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Impact of Instructions on the Developmental Status of Premature Infants on the Clinical Practice of Neonatal Intensive Care Unit (NICU) Nurses

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ABSTRACT

Background: Stabilization of the conditions of infants is essential to the neurodevelopmental interventions in neonatal intensive care units (NICUs). Premature infants are born before the third trimester of pregnancy is completed, which disrupts the evolutionary process associated with brain development in neonates. Given the importance of the position of preterm infants and limited findings on nursing education in NICUs, the present study aimed to conduct a training intervention to improve the performance of nurses to properly implement the evolutionary positions of premature infants in the NICU. We also investigated the impact of instructions on the evolutionary status of preterm infants on the clinical practices in the NICUs of the hospitals affiliated to Iran University of Medical Sciences.

Methods: This quasi-experimental study was conducted on 85 NICU nurses selected via convenience sampling. Performance of the nurses in implementing the evolutionary supportive status on the preterm infants admitted to the NICU was assessed and compared using a neonatal assessment tool before, one week, and two months after the intervention.

***Results*:** Analysis of the demographic data indicated that the majority of the NICU nurses had a master's degree (98.8%), most of whom were aged more than 30 years (48.2%). Nurses constituted the majority of the participants (97.6%), who had the highest work experience (5-10 years) (42.4%). A significant difference was observed in the performance scores of nurses in the evolutionary support status of premature infants before, one week, and two months after the training ($P<0.001$).

Conclusion: According to the results, training on the emergency support status of premature infants had a positive effect on the nursing performance in NICUs.

Keywords: Developmental support status, Neonatal intensive care unit, Performance, Training and instruction

Introduction

Premature infants are born before 37 weeks of gestation. According to the World Health Organization (WHO), the rate of premature birth is estimated to be more than one-tenth of the total childbirths across the world, with the varying incidence of 9-12 cases per 100 births. Premature infants are physically vulnerable due to the incomplete evolution of various organs (1).

The uterus provides a favorable environment for the fetus through facilitating positive sensory receptions, collecting and limiting the stretching of the organs, controlling light and noise, and providing adequate sleep and unlimited access to the mother, all of which are essential to the normal growth of the brain. Premature birth disrupts these early evolutionary needs, and preterm infants must be admitted to neonatal intensive care units (NICUs) in many cases (2).

To prevent the adverse outcomes of premature birth, several studies have focused on improving

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the environment for the mother and infant by using the tools to assess the individual evolutionary development of the infant, thus providing appropriate, specialized training on the evolution of preterm neonates, as well as further evaluations for their caregivers.

The former emphasis on avoiding contact and manipulation of preterm infants mainly revolved around the protection of these highly susceptible newborns against intrinsic sensory intrusions. An essential goal of this program is to prevent excessive stimulation and pain, thereby enhancing the neuronal development of premature infants.

Proper positioning is an integral part of evolutionary care (3). The placement of infants in an evolutionary position brings them closer to the longitudinal line of the body in order to support the infant and achieve neurodevelopment. The implications of the assessment checklists for infant placement assist nurses as the primary caregivers to evaluate the position of the infant.

The evolutionary supportive status includes restricting the body of the newborn, creating the curvature in the body (similar to the fetal position), and directing the body to its central axis. The evolutionary supportive status allows the placement of neonates in various abdominal, open or adjacent positions, while protecting them against the adverse consequences of inappropriate positions. In the described situations, the extremities are inclined toward the midline of the body, so that the position of the infant would resemble the embryonic state in the womb (4).

NICUs are located in maternity care units for the supervision of infants by pediatricians. This section has been developed to provide care services for the infants with special needs (5). NICUs have undergone momentous development in their interaction with the technology; therefore, the knowledge and performance of NICU nurses should be carefully assessed in order to enhance the ability and quality of nursing care.

Considering the meticulous implementation of nursing care in healthcare institutions, providing feedback on nursing performance not only motivates efforts to improve care processes, but it also enhances the quality of care through proper planning on various aspects of nursing care, especially in NICUs, which are insufficiently explored in terms of the quality of services. Nursing care quality of nursing is a common approach to the quality control of nursing services in accordance with the standards of the described clinical practices (6).

Nursing of the premature infants admitted to the NICU requires sensitivity, accuracy, skills, and experience. Since nurses are the main caregivers of these infants, the slightest substandard performance on behalf of nurses may cause irreversible complications that not only affect the infant, but also raise legal consequences for nurses. Therefore, standard healthcare training could increase the quality of services and reduce complications in neonates (7).

Selecting appropriate teaching methods is one of the most important steps in the design and implementation of educational programs since effective learning is primarily the result of good teaching. As such, training approaches play a pivotal role in the quality of education. In nursing education, there is a relationship between continuous education and nursing care. Considering the need to foster dynamism in this field, and given the importance of the current nursing education that is in line with lifelong learning, it is crucial to conduct educational programs, which have a significant impact on enhancing skills and capabilities and yielding economic and professional benefits. Providing constant training for nurses is a strategy likely to improve the quality of nursing practices and prevent the occurrence of incidents and errors (8).

Since infants are an extremely vulnerable group, providing standard education for nurses is necessary to raise their awareness and enhance their performance, which in turn ensure effective care services. The required training could be provided by face-to-face instruction in the presence of the infant, electronic training, and film screening and slideshows (9).

Proper positioning of infants by nurses is a precious investment since results in the delivery of healthy newborns and imposes minimum costs on the parents and community. Since the placement of infants in the proper position is an inherent element in the evolutionary care of neonates by NICU nurses, training on the use of neonatal developmental implants may have a significant effect on improving the clinical practices of nurses in NICUs (10).

Given the importance of the mentioned issue and considering the need of NICU nurses for training on the developmental position of infants and inadequate findings in this regard, the present study aimed to investigate the impact of

instructions on the evolutionary status of preterm infants on the clinical practices in NICUs.

Methods

This interventional study was conducted to investigate the impact of instructions on the evolutionary status of preterm infants on the clinical practices in the NICUs of the hospitals affiliated to Isfahan University of Medical Sciences in Isfahan, Iran during in 2015-2016 (registry code: IRCT2016071328915N1).

The selected settings for the study were the maternity care units of Shahid Akbar Abadi Hospital and Ali Asghar Hospital affiliated to Iran University of Medical Sciences. Sample population included nurses with undergraduate and graduate degrees. Sample size of the study was determined at 85 subjects (α=0.05; test power: 80%) using the MedCalc software and the following formula:

$$N = 2 (z1-\alpha / 2 + z1-\beta) 2y2 / (\mu1-\mu0)$$

Participants included 85 nurses who were enrolled in the research after obtaining informed consent and completing demographic forms. During one week and in three different shifts, the performance of the nurses in the placement of newborns in evolutionary positions was reviewed and evaluated by a research assistant using the checkpoints of an infant position assessment tool, which examined the infants in six positions. Afterwards, the required instructions were provided for the nurses by the researcher via slideshows and face-to-face conversations in the presence of the infant.

In the next step, during the first week after the training intervention and in three different shifts in the NICUs of the selected hospitals, the performance of the nurses was assessed and recorded by the research assistant using a newborn evolutionary assessment checklist.

In the second stage, the performance of the nurses was evaluated using the position assessment checklist two months after the training intervention. The performance of the nurses was assessed within one week and in three different shifts, and the results were compared via statistical methods based on the scores of the newborn evolutionary assessment checklist obtained by the participants before, one week, and two months after the training.

Observation of the nursing performance before and after the training was carried out by the research assistant, and the training intervention was conducted by the researcher. Moreover, a review list was used for collecting the data and assessing the performance of the nursing staff in evolutionary positions. The positioning of various organs of the infants was as follows:

- ✓ *Position of shoulders*: completely rounded (2), flat (1), smooth (0);
- ✓ *Position of hands and arms*: squeezed hands and arms (2), hands close to face with smooth arm (1), hands and arms on both sides of the body (0);
- ✓ *Pelvic position:* The pelvis tends to be tilted toward the longitudinal line of the infant (2), the pelvis tends toward the outside of the body (1), the entire hip is oriented toward the outside of the body (0);
- ✓ *Knee and ankle position:* The knees and legs rotate to the longitudinal line of the body (2), the knees and ankles are removed from the longitudinal line (1), the knees and ankles are distant from the longitudinal line of the body with the legs turned to the back (0);
- ✓ *Position of the head:* head is rotated along the longitudinal line of the body and rotated less than 45 degrees to the right/left (2), rotated 45 degrees to the right/left (1), the head is rotated more than 45 degrees (0);
- ✓ *Chin and neck position:* Chin condition, natural tonus, and neck along the spine (2), chin is normal and loose and the neck is slightly distant from the longitudinal line of the body (1); the chin is rotated to the right/left and the neck (0)

Total score of the positioning of newborns by the nurses based on these indicators determined their final performance score. Finally, the effect of the training intervention on the use of the evolutionary positioning of premature infants on the performance of the nurses was determined based the obtained scores before, one week, and two months after the training.

Instructions and Training Methods

Initially, the participants were divided into five groups by the researcher. Following that, they were instructed on the accurate positioning of the organs of the infants via 10 educational slides displayed for one hour at the NICUs using a computer and video projector. The study groups were immediately placed in the emergency room at the bedside of the infants, and face-to-face training was conducted by the researcher for two hours.

Validity and Reliability of Data Collection Tools

The assessment checklists of infant positioning have been evaluated in a study by Spielker, the results of which were translated into Persian and back-translated into English. The content validity of the checklist was confirmed by a panel of nursing experts, and the reliability was confirmed by 15 samples at the Cronbach's alpha of 93%.

Data analysis was performed in SPSS version 21. Comparison of the mean nursing performance before and after the intervention was performed using paired t-test. To remove the effects of the confounding factors (e.g., age and work experience), comparison of the nursing performance before and after the training was carried out via stratification considering various strata based on the age and work experience of the participants separately. All the statistical analyses were performed at the significance level of less than 0.05.

Result

The results of this study showed that in the demographic profile the highest frequency was related to undergraduate education (98/8%) Most of nurses age were (48/2%) over 30 years of old. the task of most of the samples were nursing (97/6%) most of the work experience was 5-10 years (42/4%) (Table 1). There was a significant relationship between the performance of nurses before and after the first week training (P<0/001) Also, the score of nurses performance in the pre-training stage and two months after the training (P<0/001) and There was a significant difference between the performance of nurses before and after training in the first week after training and two months after training (P<0/001) (Table2).

Table 1. Demographic Characteristics of Nurses in Selected Hospitals Affiliated to Iran University of Medical Sciences

Variable		Frequency	Percentage
Education Level	Postgraduate	84	98.9
	Undergraduate	1	1.1
Age (year)	25-30	13	15.3
	31-35	31	36.5
	>30	14	48.2
Position	Head Nurse	2	2.4
	Nurse	83	97.6
Work Experience (year)	1-5	16	18.8
	6-10	36	42.4
	>10	33	38.8

Table 2. Comparison of Mean Score of Nursing Performance in Neonatal Developmental Positioning before and One Week after Training

		N	Mean	SD	P-value
Group	Before Training	85	5.84	2.03	0.001
	One Week after Training	85	8.35	1.42	

*Results were similar with repeated analysis in different age strata (25<30) (P<0.05) and work experience strata (30<35) (>30) (P<0.05)

Table 3. Comparison of Mean Score of Nursing Performance in Neonatal Developmental Positioning before and Two Months after Training

		N	Mean	SD	P-value
Group	Before Training	85	5.84	2.03	0.001
	Two Months after Training	85	8.71	1.16	

*Results were similar with repeated in different age strata (1>5) (P<0.05) and work experience strata (5>10) (>10) (P<0.05)

Table 4. Comparison of Mean Score of Nursing Performance in Neonatal Developmental Positioning One Week and Two Months after Training

		N	Mean	SD	P-value
Group	One week after Training	85	8.35	1.42	0.001
	Two Months after Training	85	8.71	1.16	

Discussion

The present study aimed to investigate the impact of instructions on the evolutionary status of preterm infants in clinical practices at the NICUs of two hospitals affiliated to Iran University of Medical Sciences. The demographic characteristics of the participants included age,

education level, occupation status, and work experience.

According to the findings, the highest education level was undergraduate (98.8%) among the participants. The majority of the participants (48.2%) were aged more than 30 years and nurses (97.6%). In addition, the majority of the participants (42.4%) had a work experience of 5-10 years. In similar studies, the majority of nurses (82.8%) have also been reported to be undergraduates who had not completed the courses of neonatal intensive care (11).

Regarding the first objective of the present study (i.e., comparison of the mean score of nursing performance in developmental neonatal positioning before and one week after the training), the results of the present study indicated that the training intervention was effective in applying developmental positioning in premature infants, as well as the clinical practices of NICU nurses one week after the intervention. Correspondingly, the score of nursing performance increased from 5.84 in the pre-training stage to 8.35 one week after the training, which was considered to be statistically significant (P<0.001).

In a similar study, the results indicated that instructions and training while providing care services significantly enhanced the performance of neuroscientists in the special department of neonatology, thereby foregrounding the planning for staff training during service as an essential element of improving the quality of health services in the community (P<0.01).

In the current research, a significant difference was observed in the knowledge and practices of nurses before and after the training (12). Nurses in NICUs must be trained on the necessary care services, such as the use of developmental positioning in newborns, and training plays a key role in enhancing their performance. Undoubtedly, face-to-face training is considered to be an effective educational approach to be applied as a common practice in providing instructions for nurses. Moreover, the results of various studies in this regard have denoted that appropriate educational content and lecturers could promote positive outcomes and feedback.

With respect to the second objective of the present study (i.e., comparison of the mean score of nursing performance in neonatal evolutionary positioning before and two months after the training), our findings demonstrated that the mean score of nursing performance increased from 5.84 before training to 8.71 two months after the training, which was considered to be statistically significant (P<0.001). In the study, Spilker claimed that the performance score was 8.39 before training and 9.4 three months after the training, while the increment was not considered significant due to the obtained score (P>0.1).

Since training and instructions are of paramount importance in empowering nurses, enhancing their clinical decision-making, and improving diagnostic treatment, when nurses have a higher diagnostic capacity than the clinical conditions of patients with acute care, they are likely to carry out optimal nursing interventions to meet the needs of the patients, which results in rapid recovery and reduced incidence of neonatal complications, thereby improving the quality of nursing care services, promoting positive attitudes, and reinforcing the performance of nurses in the care of newborns. Furthermore, improving the knowledge and skills of nurses by correcting their attitudes and eliminating their misconceptions could remarkably enhance the quality of neonatal care (13).

Regarding the third objective of the present study (i.e., comparison of the mean score of nursing performance in neonatal evolutionary positioning one week and two months after the training), our findings indicated that the mean score increased from 8.35 one week after the training to 8.71 two months after the training, which was considered statistically significant (P<0.001).

Another study in this regard was performed by Jinson (2013), which aimed to investigate the effect of training on the use of standard posture devices and clinical skills of nurses in NICUs. According to the findings, the mean score of nursing performance in neonatal developmental positioning significantly increased from 8.3 before training to 8.7 and 9.2 one and four months after the training (P<0.001) (14).

Since nursing education consists of theoretical and clinical aspects, continuous clinical education of these professionals may have a positive effect on their performance. Clinical education is one of most effective methods to improve the performance of nurses. In this regard, Kalhor has stated that continuing educational programs to enhance the performance of nurses could ensure the safety of the practices involving invasive treatments in

various patients (15).

According to the results of the present study, the majority of the NICU nurses had poor performance in the pre-training phase, which might have been due to the lack of continuous nursing education regarding the correct positioning of infants or lack of the coherent participation of nurses in educational programs. Considering that NICU nurses must have adequate competence to provide care for the newborns requiring special care, nursing care education based on the standard principles could improve the health status of infants and reduce neonatal complications (16).

Conclusion

Proper positioning of infants is one of the main elements of neonatal care and an important neurological intervention in NICUs. According to the literature, different positions may variably affect premature infants. Each position has specific strengths and limitations, which should be identified by nurses. As a result, infants must be assessed individually and receive appropriate care based on their requirements and behavioral responses (17).

According to the results of the current research, the educational needs of nurses regarding their performance in neonatal developmental positioning were well-demonstrated before the implementation of the training intervention. The effectiveness of the intervention in our study lies in incorporating training on neonatal developmental positioning into the formal hospital education and strategic planning of the treatment department officials. Considering the positive effects of developing evolutionary care (e.g., proper placement of premature infants for neurodevelopment, reducing neurological defects), it could be concluded that proper education and improving the behavior and performance of nurses may play a pivotal role in enhancing the quality of care and treatment, while facilitating the timely identification of the premature infants admitted to NICUs. It is hoped that our findings broaden the scope of nursing activities regarding the care of premature infants and increase the quality of nursing care.

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Conflicts of interests

None.

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