

Impact of On-the-Job Training on Nurses' Performance in Creating a Healing Environment and Clustered Nursing Care for Premature

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Abstract

Introduction: Premature infants require specialized care, and nurses need to have specific skills and knowledge to provide this care effectively.

Objective: To evaluate the impact of an on-the-job training program on the improvement of nurses' knowledge and practice related to creation of a healing environment and clustering nursing procedures.

Methods: From January to April 2022, a study utilizing a one-group pre- and post-test design was conducted at NICUs in governmental hospitals. The study participants involved 80 nurses working in these NICUs. Researchers used predesigned questionnaire and checklist practice to collect the data pre and post the intervention.

Results: 37.5% of the participants were aged between 25 and less than 30 years, with a mean age of 28.99 ± 7.43 years. Additionally, 73.7% of the nurses were female, with a mean experience of 9.45 ± 3.87 years. Prior to the intervention, the study found that a majority of the nurses (62.4%) demonstrated poor knowledge. However, after the intervention, a significant improvement was observed, with 60.0% of the nurses demonstrated good knowledge. Likewise, prior to the intervention, the study revealed that the majority of the nurses (83.8%) exhibited incompetent practice. However, post-intervention, a substantial improvement was observed, with 81.3% of the nurses demonstrated competent practice.

Conclusion: On-the-job training had significant improvements in nurses' knowledge and practices regarding applying healing environments and clustering nursing care. On-the-job training is suggested as an adaptable, effective and low-cost technique to train nurses. To maintain the improvement achieved, ongoing instruction, feedback, assessment/reassessment, and monitoring are encouraged.

Keywords

healing environment, nursing care, premature infants, education, on-job-training

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Introduction/Background

Premature infants require specialized care to support their growth and development, particularly in the neonatal intensive care unit (NICU) (Sathish et al., 2019). The NICU is a specialized facility where premature neonates receive intensive medical care. However, the NICU environment can be stressful for these premature infants, who lack the physiological and behavioral maturation to cope with the unit's environmental stressors, which include loud and unpredictable sounds, glaring lighting, and frequent invasive medical procedures. Environmental stressors in the NICU contribute to the development of toxic stress, which can have negative effects on the emotional, physical, and cognitive development of premature infants (Bazregari et al., 2019). Globally, 2.3 million neonates died in the first month of life in 2021—approximately 6,400 neonatal deaths every day (UNICEF, 2023).

Premature infants may experience a great deal of stress during hospitalization, and various approaches have been recommended to decrease this stress (Hendy et al., 2023). Among them are the use of developmental care approaches such as creating a healing environment and providing clustered nursing care, which aim to reduce exposure to environmental stressors (Maria et al., 2021).

High-quality nursing care is crucial to providing premature infants with a safe environment that improve their health (Upadhyay et al., 2021). A healing environment is one in which infants' physical, developmental care, emotional needs are achieved (Macho, 2018; Zahourek, 2020). Creating a safe environment involves practices such as dimming the lights, playing soothing music, and offering reassuring hugs, all of which support the achievement of this goal (Shah et al., 2016). The application of a healing environment and clustered nursing care has been shown to significantly improve respiration, heart rate, oxygen saturation, and systolic blood pressure. Furthermore, it increases sleep time and decreases wake time and pain scores (Hendy et al., 2022a).

Neonatal nurses play a critical role in forming a healing environment and providing clustered nursing care that improves the growth and development of premature infants (Küçük Alemdar & İnal, 2020). To accomplish this role, neonatal nurses must acquire the basic knowledge, abilities, and attitudes, which are gained through attending education programs. On-the-job training is a practical training method focused on a hands-on approach in a clinical or simulated training lab, usually under the direction of a trainer. Therefore, it can improve nurses' skills and experiences (Hassanein et al., 2021).

Review of Literature

Elsheshtawy and others concluded that application of "wee care" for preterm neonates in NICU enhances weight gain, improve autonomic visceral responses, and enhances behavioral organization (Elsheshtawy et al., 2022).

Additionally, clustering nursing care is considered one of the main developmental care approaches. Nursing interventions are

clustered to provide premature infants with more uninterrupted time to sleep and relax between nursing interventions, which is valuable for their development and health outcomes (Hei et al., 2021). Clustered nursing is a technique that combines common procedures that would normally require multiple interruptions for the infants. For example, measuring blood pressures, temperatures, heart rate, blood samples, and changing diapers are all done at the same time, allowing premature infants to sleep longer (Hendy et al., 2022b; Wang et al., 2021). According to a study by Bazregari et al. (2019), cluster care can significantly improve neonates' calm and active sleep.

Despite the familiar benefits of creating a healing environment and clustered nursing care, the application of these methods can be challenging (Ceylan et al., 2020). One of the chief challenges is the requirement for specific skills, knowledge, and attitudes to effectively perform them. However, the availability of training programs for nurses with such skills is limited (Browne et al., 2020). Therefore, the current study aimed to investigate the effectiveness of these approaches in promoting nurses' performance in creating a healing environment and providing clustered nursing care for premature infants.

Hypothesis 1: On-the-job training will improve nurses' performance in creating a healing environment and providing clustered nursing care for premature infants.

Methods

Design

From January to April 2022, a study utilizing a one-group pre- and post-test design was conducted.

Study Setting

The study was conducted at NICUs in two government-affiliated university hospitals that provided care for both medical and surgical conditions.

Study Subjects

The study included 80 nurses responsible for the direct care of premature infants, selected through convenience sampling. The total number of nurses in the study settings was 98 nurses.

Inclusion Criteria

The nurses included in the study must have met the criteria of providing direct care to neonates and having at least one year of experience.

Sample Size

Assuming a medium effect size of 0.84 which detected at the study by Jalali et al. (2022), a level of significance of 0.05,

and a power of 0.95, the sample size can be estimated using the formula:

$$n = \frac{(2 * (Z\alpha / 2 + Z\beta)^2 * \sigma^2)}{d^2}$$

where:

n = sample size

$Z\alpha / 2$ (0.05 level, $Z\alpha / 2$ is 1.96)

$Z\beta$ = critical value of the standard normal distribution at the power level (0.95 power, $Z\beta = 1.645$)

σ is the standard deviation of the pre-test scores

d is the expected difference between the pre- and post-scores

Therefore, after accounting for a 5% attrition rate, the total sample size is approximately 80 participants, would be required to reveal a large effect size ($d = 0.84$), significance of 0.05 and a power of 0.95 in a pre-post one-group design. The nurses were selected through a convenience sampling technique.

Tools of Data Collection

Tool I: A Pre-designed Questionnaire was designed by the researcher in Arabic and consisted of the following components: characteristics of nurses including age, gender, educational level, marital status, experience, previously training courses and working hours. The evaluation of nurses' knowledge comprised 13 closed-ended questions presented in the form of multiple-choice questions (MCQs). These questions were used to assess nurses' knowledge about healing environments and clustering care. The questionnaire was prepared based on previous literature, such as Altimier and Phillips (2016) and Wang et al. (2021). Each correct answer was assigned a single point while an incorrect answer received zero points. The scores were classified into three categories based on performance: good (score > 75%), average (score between 60% and 75%), and poor (score < 60%) (Hassanein et al., 2021).

Tool: II: Observation Checklists (Pre/Post) tool was adopted from Altimier and Phillips (2016). It was designed to evaluate the practices of nurses in creating healing environments and clustering nursing care. This assessment tool consists of various steps, including controlling sound and noise (eight steps), controlling light and vision (five steps), taste and smell (four steps), touch (five steps), and cluster care (five steps). Each step was assessed as either "done" or "not done," with a score of one or zero, respectively. The scores were further categorized as competent (score \geq 90%, 24 to 27) or incompetent practices (score < 90%, 0 to 23).

The data collection tools were determined by a panel of experts in neonatal nursing, consisting of three members. They evaluated the construct and content of the tool to ensure its validity. Additionally, reliability was assessed using the Cronbach alpha test, with a reliability score of 0.810 indicating good reliability for Knowledge and 0.908 indicating excellent reliability for Practice.

Fieldwork

The fieldwork commenced in January 2022 and spanned until April 2022. The research involved training nurses, who were responsible for the care of preterm infants, in the approach of clustered nursing care, as well as creating a healing environment. This was achieved through an educational program that incorporated theoretical knowledge and on-the-job training to enhance the practical performance of the nurses.

Assessment of Nurses (Pre)

The study's objectives were communicated to the participating nurses by the principal investigator. Subsequently, the nurses were administered a questionnaire to assess their baseline knowledge. Additionally, the researcher observed the nurses' practices using pre-established observational checklists, specifically designed to evaluate the implementation of clustered nursing care and the promotion of a healing environment. The educational program was created and crafted to meet the needs of the nurses as identified by the pretest.

Intervention Phase

The researcher organized the studied nurses to five groups, with each group undergoing three one-hour lectures and seminars. Additionally, they engaged in three 30-minute practical sessions, which took the form of on-the-job training through coaching and workshops. These structured training activities comprised both classroom-style instruction and hands-on exercises. Participants were informed of their group assignments through invitation letters, which also provided information about the timing and venue of the training sessions. The theoretical sessions were conducted by the researcher in the conference hall of the NICU, while the practical sessions were conducted on-site at the NICUs.

The researcher developed a training program for NICU nurses, which was based on a comprehensive review of the existing literature. The program was designed to enhance the nurses' knowledge and practical skills in creating healing environments, clustered nursing care, and their application in the NICU.

The Training Program's Content

During the first session of the training program, the researcher discussed the concept, components, principles, and advantages of developmental care. The session also emphasized the importance of safeguarding sleep by preventing sleep disturbances from loud noises, bright lights, and unnecessary disturbing activities.

The second session focused on the concept and advantages of a healing environment, as well as the essential measures required to achieve it. The session highlighted

preserving a safe environment for premature infants, diminishing noise level and light intensity, and optimizing smell and taste. In the third session, the researcher explained the concept of clustering nursing care, its profits for nurses, and its practical application in the care of premature infants.

The fourth, fifth, and sixth sessions comprised on-the-job training sessions (on-the-job training by coaching and workshops that formal training events that typically involve classroom-style instruction and hands-on exercises) aimed at implementing the knowledge acquired in the previous theoretical sessions. In the fourth session, the participants learned how to control light and noise to create a healing environment. The fifth session focused on perfecting touching and improving taste and smell to enhance the healing environment. In the sixth session, the nurses learned how to apply clustering nursing care by selecting five nursing procedures performed without interruption.

Evaluation Phase for Nurses (Post)

After completing the training program, the researcher summarized its content and invited the nurses to ask any questions or provide feedback they may have had. An open discussion was held to allow the nurses to share their thoughts and experiences related to the program. Following this, after one month the nurses were asked to complete a posttest questionnaire to assess their level of knowledge acquisition and researcher observed nurses by using checklist for assessing their practice level. The same study tool that was used during the pre-intervention phase was employed to assess their practices. Throughout the program, the researcher employed a range of educational methods, including group discussions, brainstorming, and reflective thinking. Different illustrative methods such as power points, figures, and videos were also used to reinforce the concepts covered during the program.

Data Analysis

The data collected during the study were entered into SPSS and coded for analysis. Prior to analysis, the data were checked for errors or outliers. Quantitative data were described using appropriate measures such as mean and standard deviation. The chi-square test was utilized to examine differences between categorical variables. Statistical significance was set at a *P*-value of ≤ 0.05 , while highly significant findings were denoted by a *P*-value of $< 0.01^{**}$.

Ethical Considerations

Ethics approval was obtained from the institutional review board of governmental university, approval number 12.112021. Participation in this study was voluntary and complied with the Declaration of Helsinki. Prior to

commencing the study, the researcher provided a thorough explanation of the study's objectives to the participating nurses. The nurses provided written consent before being included in the trial. Participants who chose to take part in the study were assured that all information collected would be kept strictly confidential, and they had the option to withdraw from the study at any time if they so desired. The researcher assured the nurses that no harm would come to them as a result of their participation in the study. Furthermore, the nurses were informed that they could disengage from the study at any time.

Results

According to the characteristics of the nurses, the results revealed that 37.5% of the participants were aged between 25 to less than 30 years with a mean age of 28.99 ± 7.43 years. The majority of the nurses were females, accounting for 73.7% of the sample, and 66.2% of them were married. In terms of education, more than half of the nurses (52.5%) had received their nursing education from technical health institutes. Additionally, 28.7% of the nurses had 10 to less

Table 1. Distribution of Studied Nurses Regarding Their Characteristics (*n* = 80).

Nurses' characteristics	<i>N</i>	%
Age in years:		
20–<25	13	16.3
25–<30	30	37.5
30–<35	22	27.5
≥ 35	15	18.7
Mean \pm SD	28.99 \pm 7.43	
Gender:		
Male	21	26.3
Female	59	73.7
Marital status:		
Married	53	66.2
Unmarried	27	33.8
Educational level:		
Diploma of nursing	22	27.5
Technical health institute	42	52.5
Bachelor of nursing	14	17.5
Postgraduate	2	2.5
Years of experience:		
1–<5 years	22	27.5
5–<10 years	19	23.8
10–<15 years	23	28.7
≥ 15	16	20
Mean \pm SD	9.45 \pm 3.87	
Working hours:		
Full time	47	58.7
Part time	33	41.3
Attendance of training courses:		
Yes	22	27.5
No	58	72.5

Table 2. Distribution of Studied Nurses' Knowledge Regarding Developmental Care and Cluster Care Pre- and Post-Intervention ($n=80$).

Nurses' knowledge	Pre-intervention				Post-intervention				X ² test P value
	Correct		Incorrect		Correct		Incorrect		
	<i>n</i>	%	<i>N</i>	%	<i>n</i>	%	<i>N</i>	%	
Aim of developmental care	14	17.5	66	82.5	73	91.2	7	8.8	14.505 <0.01**
Concept of developmental care	30	37.5	50	62.5	70	87.5	10	12.5	11.909 <0.01**
Concept of cluster nursing care	13	16.3	67	83.7	73	91.3	7	8.7	15.772 <0.01**
Concept of minimal handling	8	10	72	90	64	80	16	20	17.123 <0.01**
Positive effect of clustering care	10	12.5	70	87.5	69	86.2	11	13.8	16.444 <0.01**

Table 3. Distribution of Studied Nurses' Knowledge About Healing Environment Pre- and Post-Intervention ($n=80$).

Nurses' knowledge	Pre-intervention				Post-intervention				Chi-square P value
	Correct		Incorrect		Correct		Incorrect		
	<i>N</i>	%	<i>N</i>	%	<i>n</i>	%	<i>N</i>	%	
Concept of healing environment	58	72.5	22	27.5	77	96.3	3	3.7	12.666 <0.01**
Component of healing environment	8	10	72	90	65	81.3	15	18.7	12.454 <0.01**
Ways of noise control at NICUs	19	23.8	61	76.2	75	93.7	5	6.3	13.199 <0.01**
Allowed sound level at NICU	12	15	68	85	72	90	8	10	10.243 <0.01**
Ways of control extensive light at NICU	13	16.3	67	83.7	72	90	8	10	15.008 <0.01**
Short term effect of incubator covers	18	22.5	62	77.5	70	87.5	10	12.5	14.565 <0.01**
Avoid strong perfume during dealing with neonate	25	31.3	55	68.7	74	92.5	6	7.5	16.101 <0.01**
Smelling of mother's milk is one of the ways to protect the sense of smell	16	20	64	80	72	90	8	10	14.296 <0.01**

than 15 years of work experience with a mean experience of 9.45 ± 3.87 years. Regarding working hours, 58.7% of the nurses worked full-time, and 27.5% of them had attended training courses, as shown at table 1.

Regarding the knowledge of the studied nurses about minimal handling, clustering care, and developmental care pre- and post-intervention, Table 2 revealed that before the intervention, only 10% and 12.5% of the nurses had correct knowledge about the concept of minimal handling and the positive effects of clustering care, respectively. However, after the intervention, these percentages increased significantly to 80.0% and 86.2%, respectively. The results also indicated that 37.5% of the nurses had correct knowledge about the concept of developmental care before the intervention, while 87.5% of them had correct knowledge after the

intervention. Furthermore, there was a statistically significant improvement in the nurses' knowledge levels about developmental care and cluster care after the intervention, with a highly significant difference between pre- and post-intervention at a p -value of ($<0.01^{**}$).

The results presented in Table 3 demonstrated that pre-intervention, only 10% and 15% of the studied nurses had accurate knowledge regarding the components of a healing environment and the permissible sound level, respectively. In contrast, post-intervention, 81.3% and 90% of the participants had correct knowledge regarding these aspects, respectively. Furthermore, pre-intervention, 72.5% of the studied nurses had accurate knowledge about the concept of a healing environment compared to 96.3% post-intervention. The findings indicate a significant improvement in the

Table 4. Distribution of Studied Nurses' Practices Regarding Developmental Care and Cluster of Nursing Care Pre- and Post-Intervention ($n = 80$).

Practices	Pre-intervention				Post-intervention				Chi-square P value
	Competent		Incompetent		Competent		Incompetent		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
Sound and noise	12	15	68	85	65	81.3	15	18.7	17.022 <0.01**
Light and vision	10	12.5	70	87.5	63	78.7	17	21.3	18.444 <0.01**
Taste and smell	14	17.5	66	82.5	66	82.5	14	17.5	19.714 <0.01**
Touch	19	23.7	61	76.3	71	88.7	9	11.3	16.225 <0.01**
Cluster nursing care	11	13.7	69	86.3	73	91.3	7	8.7	19.733 <0.01**
Total	13	16.2	67	83.8	65	81.3	15	18.7	18.361 <0.01**

nurses' knowledge about healing environments following the intervention, with a highly statistically significant difference between pre- and post-intervention ($p < 0.01^{**}$).

The results revealed that prior to the intervention, 62.4% of the studied nurses had poor knowledge about developmental care, whereas after the intervention, 60.0% of them had good knowledge. This difference was found to be highly statistically significant with a p -value $< 0.01^{**}$.

Table 4 indicated that the percentage of studied nurses who demonstrated competent practice before and after the intervention. Before the intervention, only 12.5% and 13.7% of nurses had competent practice in controlling light and vision and clustering nursing care, respectively. However, after the intervention, the majority of nurses became competent in these areas, with 78.7% demonstrating competent practice in controlling light and vision and 91.3% demonstrating competent practice in clustering nursing care. Furthermore, only 23.7% of nurses had competent practice in improving touch pre-intervention, but this increased to 88.7% post intervention. The improvement in practice was statistically significant at a highly significant level of $p < 0.01^{**}$.

Discussion

The current study found that the on-the-job training program had a significant impact on the knowledge and skills of 80 participating nurses. The results presented that the training program had a considerable effect on growing the nurses' knowledge and practice related healing environments and clustering nursing care. These results are cohort with those of previous studies conducted by Ahmed and Mohammed (2019) and Lee and Cho (2023) stated that the educational program was effective in improving nursing knowledge and competence in developmentally supportive care for preterm infants. However, the study by Khalil et al. (2021)

showed that more than two-thirds of the nurses had a satisfactory level of knowledge about developmental supportive care for preterm and low birth weight infants during the pre-assessment phase, which differs from present findings.

To enhance nurses' proficiency in applying healing environments and clustering care, researchers employed two on-the-job training methods: coaching and workshops. Coaching provided personalized guidance and feedback, while workshops constituted formal training events involving classroom-style instruction and hands-on exercises (Hendy et al., 2022a). Additionally, educational programs incorporating lectures and simulation practice have been shown to effectively enhance the clinical core competency of novice nurses (Jeong et al., 2021). Riad et al. (2023) found that nearly two-thirds of the surveyed nurses demonstrated inadequate proficiency in overall performance related to developmental care in NICUs. They recommended raising awareness about developmental care and its core measures in the neonatal care at NICUs. Furthermore, Salins and colleagues revealed the need for intensive teaching and training of physicians and nurses for the successful implementation and practice on neuroprotective environment in clinical setting (Salins et al., 2023).

Several studies have also investigated the effectiveness of coaching and workshops as training methods. For example, Youssef (2020) found that the majority of nurses had "unsatisfactory" scores in their practices before the training program, but this difference was statistically significant compared to immediately after the training program and one month later. Additionally, the program enhanced newborn care and practices generally, which is similar to the findings of Altimier et al. (2015). However, the study by Hasanpour et al. (2017) found that while this training program's approach could raise nurses' knowledge, it did not significantly enhance their performance. Furthermore, Zamani

et al. (2019) demonstrated that web-based education did not significantly improve NICU nurses' knowledge, attitude, and care performance.

Overall, the current study highlights the significant impact of on-the-job training programs on improving nurses' knowledge and skills. The use of coaching and workshops as training methods can be effective in enhancing the quality of care provided to patients, particularly in neonatal intensive care units.

Limitations

The data collection took place one month following the intervention. It is suggested that future extended follow-ups (3–6 months) be conducted to obtain more accurate results, ascertain the long-term impact of the training, and evaluate the efficacy of nurse education programs.

Implications of Practice

The practice of on-the-job training for nurses, as supported by the findings of this study, offers a cost-effective, adaptable, and sustainable approach to improving nursing knowledge and practices, ultimately leading to enhanced quality of patient care.

Conclusion

Based on the results obtained in this study, researchers can conclude that, on-the-job training had significant improvements in nurses' knowledge and practices regarding applying healing environments and clustering nursing care. On-the-job training is suggested as an adaptable, effective and low-cost technique to train nurses. To maintain the improvement achieved, ongoing instruction, feedback, assessment/reassessment, and monitoring are encouraged.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Declaration of Conflicting Interests


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