefly discussed. Given their importance and relevance in behavior management, I would have wanted to read more about them.

I found the discussion of the impact of temperamental variability on a child's behavioral profile helpful. This perspective can help parents understand their child's behavior and ultimately guide clinicians to appropriate clinical interventions. The appendix provides simplified questionnaires for clinicians to use with families to identify children's temperamental profile. While this is referred to as a rapid clinical survey, in practice, its administration may be more time consuming than described.

Overall, this book was clear and user-friendly, which makes it highly accessible to a busy pediatric primary care clinician. The recommendations the authors offer are useful and descriptive. This book conveys the importance of understanding temperament. More importantly, the impact of temperament on behavioral management for children and adolescents is considered theoretically but with clear practical applications. Disclosure: The author declares no conflict of interest.

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