

Correlation between Quality of Care and Length of Hospital Stay in Neonatal Intensive Care Unit

Narges Nikuee¹, Maryam Rassouli^{2*}, Housman Manuchehri¹, Abolfazl Payandeh³, Leila Khanali Mojen¹

1. School of Nursing and Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran

2. Cancer Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

3. Health Promotion Research Center, Zahedan University of Medical Sciences, Zahedan, Iran

ABSTRACT

Background: Length of hospital stay (LHS) is the most important and practical indicator in hospitals, which largely reflects the level of hospital performance and activity. It is also an important indicator for resource planning. Moreover, the quality of care can theoretically be related to LHS. The aim of this study was to investigate the relationship between LHS and quality of nursing care in the neonatal intensive care unit (NICU).

Methods: In this descriptive correlational study, the samples were 205 premature infants hospitalized in the NICU and 80 nurses working in the NICUs of selected hospitals. They were selected based on the inclusion criteria. The data were gathered using the demographics of nurses and neonates through Quality Patient Care Scale (QUALPAC). The data was analyzed in SPSS (version 21) using Spearman correlation coefficient.

Results: The results showed that 47.5% of the nurses were within the age range of 29-36 years and 68.8% of nurses had a working experience of 1-5 years. There was an inverse correlation between the neonate's length of stay and the quality of care ($r=-0.507$, $P<0.0001$).

Conclusion: The findings revealed an inverse relationship between the length of stay and quality of care. By improving the quality of care, we can decrease the LHS.

Keywords: Length of stay (LHS), Neonatal intensive care unit (NICU), Premature infant, Quality of care

Introduction

The development of technology, as well as significant advances in prenatal and neonatal care, has significantly increased the survival rate of preterm infants over the past two decades (1). However, preterm infants are still considered a high-risk population and in addition to the issue of their survival, the complications and challenges associated with their hospitalization in neonatal intensive care units (NICUs) are a matter of concern (2). The hospitalization of these infants puts them at significant medical risks, such as drug complications, nosocomial infections, and specific diseases. Additionally, due to the sensitivity of these infants, much of this increased risk is related to the complexity of their issues and their long stay in the NICU (3). During the prolonged stay of preterm infants in the NICU,

prematurity in multiple organs puts these infants at many risks, such as central nervous system hemorrhage, retinopathy of prematurity, and necrotizing enterocolitis, which will have profound effects on the infant's development in the long run (4).

It seems that the presence of enough specialized nurses is effective in moderating the causes of death in preterm infants. Additionally, anything that enhances nursing care, such as an increase in the proportion of specialized nurses in the NICU, may increase the chance of survival in these infants (3). The outcomes of patients depend on taking correct and quality measurements (5), and nursing staff play an important role in providing quality care for patients (6).

Quality is the ability of a product or service to

* Corresponding author: Maryam Rassouli, Cancer Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Tel: +982181454663; Fax: +982181454370; Email: Rassouli.m@gmail.com

Please cite this paper as:

Nikuee N, Rassouli M, Manuchehri H, Payandeh A, Khanali Mojen L. Correlation between Quality of Care and Length of Hospital Stay in Neonatal Intensive Care Unit. Iranian Journal of Neonatology. 2020 Jun; 11(2). DOI: [10.22038/ijn.2020.38372.1606](https://doi.org/10.22038/ijn.2020.38372.1606)

meet the expressed needs of the customer or the client and a measure to evaluate the extent that their expectations have been met. The quality of nursing care refers to the amount of access to the most favorable nursing outcomes in such a way that the provided services are effective, efficient, and cost-effective (7). Regarding the increasing costs of health care services, the continuous improvement of nursing care quality is necessary, and the quality control of these care services is essential for increasing customer satisfaction. Quality determinants of nursing care include adequate skill, caring attitudes, effective communication, efficient organizational and management systems, and effective participation (8). Several indicators are involved in the assessment of the quality of care.

In some of the assessments, the evaluation of the performance of the staff is of importance, and in some others, the outcomes of the patient are examined. These indicators include the prevalence of bedsores, incidence of hospital infections, job satisfaction and level of education in staff, and length of hospital stay (LHS) (9). The LHS (i.e., the number of days the patient spends in the hospital from admission to hospital discharge) is a hospital index to assess the quality of care provided for the clients. It indicates the level of efficiency and performance of hospital activities and is an important criterion for allocating hospital resources (10). The increase in the infant's length of NICU stay leads to consequences, such as increased costs, occurrence of nosocomial infections (11), and lack of proper interaction between the parents and newborn (12).

Regarding the increasing costs of healthcare services, the continuous improvement of nursing care quality is necessary, and the quality control of nursing care is also crucial in order to increase patient satisfaction (13). Sufficient nursing staff and organizational support of this group are the keys to improving the quality of care and also reduce job dissatisfaction and burnout (14). According to the literature, some variables are either directly or indirectly related to the quality of providing nursing care in NICUs, and consequently to the infant's length of stay in these wards (15). In this regard, by identifying the factors associated with quality care provision, it is possible to reduce the infants' length of stay in the hospital, and consequently reduce costs (16).

Therefore, this study was conducted to determine the correlation between the quality of nursing care and preterm infants' length of NICU stay in order to increase the quality of care and

reduce the infants' length of stay in the hospital through investigating this probable relationship.

Methods

In this descriptive-correlational study, the study population consisted of all the preterm infants admitted to the NICUs of three educational hospitals affiliated to Shahid Beheshti University of Medical Sciences, namely the hospitals of Mahdih, Mofid, and Imam Hossein, as well as on the nurses working in these wards.

The infants were selected through convenience sampling method in case of meeting the inclusion criteria. The infants entering the study were the ones who had been admitted to the ward for at least 24 h, had been born within the gestational age of 30-37 weeks, and had no congenital anomalies. In order to determine the sample size, the NCSS PASS software (version 2004) was used. Using this software, the standard deviation of the population with 40 primary samples was estimated to be 27.71. Considering the confidence interval of 0.95 and a type I error of 0.05, a sample size of 205 neonates was determined. Then, based on the number of NICU beds in the three hospitals of Mahdih (36 beds), Mofid (18 beds), and Imam Hossein (11 beds), 113, 57, and 35 infants were selected from Mahdih, Mofid, and Imam Hossein hospitals, respectively. In addition, all the nurses working at NICUs with over one year of work experience in the above-mentioned wards were selected through complete enumeration sampling. After obtaining an informed consent, a total of 80 nurses participated in this study.

The research tools included neonatal demographic characteristics form, nurses' demographic characteristics form, and Quality Patient Care Scale (QUALPAC). The neonatal demographic characteristics form included information on the gestational age, multiple birth, and birth weight. In addition, the nurses' demographic characteristics form included items about age, employment status, work experience, educational degree, and work shifts.

The QUALPAC has been used to assess the quality of nursing care since 1975 in the United States, England, and Nigeria, and it was translated and validated in Iran in 2003. This questionnaire consists of 47 questions in three dimensions, namely physical (16 items), psychosocial (20 items), and communicational (11 items). The items are rated based on a 3-point Likert scale (rarely=1, sometimes=2, and often=3). The face validity of the questionnaire was evaluated by eight faculty members and the nursing

management boards of the Faculty of Nursing and Midwifery of Shahid Beheshti University of Medical Sciences. In addition, its reliability was determined using Cronbach's alpha coefficient ($\alpha=0.89$).

The nurses completed the questionnaires during their shifts. The infants' information was also collected through the neonatal demographic characteristics form. The duration of the infant's stay was calculated in terms of the number of the hospitalization days (i.e., from 24 h after admission until discharge). In this research, ethical issues have been considered based on the codes of human protection medical science research (National Ethics Committee for Medical Sciences, 2010) and according to the type of the research and samples. A written consent was obtained from the nurses and parents of the admitted infants.

In this study, the data were analyzed in SPSS software (version 21). The Kolmogorov-Smirnov

statistical tests were used to test the normality of the data. The data analysis was performed using the Spearman's correlation coefficient.

Results

The demographic characteristics of the infants and nurses under study are presented in tables 1 and 2. Table 3 presents the mean scores of the QUALPAC and its dimension among nurses. There was an inverse correlation between the two variables of the quality of care and LHS in infant ($P<0.0001$). The findings of this study showed a correlation between the quality of care and HSL; in this regard, the HSL decreased as a result of an increase in the quality of care.

Moreover, the HBS showed a significant correlation with gestational age ($P=0.000$) and birth weight ($P=0.000$). However, the significance level obtained from Kendall's Tau non-parametric correlation test showed no significant correlation neither between the infants' length of stay in the

Table 1. Frequency distribution of demographic characteristics of neonates admitted to Neonatal Intensive Care Unit in selected hospitals of Shahid Beheshti University of Medical Sciences

Property	Category	Frequency (Percentage)
Sex	Female	80 (39)
	Male	125 (61)
Multifetal	Singleton	159 (77.6)
	Twine	35 (17.1)
	Triplet	11 (5.4)
Gestational age (week)		31.18 ± 2/99
The weight of neonate (gram)		1627.75 ± 629/602

Table 2. Frequency distribution of demographic characteristics of nurses working in Neonatal Intensive Care units in selected hospitals of Shahid Beheshti University of Medical Sciences

property	category	Frequency (Percentage)
Age (year)	18-28	36 (45)
	29-38	38 (47.5)
	39-48	6 (7.5)
Average hours of overtime	19-36	9 (11.2)
	37-47	50 (62.5)
	48-61	18 (22.5)
	62-75	2 (2.5)
	76-90	1 (1.2)
Clinical work experience (year)	1-5	55 (68.8)
	6-10	18 (22.5)
	11-15	7 (8.8)
Pass the retraining	Yes	55 (68.8)
	No	25 (31.2)

Table 3. Mean and standard deviation of dimensions of quality of care in Neonatal Intensive Care units in selected hospitals of Shahid Beheshti University of Medical Sciences

The dimensions of quality Of care	Hospital			
	Mahdiye	Mofid	Emam Hossein	Total
Physical dimension	44.21 ± 3.77	41.54 ± 5.87	40.43 ± 4.87	42.61 ± 4.98
Psychosocial dimension	46.42 ± 6.36	46.04 ± 6.60	48.14 ± 5.27	46.59 ± 6.24
Communication dimension	29.50 ± 2.86	27.36 ± 4.29	27.07 ± 3.17	28.32 ± 3.61
Total score	120.13 ± 11.28	114.93 ± 13.14	115.64 ± 10.13	117.520 ± 11.91

hospital and gender ($P=0.539$), nor between the duration of the infants' stay in the hospital and multiple birth ($P=0.776$).

Discussion

In recent years, the birth rate of preterm infants has been rising, but at the same time, medical advances have also made it possible to take care of these infants. A high percentage of preterm infants face problems that lead to NICU admission for more than 20 days, and this is a major factor in increasing the cost of health care services. According to the previous studies, the average cost of hospitalization in the NICUs is equivalent to the cost of hospitalization for spinal cord injury and valvular heart diseases (15-17). The elongation of hospital stay will lead to a reduction in the capacities of the hospital system, by engaging the staff and occupying the hospital beds (16-11). The results of this study revealed an inverse correlation between the quality of care and the duration of NICU stay. In this regard, an increase in the quality of care provided for the infant led to the shortening of the length of hospital stay.

Previous research has investigated the relationship and influence of several factors regarding the infants' length of NICU stay. These factors include severe neonatal problems, lack of proper leveling of NICUs (18), low Apgar score (19), low neonatal birth weight in relation to gestational age (12), prematurity of the infant (20), parents' lack of knowledge and proper ability to care for preterm infants (21), inadequate specialty of the staff to provide care for preterm infants (22), lack of job satisfaction and fatigue in the nursing staff (15), and work overload and long working hours (23). Nevertheless, in the literature reviews conducted by the researcher, no study was found that specifically aimed at examining the relationship between the quality of care and length of NICU stay. However, many of the factors that have been addressed in various studies affect the quality of care provision either directly or indirectly.

The findings of the current study on LHS are similar to the results obtained by Bhutta et al. performed a study entitled "Reducing Length of Stay in Hospital for Very Low Birth Weight Infants by Involving Mothers in Step Down Unit". The mentioned study noted that due to the increase in the treatment costs of low-birth-weight infants and the lack of specialized nursing staff, one of the strategies to reduce the LHS is the participation and involvement of mothers in caring for low-

birth-weight infants. This leads to the reduction of LHS in infants, and consequently a drop in nosocomial infections. Moreover, the findings of the mentioned study showed that providing poor care to a low-birth-weight infant increased the LHS (24). In the mentioned study, in order to reduce hospital costs and due to the shortage of workforce, the infants' mothers were involved in caring for infants in order to improve the quality of care, whereas in the current study, nursing staff were examined.

In addition, the findings of a study conducted by Tongjarunkal et al., who examined the relationship among nursing staff, hospital costs, and LHS, showed that nurses' work overload and long working hours would lead to a decrease in the quality of care. Enhancement of the staff members can help reduce hospital costs because sufficient force can reduce the adverse effects in patients. Consequently, the LHS will be reduced. Besides, staff with a higher level of expertise can provide better care for patients (23). The mentioned study pointed out that measures could be taken to improve nursing care by increasing the nursing force in order to reduce the workload of nurses, which is consistent with the findings of the current study.

In another study, aiming at improving the quality of care provided for infants, Lee et al. examined the impact of the standardization of care to improve the quality of care provided for the infants aged below 32 weeks in the NICUs in Canada in order to reduce the incidence of nosocomial infections. The results of the mentioned study indicated that the standardization of care could be effective in reducing the incidence of nosocomial infections in infants, as well as improving productivity and reducing costs (25). Given that one of the reasons for increasing the infants' length of stay in the hospital is their being affected by nosocomial infections, in this situation, it is expected that the standardization of care would lead to a reduction in LHS. This study describes how hospital-acquired infections, and as a result the infant's length of stay can be reduced by the standardization of care. This study does not directly refer to the nursing factors.

In a study conducted by Shah et al. on 1,053 infants admitted to the NICUs with the aim of investigating the factors associated with infants' death and their LHS, it was found that the factors, such as gestational age, birth weight under 2 kg, too small body for gestational age, and pneumonia, would lead to the elongation of LHS.

Enhancement of the staff skills and their working conditions, improvement of prenatal care, and care of infants after birth can reduce the infants' death rate and LHS (26). This study involved the investigation of a set of factors, including the neonatal factors that prolong the infant's length of stay. It also referred to the fact that by improving the working situations of the treatment team, the length of stay could be reduced.

In another study, Borghans et al. examined the strategies of reducing LHS through medical and nursing staff, and acknowledged that the focus of these strategies needs to be on the quality of care provided for the patient and improving it in addition to reducing the length of hospital stay (27). This study states that considering the medical and nursing factors can improve the quality of care and reduce the length of stay, which is consistent with the present study.

The previous studies conducted on infants have mostly focused on the neonatal factors associated with the length of hospital stay. Therefore, it seems that the present study, which explores the correlation between the quality of nursing care and the length of hospital stay, can confirm the importance of improving the quality of care as one of the factors associated with reducing the infants' LHS.

Limitations

Due to the fact that in the present study, nursing care quality has been obtained through the nurses' filling out a self-report questionnaire, it may not express the real quality of nursing care and can merely reflect the quality of provided care from the viewpoint of the nurses participating in the study. Therefore, for future studies, it is recommended to measure the care quality by using checklists and through the direct observation of performance.

Conclusion

Considering the findings of this study and the relation between the length of hospital stay and the quality of care, the need to improve the quality of care is also emphasized from another perspective. In this regard, it is necessary to improve the quality of nursing care provided for the infants admitted to NICUs and to try to reduce the preterm infants' length of hospital stay through examining the factors associated with the quality of care and its improvement.

Acknowledgments

This research is part of a Master's thesis in

neonatal intensive care nursing and a research project approved by the research council of Shahid Beheshti University of Medical Sciences. The researcher expresses her appreciation to the authorities of the hospitals under study, the parents and the participants in this study, and to all others who collaborated with her in conducting this research.

Conflicts of interest

Authors declare no conflict of interest.

References

1. Reynolds LC, Crapnell T, Zarem C, Madlinger L, Tiltges L, Lukas K, et al. Nursing perceptions of clinical research in the neonatal intensive care unit. *Newborn Infant Nurs Rev.* 2013; 13(2):62-6.
2. Underwood MA, Danielsen B, Gilbert WM. Cost, causes and rates of rehospitalization of preterm infants. *J Perinatol.* 2007; 27(10):614-9.
3. Hamilton KE, Redshaw ME, Tarnow-Mordi W. Nurse staffing in relation to risk-adjusted mortality in neonatal care. *Arch Dis Child Fetal Neonatal Ed.* 2006; 92(2):99-103.
4. Lake ET, Hollowell SG, Kutney-Lee A, Hatfield LA, Del Guidice M, Boxer B, et al. Higher quality of care and patient safety associated with better NICU work environments. *J Nurs Care Qual.* 2016; 31(1):24.
5. Schulman J. Studying determinants of length of hospital stay. *J Perinatol.* 2006; 26(4):243-5.
6. Borhani F, Keshtgar M, Abbaszadeh A. Moral self-concept and moral sensitivity in Iranian nurses. *J Med Ethics And Hist Med.* 2015; 8:4.
7. Ramezani MR, Gheibdoust H. Prioritization of the influential factors on health care services quality using a hybrid approach based on analytic network process (ANP) and fuzzy TOPSIS in public hospitals. *J Hosp.* 2010; 15(40):80-8.
8. Neishabory M, Raeisdana N, Ghorbani R, Sadeghi T. Nurses' and patients' viewpoints regarding quality of nursing care in the teaching hospitals of Semnan university of medical sciences. *Koomesh.* 2011; 12(2):134-43.
9. Isis Montalvo MS. The national database of nursing quality indicators (TM)(NDNQI®). *Online J Issues Nurs.* 2007; 12(3):e1414-27.
10. Abbaszadeh A, Borhani F, Asadi N. Effects of health belief model-based video training about risk factors on knowledge and attitude of myocardial infarction patients after discharge. *J Res Med Sci.* 2011; 16(2):195-9.
11. Kandi Kele M, Kadivar M, Zeraati H, Ahmadnezhad E, Holakoui Naini K. Length of stay in NICU admitted infants and its effective factors at children's hospital medical center using survival analysis. *Iran J Epidemiol.* 2014; 10(1):25-32.
12. Neary E, Al-Assaf N, McDermott C, Sheehan K, Kirkham C, Corcoran D, et al. Planned hospital discharge: a strategy for reducing length of stay of

- very low birth weight (VLBW< 1500G) infants in NICU. *Pediatr Res.* 2011; 70(S5):698.
13. Freitas JS, Silva AE, Minamisava R, Bezerra AL, Sousa MR. Quality of nursing care and satisfaction of patients attended at a teaching hospital. *Rev Lat Am Enfermagem.* 2014; 22(3):454-60.
 14. Borhani F, Mohamadi S, Roshanzadeh M. Moral distress and perception of futile care in intensive care nurses. *J Med Ethics Hist Med.* 2015; 8:2.
 15. Lathrope P, Van Leeuwen M, Campbell D, Seiler K, Dvorak H, Schmelzel M, et al. Can improving continuity of care decrease length of stay in the NICU? Arusha, Tanzania: Evidence-Based Approach to Decreasing Length of Stay in the NICU; 2008.
 16. Rothberg MB, Abraham I, Lindenauer PK, Rose DN. Improving nurse-to-patient staffing ratios as a cost-effective safety intervention. *Med Care.* 2005; 43(8):785-91.
 17. Kornhauser M, Schneiderman R. How plans can improve outcomes and cut costs for preterm infant care. *Managed Care.* 2010; 19(1):28.
 18. Parker L, Krueger C, Sullivan S, Kelechi T, Mueller M. Effect of breast milk on hospital costs and length of stay among very low-birth-weight infants in the NICU. *Adv Neonatal Care.* 2012; 12(4):254-9.
 19. Pepler FT, Uys DW, Nel DG. Predicting mortality and length-of-stay for neonatal admissions to private hospital neonatal intensive care units: a Southern African retrospective study. *Afr Health Sci.* 2012; 12(2):166-73.
 20. Pizzolorusso G, Turi P, Barlafante G, Cerritelli F, Renzetti C, Cozzolino V, et al. Effect of osteopathic manipulative treatment on gastrointestinal function and length of stay of preterm infants: an exploratory study. *Chiropr Man Ther.* 2011; 19(1):15.
 21. Melnyk B, Feinstein NF, Alpert-Gillis L, Fairbanks E, Crean HF, Sinkin RA, et al. Reducing premature infants' length of stay and improving parents' mental health outcomes with the creating opportunities for parent empowerment (COPE) neonatal intensive care unit program: a randomized, controlled trial. *Pediatrics.* 2006; 118(5):e1414-27.
 22. Lake ET, Hallowell SG, Kutney-Lee A, Hatfield LA, Del Guidice M, Boxer BA, et al. Higher quality of care and patient safety associated with better NICU work environments. *J Nurs Care Qual.* 2016; 31(1):24-32.
 23. Thungjaroenkul P, Cummings G, Embleton A. The impact of nurse staffing on hospital costs and patient length of stay: a systematic review. *Nurs Econ.* 2007; 25(5):255-65.
 24. Bhutta ZA, Khan I, Salat S, Raza F, Ara H. Reducing length of stay in hospital for very low birthweight infants by involving mothers in a stepdown unit: an experience from Karachi (Pakistan). *BMJ.* 2004; 329(7475):1151-5.
 25. Lee SK, Aziz K, Singhal N, Cronin CM, James A, Lee DS, et al. Improving the quality of care for infants: a cluster randomized controlled trial. *CMAJ.* 2009; 181(8):469-76.
 26. Shah S, Zemichael O, Meng HD. Factors associated with mortality and length of stay in hospitalized neonates in Eritrea, Africa: a cross-sectional study. *BMJ Open.* 2012; 2(5):792-801.
 27. Borghans I, Kool RB, Lagoe RJ, Westert GP. Fifty ways to reduce length of stay: an inventory of how hospital staff would reduce the length of stay in their hospital. *Health Policy.* 2012; 104(3):222-33.