ORIGINAL RESEARCH ARTICLE

Impact of a nursing intervention based on Meleis transformation theory on discharge readiness of preterm infants: an intervention study

DOI: 10.29063/ajrh2025/v29i10.4

Baoyu Li[1], Mengnan Li[2], Liyuan Tian[2], Hongjuan Pang[1] and Songyan Zhao[1]*

Department of Nursing, Chifeng Municipal Hospital, Chifeng, Inner Mongolia 024000, China[1]; Department of Neonatology, Chifeng Municipal Hospital, Chifeng, Inner Mongolia 024000, China[2]

***For Correspondence:** Email: *cfzhaosongyan@163.com*

Abstract

This study aimed to explore the effect of the discharge readiness linkage intervention programme based on the Meleis transformation theory in the home ward of preterm infants. The study population consisted of 74 preterm infants and their caregivers who were admitted to the NICU of Chifeng Municipal Hospital between January and June 2023. The intervention group received the routine care combined with the intervention model of discharge preparation based on the Meleis transition theory, while the control group received routine care. The results indicated that the discharge readiness linkage intervention programme based on the Meleis transformation theory significantly improved the caregiving capacity of preterm caregivers, increased the readiness of the babies for discharge, and reduced the readmission rate of preterm infants within 1 year of discharge. In addition, the discharge readiness linkage intervention programme based on the Meleis transformation theory helped to improve the physical development of preterm babies and the negative emotions of caregivers. We conclude that the discharge readiness linkage intervention programme based on the Meleis transformation theory effectively improves the survival of preterm infants. *(Afr J Reprod Health 2025; 29 [10]: 40-49).*

Keywords: Meleis Transformation Theory; preterm infants; Discharge Preparation Service; prognosis

Résumé

Cette étude visait à explorer l'effet du programme d'intervention de préparation à la sortie, basé sur la théorie de la transformation de Meleis, sur le domicile des prématurés. La population étudiée était composée de 74 prématurés et de leurs aidants, admis à l'USIN de l'hôpital municipal de Chifeng entre janvier et juin 2023. Le groupe d'intervention a bénéficié des soins de routine associés au modèle d'intervention de préparation à la sortie, basé sur la théorie de la transition de Meleis, tandis que le groupe témoin a bénéficié des soins de routine. Les résultats ont montré que le programme d'intervention de préparation à la sortie, basé sur la théorie de la transformation de Meleis, a significativement amélioré la capacité de prise en charge des prématurés par les aidants, accru la préparation des bébés à la sortie et réduit le taux de réadmission des prématurés dans l'année suivant leur sortie. De plus, ce programme a contribué à améliorer le développement physique des prématurés et à atténuer les émotions négatives des aidants. Nous concluons que ce programme améliore efficacement la survie des prématurés. *(Afr J Reprod Health 2025; 29 [10]: 40-49).*

Mots-clés : théorie de la transformation de Meleis ; nourrissons prématurés ; service de préparation à la sortie ; pronostic

Introduction

Preterm infants are live-born infants born with a gestational age less than 37 weeks, who are prone to a variety of complications due to immature organ development and poor body responsiveness[1]. A study reports the changes in the incidence of preterm infants globally in 1990-2019, and while morbidity and mortality associated with preterm births have declined, it remains a key challenge in child health. Data from 2019 showed that about 950,000 babies were born prematurely in China, accounting for 6 percent of live births[2]. The Global Report on Preterm Infants published by the WHO[3] suggests that premature births account for 11.1 per cent of all births each year, with a mortality rate of 36 per cent of all neonatal deaths[4]. Due to the immature development of premature babies, the vast majority of premature babies are transferred to the neonatal intensive care unit (NICU) for medical support after

birth[5]. However, due to the cramped treatment environment of the NICU, caregivers are separated from premature babies for long periods of time and lack of nursing experience, making it difficult to transition roles[6]. In addition, caregivers' knowledge directly affects the quality of life and long-term survival of preterm infants after discharge from the hospital. Therefore, it is necessary to conduct nursing intervention for preterm infants and understand the nursing needs of their parents in the transitional stage.

The Meleis transition theory is a theoretical transition model that includes the nature of transition, conditions of transition, nursing therapies, process indicators and outcome indicators, which provides insight into the patient's transition experience and the development of effective care strategies based on the patient's needs[7]. Discharge Preparation Service (DPS), also known as discharge planning, is the most commonly used practice model for achieving continuity of health care[8]. DPS refers to the health team's planned provision of appropriate health services to premature infants from the time they are admitted to the hospital and the integration of the health resources needed to enable them and their families to leave the hospital with peace of mind, so that premature infants can receive complete and continuous care as they transition from one care environment to another. DPS are supportive interventions whereby healthcare workers engage with carers to provide appropriate guidance and encouragement in areas such as feeding, nappy changing, breech care, bathing and newborn touching[9].

We found that the Meleis transition theory was highly aligned with the philosophy of the DPS. We therefore combined the Meleis transition theory with the DPS to develop a linked intervention programme for discharge preparation of preterm babies, and explored its effect in the home ward of preterm infants, in order to evaluate the impact of discharge readiness on the prognosis of preterm infants.

Methods

Study design

This was a case control study. Cases were selected from patients who visited the hospital using convenient sampling method. Patients were randomly divided into a control group (n=36) and an intervention group (n=37) using random number table method. The intervention group received the routine care combined with the intervention model of discharge preparation based on the Meleis transition theory, while the control group received routine care.

Participants

Seventy-four preterm infants and their caregivers who were admitted to the NICU of Chifeng City Hospital from January to June 2023 were selected for the study. The inclusion criteria were as follows: ①gestational age at birth <37 weeks. ②hospitalisation for at least 3 days. ③birth weight ＞1000 g preterm. Apgar score ≥7.

The exclusion criteria were: ①combination of serious congenital diseases or malformations. ②hereditary of metabolic diseases. ③children with birth injuries, severe infections and serious complications.

The inclusion criteria for caregivers of preterm babies were: ①Age ≥18 years old and immediate family members of preterm babies. ②normal communication ability. ③the primary caregiver of the preterm infant after discharge from the hospital. ④informed consent to participate in the study.

The exclusion criteria for caregivers of preterm infants: ①engaged in medical-related industries. ②cannot use mobile phone WeChat proficiently. ③suffering from serious diseases, mental or intellectual disabilities.

Intervention

Control group programme: The nurse informed the preterm caregivers of the discharge instructions, and explained the preterm infant's condition, home environment, feeding, bathing, touching hands, breastfeeding techniques, basic knowledge of infection prevention, growth and development, disease prevention and care, medication at discharge, and follow-up.

Intervention programmes

Establishment of a joint multidisciplinary preterm care team

The team consisted of: 1. neonatologists, who were responsible for the treatment of preterm babies during their hospitalization and answered questions and provides nutritional guidance to caregivers

during home care after discharge. 2. rehabilitation therapist, responsible for the needs of preterm infants at different stages of recovery, giving rehabilitation guidance, and providing caregivers with touch massage methods. 3.neonatal nurses, responsible for assessing the caregivers' ability to care for preterm infants, assessing the physical condition of preterm infants, and providing guidance on discharge preparation and breastfeeding according to the Meleis transition theory. 4. psychotherapists, responsible for paying attention to the emotional changes of mothers of preterm infants, so that they could adapt more quickly to the changes in the role of motherhood, and helped relieve bad emotions such as postpartum stress, anxiety, and depression. 5. Master of Nursing in Neonatal Nursing, responsible for evidence-based literature search, data collection and follow-up after discharge.

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Establishment of discharge preparation service implementation process

Assessment: The nurse established a personal profile of preterm infants and recorded baseline information at the time of admission of preterm infants and caregivers. An initial assessment was carried out within 24 hours of admission and a discharge plan document was established for preterm infants within 48 hours. Nurses recorded and assessed the care needs of preterm infants and their caregivers and provided personalized education based on the assessment results.

Planning: The length of hospital stay was predicted according to the basic information and examination indicators of premature infants. Based on the assessment results of premature infants, team members and caregivers work together to develop a personalized discharge preparation service plan for the recovery of premature infants.

Implementation: This consisted of regular caregiving training for parents of preterm infants, and the establishment of a preterm home-based ward in the preterm intensive care unit. Two weeks before the premature baby was discharged, parents went to the premature baby family ward to learn care skills under the guidance of medical staff, increased parents' confidence in taking care of their children, and reduced the anxiety caused by being unable to take care of their children.

Continuity of care

Upon admission, the families of preterm infants obtained the hospital's neonatal WeChat public account and established a WeChat exchange group to provide information platform support for preterm infant caregivers. This platform regularly pushed care videos to carry out continuous care services. Additionally, caregivers gave feedback to medical staff on the growth of preterm infants and problems arising in the process of care, and receive timely, professional and personalized guidance, regular follow-up visits to child development clinics, and guidance and advice from professional child health personnel.

Follow-up time: the relevant objective evaluation indicators of preterm babies were evaluated at 3 months, 6 months and 1 year respectively.

Outcomes

Physical development on the day of admission, on the day of discharge and at the corrected gestational age of 1, 3 months and 1 years. Physical development was expressed in terms of weight, length and head circumference. Weight: in a quiet state, with nappies and other clothing removed, the preterm baby was placed on a special scale for infants and toddlers, and the value was accurate to 0.1 kg; length: the preterm baby was placed in the supine position, with his head pressed against the top plate, his legs straight, and his heels close to the bottom plate, and the value was accurate to 0.1 cm; head circumference: the head circumference was measured with a soft ruler starting from the upper edge of the arch of the eyebrow and going through the highest point of the occipital tubercle and circling back to the starting point, and the value was accurate to 0.1 cm. The measurements were carried out by trained team members, using a uniform measuring tool, and the average value was taken as the final measurement after three repetitions.

Assessment of preterm caregivers' caring capacity before and after the intervention. The Neonatal Parents' Discharge Care Competence Questionnaire[10] has 3 dimensions and 43 items to assess the current caregiving competence of the caregivers, and was scored on a Likert scale of 5, with a total score ranging from 0 to 172, with higher scores indicating higher caregiving competence of

the caregivers. The content validity of the questionnaire was 0.924, the total Cronbach's alpha coefficient was 0.848, and the Cronbach's alpha coefficients for the three dimensions of caregiving knowledge, skills, and attitudes were 0.801, 0.856, and 0.887, respectively.

Preterm caregivers were tested for psychological status on the day of admission, on the day of discharge, and at corrected gestational age of 3 months, 6 months, and 1 year. The level of anxiety was tested using the Hamilton Anxiety Scale (HAMA) scale[11], and the level of depression was tested using the Hamilton Depression Scale (HAMD) scale[12], and the scale scores were negatively correlated with psychological state.

Assessment of caregivers' readiness for discharge. Caregivers' readiness for discharge was assessed using the Readiness of Parents for Discharge Scale (RHDS). As shown previously[13] , the scale contains 29 entries scored on five dimensions: individual child status, individual parent status, knowledge, coping activities, and desired support. The scores are proportional to the carer's readiness for discharge.

Statistics on the rate of (unplanned) readmission of preterm infants within 1 year of discharge, referring to readmission of preterm infants triggered by poor care such as infection, pneumonia, and malnutrition.

Statistical analysis

Epidate was used for data double entry, and SPSS 22.0 statistical software was applied for statistical processing. Count data were described by frequency and percentage, and comparisons between groups were made using the χ^2 test or Fisher's exact probability method; measurement data were expressed as mean ± standard deviation, and were tested for normality by the independent samples t-test for comparisons between groups if they met the normal distribution, and by the rank-sum test (Mann-Whitney U-test) for comparisons between groups if they did not meet the normal distribution.

Quality control

Ensure that team members understand their respective roles and responsibilities, the application of uniform terminology and the use of assessment tools during the implementation process, and safeguard the validity of the data by providing uniform training to all team members.

The collection of questionnaires in this study was completed by fixed personnel in the group, applying uniform terminology to answer the questionnaires, checking the completeness of the completed questionnaires on the spot when they were recovered, and checking and confirming with the participants in a timely manner if there were obvious errors in the completed contents.

The research subjects were uniformly numbered, and the data were entered by double-checking and checking, and 20% of the questionnaires were randomly selected for logical checking to ensure the accuracy of data entry.

Ethical considerations

This study was approved by the Ethics Committee of Chifeng Municipal Hospital, and the Ethics approval number was CK20250118. All patients and their families volunteered to participate in the study and signed informed consent.

Results

Baseline information on preterm babies and caregivers

As shown in Table 1, we collected general information on preterm babies and their caregivers separately. One infant in the control group had severe pneumonia and withdrew from the study, so the number of cases included in the study in the control group was changed to 36. In these data, the length of hospital stay of preterm babies in the intervention group was less than that of the control group ($p<0.05$), and the rest of the data was not statistically different between the two groups ($p>0.05$).

Assessment of the physical development of preterm babies

As shown in Figure 1, the head circumference, length and weight of preterm infants in both groups were significantly improved after the intervention, and the physical development of preterm infants in the intervention group was significantly better than that of the control group at the corrected age of 1 month, 3 months and 1 years ($P<0.05$).

Table 1: Baseline characteristics of 74 preterm babies and their caregivers (Mean±SD) or n (%)

Parameter		Control	Intervention	X^2(t)	P
Number		36	37		
Infant demographic characteristics					
Age(days)		19.71±12.04	18.38±10.33	0.50	0.61
Mode of delivery, n (%)	Vaginal	17 (47.22)	18 (48.65)	0.12	0.90
	Cesarean	19 (52.78)	19 (51.35)		
Gestational age (day)		241.37±17.49	240.69±18.42	0.16	0.87
Birth weight(kg)		2.21±0.29	2.26±0.33	0.69	0.50
Length(cm)		42.67±1.37	42.46±1.31	0.67	0.51
Head circumference(cm)		30.67±1.21	30.52±1.35	0.50	0.62
Length of hospital stay (day)		20.68±9.22	16.11±9.021	2.11	0.04
Apgar score(points)		8.04±0.59	8.15±0.66	0.75	0.46
Parental demographic characteristics					
Gender, n (%)	Farther	9 (25.00)	7 (18.92)	0.63	0.53
	Mother	27 (75.00)	30 (81.08)		
Age(years)		28.96±3.86	29.25±3.77	0.32	0.75
Educational level, n (%)	Middle school	8 (22.22)	10 (27.03)	-	0.82
	High school	14 (38.89)	12 (32.43)		
	College and above	14 (38.89)	15 (40.54)		
Place of residence, n (%)	Town	27 (75.00)	26 (70.27)	0.45	0.65
	Village	9 (25.00)	11 (29.73)		

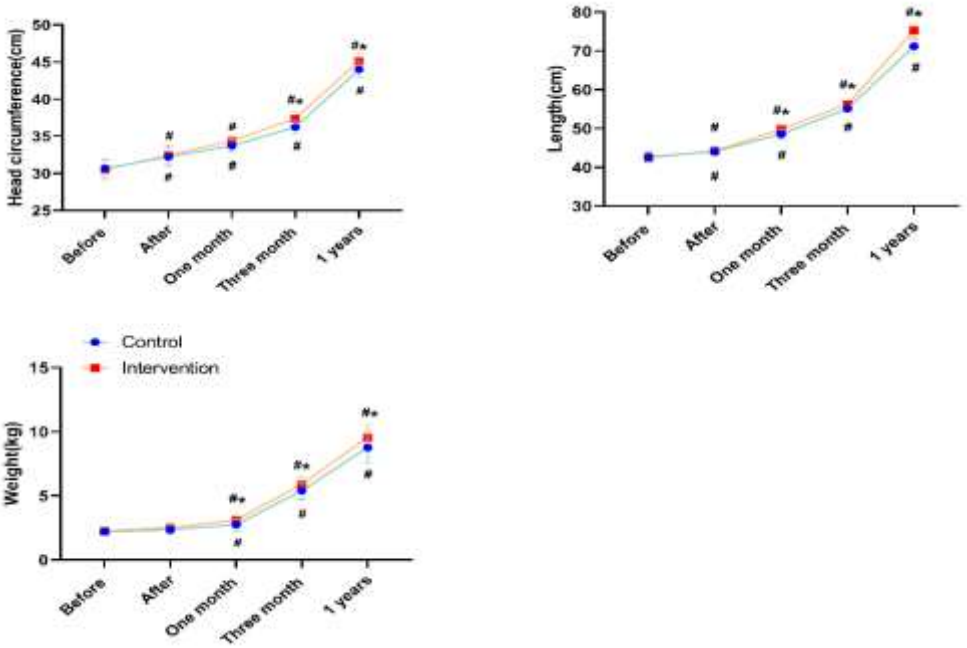

Figure 1: Statistics on the physical development of premature babies. #compared with before intervention, * compared with control group.

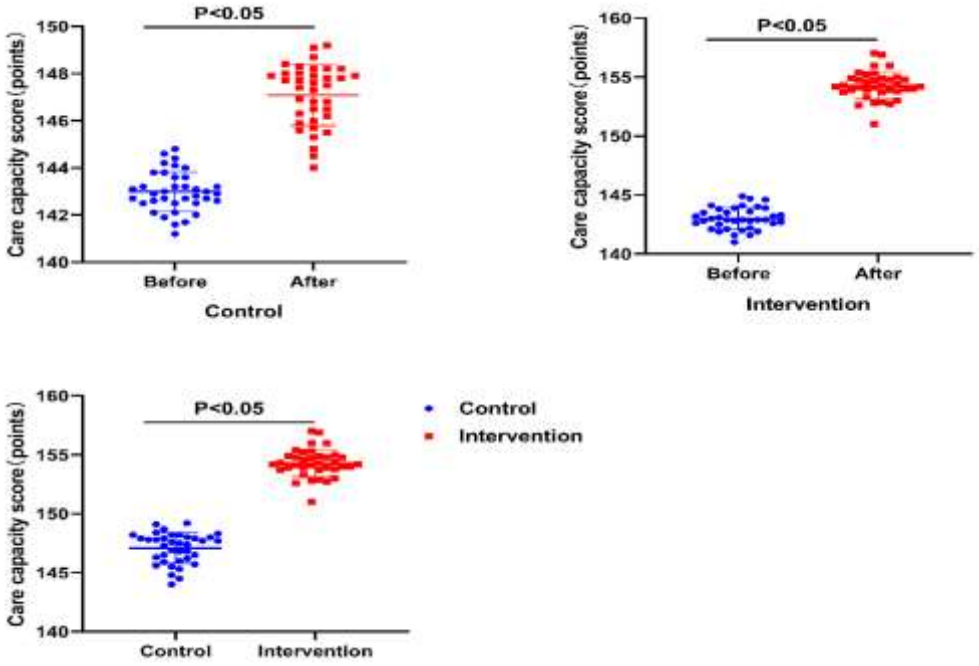

Figure 2: Assessment of the caregiving capacity of caregivers of premature babies.

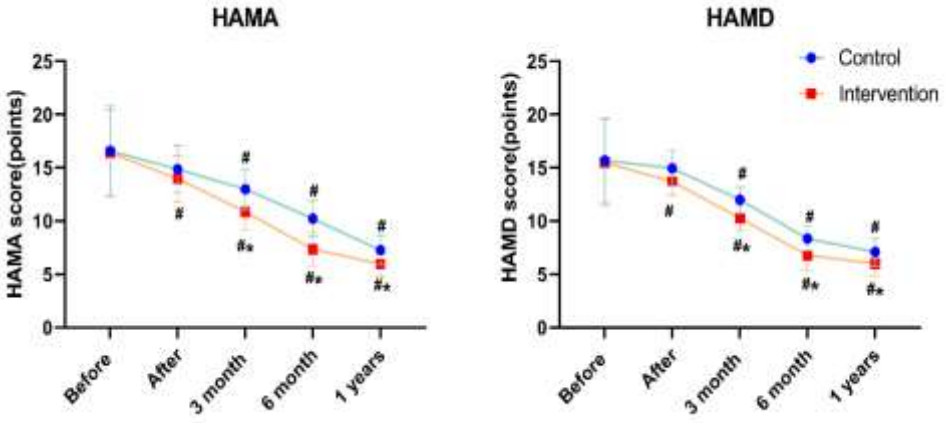

Figure 3: Comparison of caregivers' HAMA and HAMD scores. #compared with before intervention, * compared with control group

Assessment of the caregiving capacity of caregivers of premature babies

As shown in Figure 2, there was a significant improvement in caregiving capacity after the intervention, and the caregiving scores of the intervention group were significantly better than those of the control group ($p<0.05$).

Assessment of the psychological state of caregivers of premature babies

As shown in Figure 3, the HAMA and HAMD scores of the caregivers in both groups decreased after the intervention, and the anxiety and depression of the caregivers were further improved after 3 months of gestational age correction.

Table 2: Assessment of readiness for discharge (Mean±SD)

Scale	No.	Control (n=36)	Intervention (n=37)	Statistics	
				t value	P
Total scale	29	192.78±38.21	211.93±27.19	2.47	0.02
Knowledge	9	52.19±17.22	61.64±15.17	2.49	0.02
Parent personal status	7	50.67±7.42	54.23±7.10	2.10	0.04
Child personal status	6	40.01±6.98	43.59±6.25	2.31	0.02
Expected support	4	31.19±5.64	31.32±5.56	0.10	0.92
Coping ability	3	21.21±4.58	23.54±4.36	2.22	0.03

Table 3: Readmission rate of premature infants within 1 years of discharge [n (%)]

Groups	Reason for readmission					Total rate
	Infections	Pneumonia	Dystrophy	Red Buttock	Aspiration	
Control (n=36)	2(5.55)	1(2.78)	2(5.55)	3(8.33)	3(8.33)	11(30.5）
Intervention (n=37)	1(2.70)	0(0.00)	1(2.70)	1(2.70)	1(2.70)	4(10.81)
X^2						-
P						0.04

Compared with the usual care, the nurses in the intervention group had fewer negative emotions ($p<0.05$).

Assessment of discharge preparedness for caregivers of preterm babies

As shown in Table 2, the RHDS of the intervention group was significantly higher than that of the control group, and among the five dimensions, there was a statistical difference between the two groups in the remaining four dimensions except for expected support ($p<0.05$).

Assessment of readmission rates within 1 years for preterm infants

We counted the readmission rate of preterm infants within 1 years after discharge, and the readmission rate was significantly lower in the intervention group than in the control group ($p<0.05$). The main reasons for readmission included infection, pneumonia, red buttock, aspiration and dystrophy.

Discussion

Preterm birth or low birth weight is the leading cause of neonatal mortality. In recent years, the mortality rate of premature infants has also become an important indicator to evaluate the health status of a country's population[14]. Most premature babies require life support technology and nursing interventions, and neonatal intensive care units in China are managed in a closed model, which often limits how and when parents can visit their babies. This not only affects the lack of parental caregiving knowledge and competence, but also affects the quality of life and survival rate of preterm infants after discharge from the hospital to a certain extent. To address this phenomenon, we developed a discharge readiness linkage intervention programme based on the Meleis transformation theory to explore whether the programme meets the care needs of preterm infants and the care needs of caregivers.

In this study, the caregiving ability of parents in both groups was significantly higher after the intervention, and the scores in the intervention group (154.21±1.19) were significantly higher than those in the control group (147.08±1.29), suggesting that a discharge readiness linkage intervention programme based on the Meleis transformation theory could promote the caregiving ability of parents.

Due to weaker immunity and the need to adapt quickly to the extrauterine environment, preterm infants are at higher risk of metabolic and neurodevelopmental dysplasia than normal infants[15]. Growth retardation and abnormal body composition at birth are adverse signs of preterm birth[16]. It has been found that breastfeeding may be an important determinant of organic development of premature babies, and that the nutritional needs of different levels of prematurity vary[17]. Preterm infants differ from full-term infants in terms of breastfeeding, and physical data on the day of discharge of preterm

infants found that exclusively breastfed preterm infants tended to have the most delayed physical development, and the addition of formula increased the amount of obesity in preterm infants[18].

Therefore, it is necessary to adjust the ratio of breastfeeding to formula for preterm infants at different times. In our study, we assessed the feasibility of discharge readiness linkage intervention programme based on the Meleis transformation theory by studying the physical development of preterm infants at admission, discharge, corrected gestational age of 1 month, 3 months and 1 years. Head circumference indicates the degree of brain development, length reflects skeletal development and fat-free mass, and weight reflects nutritional status and organic growth[19]. The results of our study showed that head circumference, length and weight were significantly higher in the intervention group after correcting the gestational age compared to the pre-intervention period. After correcting the gestational age for 6 months, the preterm babies in the intervention group showed a faster increase in the indicators compared to the control group. All these results suggested that discharge readiness linkage intervention programme based on the Meleis transformation theory could promote the physical development of preterm infants.

Planning is the key to discharge readiness, and the implementation of discharge readiness plans helps to provide social support for caregivers, helps caregivers to understand the treatment of their newborns, understand the daily care needs of their newborns, and thus help them to prepare for the newborn before the discharge. The results of a study in Iran showed that increased readiness for discharge was associated with shorter hospital stays for newborns, reduced treatment costs, and an increase in hospital beds for other infants[20]. The readiness of preterm infants to discharge from the hospital is determined by the organic health of the infants, ignoring the adaptability of caregivers to changing roles after discharge. Due to less contact with preterm infants, caregivers are less able to handle some emergencies, and instructional interventions are predictors of preterm infants' readiness for discharge[21]. The quality of discharge education is related to the frequency and form of teaching intervention, which increases the caregiver's nursing knowledge, the mutual exchange of parenting experience and the caregiver's confidence[22]. In addition, nursing of premature infants is one of the key factors in regulating mothers' negative emotions[23]. A lack of knowledge and ability to care for a premature baby can lead to a lack of confidence in parents, which can lead to negative emotions such as anxiety and depression, while studies have found that up to 48.3 percent of mothers suffer from postnatal depression[24]. Whereas, positive caring model and good psychological status of parents have lasting advantages on the healthy development of preterm babies[25]. In our study, a linked intervention programme for discharge readiness based on Meleis transformation theory increased caregivers' competence and readiness for discharge, with significant improvements in caregiving knowledge, attitudes, parental status, and preterm infants' physical status. Therefore, the role transformation of the nursing staff and the care of the premature infants after discharge are of great importance.

The ability of primary caregivers of preterm infants directly affects the growth and development, nutritional support and readmission rate of preterm infants. The higher the ability of caregivers to take care of preterm infants, the stronger the ability to prevent and cope with various problems after discharge, and the better the ability of caregivers to provide optimal care for preterm infants. The results of this study found that the readmission rate of infants within 1 year in the discharge readiness linkage intervention programme based on the Meleis transformation theory was significantly lower than that of the usual care group, which may be attributed to the caregiver' good caregiving theories and coping skills.

Study strengths and limitations

The strengths are that our study may provide a reference basis for the development of continuity of care for preterm infants. On the other hand, by analysing the readiness of preterm infants and their caregivers for discharge, we can provide reference for the subsequent development of individualised discharge plans, promote the health promotion of preterm infants in China, and improve the quality and satisfaction of nursing services. However, there are limitations to this study. There may be limited generalisability of the findings due to the small sample size and uniformity of the source.

Conclusion

This study carried out a linked intervention model of discharge preparation based on the Meleis transition theory in a preterm home-based ward. On the one hand, it enabled caregivers to master the knowledge and skills of daily care, understand the growth and development patterns of preterm infants, help caregivers adapt to the change of roles, help preterm infants to transition smoothly to home-based care, reduce the incidence of post-discharge complications in preterm infants, improve the survival rate of premature infants and provide a reference for the formulation of continuous care for premature infants.

Funding

This work was supported by the Science and Technology Program of the Joint Fund of Scientific Research for the Public Hospitals of Inner Mongolia Academy of Medical Sciences (No. 2024GLLH0982).

Competing interests

The authors report no actual or potential conflicts of interest.

Authors contribution

Baoyu Li and Mengnan Li: conceived and designed the study, as well as collected and analysed the data. Liyuan Tian, Hongjuan Pang and Songyan Zhao: prepared the manuscript. All authors mentioned in the article approved the manuscript.

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