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The rate of developmental care delivery in neonatal intensive care unit

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ABSTRACT

Aims: The delivery of developmental care in neonatal intensive care units helps save neonates' energy, maintains their physiologic stability, reduces their and their families' stress, shortens their hospital stay, and cuts healthcare costs. This study was undertaken "to determine the rate of developmental care delivery in neonatal intensive care units".

Methods: This cross-sectional descriptive study was conducted in 2012–2013. We used the census method and recruited 138 critical care nurses from neonatal intensive care units of nine teaching hospitals affiliated to Tehran University of Medical Sciences, Tehran, Iran. The data collection tool was a questionnaire developed by using the findings of a study conducted by Coughlin et al. (2009). Data analysis was carried out with SPSS v. 20.0 and by using descriptive statistics measures and inferential statistics tests such as the independent-samples t-test.

Results: The rates of delivering the five dimensions of developmental care were as follows: Daily routine care: 79.46%; Protected sleep: 65.43%; Provision of a healthy environment: 65.27%; Family-centered care: 63.32%; and Pain and stress assessment and management: 66.53%. The total rate of developmental care delivery was 66.53%.

Conclusions: Developmental care delivery is not a common practice in neonatal intensive care units. Consequently, more efforts are needed for enhancing the rate of delivering developmental care. Strategies such as educating families and neonatal critical care nurses, developing and enforcing developmental care guidelines by public health authorities, and supervising care measures can enhance the rate and the quality of developmental care delivery.

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1. Introduction

Some neonates may need intensive care services due to prematurity or physical health problems and hence, may be hospitalized in neonatal intensive care unit (NICU). From each 100 live births, one or two neonates need intensive care services for at least one hour [1]. Premature and full-term neonates who are hospitalized in NICU are deprived from stimulations which are normally provided to healthy ones either in the sheer heaven of their mother's uterus or in families. Accordingly, they usually experience sensory deprivation or overload in NICU [2].

One strategy for reducing irritating stimulations and helping neonates grow normally in NICU is developmental care. Developmental care includes care services provided by NICU nurses and other care providers in order to minimize neonates' stress and reduce external stressors such as sounds and light [3]. The aim of developmental care is to minimize stressful interventions such as blood sampling, physical examinations, and medical and nursing procedures so that a neonate can take a longer undisturbed rest [4 and 5]. In developmental care, services are categorized and provided in such a way that does not tire neonates [6]. In other words, as soon as a neonate shows signs of intolerance such as facial grimacing or physiologic changes, care delivery should be discontinued [7]. Developmental care helps save neonates' energy for growth and development and therefore, facilitates physiologic stability and recovery [8], improves neonates and their parents' psychosocial status, and cuts healthcare costs [3].

Despite its major benefits, there is no consensus over the definition of developmental care and therefore, assessing its delivery in NICUs is difficult [9]. Currently, developmental care is mainly provided in developed countries. Given its importance and in order to facilitate the evaluation and the delivery of evidence-based developmental care, the American Joint Commission on Accreditation of Healthcare Organizations defined the five domains of developmental care irrespective of the type of neonates' underlying disorders and based on the comprehensive developmental care in NICUs. These five domains are daily routine care (including feeding, skin care, and positioning), protected sleep, provision of a healthy environment (sound and light management, teamwork, and evidence-based practice), family-centered care, and pain and stress assessment and management [10]. Developmental care provides a framework in which caring processes and environment are modified and a supportive structure is created for facilitating neonates' growth and development, providing individualized care, and fulfilling neonates and families' psychological needs [10].

Many studies have been conducted on the benefits of developmental care. Nonetheless, there is limited information on the rate of developmental care delivery in NICUs worldwide [11]. The results of a study conducted in the United States revealed that from 146 participating nurses, only 14% considered the delivery of developmental care in their working unit as optimal while the remaining 86% believed that they were not providing optimal developmental care [12]. Wu (2010) reported that the most common types of developmental care provided by nurses and parents in Taiwan included nesting, incubator coverage, and positioning [13]. Hamilton and Redshaw (2009) also found that the total score of developmental care delivery in the United Kingdom was 6.2 out of 8 [11].

As the core of nursing care in NICUs, developmental care has been developed for facilitating neonates' neural development [14]. Nonetheless, our personal experiences showed that developmental care is not provided optimally in NICUs. This study was undertaken to determine the rate of developmental care delivery in NICUs.

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2. Methods

The population of this cross-sectional descriptive study comprised 172 nurses working in NICUs of nine teaching hospitals affiliated to Tehran University of Medical Sciences, Tehran, Iran. Nurses were recruited in 2012–2013 by using the census method. The inclusion criterion was having a work experience of more than six months in nursing.

A two-part researcher-made instrument was used for data collection. The first part of the instrument was a demographic questionnaire which contained the eight items of age, gender, university degree in nursing, work experience in nursing, work experience in NICU, employment status, previous knowledge of developmental care, and ways of acquiring such knowledge. The second part of the instrument was a self-report 57-item questionnaire on developmental care delivery. This questionnaire was developed by using the criteria defined by Coughlin et al. (2009) [10]. The five domains and the item-distribution of the questionnaire were as follows:

1. Daily routine care: eleven items (feeding: four items; skin care: three items; and positioning: four items);
2. Protected sleep: eleven items;
3. Provision of a healthy environment: sixteen items (sound and light management: seven items; teamwork: six items; and evidence-based care: three items);
4. Family-centered care: ten items; and
5. Pain and stress assessment and management: nine items.

The items of this questionnaire were responded on a Likert-type scale including the five points of Always, Often, Sometimes, Rarely, and Never. These five points were scored from 4 to 0, respectively. The third item of the sleep domain was scored reversely. The total score of the developmental care delivery questionnaire was presented on a 0–100 score, i.e. by using percentage values. For assessing the content validity of this questionnaire, seventeen experts (including neonatal nursing and medical faculty members, NICU nurses and head-nurses, and developmental care specialists) were invited to evaluate its content. Moreover, we evaluated the reliability of the questionnaire by performing a test-retest assessment with a two-week interval in between. Accordingly, 22 nurses were recruited to complete the questionnaire twice. The test-retest Kappa coefficient ranged from 54.55 to 100% with a mean of 86%.

After obtaining written consent from the participating nurses and ensuring them about the confidentiality of their data, we asked them to complete the study questionnaires. About ten minutes was needed for completing the questionnaires. However, in order to minimize the negative effects of workload and occupational stress on responses, we asked the participating nurses to complete and return questionnaire within one week. In total, 138 out of the 172 recruited nurses filled out the questionnaires completely. Data analysis was carried out with SPSS v. 20.0 and by using descriptive statistics measures and inferential statistics tests such as the independent-samples t. The level of significance for all statistical analyses was set at less than 0.05.

3. Results

From 138 nurses who participated in the study, only one nurse was male (0.7%). Most of the participants (128 nurses; 92.8%) held Bachelor's degree in nursing while ten nurses (7.2%) had Master's degree in neonatal care nursing. The means of participants' age, work experience in nursing, and work experience in NICU were 31.76±5.41, 7.17±4.84, and 4.36±3.58 years, respectively. About 79.71% of the participants (110 nurses) had previous knowledge of developmental care. Table 1 shows ways of acquiring such knowledge. The most and the least common ways of acquiring knowledge about developmental care were exchanging information with nursing colleagues (56.4%) and participating in the

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National Continuing Medical Education Programs (1.8%). The relationship between the rate of developmental care delivery and nurses' previous knowledge of developmental care is shown in table 2.

Table 1: Ways of acquiring knowledge about developmental care

Ways of acquiring knowledge about developmental care	N	%
Exchanging information with nursing colleagues	62	56.4
Taking short-term neonatal intensive care courses	60	54.5
Self-study	57	51.82
Participating in educational workshops	55	50
Attending in-hospital seminars and group discussions	47	42.7
Exchanging information with medical colleagues	37	33.6
Attending congresses	19	17.3
Participating in the National Continuing Medical Education Programs	2	1.8

Table 2: The relationship between the rate of delivering different domains of developmental care and nurses' previous knowledge of developmental care

Previous knowledge Developmental care	Yes (n=110)	No (n=28)	Independent-samples t test
Protected sleep	67.19.13.87	58.52±15.84	P=0.005 *
Pain and stress management	59.75±19.45	56.85±17.16	P=0.47
Feeding	72.84±17.32	7.88±13.61	P=0.77
Skin care	82.27±15.11	80.36±12.47	P=0.54
Positioning	85.91±12.25	76.77±15.20	P=0.001*
Daily routine care	80.17±11.34	76.7±11.23	P=0.15
Family-centered care	64.27±14.19	59.55±15.72	P=0.13
Sound and light management	52.53±20.44	43.24±19.55	P=0.03*
Teamwork	81.86±14.44	72.02±15.38	P=0.002
Evidence-based practice	73.56±24.44	57.14±26.26	P=0.002*
Provision of a healthy environment	67.47±14.81	56.64±16.39	P=0.001*

Table 3 shows the rate of delivering different domains and sub-domains of developmental care. In this table, 'Minimum' and 'Maximum' stand respectively for the highest and the lowest rates of delivering developmental care by the participating nurses. The total rate of developmental care delivery in NICU was 66.53% while the rates of delivering different domains of developmental care were as follows: Daily routine care: 79.46%; Protected sleep: 65.43%; Provision of a healthy environment: 65.27%; Family-centered care: 63.32%; and Pain and stress assessment and management 59.16%.

4. Discussion

Recent advances in medical technologies have significantly reduced neonatal mortality rate, particularly among premature neonates. Nonetheless, the combination of technologies and care services can inhibit neonates' neural development and lead to adverse long-term consequences for them. A strategy for preventing such adverse effects is developmental care. Developmental care minimizes the adverse effects of technologies and improves the conditions for neonates' growth and development [15]. Developmental care includes a wide spectrum of interventions and incorporates the three main components of

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assessing neonates' nervous system and neural condition, minimizing environmental stress, measures were among the primary responsibilities of NICU nurses. Moreover,

Table 3: The rate of delivering different domains and sub-domains of developmental care

Domains of developmental care	Delivery rate	Minimum	Maximum	Mean	Standard deviation
Daily routine care	Positioning	50	100	84.06	13.36
	Skin care	50	100	81.88	14.59
	Feeding	25	100	73.05	16.59
Daily routine care		45.45	97.73	79.46	11.36
Protected sleep		11.36	97.73	65.43	14.65
Neonatal intensive care	Teamwork	33.33	100	79.86	15.11
	Evidence-based practice	8.33	100	70.23	25.59
	Sound and light management	0	96.43	50.65	20.56
Provision of a healthy environment		26.56	98.44	65.27	15.7
Family-centered care		32.50	100	63.36	14.58
Pain and stress assessment and management		16.17	97.22	59.16	18.98

and involving parents in the process of care delivery [16].

The chief advocates of developmental care in NICU are neonatal care nurses. Neonatal care nurses manage participations, collaborations, and treatment policies. Moreover, supporting thousands of critically-ill and premature neonates as well as their family members is among the main responsibilities of neonatal care nurses [17]. Besides, nurses are directly and continuously in contact with patients and are aware of their needs. Accordingly, assessing nurses' viewpoints would be the best way for determining the rate of developmental care delivery in NICU. In this study, we developed a data collection instrument by using the criteria defined by Coughlin et al. (2009) [10] and employed it for assessing nurses' performance in delivering developmental care in five main domains. The findings of the study are discussed below.

Delivering daily routine care

The highest rate of developmental care delivery was related to the daily routine care domain (79.46%). This domain comprised the sub-domains of nesting, feeding, positioning, and skin care. The reason behind such high rate of daily routine care delivery is that such care implementing these measures is not time-consuming for nurses. Besides, given the availability of equipments such as nests in the study setting, optimum and easy positioning of neonates was perfectly feasible. Wu (2010) also found that the mean of using nest was higher than the means of implementing other types of developmental care measures [13]. The mean of implementing feeding-related measures (such as giving pacifier, assessing neonate's readiness for being fed, and training mothers for breastfeeding) was also as high as 73.05%. Valizadeh et al. (2013) also reported that feeding-related measures (such as paying attention to neonates' weak digestive system, assessing their negative reactions during feeding, and using feeding protocols) obtained the highest score [18]. Our findings also revealed that the means of skin care delivery and optimum positioning were 81.88% and 84.06%, respectively. In other words, our participating nurses held neonates' head and trunk in the same direction while positioning or moving them, widely used nests particularly for premature neonates, and placed them in fetal or prone positions in order to aid their development. Wu (2010) also reported that the

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highest rates of delivering daily routine care were related to nesting and positioning.

Protected sleep

The rate of implementing protected sleep measures was 65.43%. Nurses who had previous knowledge of developmental care obtained significantly higher protected sleep scores than the nurses who did not have such knowledge (p=0.005). We also found that most nurses were aware of the importance of adequate sleep to neonates and hence, attempted to provide non-emergency care measures while neonates were awake and also in response to neonates' behavioral manifestations. Moreover, they attempted to provide neonates with periods of silence and place them in fetal position (i.e. putting arms and legs flexed in towards neonates' own body) or kangaroo positions during their sleeps. Valizadeh et al. (2013) also reported that 97.2% of their participating nurses sometimes, often, or always paid attention to neonates' sleep [18].

Provision of a healthy environment

Study findings revealed that the rate of providing a healthy environment was 65.27%. This finding denotes that our participants could not provide a healthy environment to neonates hospitalized in NICU due to problems such as inappropriate and inadequate equipments. Valizadeh et al. (2013) also reported the same finding [18]. We also found that the mean of providing a healthy environment domain was significantly higher among nurses with previous knowledge of developmental care (p=0.001), confirming the importance of having knowledge about developmental care.

The highest sub-domain score in this domain was related to the teamwork sub-domain (79.86%). Again, nurses with previous knowledge of developmental care acquired significantly higher teamwork scores compared with nurses without such knowledge (p=0.002). We also found that the mean of evidence-based practice sub-domain was 70.23%. Moreover, the mean of evidence-based practice sub-domain among nurses having previous knowledge of developmental care was again significantly higher than the nurses who did not have such knowledge (p=0.002). This finding implicates that pre-familiarity with developmental care increases the likelihood of its delivery.

Study findings revealed that the mean of the sound and light management sob-domain of the healthy environment domain was 50.65%. Our participants made shift handover reports at neonates' bedside without taking into account the effect of sounds on neonates' health and development. In other words, they were unable to maintain environmental sounds at 45–50 decibel level. Moreover, they could not decrease the intensity of environmental light to 60 foot-candles even by using separate light switches. However, they attempted to cover incubators while performing nursing procedures in order to protect neonates from direct light exposure. These findings are in line with the findings of a study conducted by Perapoch et al. (2006). They reported that environmental sound and light were managed only in 31% and 72% of Spanish NICUs, respectively [19]. Our findings indicated that the mean of sound and light management sub-domain was also significantly higher among nurses with previous knowledge of developmental care (p=0.032), denoting that greater knowledge is associated with better performance.

Family-centered care

The rate of family-centered care delivery was 63.32%. Our participating nurses allowed parents to visit their neonates, sing lullaby for neonates, cuddle their neonates, and sometime attend neonates' bedside while nurses were implementing invasive procedures. Moreover, they educated parents about the delivery of Kangaroo care and also about the manifestations of neonates' growth and development. Meanwhile, they provided parents with the opportunity of implementing

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daily care measures such as breastfeeding, changing, and bathing without confining them to visitation hours. Valizadeh et al. (2013) also found that the least score was related to the family-centered care domain of developmental care [18]. Estiri and Zendehtalab (2013) reported that providing educations to parents by nurses enhances parents' efficacy in looking after their neonates [20]. Skene et al. (2012) noted that parental involvement in neonatal care facilitates devolving care responsibilities from nurses to parents [21]. The results of a study conducted by Pallás-Alonso et al. (2012) revealed that parents in different European countries such as Italy, France, and Spain had limitations in providing kangaroo care to their neonates in NICU up to 80%, 73%, and 41%, respectively [22].

Pain and stress assessment and management

Our findings revealed that compared with other domains of developmental care, the least score was related to the pain and stress assessment and management (59.16%). Cong et al. (2013) also reported that only 44% of their participants were successful in assessing and managing neonates' pain [23]. Although pain is considered as the fifth vital sign [24], there was no valid instrument in our study setting for assessing and documenting neonates' pain even during implementing potentially painful procedures.

The best method for assessing the rate of developmental care delivery is to employ the observation technique as well as some checklists. However, because of facing several limitations, we used a self-report questionnaire.

5. Conclusions

Study findings revealed that many efforts are still needed for providing quality developmental care in NICUs. We recommend future studies to identify barriers to developmental care delivery. Successful delivery of developmental care necessitates adopting an interdisciplinary approach, involving all healthcare professionals, and educating them about the principles of developmental care delivery. Moreover, developmental care policy making by using interdisciplinary approaches would facilitate developmental care delivery and improve its quality. Given the practicality of the developmental care domains which had been used and assessed in this study, these domains can be used for developing national developmental care guidelines and protocols. Moreover, the findings of this study revealed some weaknesses of developmental care delivery such as parents' inability to visit their neonates frequently.

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