

Original Article

The effect of continuous clustered care on the physical growth of preterm infants and the satisfaction with the nursing care

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Abstract: Purpose: This study aimed to evaluate the effect of continuous clustered care on the physical growth of preterm infants and on the satisfaction with the nursing care. Methods: 120 preterm infants who were admitted to our hospital from Jan 2018 to Dec 2018 were recruited as the study cohort. These infants were randomly divided into a control group (n=60, routine care) and an experimental group (n=60, continuous clustered nursing care). The study compared the parenting skills in the two groups, the infant development at 6 and 12 months, the prevalence of diseases within one year after discharge, and the parents' satisfaction with the nursing care. Results: There was no significant difference in the parenting skill levels between the two groups. The body masses, heights, and head circumferences of the infants at 6-months and 12-months in the experimental group were better than they were in the control group. The experimental group's physical and intellectual development were significantly better than the physical and intellectual development in the control group ($P<0.05$). In the experimental group, the number of cases with infantile respiratory, umbilical, and intestinal infections was lower than it was in the control group. The parental satisfaction level with the nursing care in the experimental group was significantly higher than it was in the control group (96.67% vs 78.33%) ($P<0.05$). Conclusion: Continuous clustered nursing care can improve the physical growth of preterm infants, reduce the adverse events and improve the nursing satisfaction level.

Keywords: Continuous clustered nursing care, preterm infants, physical growth, satisfaction with the nursing care

Introduction

Preterm infants are defined as babies who are born alive before 37 weeks of pregnancy. There are about 15 million preterm infants born every year worldwide, accounting for 10% of the total number of newborns [1, 2]. The number of preterm infants in China is up to 1.8 million, which makes up more than 10% of the worldwide total [3]. It is reported that preterm birth is the leading cause of neonatal death [4]. The emergency treatment success rate and the infant survival rate have been significantly improved with the development of perinatal medical technology and with ICU newborn rescue technology [5]. However, various complications and sequelae may occur due to the immature development of organs and functions in preterm infants. The complications can severely affect the infants'

quality of life, and can burden families and society [6]. Previous clinical interventions have been focused predominantly on the hospital treatment and nursing care of the preterm infants. In recent years, the hospital nursing care service has been extended to families and communities at home and abroad. However, the requirement of infants and parents for continuous nursing care is poorly realized [7]. The present trial is being undertaken to test the effectiveness of continuous clustered nursing care.

Subjects and methods

Subjects

A retrospective analysis was conducted on 120 preterm infants who were admitted to our hos-

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Table 1. A comparison of general data between the two groups

Groups	n	Male/Female (n)	Gestational age ($\bar{x} \pm s$, weeks)	Body mass ($\bar{x} \pm s$, g)	Apgar score ($\bar{x} \pm s$)
Experimental group	60	32/28	30.48±3.15	1723.45±136.78	8.22±0.76
Control group	60	33/27	31.07±3.11	1746.98±132.71	8.36±0.69
X ² /t		0.034	1.032	0.956	1.056
P		0.855	0.304	0.341	0.293

pital from Jan 2018 to Dec 2018. This study was approved by the ethics committee in our hospital. The criteria for selecting the subjects were as follows. ① The gestational age of the infants was less than 37 weeks, and the infant birth weight was 1500-2500 g. ② The Apgar score was 7-9 points [8]. ③ No severe congenital malformations. ④ The mother was the primary guardian and a primipara, and had an educational background higher than high school, and was capable of using WeChat. ⑤ The guardian voluntarily signed the informed consent. The exclusion criteria were as follows. ① Genetic metabolic diseases. ② Preterm infants unable to participate in the whole process. ③ The mother had severe anemia, an acute viral infection, or severe eclampsia. These infants were randomly divided into the control group (n=60) and the experimental group (n=60). The general data in the two groups were homogeneous (P>0.05). See **Table 1**.

Methods

The same nursing staff group conducted the health education for the preterm infant guardians by video and multimedia. The education included the measurement of the preterm infants, the administration of routine vaccinations, the prevention and treatment of common diseases, and home nursing. The nursing staff demonstrated active exercises, passive exercises, and touching methods for infants during the visits. The control group only underwent routine nursing intervention after discharge. The continuous clustered nursing intervention method was used with the experimental group.

The content of the continuous clustered nursing intervention: First, we established the continuous clustered nursing intervention group. Then we organized a group meeting to analyze the questions and to synthesize the relevant literature. Based on suggestions recommended

by the clinical guidelines, the study created specific continuous clustered interventions.

The implementation of continuous clustered nursing care: All the nurses made sure the implementation of the clustered intervention was based on standard nursing procedures. The nurse manager took charge of the execution of the plan and evaluated the performance of the nursing staff within the prescribed time-frame. The detailed interventions were as follows. ① The nurses opened the windows twice each day, for 25 to 30 minutes each time. The nurses kept the room temperature at 22-26°C and the humidity at 55%-65%, and they kept the rooms quiet and bright. ② The mothers breastfeeding the premature babies began to take cod liver oil after 2-weeks, and they took oral iron supplements when the babies turned 1-month-old to prevent anemia. After breastfeeding, they picked up and gently patted the backs of the preterm infants. They expelled air from their stomachs, then they lay them on their sides to avoid spilled milk. ③ The nurses touched the babies twice a day for 15 mins. They placed the premature babies in a prone position, gently touched the necks, shoulders, and their upper and lower limbs with appropriate pressure. They placed the premature babies in a supine position, gently touched the faces and abdomens, then they bent and stretched their limbs. This would make the preterm infants comfortable and helps their growth. For umbilical cord care, the nurses cleaned the roots of the umbilical cords to prevent umbilical infections using sterile cotton swabs containing 75% alcohol. ④ Scientific management. After the preterm infants were discharged, the nurses conducted follow-ups to monitor the medication, abnormal breathing and coughing, and special vaccinations. After discharge, they monitored the prevention, identification, and management of any common abnormalities. Then provided training on the knowledge and skills related to growth and development.

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Table 2. A comparison of the parenting skills between the two groups ($\bar{x} \pm s$)

group	n	Total points
Experimental group	60	83.49±11.76
Control group	60	83.46±12.14
t		3.958
P		0.985

Methods for implementation. a) Telephone follow-up. The nurses made phone calls every week after discharge and every month after 3-months. Through the telephone follow-up, the nurses learned about the infants' temperatures, feeding, and bowel and skin conditions. They also answered the families' questions. b) WeChat follow-up. Through the WeChat follow-up, The nurses gave the parents with information about feeding, supplements, and growth monitoring. c) Home visit. Through the home visits, the nurses adjusted the nursing interventions based on the body mass and nutrition evaluations of the premature infants. d) Health lectures. The physicians or nurses gave lectures about health each month. The lecture contents included how to feed, how to keep the infants warm, and how to prevent common diseases. The parents were invited to share their experiences with nursing premature infants. The nurses in the continuous clustered care group demonstrated how to touch babies, and how to do passive exercises.

Process control: The implementation of the program was strictly controlled. The evaluations of the follow-ups and the health education lectures were completed. Monitoring. The ward manger, the nursing unit manager, and the relevant responsible people monitored the processes during the different steps to ensure the effective implementation of the nursing inventions. Continuous quality improvement. We evaluated the effect of the implementation of the follow-ups and the existing problems were in the weekly nurse meetings to improve the quality of care. The nurse unit managers conducted weekly telephone follow-up visits to 2-3 parents of premature infants to understand the progress of the continuous group nursing and the nursing service attitudes. The nurse unit mangers incorporated the nurses' performance into the department quality assessment and performance management.

Observation indexes

① The parenting skills were assessed based on the "parenting skills" survey [9]. The survey consisted of four sections, including routine nursing care, correct feeding methods, infection prevention, and recognition and management of common issues. Each category had 5 points and there were 20 categories. The total possible score was 100 points. A higher score indicated better parenting skills. ② The growth and development of infants. The nurses used standard weight scales, measuring beds, and tape to evaluate the body masses, lengths, and head circumferences of the infants in June and December respectively. ③ Intelligent Physical Fitness Assessment at 12-months. The intelligence scale and psychomotor development indexes were used to evaluate the physical intelligence development of the premature infants [10]. ④ Incidence of diseases. The incidence of diseases was recorded one year after discharge, including umbilical infections, respiratory infections, and intestinal infections. ⑤ Satisfaction with the nursing care. The nursing satisfaction survey designed by our hospital was used to evaluate the parents' satisfaction with the nursing care. There were 18 categories in the survey, ranging from "satisfied", and "generally satisfied" to "unsatisfied". The nursing satisfaction level = (satisfied + generally satisfied)/groups * 100%.

Statistical methods

All the analyses were carried out using SPSS, version 20 and the graphics drawing was carried out using GraphPad Prism, version 7. The quantitative data in a normal distribution were expressed as ($\bar{x} \pm s$) and tested using *t* tests. The qualitative data was expressed as (%) and was tested using χ^2 tests. $P < 0.05$ indicated a statistically significant difference.

Results

A comparison of the parenting skills between the two groups

There was no significant difference in the parenting skill levels between the two groups ($P > 0.05$). See **Table 2**.

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Table 3. A comparison of the growth of the infants at 6 months between the two groups ($\bar{x} \pm s$)

Group	n	Body mass (kg)	Length (cm)	Head circumference (cm)
Experimental group	60	7.12±1.65	64.98±1.83	42.98±1.74
Control group	60	6.08±0.98	61.46±1.18	40.09±1.13
t		4.198	12.520	10.790
P		<0.001	<0.001	<0.001

Table 4. A comparison of the growth of the infants at 12 months between the two groups ($\bar{x} \pm s$)

Group	n	Body mass (kg)	Length (cm)	Head circumference (cm)
Experimental group	60	9.23±1.54	72.46±1.77	45.18±1.49
Control group	60	7.63±0.88	70.43±1.06	43.62±1.01
t		6.987	7.622	6.713
P		<0.001	<0.001	<0.001

Table 5. A comparison of the development of the physical intelligence between the two groups ($\bar{x} \pm s$)

Group	n	intelligence	physical quality
Experimental group	60	92.13±1.54	90.46±1.77
Control group	60	107.63±4.88	106.43±5.06
t		7.787	8.632
P		<0.001	<0.001

Table 6. A comparison of prevalence of diseases in the infants at 1 year between the two groups (n, %)

Group	n	Respiratory infections	Umbilical infections	Intestinal infections
Experimental group	60	5 (8.33)	7 (11.67)	7 (11.67)
Control group	60	16 (26.67)	18 (30.00)	20 (33.33)
χ^2		6.984	6.114	8.076
P		0.008	0.013	0.004

A comparison of the infants' growth at 6 months between the two groups

The increases in the body masses, lengths, and head circumferences of the infants in the experimental group were significantly higher than they were in the control group. The differences were statistically significant ($P < 0.05$). See **Table 3**.

A comparison of the growth of the infants at 12 months between the two groups

The increases in the body masses, lengths, and head circumferences of the infants in the

experimental group were significantly higher than they were in the control group. The differences were statistically significant ($P < 0.05$). See **Table 4**.

A comparison of the development of the physical intelligence between two groups

The experimental group was significantly better than the control group in terms of physical intelligence development ($P < 0.05$). See **Table 5**.

A comparison of the prevalence of diseases in the infants within 1 year between the two groups

The incidence rates of respiratory infections, umbilical infections, and intestinal infections in the preterm infants in the experimental group were significantly lower than they were in the control group ($P < 0.05$). See **Table 6**.

A comparison of the nursing satisfaction between the two groups

The nursing care satisfaction level in the experimental group was significantly higher than it was in the control group (96.67% vs 78.33%, $P < 0.05$). See **Table 7**.

Discussion

Due to their immature organs, premature babies are prone to many diseases and their health can easily deteriorate [10]. The deterioration of premature babies' health is often overlooked because of the differences in the nursing skills of infants' mothers. If they miss the best opportunity for treatment, it will cause many adverse consequences [11]. The concept of continuous clustered nursing care has been widely applied clinically in recent years. It transfers policies and guidelines into specific implementation plans [12], making nursing care systematized. Traditional empiricist nursing model

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Table 7. A comparison of the nursing satisfaction levels between the two groups (n, %)

Group	n	satisfaction	generally satisfied	dissatisfied	Satisfaction
Experimental group	60	33 (55.00%)	25 (41.67%)	2 (3.33)	58 (96.67)
Control group	60	24 (40.00)	23 (38.33)	13 (21.67)	47 (78.33)
χ^2					9.219
<i>P</i>					0.002

has developed into a standardized and scientific nursing model, so the quality of nursing care has been improved [13]. This study utilized the continuous clustered nursing intervention model with preterm infants, thus providing the parents with needed knowledge, reducing the incidence of diseases, and improving the infants' growth.

As medical treatment models evolve, the responsibility of health professionals is not only to ensure the survival rate of preterm infants but also to guarantee the optimization of their growth and prognoses [14]. The growth and development of infants is a long-term continuous process and scientific and effective discharge guidance is a good continuation of clustered nursing care. Good nursing care will promote the neurodevelopment and intelligence of premature infants [15, 16]. Some issues related to the inexperience of the guardians, such as inappropriate feeding, will delay the growth of the premature infants after the infants' discharge from the hospital [13, 17]. The continuous clustered nursing care satisfies the need of continuous nursing service for preterm infants, such as nursing knowledge, nursing skills, and follow-ups. The continuous clustered nursing care provides the infants' mothers with disease prevention knowledge and skills, including feeding, touching, bathing, bowel monitoring, growth monitoring, vaccination, and the recognition of abnormal symptoms. It helps infant mothers master correct and scientific nursing methods, effectively enhancing their nursing knowledge and skills and further promoting the physical development of premature infants [18]. On the other hand, touching will increase the excitability of the vagus nerve in the premature infants, relaxing the preterm babies and helping them maintain regular and smooth sleep. And promoting the growth and development of the cerebral cortex and nerve cells. Also, touching will increase the production and release of insulin and gastrin, enhancing the gastrointestinal

function of the premature infants and improving their growth [19]. This study shows that the parenting skills in the experimental group were better than the parenting skills in the control group. Also, the body masses, lengths, and head circumferences of the infants at 6-months and 12-months were better than they were in the control group. The experimental group was significantly better than the control group in terms of physical intelligence development. The continuous clustered nursing care achieves complete, thorough, professional, and personalized nursing care service from hospital admission to discharge. It meets the needs of preterm infants and their parents, enhances their parenting skills, improve the growth and development of preterm infants, further reduce the incidence of diseases, and improve the nursing satisfaction levels. This study found that the respiratory, umbilical, and intestinal infection incidence rates of the preterm infants in the experimental group were lower than the corresponding rates in the control group. The nursing satisfaction rate in the experimental group was 96.67%, which is higher than the rate in the control group, 78.33%. However, the present study lacks long-term efficacy observations, and it remains unclear whether the long-term prognoses of the premature infants after the intervention were better than they were with the other premature infants, or whether there was a positive impact on the future language and exercise abilities.

In summary, continuous clustered nursing care can promote the growth and development of preterm infants, reduce their incidence of diseases, and improve the nursing satisfaction levels.

Disclosure of conflict of interest

None.

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