Original Article

Effect of peer education on the noise management in Iranian neonatal intensive care unit

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Abstract

Background: Advancements in neonatal intensive care unit (NICU) science and technology have increased the survival rate of preterm infants. Despite these advances, they are still facing with neurobehavioral problems. Noise level in NICU is a potential source of stress for preterm infants. It should be decreased to the standard level as much as possible. The purpose of this study was to evaluate the effect of peer education on the performance of staff in noise management in the NICU.

Materials and Methods: A pre-post test quasi-experimental design was used. Fifty-eight staff members (nurses and physicians) participated in this study. Sound pressure levels were measured before and after the intervention. Peer education program formed the intervention. The staff performance in noise management was evaluated before and after the intervention by using a questionnaire. Data analysis was done by using *t*-test.

Results: The results of the study showed that the mean sound level in different environments significantly decreased after the intervention. It reached from 86.7 to 74.9 dB in the center of unit and from 68.2 to 48.50 dB in the infants' bedside ($P < 0.0001$). The mean score of the staff performance in noise management significantly increased after the intervention, compared to the pre-intervention score. It increased from 74.6 to 83.4 ($P < 0.0001$).

Conclusions: Peer education was found to be successful in noise management because behavioral changes were done to avoid generating unnecessary noise by the staff.

Key words: Education, infants, intensive care unit, Iran, neonatal, noise, peer education, peer group

Introduction

Advances in technology and nursing care have led to the survival of many premature infants. Despite the advances, the premature infants are still at the risk of developmental problems that may remain with them throughout their life.[1] Receiving the sensory stimuli directly affects the brain development of fetuses and infants. Most of the human sensory systems develop before birth, and receiving high or low stimuli may interfere with the normal brain development.[2]

The hearing system of infants develops at 23 weeks of pregnancy in order to respond to stimuli.[2] The cochlea in middle ear and the auditory cortex in temporal lobe are the most important parts of the hearing system and environmental conditions easily affect development of these parts.[3] The muscular wall of uterus and amniotic fluid are the modulators of stimuli in uterus and provide suitable conditions for the growth and development of fetus by creating a dark and quiet environment.[4]

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After birth, infants are exposed to the sound of alarms and noises of equipments. The American Academy of Pediatrics has recommended 45 dB as the maximum noise in the neonatal intensive care units (NICUs).[5] The sounds and noises in NICUs are much higher than 45 dB. Studies from USA have shown that infants in NICU are continuously exposed to sounds of 50–105 dB.[6,7] In Iran, due to the large number of infants admitted to NICUs and the presence of staff and parents in the same unit, the hospitalized infants suffer from a lot of noises related to equipments, staff, and mothers. Studies show that the volume measured during the day is a minimum of 65.4 dB and a maximum of 89.8 dB.[8,9]

The exposure of premature infants to a lot of noise impedes their growth and development, and causes cognitive, verbal, and hearing disabilities.[10] The study of Lasky and Williams in 2009 showed that the sound level is higher than the standard amount proposed for premature infants and changes their cycles of sleep and breathing patterns.[11] The study of Wachman and Lahav in 2010 also revealed that the loud noise causes short-term negative impact on the cardiovascular and respiratory systems of premature infants.[12]

In general, the healthcare team, including nurses, physicians, and parents, produces a lot of noise with medical and nursing care during the daily activity, which can interfere in improving the health of infants.

Today, organizations allocate a substantial part of their resources to teaching their employees and caring about their empowerment.[13] Peer-assisted learning system is one of the effective innovations in the field of education, which has constructive effects on different aspects of education, especially in the area of medical science. The system is a kind of education in which the learners play the role of teachers or teacher assistants and accelerate the learning of other students.[14] Several studies have shown that this type of education affects knowledge, attitude, and performance.[14-17] Therefore, this study aimed to reduce noise in the NICU and improve the performance of staff in the NICU.

Materials and Methods

This quasi-experimental study used a pre-test and post-test method during 2 months in the winter of 2014. Census was chosen as the sampling method. The participants in this study consisted of 58 staff (48 nurses and 10 physicians) in the NICU of a teaching hospital in Isfahan. The reason for choosing this center is that it is a referral hospital for the hospitalization of preterm deliveries and the infants at risk. The accumulation of a large number of staff and about 25–30 infants and their mothers in one place distinguished this hospital from the other hospitals with NICUs. The sound in this study was measured by ST-8851 sound level meter. This device records a sound range of 30–130 dB and was controlled with other devices in this area to ensure its accuracy. The accuracy of this device is at a frequency of 1.5 Hz equal to ±3 dB. The performance of the staff was measured by their answers to a questionnaire. The questionnaire was prepared by a review of literature and its reliability was approved by 10 professors of nursing and midwifery, neonatal specialists, and the staff of neonatal care unit of Isfahan University of Medical Sciences. The validity of the questionnaire was reviewed and the alpha coefficient was determined as 0.945. The questionnaire consisted of two parts. The first part was concerned with the demographic characteristics of the participants and the second part assessed their performance based on 25 questions on noise control. Their answers to these questions were graded by a five-point Likert scale (never, rarely, sometimes, often, and always) and the total scores ranged from 25 to 100.

The pre-tests were completed by the participants and the mean volume of sound in the unit was measured before the training on the basis of the standard method in terms of intervals and location of the measurement. It was measured for 36 h within 2 weeks using a standard sound level meter in different locations based on the standard protocol.[18] These locations included central location, entry area, infants' bedside, isolated area, and the nursing station. This measurement was recorded at the busiest hours of all three shifts (8–10 in the morning, 16–18 in the afternoon, and 20–22 at night).

After measuring the sound level, the peer education began. Five peer trainers (four nurses and one physician) were chosen from among the participants with the highest scores in pre-test and got direct training through classes, pamphlets, and posters. This training was about sound sources and the hazards of loud sounds on the neonates and staff.

Other participants were divided into four groups of nurses and one group of physicians. Peer trainers instructed their groups through face-to-face interaction and group discussion. Peer education lasted for two consecutive weeks.

After the completion of training, the mean sound level in different environments was measured and the post-tests were completed by all the participants including the peer trainers and their groups after a 3-week delay. There was no control group in this study. The collected data were analyzed using SPSS software version 14. The registration ID in IRCT is IRCT2014122420423N1.

Ethical considerations

The study protocol was approved by the Ethics Committee of Isfahan University of Medical Sciences and also by the local authorities of the teaching hospital. The participants also signed a written informed consent. This information was kept confidential.

Results

The results revealed that majority of the participants were nurses. The average of work experience was 6 years [Table 1].

The findings showed that before the intervention, the mean level of sound was from 63.3 to 86.7 dB in different parts of the NICU. After the intervention, the mean level of sound ranged between 48.5 and 74.9 dB. The results of the study showed that the mean sound level in different environments significantly decreased after the intervention. It reached from 86.7 to 74.9 dB in the unit center and from 68.2 to 48.50 dB in the infants' bedside [Table 2].

The mean score of the staff performance was 74.6 before the intervention and reached 83.4 after it. Paired *t*-test showed that the mean score of the staff in noise management significantly increased after the intervention, compared to the pre-intervention score ($P < 0.001$) [Table 3].

Table 1: Demographic data

Variable percent	Number (%)
Gender	
Female	57 (98.3)
Male	1 (1.7)
Marital status	
Bachelor	14 (24.1)
Married	43 (74.1)
Divorced	1 (1.7)
Profession	
Physician	10 (17.2)
Nurse	48 (82.8)

Table 2: The mean sound levels in different places of the NICU before and after the intervention (peer education)

	Before		After		Paired *t*-test	
	Mean	SD	Mean	SD	*t*	*P*
Central location	86.7	12.1	74.9	7.4	5.7	0.0001
Entry area	87.6	4.5	66.1	6.2	19.4	<0.0001
Infants' bedside	68.2	5.6	48.5	10.7	9.6	<0.0001
Isolated area	63.3	5.6	52.7	7.1	9.9	<0.0001
Nursing station	79.8	7.7	62.9	6.8	9.7	<0.0001

SD: Standard deviation

Table 3: The mean scores of staff performance before and after the intervention in the NICU

Variable	Before		After		Paired *t*-test	
	Mean	SD	Mean	SD	*t*	*P*
Staff performances score	74.6	8.2	83.4	9.5	5.41	<0.0001

SD: Standard deviation, NICU: Neonatal intensive care unit

Discussion

The findings of this study show that the sound level was much higher than the recommended level in NICU. Before the intervention, the mean level of sound was between 63.3 and 86.7 dB in different parts of NICU. Similarly, studies reveal that the sound level was from 58 to 105 dB in NICUs in USA and Iran.[6,8,9] While Krueger *et al*. emphasized that the fetus receives 20–35 dB sound in the womb.[19] In fact, in NICUs, a premature infant or a fetus outside the womb receives a volume of sound that is far beyond the level received in embryonic stage. In the present study, the maximum level of sound was about 86.7 dB in the NICU before the intervention. After the intervention, the mean level of sound significantly decreased. The mean level of sound reached around the standard sound level in the infants' bedside.

In a same vein, Zamberlan-Amorim *et al*. showed a significant reduction in noise level after training ($P < 0.0001$).[20] In this study, the noise reduction program was performed in partnership with the neonatal care team, and then the trained members of each group trained the other members and offered suggestions to change the performance of noise reduction. In the present study, peer education method was used and the staff participated in the training, and considerably good results were obtained in noise reduction and improvement of staff performance in this area.

On the contrary, the study of Jacob *et al*. in 2008 showed that there was no significant difference between the intensity of the sound in NICU before and after training.[21] In the present study, peer education method was used. The nurses and physicians were trained by their colleagues and observed the appropriate behavior for sound reduction. This training method was accepted by the staffs, and a significant reduction in the mean sound level in the unit was observed after the intervention. The results of the present study show that the mean score of the staff performance in noise management significantly increased after the intervention, compared to the pre-intervention score.

The study of Weich *et al*. showed that after running a training program for the staff regarding sound control in NICU, 71.5% of them agreed that their behavior makes

the noise. According to the researcher, this sound control program was successful because the staffs were aware of the sound levels and accepted their behavioral changes to avoid sound, but there was no significant difference in the performance of the staffs.[22] In Weich *et al.*'s study, the training program included distribution of leaflets and installation of posters about the harmful effects of noise on neonates, two speeches, and informational lectures given by language therapist students about the harmful effects of sound and noise on neonates. In the present study, watching the peer trainers' performance changed the participants' behaviors in noise management.

The study of Laudert *et al*. showed that the highest volume of sound in NICU was made during the rounds. By running the round away from the infants' bedside, the volume of sound measured in the infants' bedside declined from 62.5 to 50–55 dB.[18] The findings of Laudert *et al*.'s study are similar to those of the present study. In the present study, peer training led to decrease of sound in the unit. The changes of staff performance in the present study were slow speaking, quiet walking, quick attention to alarms and turning them off, and running the round away from the infants' bedside.

In several studies, other aspects of peer education were studied, such as its impact on teaching skills, expanding the knowledge and information of students and increasing their self-esteem, as well as the impact on the knowledge and attitudes of patients, which has had a significant impact.[14-17,23]

Thus, peer education can be an effective approach in making changes, but due to the movement of large numbers of students, interns, residents, and staff in the university hospital and changing their place in units, these trainings should be continuous and used by the new healthcare team.

In this study, the noise measurement was performed within 2 weeks after the intervention and a significant reduction was observed in the volume. But it seems that this type of training also needs to continue. Due to the complex care in the NICU and the heavy workload in this unit, permanent commitment to observe silence is difficult and the training should continue.

The limitation of this study included participants' fatigue because of the high workload in the neonatal unit and also the refusal of physicians to participate in training classes and fill the questionnaires. The researcher attempted to motivate them to participate in these classes by giving them frequent encouragement at break times. It seems that making the staff to participate in these trainings will have good results on improvement of the neonatal unit.

Conclusions

The results of this study show that peer education is a useful way for making changes in the area of medicine and nursing. The mean score of the performance of the staff after the intervention significantly increased, and the sound levels in the unit reduced. However, the sound level in the unit was still higher than the standard level. Therefore, these trainings should be continued in order to create a suitable environment for the growth and development of premature infants or fetus outside the uterus.

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Conflicts of interest

There are no conflicts of interest.

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