

The Congruence of Nurses' Performance with Developmental Care Standards in Neonatal Intensive Care Units

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ABSTRACT

Introduction: Many studies support the positive short and long-term developmental care for premature infants. This study aimed to determine the congruence of nurses' activity in four areas of developmental care in order to obtain basic information for authorities to provide a program to achieve related standards in the future. **Methods:** The study was performed on 70 nurses working in neonatal intensive care units in Tabriz, Iran. Nurses answered to a questionnaire retrieved from Robison's developmental program. Content validity and reliability (Cronbach's alpha) of translated version were evaluated. Data were analysed using SPSS. **Results:** The mean (standard deviation) of total score was 3.06 (0.44). It was 3.02 (0.50) for individualized care, 3.01 (0.63) for appropriate development environment for the child and family, 3 (0.46) in supporting family relationship and approving the relationship between infant and family and 3.22 (0.56) for collaboration among all care factors. Score 4 was considered as completely meet standards. Therefore, a mean of 3.20 and above was considered as observance higher than 80% and was favorable. The Friedman test showed statistically significant difference among the activities related to the four areas ($p = 0.001$). The collaboration field had the highest mean score and providing services in this field had more congruence with the related standard of developmental care. **Conclusion:** The study showed that the congruence of nurses' performance with standards of developmental care still requires more efforts. Therefore, it is necessary to train the staff in this regard and prepare them for structural and functional facilities.

Introduction

The progress of science and technology in neonatal care has had important results in the survival rate of premature infants. Premature infants are embryos that evolve outside uterus which the infant's brain has the fastest growth at that time. Despite the progresses in neonatal intensive care, the special methods for neonatal care in neonatal intensive care unit (NICU) put infants at high risk of organ injury such as lungs, brain, eye and digestive system. These injuries include chronic lung disease, bronchopulmonary dysplasia, intra-ventricular hemorrhage, retinopathy of prematurity and necrotizing enterocolitis (NEC).¹

Peters et al.² refers to the effects of physiological stress due to care in NICU on the structure and function of infant's brain and developmental disability.

A healthy infant is under mother's care and grows with the appropriate kinds of stimulus. Forty weeks healthy infant has passed the development stage in uterus and is ready to experience a variety of feelings such as tactile, auditory, olfactory and gustatory. When the senses are experienced, appropriate patterns of adapting, learning, cognition and controlling are established.³ For premature infants, most of the existing environmental stimuli in NICU are unilateral

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and occurs regardless of the infant's needs. Loud environmental noises, bright lights and frequent aggressive actions destroy the adequate opportunity for the infant's sleep, and physical and social appropriate condition does not exist for a premature infant. Although NICU is necessary for a premature infant but compared to the uterus, this environment is problematic for infant's brain development and neurodevelopmental expectations. Using care based on developmental support is a solution to reduce premature morbidity.^{1,4}

Coughlin *et al.*⁵ summarized that according to Florence Nightingale, the origins of developmental care can be found in the principles of nursing and nurses responsibility in creating and maintaining an appropriate environment to improve the process. This principle in cohesion with the initial nurse's work and neonatal specialists and pioneers was the theoretical basis for others work.⁵ They described the complexity of the relationship among the brain development of premature infants, advancement of technology and the environment of NICU.⁶ According to Als theory, developmental care emphasis on four key concepts including: (a) personality, humanity, value and integrity of each infant; (b) the importance of parents and family; (c) effective relationship and human interaction and (d) responsibility and opportunity that encompasses the social nature of all human beings.⁶

The developmental care principles consist of four standards; individualize care, providing a supportive environment for development, supporting family and continuity of care. Its philosophy consists of child and family support, staff and family relation and the general policies in NICU. This principal emphasizes on concepts such as emotional care, family centered care, parents participation in care and decision making for infant, meticulous care with the emphasis on infant's reaction, ensure enough sleep, minimal invasive and painful actions, pain management, team work and

coordination.⁷ In developmental care, the aim is to provide an environment with a structure which supports, promotes and guides the development of premature infant or severely ill infant, so the infant and the family experience the least vulnerability.⁵

Several studies have shown the positive impact of developmental care on short and long term outcomes of infants hospitalized in NICU. A study was conducted in Edmonton, Canada based on newborn individualized developmental care and assessment program (NIDCAP) and showed the short-term results of decreased hospitalization time and decreased prevalence of chronic lung disease, long-term results of decreased disabilities, specially mental retardation.² In another study in NICU of Royal United Hospital in Bath, Britain, the infants who received developmental care had more development in neurodevelopment until two years of age compared to the others. It was also estimated that they would suffer less from risk of long-term disability and behavioral problems until the age of five.⁸ Another clinical trial was performed based on NIDCAP and revealed that children in experimental group had higher mental developmental index than the control group, and the findings indicated that NIDCAP can have a positive impact on cognitive development of premature infants.⁹ An article entitled 'Family centered neonatal care' assessed the parents access to wards, individual infant care practices, environment, breastfeeding, kangaroo mother care (KMC) and in 29% of NICUs mothers had unlimited access to the ward.¹⁰ The main reasons for parent's limitations were structural and organizational factors and interference with staff's performances. Most NICUs reported the reduction in light and noise for improving the care environment. In 67% of the wards KMC was performed. An important conclusion from this study was that there was a clear correlation between KMC and visiting time. In NICUs that parents had unlimited visit time, the KMC was reported 87%, and in wards that had

scheduled visiting time, KMC was 62%. Breastfeeding at discharge in association with KMC was reported to have higher rate.¹⁰

The success in increasing the survival rate of infants (low birth weight, prematurity) brings the next development issue for these vulnerable infants. In a study based on major depressive disorder (MDD), the rate of developmental movement disorder was about 8 in 1000.¹¹ Considering the importance of developmental care in decreasing the developmental complications of premature infants, it is important that the developmental care policy planning in NICU be updated with the advancement of technology. By upgrading the knowledge and attitude of the nurses in advantage of developmental care in four areas, infant as a dynamic individual should be placed in the center of care. The task oriented care model should be changed to collaborative model based on the infant's behavior. It helps the physical, mental and social well-being of the infant admitted to NICU.

In Iran, the kangaroo mother care program for those weighing less than 2500 g, was formed as pilot in Tabriz, 1994. From 2007, this plan has widely been running in Tabriz University of Medical Sciences, Iran. The first national workshop on mothers embracing care and secure attachment to children was held in Neonatal Research Centre in collaboration with Khorasan Razavi Health Centre, Iran, in April 2007. There have not been serious works on developmental care based on the four standards. Minor changes for this kind of need are being placed such as making a nest for the infant, reducing light by covering incubators and such cares that need structural changes with low costs based on the policies of each hospital. The NICUs of this study were managed based on traditional care (task oriented) with emphasis on breastfeeding and kangaroo mother care. The aim of this study was to examine the nurses' practice in four areas of developmental care, provide baseline information for nurses and authorities and to identify the needed

interventions and future changes in order to comply with the four standards of developmental care.

Materials and methods

The present study was conducted in NICU of Tabriz hospitals, including 3 university hospitals and 2 non-educational hospitals, based on task driven care (routine care or traditional care) with the policy to promote kangaroo mother care and breastfeeding. Although the base of care in the mentioned sections were not developmental care, but some aspects of this care was performed such as making nest for the infant and decreasing the light during night.

From the five sections under the study one NICU was in a hospital without delivery section. Three hospitals had all the levels of NICU (one, two and three) and the other two hospitals had only levels I and II. The study population was nurses working in shifts of the NICU. The study sample was equal to the population. From the total of 71 nurses, one did not return the questionnaire. Participating nurses had at least six months of working experience in NICU. To perform the study, necessary permits was obtained from the Research Council and the Ethic Committee of Tabriz University of Medical Sciences. Confidentiality of the information was met by not naming the subjects of the study.

The questionnaire was retrieved from Robinson's developmental program. This program was obtained from chapter 22 of infant's developmental care¹² in a five point scale [never (0) to always (4)]. Some long items were grouped under separate options and editorial changes were implemented. The first standard (individual care) had 17 items, second standard (developmental environment) had 10 items, third standard (supporting and confirming the child and parent relationship) had 17 items and fourth standard (collaboration) had 8 items. Total reliability was 0.95; for the first standard it was 0.85, second standard 0.88,

third standard 0.84 and fourth standard had reliability of 0.86.

The data were analyzed by Friedman test to examine the differences between the four areas. Score of 4 was considered as completely meet standards; therefore a mean of 3.20 and above was considered as observance higher than 80% and was deemed favorable.

Results

From 71 qualified nurses, 70 enrolled in the study. Mean age (standard deviation) of participants was 34 (6.5), with experience duration of 9 (5) years and NICU experience of 5 (3.4) years. Most of the nurses had changing shift (72.4%) and had bachelors' degree (97%) and the number of child under each nurse's care was 7 (2.3).

Total mean score was 3.06 (0.44). Standard observance was 76%. The results of each developmental care area are given in tables 1, 2, 3 and 4. Table 5 shows the difference between each developmental care areas. Mean score of individualized care was 3.02 (0.50). Standard observance was 75.5% and unfavorable. The items that had the highest rating in this field included medication, nutrition, chest physiotherapy and suction, paying attention to behavior and reactions during and after feeding, observe proper nutritional protocol according to the poor digestive system of the infant and necessary actions to deal with problems. Items that support the state of the infant (calm sleep ... crying) such as staying with the infant to relax and sleep, paying attention to the infant's behavior to determine activities, coordinate what should be done for the infant and the things that need certain time were items that had the lowest rating.

The second standard which included suitable developmental environment for the infant and parents had mean score of 3.01 (0.63). Standard observance was 75.5% and unfavorable. Recognizing the infant's vision and preventing infant's state change and

helping the family in providing sleeping area for the infant the same as home were the aspects which had the lowest mean. Quickly turning off the alarms and avoiding unnecessary alarm sounds had the highest rating.

The third standard about supporting the family and infant's relationship had mean score of 3 (0.46). Standard observance was 75% and unfavorable. The lowest mean rate was for giving permit to the baby's brother and sister to visit and the highest mean rate was for having the same behavior in agreement with my utterance.

The fourth standard had mean rating of 3.22 (0.56) which was collaboration among all care agents. Standard observance was 80.5% and favorable. Highest mean in these performances belonged to changing working shifts, informing colleagues about information on verge, ability and vulnerability of the infant. The Friedman test showed significant difference among four areas of developmental care ($p = 0.001$).

Discussion

Recent studies on the impact of individualized developmental care for premature infants in NICU showed different positive effects. The most important effects for infants receiving individualized developmental care was improved neural behavioral performance based on physiological, movement, state, self-regulation and more positive interaction with mother during childhood.¹³ The advantage of using Robison's questionnaire was its professional behavior, which increased the qualification of check-list for new staff or current staff orientation. This program has been used effectively for clinical purposes and guiding caregivers for all the disciplines in NICU that have interaction with parents and children such as nurses, physician, respiratory therapists and developmental therapists and subsidiary caregivers.¹³

Table 1. Nurses performance in Neonatal Intensive Care Unit based on individualized care standard (n = 70)

Standard 1: Individualized care	No answer	Never	Rarely	Sometimes	Most of the time	Always	Mean (SD)
The behaviors that the infant show determine my performance	2 (2.9)	1 (1.5)	1 (1.5)	15 (22.1)	39 (57.4)	12 (17.6)	2.83 (0.82)
Between care I give time to the infant to cope with the changes	-	-	1 (1.4)	9 (12.9)	28 (40)	32 (45.7)	3.19 (0.77)
If necessary I take care of the infant that I am not in charge of	-	-	1 (1.4)	12 (17.1)	33 (47.1)	24 (34.3)	3.16 (0.69)
I pay attention to the changes of sleep sign and awareness; when the infant wake up I start looking after him	-	2 (2.9)	-	13 (18.6)	25 (35.7)	30 (42.9)	3.19 (0.49)
I do not do the unnecessary care when the infant is sleep	2 (2.9)	2 (2.9)	7 (10.3)	10 (14.7)	30 (44.1)	19 (27.9)	2.73 (1.16)
I do the things that need specific time with the things that do not need a specific time	1 (1.4)	4 (5.8)	10 (14.5)	11 (15.9)	29 (42)	15 (21.7)	2.73 (1.16)
I perform the infant's care without making him tired	-	-	3 (4.3)	9 (12.9)	38 (54.3)	20 (28.6)	3.09 (0.82)
I perform tasks such as medication, nutrition, chest physiotherapy with care and gently	-	-	1 (1.4)	2 (2.9)	29 (41.4)	38 (54.3)	3.52 (0.55)
When it is time for the infant to wake up, I gently touch him and whisper to him until he is awake	1 (1.4)	1 (1.4)	6 (8.7)	11 (15.9)	30 (43.5)	21 (30.4)	3.04 (0.98)
Before any examination, I wait for a few minutes until the infant is completely awake	-	3 (4.3)	11 (15.7)	15 (21.4)	30 (42.9)	11 (15.7)	2.64 (0.98)
I do not do any procedure while the infant is in prone position	-	2 (2.9)	9 (12.9)	16 (22.9)	26 (37.1)	17 (24.3)	2.73 (1.08)
During procedure, I have all the necessary equipment so I do not need to leave the infant	-	-	3 (4.3)	5 (7.1)	29 (41.4)	33 (47.1)	3.33 (0.81)
I pay attention to any unfavorable reaction during and after feeding the infant	2 (2.9)	-	2 (2.9)	1 (1.5)	22 (32.4)	43 (63.2)	3.54 (0.63)
Considering the vulnerability of the infant's digestive system, I follow the diet protocol	3 (4.3)	-	-	2 (3)	21 (31.3)	44 (65.7)	3.59 (0.59)
If there is any problem, I stop the procedure on the patient and take action to solve it	1 (1.4)	-	-	3 (4.3)	22 (31.9)	44 (63.8)	3.59 (0.58)
I interact with the infant when he is awake	1 (1.4)	1 (1.4)	9 (13)	22 (31.9)	23 (33.3)	14 (20.3)	2.64 (0.98)
After performing care, I stay with the infant until he is relaxed and calm	3 (4.3)	1 (1.5)	21 (31.3)	20 (29.9)	13 (19.4)	12 (17.9)	2.28 (1.13)

Values are expressed as Number (%)

Table 2. Nurses performance in Neonatal Intensive Care Unit based on favorable standard of developmental environment for the infant and family (n = 70)

Standard 2: Appropriate developmental environment for each infant and family is provided	No answer	Never	Rarely	Sometimes	Most of the time	Always	Mean (SD)
I always perform care interaction in a calm environment with low light and sound	2 (2.9)	2 (2.9)	7 (10.3)	20 (29.4)	21 (30.9)	18 (26.5)	2.85 (1.02)
During care, I pay attention to the sources of light, sound, scent and motions, and I eliminate the unnecessary ones	1 (1.4)	2 (2.9)	3 (4.3)	11 (15.9)	30 (43.5)	23 (33.3)	3.02 (1.04)
I speak with a low voice and do not make noises during working	1 (1.4)	2 (2.9)	-	8 (11.6)	33 (47.8)	26 (37.7)	3.16 (0.98)
I immediately turn off the alarms and avoid unnecessary alarm noises	1 (1.4)	1 (1.4)	1 (1.4)	6 (8.7)	24 (34.8)	37 (53.6)	3.42 (0.91)
I place the eye support in a way that does not block the infant's vision	7 (10)	4 (6.3)	1 (1.6)	7 (11.1)	25 (39.7)	26 (41.3)	3.07 (1.04)
I provide the sleep equipment for appropriate infant's position	3 (4.3)	1 (1.5)	2 (3)	7 (10.4)	34 (50.7)	23 (34.3)	3.11 (0.88)
I determine the vision style of the infant and prevent changes in infant's vision	6 (8.6)	1 (1.6)	9 (14.1)	12 (18.8)	29 (45.3)	13 (20.3)	2.64 (1.05)
I provide a calm environment for the family taking care of the infant	1 (1.4)	2 (2.9)	2 (2.9)	10 (14.5)	36 (52.2)	19 (27.5)	3.04 (0.93)
I encourage the family to make a home like environment for the infant's sleep	3 (4.3)	1 (1.5)	5 (7.5)	15 (22.4)	29 (43.3)	17 (25.4)	2.95 (0.88)
I place the infant in a sleep position in the bed to prevent unnecessary movement	1 (1.4)	-	5 (7.2)	4 (5.8)	38 (55.1)	22 (31.9)	3.23 (0.69)

Values are expressed as Number (%)

According to the overall mean score of all the four standards individually, nurses' performance in the collaboration area among all the care factors has higher mean. By examining the individual items within the domains, the highest mean was related to the items that are part of nurses' routine care practices and were favorable. There are challenges associated with developmental care, which are discussed according to its importance.

In individual care the infant's nutrition is important. Safe nutrition and assisting in oral feeding are not discussed but attention to the infant's enjoyment of food is important. Getting parents assistance in feeding the infant makes them feel satisfied. Nutrition is an interaction factor between infant and parents. Caregivers need to develop this relationship; so families can obtain the skills needed to assess infant during nutrition.^{3,7} In NIDCAP, the caregiver determines his/her performance according to the infant's behavior. The infant's behavior is the way for

infant's communication. According to the infant's behavior, care program is planned and the infant's reaction to everyday care is evaluated. Thereby, the types of environmental protection that helps maintaining stability are determined and the family care is planned. Infant care based on sign is a part of providing developmental care. These signs provide connection between the infant's needs and opportunities.^{1,3,7,14} In Symington and Pinelli study,¹⁵ developmental care support to estimate the effect of specific developmental care intervention on the results of treating premature infants was examined. Interventions included positioning, clustered care performances, adjusting external stimuli and individualized developmental care interventions. The overall results of developmental care interventions showed improve in growth in short time, decreased respiratory support, decreased incidence of chronic lung disease, reducing the length and cost of hospital stay and improved

Table 3. Nurses' performance distribution in Neonatal Intensive Care Unit based on support and approval standard of infant and family relationship (n = 70)

Standard 3: Support and approval of infant and family relationship from birth	No answer	Never	Rarely	Sometimes	Most of the time	Always	Mean (SD)
I interact with the infant's family respectfully	1 (1.4)	1 (1.4)	1 (1.4)	3 (4.3)	29 (42)	35 (50.7)	3.38 (0.85)
My behavior is the same as my utterance	-	-	-	1 (1.4)	37 (52.9)	32 (45.7)	3.47 (0.55)
Any time of the day, I support the family generously	1 (1.4)	-	1 (1.4)	6 (8.7)	32 (46.4)	30 (43.5)	3.38 (0.73)
During changing shifts, I am prepared at the admitted infants area and politely provide the family with the information	2 (2.9)	1 (1.5)	2 (2.9)	15 (22.1)	32 (47.1)	18 (26.5)	3.09 (0.90)
At the presence of the family, I perform support and interaction with the infant	-	-	1 (1.4)	7 (10)	33 (47.1)	29 (41.4)	3.40 (0.70)
I interact with the family and patiently listen to them	-	-	-	8 (11.4)	36 (51.4)	26 (37.1)	3.35 (0.570)
I record the interactive activities that the family is involved in	-	3 (4.3)	4 (5.7)	12 (17.1)	29 (41.4)	22 (31.4)	3.14 (0.92)
I participate the family in training activities	-	-	1 (1.4)	10 (14.3)	30 (42.9)	29 (41.4)	3.38 (0.79)
I explain the positive feedback of parents interaction and their role in developmental care	-	-	2 (2.9)	13 (18.6)	33 (47.1)	22 (31.4)	3.26 (0.76)
I ask the parents to help in reducing stress during aggressive procedures	1 (1.4)	4 (5.8)	13 (18.8)	19 (27.5)	24 (34.8)	9 (13)	2.57 (1.06)
I help the parents in performances that are related to them like bath	2 (2.9)	4 (5.9)	4 (5.9)	23 (33.8)	20 (29.4)	17 (25)	2.73 (1.01)
I assist the parents in interacting with their infant and understanding the behaviors	2 (2.9)	-	2 (2.9)	13 (19.1)	27 (39.7)	26 (38.2)	3.23 (0.79)
I explain to the family to perform according to the infant's behavior	-	-	1 (1.4)	10 (14.3)	35 (50)	24 (34.3)	3.26 (0.73)
I examine the mother's tendency towards KMC	-	-	-	4 (5.7)	34 (48.6)	32 (45.7)	3.45 (0.63)
I allow the infant's brother and sister to visit him/her	2 (2.9)	16 (23.5)	22 (32.4)	16 (23.5)	8 (11.8)	6 (8.8)	1.69 (1.37)
Do the families complain about not having the same care for each infant?	3 (4.3)	25 (37.3)	24 (35.8)	8 (11.9)	7 (10.4)	3 (4.5)	2.69 (1.21)
Parents are satisfied with the permanent care	2 (2.9)	-	2 (2.9)	9 (13.2)	32 (47.1)	25 (36.8)	3.11 (0.80)

KMC: Kangaroo mother care, Values are expressed as Number (%)

Table 4. Nurses' performance in Neonatal Intensive Care Unit based on standard of collaboration among care agents (n = 70)

Standard 4: Collaboration exists among all the care agents	No answer	Never	Rarely	Sometimes	Most of the time	Always	Mean (SD)
To support the infant during stressful procedures, I stay close to the infant	1 (1.4)	1 (1.4)	3 (4.3)	6 (8.7)	35 (50.7)	24 (34.8)	3.02 (0.78)
While the staff or the parents are present during a procedure, I will talk to them about my performances in a right time	2 (2.9)	1 (1.5)	-	11 (16.2)	39 (57.4)	17 (25)	3.07 (0.63)
Before any act, I talk to the other persons who are in charge of the infant's care	2 (2.9)	-	3 (4.4)	15 (22.1)	30 (44.1)	20 (29.4)	3.02 (0.78)
When the infant is ready for other procedures, I will coordinate with the caregivers for future procedures	1 (1.4)	-	3 (4.3)	8 (11.6)	31 (44.9)	27 (39.1)	3.28 (0.74)
During potential stressful procedures, I ask for help from others for the infant's care	3 (4.3)	-	-	14 (20.9)	26 (38.8)	27 (40.3)	3.16 (0.76)
During stressful procedures, I help my colleagues	1 (1.4)	-	3 (4.3)	3 (4.3)	31 (44.9)	32 (46.4)	3.47 (0.67)
During shift change, I provide my colleagues with the infant's information on abilities and vulnerabilities	2 (2.9)	-	1 (1.5)	4 (5.9)	23 (33.8)	40 (58.8)	3.52 (0.70)
I respect everyone involved in the infants care and provide opportunities for them to perform their duties	2 (2.9)	-	1 (1.5)	7 (10.3)	21 (30.9)	39 (57.4)	3.42 (0.70)

Values are expressed as Number (%)

Table 5. Freidman test for differences between the four areas of developmental care

Developmental care	Mean (SD)	Mean score	Freidman test
Individualized care	3.02 (0.50)	2.35	Chi-square = 16.62 df = 3 p = 0.001
Appropriate developmental environment for the infant and family	3.01 (0.63)	2.31	
Support and approval of the infant's and family relationship	3.00 (0.46)	2.30	
Collaboration among care agents	3.22 (0.56)	3.04	
Total	3.06 (0.44)	-	-

neurodevelopmental outcomes until the age of 24 months for premature infants.¹⁵ In Kleberg *et al.*⁹ study, babies in experimental group showed higher intellectual development compared to the control group. It can have a very positive effect on the cognitive development of very premature infants.¹⁵

Categorizing routine care in individually defined unique care and carried out them together at the same time (clustered care) allows the baby to rest in longer periods, and can be integrated with routine nurse's care.^{3,7} Bertelle *et al.*¹⁶ conducted a study to determine the impact of developmental care on premature infant's sleep. In one group infants received developmental care based on NIDCAP, reducing direct light by covering incubator, reducing environmental noise by closing the door and head as well as back and leg support during sleeping. In the control group infants received care based on the method before using NIDCAP which means without reducing light, noises and sleep supports. Researchers believed that developmental care had positive effect on improving sleep. More studies should be done on the impact of developmental care on neural behavioral outcomes.

This study showed that sleep is the important reason for premature infant's behavior. Evolution and differentiation of the brain, memory consolidation and learning, supporting behavioral patterns and emotions are the possible aspects of active sleep (REM: rapid eye movement). Energy storage, increase in protein synthesis and release in growth hormone are known consequences of quiet sleep (non-REM).¹⁶ Before starting any examination, the infant should be conscious. It is emphasized that even when the baby is awake he/she should be allowed to

recognize touch and care, and to start with soft talking, calling their names, familiar scent and finally touching them.^{3,7} After any treatment, as long as the baby is not in a comfortable situation, he/she should not be left alone. By paying attention to the infant's behavior, his/her satisfaction can be recognized. Very premature infants have hypotonic ends. Nest or restricting areas help in maintaining proper position of infant which prevents disorganization of physiological balance and energy loss.³

Another study aimed to discover the relationship between specific behavior of nurses' care and behavioral responses of premature infants during bath, and to determine nurses behavior associated with infant's stress.¹⁷ The results showed that when nurses provide additional support the infant's stress decreased, and self-regulation increased during bath specially when the infant had limited holding and support.¹⁷ Salimi *et al.*¹⁸ study showed that mother's skin contact decreased the heart rate and respiration rate, and enhanced the premature infants behavior toward relaxation.

The area of supporting and approving the parents and child relationship has an important developmental care role in the family centered care. There are also some challenges in this area. For example, there was no interest in getting parents assistance in reducing the infant's stress during invasive procedures. Skin to skin contact with the mother during getting blood from the infant's heel reduces pain.⁷ In an article entitled 'supporting family and family centered care in NICU, supporting palliative care was emphasized.¹⁹ Allowing the infant's brother or sister to visit helps them in feeling important and to start knowing the new

member.¹⁹ Nurian et al.²⁰ compared the impact of KMC and traditional care on physiological criteria of low birth weight infants. This method can be effective for infant's physiological stability criteria and provide the family centered care.²⁰ Valizadeh et al.²¹ showed that nurses can distinguish the mother-infant attachment cues when KMC continues for a mother-infant diad in NICU. The results of Cooper et al.²² study showed the positive impact of family centered care on the stress level, ease and confidence.

In providing a favorable developmental environment for the family and child, immediate turning off the alarm was emphasized. Since most of the alarms like pulse oximetry and apnea alarms are associated with the infant's physiological status, nurses are more sensitive about them. Other issues are different, such as the infants' visual system, there are less days needed for mechanical ventilation, lowering the heart rate and reducing activity, increasing sleep and improving nutrition by creating day and night cycle using different lightening.

For hearing environment, sleep disorder model and behavioral and physiological responses in term and premature infants in NICU can be mentioned.⁷ Kangaroo care by creating a favorable environment helps the baby to have a deep sleep and harmful stimuli such as loud noises, bright lights and even taking blood will not hurt the infant.⁴ Amiri et al.²³ study showed the effect of lullaby on the percentage of oxygen saturation of blood in premature infants. Valizadeh and Hasani²⁴ studied experiences of mothers in NICU in Iran and revealed stressors affecting them. In other questionnaire based quantitative study, Valizadeh et al.²⁵ and Borim Nejad et al.²⁶ studied the mothers stressors in NICU. According to mothers, the most stressors were 'parent role and parental relation', 'environmental factors' and 'the appearance and behavior of infants and special treatments', respectively.²⁵ Environmental factors were 3rd in Borim Nejad et al. study.²⁶

Environmental stressors such as infants' respiratory device, sudden monitor alarm sounds and special equipment were the most experienced stressors by mothers.^{25,26} Mothers experience disappointment in NICU can affect the interaction between mother and child, emotional development and infant's health.²⁵

The last developmental care is the collaboration between health care agents. The performances related to this area had the highest mean and was favorable. The intensive care unit is a professional practice environment. Without collaboration there is the possibility of irregularities, therefore collaboration observance in nurses' performances is crucial. Communication through medical records or direct communication between caregivers, shifts or doctors' rounds, parental participation in care and trust is important in ensuring effective care.⁷ The results showed that nurses' performance in association with collaboration was different from other areas. It also pointed out the importance of planning for future changes related to the other three areas.

Based on the results of the present study, it is required that authorities and experts prepare this kind of care model in NICU. Advanced technology and neonatal professionals cause survival of more premature infants. To implement this plan, it is required to train more nurses. In national neonatal audit program the aim is to provide clinical information of care with national standards such as one nurse for each infant in NICU.²⁷ According to the classified level of services for mothers and infants, by Association of Iranian Neonatologists, one nurse is assigned to two infants in a third level NICUs. However, in the present study the number of infants under the supervision of one nurse was 7 ± 2.3 . Studies on developmental care in developing countries have been started for two decades. In Iran, except effect of KMC, breastfeeding and massage, there is no other study in this regard. The present study

introduces the developmental care approach to the nurses of NICU.

Due to ethical considerations, no comparison was made between educational and non-educational hospitals in Tabriz, Iran. Training developmental care standards should be in the lead of all the future training programs due to its importance in NICU. It is recommended that an experimental study with training interventions be conducted in this matter. This study cannot be extended to other nurses in NICU of Iran. Self-report may not be entirely consistent with the reality, and research objectives were explained at the beginning of the research to reduce the errors. It is also recommended to use observation tools for measuring developmental care standards in future studies.

Ethical issues

None to be declared.

Conflict of interest

The authors declare no conflict of interest in this study.

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