

The Effects of a Home-Visiting Discharge Education on Maternal Self-esteem, Maternal Attachment, Postpartum Depression and Family Function in the Mothers of NICU Infants

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Purpose: A quasi-experimental study was performed to investigate the effects of a home visiting discharge education program on the maternal self-esteem, attachment, postpartum depression and family function in 35 mothers of neonatal intensive care unit (NICU) infants.

Methods: Twenty-three mothers in the intervention group received the home visiting discharge education while 12 mothers in the control group received the routine, hospital discharge education. Baseline data was collected in both groups one day after delivery. The intervention group received the home visiting discharge education while the control group did the routine hospital-based discharge education. The questionnaire including the data on maternal self-esteem, attachment, postpartum depression and family function were collected within 1 week after the discharge by mail.

Results: The scores of maternal self-esteem, and attachment were significantly increased, and the postpartum depression and the family function score were decreased after the home visiting discharge education in intervention group. There were no changes in these variables before and after the routine hospital-based discharge education in control group.

Conclusion: These results support the beneficial effects of home visiting discharge education on the maternal role adaptation and family function of the mothers of NICU infants.

Key Words : Premature infants, Postpartum depression, Patient discharge, Follow-up study

INTRODUCTION

Advances in reproductive technologies with high quality care have increased the survival of high-risk infants who might not have previously survived. Recently, more premature, smaller, and more medically complicated neonates have been hospitalized at neonatal intensive

care units (NICU). Pregnant women may have developed the maternal identity in conjunction with the blurry image of the growing fetus (Rubin, 1984). Every woman wants her future newborn to be perfectly healthy. In the latter stage of pregnancy and through the final experience of labor and delivery, the subjective image of the future newborn becomes an objective reality to the mother. When there is no discrepancy between

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This work was supported by INHA UNIVERSITY Research Grant. (INHA-22693).

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Received September 30, 2004 ; Accepted November 24, 2004

the subjective view and the objective reality of the neonate, mothers feel the successful completion of pregnancy and continue to develop the maternal adaptation further.

Mothers of high-risk infants have a very different experience, compared to the mothers of full-term infants who are taken home within days of birth (Brazy, Anderson, Becker & Becker, 2001; Pridham, 1998; Rubin, 1984). They are disappointed with the unexpected pregnancy outcome, and continuously overexerted with fears for their infant's survival and feelings of loss of control in apprehension and uncertainty. For a preterm in an incubator in NICU, surely the care is 100% in the hands of the health care professionals for the first few days. Mothers feel insecure and depressed when the nurses are more skillful in caring for the baby and know their baby better than they do. In other words, the nurses become the pseudo-parents while the mothers become visitors to the hospital. Also, the mothers of high risk infants are high-risk patients themselves in the neo-maternal dyad due to a variety of reasons related to the high risk delivery, including preterm labors, mothers with diabetes or pregnancy induced hypertension, multiple gestation, congenital anomaly, infections, etc. When the mother's complication is negligible, they are discharged from the hospital at about 48 hours after delivery with empty hands while their newborns remain hospitalized in NICU.

The current trend is toward the early discharge of newborns, even high-risk infants from NICU due to the emphasis on medical cost effectiveness and family-centered care in the health care environment (Fishbein, 1997; Ortenstrand, Winbladh, Nordstrom & Waldenstrom, 2001; Poets & Harms, 2002). The discharge from NICU means that the infant is in a stable physiologic condition without acute tertiary health problems. It does not guarantee the absence of future problems for the discharged infant. Some infants with chronic health problems may be discharged with medical devices, such as artificial ventilator, apnea monitor, or mechanical feeding tube. There is an imperative need for the mothers of high-risk infants to know and raise their infant with the careful attention to the health problems and developmental courses at the time of NICU discharge.

Parents of high-risk infants experience extreme stress, including severe health problems, concerns about complications, parental mal-adaptation, low self-esteem, and even posttraumatic stress disorders (Armstrong, Fraser,

Dadds & Morris, 2000; Blair, 2002; Davis, Edwards, Mohay & Wollin, 2003; DeMier, Hynan, Harris & Manniello, 1996). Research reports the needs for parents of premature infants during hospitalization and after discharge such as increased emotional support, education that addresses parents at their level, and more continuous and consistent communication with health care providers (Rubin, 1984). The mothers need to learn the cues of behaviors unique to their infants, common newborn concerns about high-risk infants, and the sequels of high-risks, assessment and social support including the home environment (Fishbein, 1997; Pearson & Anderson, 2001; Poets & Harms, 2002). However, the current content of hospital-based discharge education in Korea does not cover these needs.

Most high-risk infants are discharged from NICU to home directly without the standard regulation on follow-up care in Korea. The discharge education is provided at the time of the infant's discharge, when the mother, who may still be in high-risk postpartum transition, may not be ready to incorporate the maternal role with the lack of confidence and the overwhelming responsibility in her mothering skill (Pearson & Anderson, 2001; VandenBerg, 2000). Few nurses are available to provide full family support and these days the hospital support is limited to a program of structured discharge education for the new mothers and their families in these days. With a strict restriction on the visiting hours, less time is available for the interaction between the mother and the nurses before discharge. The mothers, who remain in the high-risk postpartum period, are often not ready to activate themselves to obtain information and support for their high-risk infants at NICU. This implies that mothers of high-risk infants still need professional support after discharge for infant care and the educational and supportive needs of the complex health concerns.

Recent investigations have supported the beneficial effects of home visiting follow-up care on maternal emotion and role, as well as on infant growth (Armstrong et al., 2000; Blair, 2002; Melnyk et al., 2001). The mother may be confronted with the reality of mothering responsibility when her infant is in front of her at home. She may be in vital need of the discharge education after her infant is discharged when she herself becomes the primary care person. With confidence and skillful care for her infant, she may develop positive maternal self-esteem, which is an essential part of mothering, influenced by infant health, behavior and her own social support

(McGrath & Meyer, 1992). The affection and attitude of the mother toward her infant are reflected in maternal self-esteem within the mother-infant relationship. Others who develop positive maternal self-esteem may well develop fine maternal attachment with good family function as social support, which reciprocally decreases postpartum depression. This study was conducted to examine the effects of an enhanced discharge education program, consisting of home visiting discharge education, on the maternal self-esteem, attachment, postpartum depression and family function in the mothers of NICU infants. .

METHODS

Subjects

A quasi-experimental design was applied to investigate the effects of a program of home-visiting discharge education on the maternal self-esteem, maternal attachment, postpartum depression and family function in the mothers of high-risk infants at the NICU. A consecutive eligible sampling method was applied to recruit the study participants at the level III NICU of a university affiliated medical center in Incheon, Korea. The inclusion criteria included mothers of newborns with prematurity, LBW, small or large size for gestational age, infection, apnea, etc, with informed consent after approval by the internal review committee of the department of pediatrics and the nursing department. The mothers of in-

fants with congenital anomaly or intraventricular hemorrhage (IVH) greater than grade III were excluded due to the possibility of different postpartum course in terms of psychological adaptation.

A power analysis suggested the 26 subjects per each group using a two-sided $\alpha = .05$, effect size = .8 and $d = .08$ (Hulley, Cummings, Brown, Grady, Hearst & Newman, 2001). The subjects in the control group were intentionally enrolled first, then the subjects later in the intervention group. The reason for separating the two groups consecutively was to prevent their contact with each other to minimize the contamination of the research interventions; the hospital-based, routine discharge education versus the home visiting discharge education.

Fifty mothers of high-risk infants, 25 in each group, were enrolled into the study at the beginning, but 15 from the control group did not respond to the mail survey after discharge. The possible reason for this may be no direct beneficial effects from the study for the control group while the intervention group received the enhanced discharge education. Finally 35 mothers of high-risk infants, 23 for the intervention group and 12 for the control group, completed the whole process of study. There were no significant differences in the baseline data of interest between the two groups except family function as well as in the subjects between the beginning and the final (Table 3). Whole procedures such as subject recruitment, the employment of interventions etc, were

Table 1. Demographic and Medical Characteristics of the Subjects (N = 35)

Characteristics	Frequencies(%)	Characteristics	Frequencies(%)
Maternal Job		Family type	
Not employed	29 (82.9)	Nuclear	21 (60.0)
Part time employed	1 (2.9)	With wife-parents	3 (8.6)
Full time employed	5 (14.3)	With husband-parents	11 (31.4)
Planned pregnancy		Prenatal care	
No	17 (48.6)	No check up	8 (17.1)
Yes	18 (51.4)	Irregular check up	7 (20.0)
Caregiver		Regular check up	22 (62.9)
Husband	9 (25.7)	Feeding type	
Mother-in-law	8 (22.9)	Breast feeding	20 (57.1)
Own mother	14 (40.0)	Bottle feeding	6 (17.1)
None	4 (11.4)	Mixed	9 (25.7)
Newborn sex		Current health problems	
Female	15 (42.9)	prematurity	16 (45.7)
Male	20 (57.1)	RDS	6 (17.1)
Premature infant		Respiratory difficulty	5 (14.3)
Yes	27 (77.1)	Hyperbilirubinemia	4 (11.4)
No	8 (22.9)	Sepsis	3 (8.6)
		Pneumonia	4 (11.4)

performed by the researchers.

Interventions and data collection

Once the new mothers were enrolled in the study, baseline data was collected on the demographic and medical information as well as the dependant variables, such as maternal self-esteem, maternal attachment, postpartum depression and family function, before delivering the discharge education at the second day after delivery. For the control group, the hospital-based, routine discharge education was performed by an NICU staff nurse at the time of discharge, which is mostly the second to third day after vaginal delivery, or the fourth to fifth day after cesarean section delivery. It took about 10 minutes, generally delivering the information limited to the discharge process, bill management, referral sites & schedule, etc. The intervention group received one home visit of discharge education within 1 week of discharge by the PI in addition to the hospital-based, routine discharge education given at the time of discharge. The home visiting discharge education, taking about one hour, involved the guided education with a booklet consisting of the common growth and development concerns focused on high-risk infants, cues of infant behaviors, sequels of high-risks, assessment and support of home environment. After administering the discharge education to both groups, a questionnaire to measure the maternal self-esteem, maternal attachment, postpartum depression and family function was left with a return envelope for the mothers of high-risk infants, who were asked to

complete and mail it back within several days. Follow-up calls were made to increase compliance in both groups.

Measures

Four variables were measured to investigate the effects of discharge education in this study: maternal self-esteem, maternal attachment, postpartum depression and family function. Maternal self-esteem measures a woman's own reflected appraisal of herself as a mother (McGrath & Meyer, 1992). In the study, a maternal self-report inventory (MSRI) by Shea and Tronick (1988) was used to measure maternal self-esteem. The original version consisting of 26 items was translated and tested for its validity and reliability among Korean mothers by Han and Bang (1999), during which one item was deleted due to the low inter-item correlation. It was used for Korean mothers of LBW infants by Ahn & Kim (2003) with Cronbach's alpha of reliability of 0.71 (Ahn & Kim, 2003). In this study, Cronbach's alpha was measured twice before and after the intervention with results of 0.88 and 0.82.

Maternal attachment, a measure of the social relationship between mother and her child, is an affective tie to the child. In this study it was measured using the maternal attachment inventory (MAI) developed by Muller (1994). The original version consisted of a 26-item survey with a 5-rating scale from 0 to 4. A higher total score indicates greater depression. Ahn (2004) translated it into Korean, retranslated back into English for comparison check, and then applied it to the mothers of Korean LBW infants by removing 3 items which were considered not proper for mothers whose infants have been hospitalized in NICU. The reliability of this instrument was measured twice with Cronbach's alpha of 0.8181 and 0.9104.

Postnatal depression was measured using the Edinburgh Postnatal Depression Scale (EPDS) which was developed by Cox et al (1987). EPDS, a 10-item self-rat-

Table 2. Demographic and Medical Characteristics of the Subjects II (N = 35)

Characteristics	mean (SD)	range
Maternal age (year)	29.03 (4.13)	20 - 42
Family numbers	3 (1.24)	1 - 6
Marital period (year)	3.37 (3.23)	0.42 - 18.00
Birth weight (gram)	2199.17 (660.83)	941 - 3660
Gestational age (week)	34.34 (3.29)	27 ⁺⁵ - 40 ⁺³

Table 3. The Homogeneity of the Baseline Scores of MSRI, MAI, EPDS and FAPGAR between Two Groups (N = 35)

M(SD)	Total	Intervention Group	Control Group	t*(p)
MSRI	92.17 (11.50)	93.48 (9.93)	89.67 (14.19)	.830 (.413)
MAI	85.63 (5.27)	84.74 (5.71)	87.33 (3.96)	- 1.571 (.27)
EPDS	8.03 (4.05)	8.87 (4.30)	6.42 (3.09)	1.940 (.62)
FAPGAR	7.37 (2.37)	6.74 (2.51)	8.58 (1.51)	- 2.12 (.011)**

MSRI: Maternal Self-Report Inventory, MAI: Maternal Attachment Inventory
EPDS: Edinburgh Postnatal Depression Scale, FAPGAR: Family APGAR score

* equal variances not assumed, ** significance at $\alpha = .05$

ing scale, has been shown to have high sensitivity for detection of postpartum depression.^{10, 22} Each item is rated from 0 to 3, giving a total score of 0 to 30. A higher score indicates greater depression. The original version was translated into Korean and retranslated again for comparison check, then tested with postpartum Korean women with the normal and LBW infants (Ahn & Kim, 2003). Based on the original instruction and the report by Stamp et al (1996), a total score above 12/13 is considered most presumptively depressed, below 9 is considered to be normal, while between 9 and 12 is probably depressed. The reliability was measured twice in this study with Cronbach's alpha of 0.79 and 0.82.

Family function was measured with family APGAR (FAPGAR) as introduced by Gabriel (1978). It measures the 5-items of perceived family support including adaptation, partnership, growth, affection and resolve with 2 Likert scales from 0 to 2. Each score is totaled; the range of the total score is 0 - 10 just like the APGAR score. A higher score indicates more effective family function. Scores of 7 - 10 suggest a highly functional family; 4 - 6, a moderately dysfunctional family; and 0 - 3, a severely dysfunctional family (Gabriel, 1978). For the study, the original version was translated into Korean, and in turn retranslated back into English for comparison check in the author and applied to the mothers of normal and low-birth weight infants (Ahn & Kim, 2003). The Cronbach's alpha of 0.67 for the reliability was 0.71 in the previous study and 0.67 before the intervention and

0.78 after the intervention in this study.

The questionnaire included the above four instruments with demographic information for baseline measurement and without any other information for post-intervention measurement except a numeric code to match the two questionnaires. Confidentiality was assured by assigning a code number to each subject and by analyzing data only with the coded numbers and aggregate data. All of the data was double entered, and analyzed using SPSS10.5. Descriptive statistics, paired-t test, and Chi-square were used to explore the nature of the data. Nonparametric statistics were performed to test the effects of the two types discharge education because of the possibility of skewed distribution of variables of research interest with wide variances due to the nonequivalent subject numbers in the two groups.

RESULTS

The demographic and medical information of the mothers and infants are presented in Tables 1 and 2. The mean age of the mother was 29.3 years (SD = 4.13) with a mean marital period of 3 years and 4 months. Among the mothers, 82.9% were not employed. Sixty percent of the subjects were in a nuclear family type with a mean number of family members of 3. Of the subjects, 31.4% lived with their parents-in-law, and 40% of the caregivers for postpartum care were the subject's own mothers. The pregnancy was planned for 51.4% of sub-

Table 4. The Level of EPDS between the Intervention and the Control Group before and after the Education (N = 35)

	EPDS before education			EPDS after education		
	none	probable	presumptive	none	probable	presumptive
Intervention	12 (52.17)	8 (34.78)	3 (13.04)	18 (78.26)	5 (21.74)	0 (0)
Control	9 (75.0)	2 (16.67)	1 (8.33)	9 (75.0)	2 (16.67)	1 (8.33)
Total	21 (60.0)	10 (28.57)	4 (11.43)	27 (77.14)	7 (20.0)	1 (2.86)
Chi-square (p) = 1.744 (.418)			Chi-square (p) = 2.029 (.363)			

EPDS: Edinburgh Postnatal Depression Scale

Table 5. The Level of Family Function between the Intervention and the Control Group before and after the Education (N = 35)

	family function before education			family function after education		
	highly functioned	moderately dysfunctional	severely dysfunctional	highly functioned	moderately dysfunctional	severely dysfunctional
Inervention	14 (60.87)	6 (26.09)	3 (13.04)	18 (78.26)	4 (17.39)	1 (4.35)
Control	11 (91.67)	1 (8.33)	0 (0)	11 (91.67)	1 (8.33)	0 (0)
Total	25 (71.43)	7 (20.0)	3 (8.57)	29 (82.86)	5 (14.29)	1 (2.86)
	Chi-square (p) = 3.855 (.146)			Chi-square (p) = 1.146 (.564)		

jects, only 62.9% received regular prenatal care and 17.1% experienced no prenatal check-up. Twenty (57.1%) of the subjects were in complete breastfeeding and nine (25.7%) in partial breastfeeding. Only 17.1% were in artificial bottle-feeding. The reason for the relatively high breastfeeding rate is considered due to the breast feeding policy in this proposed NICU. Among 35 infants, 15 (42.9%) were female and 20 (59.1%) were males. Twenty-seven (77.1%) of the 35 neonates were premature infants, with the main cause for NICU hospitalization being prematurity (45.7%), followed by RDS (17.1%), respiratory difficulty (14.3%), hyperbilirubinemia (11.4%), sepsis (8.6%) and pneumonia (2.9%). The mean birth weight of the newborns was 2,199.17 gram (g) (SD = 660.83) with a mean gestational age (GA) of 34^{±4} weeks.

Table 3 presents the homogeneity of the baseline data in the scores of the variables of research interest before the discharge education was performed between two groups. The mean scores of MSRI, MAI, EPDS and FAPGAR were 93.43 (SD = 9.93), 84.74 (SD = 5.71), 8.87 (SD = 4.30), and 6.74 (SD = 2.51) in the intervention group, while 89.67 (SD = 14.19), 87.33 (SD = 3.96), 6.42 (SD = 3.09), and 8.58 (SD = 1.51) in the control, retrospectively. There was no statistical difference in the means of MSRI, MAI and EPDS, but the mean of family function score was higher in the intervention group than in the control group. The item mean was 3.7 both for MSRI and MAI, indicating that the subjects selected the quite positive maximum choice per each item.

The EPDS and FAPGAR scores were recorded into three levels: not depressed, probably (or moderately) depressed and presumptive (or severely) depressed for EPDS; and normal, moderately dysfunctional and highly dysfunctional for FAPGAR. Tables 4 and 5 present the degrees of each EPDS and FAPGAR between the intervention and control groups before and after the discharge education. The baseline EPDS, which was measured mostly on the second day after delivery, revealed that 14 (40.0%) of the subjects tended to experience moderate to severe postpartum depression. After the discharge education, the percentage experiencing depression decreased to 22.86% of all subjects. There was no significant difference of each EPDS level between the intervention and control groups, neither before nor after the education ($\chi^2 = 1.744$, $p = .418$; $\chi^2 = 2.029$, $p = .363$, retrospectively).

In the same manner, the levels of FAPGAR of all subjects were examined using Chi-square and paired-t test. The FAPGAR level showed the increase in the number of highly functional families with a decrease in the number of dysfunctional families after the discharge education. Though, the prevalence of each FAPGAR level between the intervention and the control group, either before or after the education, did not differ statistically ($\chi^2 = 3.855$, $p = .146$; $\chi^2 = 1.146$, $p = .564$, retrospectively).

The scores of MSRI, MAI, EPDS and FAPGAR were compared before and after the discharge education between the intervention group, the control group and all subjects using paired t-test (Table 6). All scores revealed

Table 6. The Scores between the Intervention and the Control Group before and after the Discharge Education (N = 35)

Variables	group	before	after	t(p)
MSRI	Intervention group	93.48 (9.93)	101.39 (9.55)	- 2.624 (.000)
	C control group	89.17 (11.50)	86.58 (18.11)	.818 (.431)
	Total	92.17 (11.50)	96.31 (14.69)	- 2.306 (.027)
MAI	Intervention group	84.74 (5.71)	88.09 (4.56)	- 4.215 (.000)
	Control group	85.63 (5.27)	87.06 (5.55)	- 1.680 (.102)
	Total	87.33 (3.96)	85.04 (6.86)	1.507 (.160)
EPDS	Intervention group	8.87 (4.30)	5.30 (3.83)	3.774 (.001)
	Control group	6.42 (3.09)	7.75 (2.96)	- 1.361 (.201)
	Total	8.03 (4.05)	6.14 (3.70)	2.348 (.025)
FAPGAR	Intervention group	6.738 (2.51)	7.91 (1.95)	- 3.319 (.003)
	Control group	8.58 (1.51)	8.42 (1.56)	.692 (.504)
	Total	7.37 (2.37)	8.07 (1.82)	- 2.670 (.012)

MSRI: Maternal Self-Report Inventory

MAI: Maternal Attachment Inventory

EPDS: Edinburgh Postnatal Depression Scale

FAPGAR: Family APGAR score

significant changes after the discharge education in the intervention group but no changes in the control group. The differences in the changes of scores before and after the education were analyzed between the intervention group and control using Mann-Whitney U test and are presented in Table 7. The MSRI score significantly increased with a median of 9 after the home visiting discharge education while the median difference score was decreased in the control group which received the routine hospital-based discharge education ($Z = 61.000$, $p = .007$). The median of 3 in the difference of MAI score significantly increased after the home visiting discharge education while the median difference score was decreased to -3 in the control group which received the routine hospital-based discharge education ($Z = 51.500$, $p = .003$). There was a decrease in EPDS scores after the home-visiting education while EPDS score was slightly increased after the routine hospital-based discharge education ($Z = 47.500$, $p = .001$). The increase in FAPGAR score after the discharge education in the intervention group was greater than that in the control group ($Z = 73.000$, $p = .019$). The observed powers in these changes were 0.894 for MSRI, 0.943 for MAI, 0.890 for EPDS and 0.703 for FAPGAR.

DISCUSSION

Recent trends toward early discharge for high-risk infants and their mothers demand an increasing need for the continuity of professional care after NICU discharge with a focus on family-centered care (Ahn, 2004; Fishbein, 1997; Pearson & Anderson, 2001; Poets & Harms, 2002). Studies support the safety of early discharge with the compliance of home follow-up after discharge with strict guidelines (Frank-Hanssen, Hanson & Anderson, 1999; Gardner et al., 2001). However, special

caution is needed when extending such an early discharge policy to high-risk infants and their mothers (Ortenstrand et al., 2001). Therefore, the discharge education of NICU has been enhanced in terms of supportive and educational function such as physical assessment, characteristics of newborn and high-risk infants, nature of health problem, physiologic knowledge to support the progress of feeding, appropriate knowledge base for family teaching, psychosocial support and the required technical skill for home management for the NICU graduates and their family (Pearson & Anderson, 2001; VandenBerg, 2000).

In this study, a program of home visiting discharge education was developed with these considerations and delivered within the first week of NICU discharge. The study result shows that the home visiting discharge education had a positive effect on maternal role adaptation process and family function. The traditional, hospital-based, routine education had no beneficial effects on them. The validity of this finding remains to be confirmed because the limited sample size allows no guarantee for the homogeneity of the two groups in the aspect of family function. However the powers of the changes in maternal self-esteem, maternal attachment, postpartum depression and family function support a low likelihood for any statistical error in the results due to the unequal group sizes.

Considering the infants' GA and overall condition, the mothers in the study were unlikely to have been fully recovered from the delivery at the time of infant discharge. They might not be familiar with the cues of their infants, who have been staying at NICU for the first days of life, and who have developed their own pattern of behaviors and habituation. The maternal role may not have become a reality for the mothers as long as their infants were still in the care of others at NICU. In addition, their

Table 7. The Comparison of the Differences in the Scores between the Intervention and the Control Group ($N = 35$)

	Intervention group		Control group		Z(p)
	M(SD)	median(range)	M(SD)	median(range)	
MSRI ^a	7.91 (6.75)	9 (-6 - 25)	-3.08 (13.06)	-1.50 (-35 - 13)	61.000 (.007)*
MAI ^b	3.35 (3.81)	3 (-2 - 25)	-2.25 (1.49)	-3.00 (-14 - 4)	51.500 (.003)*
EPDS ^c	-3.57 (4.53)	-2 (-19 - 1)	1.33 (3.39)	0.50 (-3 - 8)	47.000 (.001)*
FAPGAR ^d	1.17 (1.70)	1 (-2 - 5)	-0.17 (.83)	0.5 (-2 - 1)	73.000 (.019)*

MSRI: Maternal Self-Report Inventory a: eta square = 0.249, observed power = 0.894 calculated in GLM.

MAI: Maternal Attachment Inventoryb: eta square = 0.287, observed power = 0.943 calculated in GLM.

EPDS: Edinburgh Postnatal Depression Scale c: eta square = 0.247, observed power = 0.890 calculated in GLM.

FAPGAR: Family APGAR score d: eta square = 0.166, observed power = 0.703 calculated in GLM.

infants might still need careful monitoring and skillful hands for their routine care because the graduation from NICU carries no guarantee for problem-free health. All of these factors validate the administration of the home visiting discharge education such as proposed in this study for the NICU graduates and their family.

The family with an NICU graduate could be considered a high-risk family. However, high-risk itself does not mean the presence of any ongoing pathology. The studies using the family APAGR tool supported its effectiveness to measure the family function with internal consistency (Ahn & Kim, 2003). Ahn & Kim (2003) reported that the family APGAR score could be higher in the family of high-risk infants if supportive follow-up management such as home-visiting care is delivered, compared to normal infants without follow-up care.

Special focus is needed on the outcomes on postpartum depression that were measured with EPDS. A systematic review of the EPDS validation studies reported the predictive values of EPDS on assuming a 5% to 20% prevalence of postpartum depression (Davis, Edwards, Mohay & Wollin, 2003). One study reported the incidence of an EPDS score of more than 8 as 54%, and of more than 12 as 22.2%, of the mothers of LBW infants who received the routine, hospital-based discharge education at the time of infant discharge in Korea (Ahn & Kim, 2003). In this study, 40% of the subjects showed an EPDS score above 8 and 11.4% above 12 at about the second day of delivery. The slight lower EPDS scores of the later study may be explained by differences in the infants' condition. The subjects of the previous study were all LBW infants' mothers, while 71.4% of the subjects were LBW infants' mothers in this study.

Furthermore, data of this study was collected one or two days after delivery while data of the previous study was collected several months after delivery. The mothers who have just delivered the newborn and is still hospitalized might not develop her full emotional reality yet because she is still taking-in phase, a passive and dependent maternal behavior phase with the personal and professional supports (Rubin, 1984). Above all, more attention is paid to two factors: the high incidence and the degree of depressive mood in mothers of high-risk infants including LBW infants and the effects of home visiting discharge education. In this study, the incidence of scores more than 8 decreased to about 22%, including 0% for scores more than 12, after the home visiting discharge education, compared to 25% for scores more

than 8, including about 8% for scores more than 12 after the hospital discharge education. This result implies that the mothers of high-risk infants have an increased chance for a depressive mood and that the home visiting discharge education, compared to the routine hospital discharge education, could promptly reduce the incidence and degree of postpartum depression. Though postpartum depression is a maternal psychosocial factor, the cultural diversity is not certain. Rather, the infant conditions, maternal stress or the existence of professional support system may be more dominant influencing factors (Davis et al., 2003). A western study reports 40.3% of subjects scored (12 on the EPDS measured 1 month after delivery in the mothers of very premature infants whose GA was at less than 32-week gestation (Davis et al, 2003). The difference in the EPDS severity between the two different ethnic groups prevents any conclusive comparison on the cultural diversity.

Postpartum depression is related to the development of maternal role, attachment, and spousal relationship (Fishbein, 1997). In this study, postpartum depression was related to the maternal attachment before the discharge education in all subjects ($r = 1.423$, $p = .001$) while the relation was not revealed after the education. This may imply that the home visiting discharge education is mainly accountable for the improvement of postpartum depression in relation to maternal attachment. The NICU experience may seriously delay successful attainment of the maternal role and negatively influence early mother-infant interaction. Such maternal psychological stress and altered perception of her child may influence maternal self-esteem and later child development. If a negative process is triggered by these dynamics, a vicious cycle could be accelerated on mother-infant interaction. Therefore, early intervention such as home visiting discharge education is needed to prevent this process from becoming tenacious. The frequency of the visiting could be tailored to the needs of the family. However, Brown and Johnson (1998) reported that the first visit is the most critical and that the second visit is not necessary for the majority of families. This supports the justification for the home visiting discharge education in vulnerable populations such as the NICU graduates.

Successful home care management needs strict legal regulation of its role and responsibility. A program of hospital-based, routine home visiting after NICU graduation is not yet a realistic option in terms of cost-effec-

tiveness and there is no standard regulation for its implementation in Korea. The Korean government has developed a policy for the nursing staff at public health centers to recommend home visiting after discharge for LBW infants since 1999 (Ahn, 2004). Currently, 10% of about 250 public health care centers provide home visiting follow up. However, with the lack of neonatal specialty among public health nurses and the absence of mandatory regulation, the effectiveness of follow-up care for NICU graduates by public nurses remains questionable. The nursing professional who is involved in the follow-up care of NICU graduates needs a high qualification of professional nursing skills and critical thinking ability in the area of critical infant care, along with access to the complete medical history. Therefore, hospital-based, follow-up management may be more effective in the delivery of high quality nursing care for NICU graduates than public health center-based follow-up. More study is needed to compare the cost-effectiveness and regional accessibility-effectiveness between hospital-based and public health center-based follow up programs, and to determine which is more valuable for long term, overall health care management in the Korean population.

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