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Application Study of Nursing Intervention Program under NIDCAP Philosophy in the Early Life of Extremely Low Birth Weight Infants

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Abstract:Objective: To study the application of the nursing intervention program under the individualized development care and assessment program (NIDCAP) philosophy in the early life of extremely low birth weight infants.
Methods: An asynchronous controlled experimental method was used. Clinical data of extremely low birth weight infants treated in our hospital from June 2020 to May 2022 before and after NIDCAP nursing intervention were collected. The control group included 99 patients (extremely low birth weight infants) treated from June 2020 to May 2021 and the NIDCAPl group included 103 patients treated from June 2021 to May 2022.
General information of the two groups of patients, NIDCAP quantification indicators, growth and development indicators, neurological behavior scores, incidence of complications, and nursing satisfaction were compared.
Results: After the intervention under the guidance of NIDCAP philosophy, there was a statistically significant difference between the NIDCAPl group and the control group in NIDCAP quantification indicators (P<0.05). The daily weight gain of the infants in the NIDCAP group（NG.） was higher than that of the control group (P<0.05), the time to achieve full oral feeding in the NIDCAPl group was shorter than that in the control group (P<0.05) and the TIMP neurological behavior scores and nursing satisfaction ratings of the infants in the NIDCAPl group were higher than those of the control group (P<0.05). The incidence of intraventricular hemorrhage in the NIDCAPl group was lower than that in the control group (P<0.05).
Conclusion: The nursing intervention program under the NIDCAP philosophy can effectively increase the daily weight gain of extremely low birth weight infants, shorten the time to achieve full oral feeding, improve neurological behavior, promote brain development, reduce the incidence of intraventricular hemorrhage and achieve higher nursing satisfaction ratings.

Keywords: NIDCAP Nursing Model, Very Low Birth Weight Infants, Early Life, Growth and Development

Clinically, newborns with a birth weight of less than 1500g are referred to as very low birth weight infants (VLBWI), who face more health problems and long-term developmental disorders than healthy newborns [1]. These problems include common conditions such as respiratory distress syndrome, intraventricular hemorrhage, hydrocephalus, infections, and pneumonia. Long-term prognosis may include developmental delays, diminished behavioral organization abilities, cognitive impairment, and cerebral palsy [2,3]. Therefore, how to improve their quality of life and physical condition has become a hot topic in neonatal research at home and abroad.

In response to the developmental characteristics of very low birth weight infants, American doctor Heidelise Als [4] and others proposed the Newborn Individualized Developmental Care and Assessment Program (NIDCAP) in 1984. This model pays more attention to the individual, comprehensive, and developmental care of preterm infants, and this idea is gradually being promoted in related care fields [5]. However, there is still some controversy over the effectiveness of this concept [6,7], and there is still a lack of comprehensive research ofNIDCAP on VLBWI in China, making systematic promotion challenging.

Based on this, this study aims to explore the impact of nursing interventions under the NIDCAPphilosophy on the early life of very low birth weight infants through empirical research. The goal is to discuss whether this nursing program can better meet the developmental needs of very low birth weight infants, improve the clinical outcomes of very low birth weight infants during hospitalization in the NICU, and improve their quality of life, providing clinical reference. The research report is as follows.

1. Research Data

1.1 Research subjects

1.1.1 Experiment group

Very low birth weight infants treated in the NICU of a Class A tertiary hospital in Wenzhou after the implementation of the program from June 2021 to May 2022 were selected. From June 2021 to May 2022, 610 preterm infants were admitted to

our hospital, of which 126 were very low birth weight infants of 1000g~1500g. According to the inclusion and exclusion criteria, 103 patients were actually included in the experiment group.

1.1.2 Control group

Very low birth weight infants treated in the NICU of the same Class A tertiary hospital in Wenzhou before the implementation of the program from June 2020 to May 2021 were selected. From June 2020 to May 2021, 589 preterm infants were admitted to our hospital, of which 147 were very low birth weight infants of 1000g~1500g. According to the inclusion and exclusion criteria, 99 patients were actually included in the control group.

1.2 Inclusion criteria

① Birth weight 1000g-1500g.

② Apgar score ≥ 7 points.

③ Admitted to NICU within 1 hour after birth, with medical support during transfer.

④ family members have a high degree of cooperation, who understand the purpose of this research, and sign the informed consent.

1.3 Exclusion criteria

① Infants with severe congenital hereditary metabolic diseases, chromosomal diseases, severe nervous system diseases, physical deformities, significant organ function defects, and digestive dysfunction.

② Infants who died due to severe complications during the research process, whose families gave up treatment, or being transferred to other hospitals.

③ Infants with incomplete data.

1.4 Definition range

The term "routine care for preterm infants" in this paper refers to the care method used for very low birth weight infants before the NIDCAP care program was introduced in 2021 in this hospital. This is a specific term used in nursing work for convenience, rather than the general meaning of "basic" and "common" in Chinese.

1.5 Data collection range

This study uses a non-synchronous control experiment. The "control group" experimental data collection object in this paper is the data before the implementation of the NIDCAP nursing program (June 2020-May 2021); the "NIDCAPl group" experimental data collection object is the data after the implementation of the NIDCAP nursing program (June 2021-May 2022). This study was approved by the Ethics Committee of the author's hospital (YJ-2022-K-277-01), and the family members of all the research subjects were informed, agreed and signed the informed consent, so all the data collected in this research are authorized.

2. Research Methods

2.1 Implementation of NIDCAP care

2.1.1 constitute of the NIDCAP program leading team

the team consists 5 nurses, all of whom bear rich experiences in NICU, including 1 with a senior title, 2 with intermediate titles, 2 neonatal specialist nurses. They are in charge of working out plans and assigning tasks. Neonatal specialist nurses in the team conduct specialized training according to the NIDCAP nursing program, including teaching the NIDCAP concept and interpret intervention measures.

2.1.2 Training: All nursing staff in the department have been trained with NIDCAP nursing homogenized management, unifying the standards for various nursing operations. various operations are implemented and reviewed. Training is conducted once a week for 4 consecutive weeks. A score of 90 or above is considered up to the standard, and those who failed would continue to strengthen the training until they were qualified. Thus, nursing care for the NIDCAPl group research subjects follows the routine care for preterm infants and the NIDCAP nursing program.

2.2 Nursing implementation of the NIDCAPl group

(1) Ward environment: a. Rectify the ward environment: create a clean and comfortable ward environment, the bed spacing of the patient's incubator or small bed is reasonable, bed spacing >1.5m; through 5S management, sort out the equipment in the room, neatly place the items, no idle backup equipment; b. Reduce environmental noise: reduce environmental noise from equipment and general activities in the Newborn Intensive Care Unit (NICU): use sound control noise meter to provide suitable sound environment for fragile infants, ward noise does not exceed 60 decibels; c. Standardize the behavior of medical staff: Update the working shoes of medical staff to reduce the noise of walking; close the incubator gently; set the alarm volume of medical equipment reasonably; reduce the volume of medical staff speaking in the ward.

(2) Sleep Support: a. NICU lighting intensity: 25ftc-60ftc; special treatment 100ftc; b. For infants aged 24w-30w, use a blackout cloth for light control; for infants aged 30w-34w, keep the blackout cover half open during the day to cycle day and night. c. Nurses pay attention to the adjustment of indoor lighting during non-operation periods, such as room curtains and light adjustment; d. For non-emergency medical orders or operations, operations can be appropriately postponed during the quiet sleep of the patient, and the order and timing of disposal can be adjusted according to the current situation.

(3) Feeding: a. Breastfeeding, try to increase the breastfeeding rate; b. Start milk as soon as possible after birth, using colostrum oral drop; c. Use non-nutritive sucking, use pacifier oral sucking for 5 minutes before milk during the transition from nasal feeding to oral feeding. d. Choose to use preterm baby-specific bottles for feeding. e. Strengthen health education on breastfeeding, enhance teaching and learning through WeChat official account, so that family members can strengthen and improve their belief and confidence in breastfeeding, improve the pass rate of breast milk collection, storage, and transportation, and improve the safety of breastfeeding.

(4) Pain Relief: a. For operations with painful experiences, such as tracheal intubation, deep vein cannulation, suction, puncture, foot blood sampling, etc., use two-person operation, one person soothes and stabilizes the patient to reduce the pain experience, and the other person performs operations with gentle movements; b. Use non-nutritive sucking, 5% GS sugar water, and swaddling to reduce pain experiences; c. Concentrate operations, keep the patient quiet and stable during operation. After each operation, soothe the patient until the patient's vital signs return to stability, and minimize the patient's pain experience. d. Follow the doctor's advice to

arrange sedative drugs reasonably, use the N-PASS score, and evaluate the patient's pain.

(5) Positioning: a. Use bird's nest, frog-shaped pillow, straps to better support the baby's position; b. Choose the appropriate size of medical equipment and care products, such as the size of respirator nose masks, nasal congestion, preterm baby diaper sizes, etc.

(6) Olfactory Stimulus: Place a gauze soaked with the mother's breast milk next to the patient's nose, change it every 3 hours, and place it for 1 hour each time.

(7) Strengthened Nurse Training:

The training content mainly includes: a. The special conditions and physiological development laws of preterm infants. b. The principles and methods of preterm infant care. c. Safety measures and danger recognition in the nursing process. d. The prevention and treatment of common diseases in preterm infants. e. Nursing records, observation and assessment skills. f. Communication skills and psychological support with family members.

(8) Parent Class: a. Regular knowledge training for parents every week, courses include the growth and development characteristics of preterm infants, daily care of preterm infants, nutrition and feeding of preterm infants, prevention of disease infection, vaccination; b. Before preparing for discharge, invite family members to enter the ward to learn about newborn feeding and newborn care, guide home care knowledge and skills. Including learning to recognize preterm infant physiology, motor and behavioral stress signals, common infant choking, asphyxia first aid measures, etc.

2.3 Control Group Implementation Method（before May. 2021）

Before May 2021, the implementation process of the nursing plan of the control group: According to the nursing norms for premature infants, the routine nursing rules for low-weight premature infants were implemented, including oral care, skin care, temperature management, nutritional support, infection prevention, respiratory management and circulation monitoring, etc. In addition, psychological support was provided to the families of the infant. However, care for the control group was not being guided by the NIDCAP philosophy of care until May 2021, and the scope and standards of those operations are not specified.

2.4 Assessment Tools

2.4.1 A general information survey: The content includes gestational week of birth, gestational age, weight, mode of delivery, patient medication treatment situation, oxygen use, complications, discharge weight, implementation of NIDCAP intervention nursing measures, etc.

2.4.2 Intervention measure recording form: The content includes observation time of two groups of patients, records of nursing operation in 4 hours, frequency of door opening of the incubator, number of patients per ward, ward light, environmental noise, parent care time, pacifier use, etc.

2.5 Evaluation Indicators

2.5.1 NIDCAP Quantitative Indicators:

① FCC (family centered care): The time the family enters the ward to care for the patient, including kangaroo care and family breastfeeding time.

② Ward noise: Use a sound control noise meter to measure the overall sound decibel in the unit room.

③ Environmental light: Use a spectrometer to measure the light in the patient's incubator.

④ number of patients per ward : Refers to the number of patients placed in the unit room, indirectly reflecting ward management, nursing quality, environmental control.

⑤ 4-hour incubator door opening times: Record the number of incubator door openings in 4 hours at a designated time, indirectly reflecting the degree of concentrated nursing operations.

⑥ Pacifier user: The number of people who use a pacifier for non-nutritive sucking.

2.5.2 Growth and Development Indicators: Full oral gestational age, hospitalization days, discharge weight, daily weight gain situation.

2.5.3 Neurobehavioral Score (TIMP)[8]: Test of Infant Motor Performance (TIMP) evaluates preterm infants' motor abilities, including muscle tension, movement coordination, balance ability, etc. The evaluator will observe the infants motor performance including head control, trunk control, limb control, etc., and give corresponding scores. The test subjects are infants from 34 weeks corrected age to 17 weeks after full term. The test can effectively predict the infant's motor development [9].

2.5.4 Complications: Intraventricular hemorrhage, late-onset sepsis, neonatal necrotizing enterocolitis (NEC), patent ductus arteriosus (PDA).

2.5.5 Scale of Nursing Satisfaction: The scale mainly includes 25 points of evaluation in six dimensions, including ward environment, doctor-patient communication, professional operation, diagnosis and treatment quality, humanitarian care, and medical costs. The total score is 100 points. Satisfaction = (Number of Satisfied Cases + Fairly Satisfied Cases) / Total Cases * 100%. The questionnaire is distributed and collected on the spot, guided and reviewed by the responsible nurse, with a 100% recovery rate.

2.6 Data Collection and Control Methods

A dedicated area is set up at the bed units of the experimental subjects for the placement of intervention measure records. Before collecting the data, systematic training is given to the nurses to ensure the homogeneity of the records. The data is recorded at regular times and places. Two group members enter the final data into the electronic system after reviewing and auditing the electronic medical record system and collecting the intervention measure records, ensuring the timeliness and accuracy of data collection.

2.7 Statistical Methods

For normally distributed measurement data, mean ± standard deviation ($\bar{x}\pm s$) is used for description. Independent sample t-tests are used for comparison between two groups. Non-normally distributed measurement data are described with median and interquartile range [M(Q1,Q3)], with Mann-Whitney U rank-sum test used for comparisons between two groups. Count data is described with number and percentage [N(%)], and Chi-square test or Fisher's exact test are used for comparisons between two groups of categorical data. Statistical analyses are performed using SPSS 26.0 software. Two-sided tests are used, and a p-value < 0.05 is considered statistically significant.

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3. Results

3.1 Comparison of General Information of the Two Groups of Subjects

From Table 1, after differential analysis, it was found that the gestational age of the NIDCAPl group was 30.14 (28.90, 31.86) weeks, with 54 males and 49 females. The median birth weight was 1250g, including 67 cases of cesarean section and 36 cases of vaginal delivery. The gestational age of the control group was 30.10 (29.00, 31.90) weeks, with 47 males and 52 females. The median birth weight was 1280g, including 76 cases of cesarean section and 23 cases of vaginal delivery. There was no statistically significant difference in gestational age, gender, birth weight, and mode of delivery between the two groups of subjects (P>0.05).

Table 1. Differential analysis of gestational age, gender, birth weight, and mode of delivery in the two groups of subjects.

VariablesNG.	NG. (n=103)CG.	CG. (n=99)Amount of InspectionPGestational Age, M(Q1,Q3)30.14(28.90,31.86)30.10(29.00,31.90)Z=-0.0790.937Gender, n(%)χ2=0.4950.482Male54 (52.43)47 (47.47)Female49 (47.57)52 (52.53)Birth Weight, M(Q1,Q3)1250.00(1100.00,1385.00)1280.00(1160.00,1420.00)	Amount of InspectionPGestational Age, M(Q1,Q3)30.14(28.90,31.86)	PGestational Age, M(Q1,Q3)30.14(28.90,31.86)30.10(29.00,31.90)Z=-0.0790.937
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3.2 Comparison of NIDCAP Quantitative Indicators of the Two Groups of Subjects: See Table 2. In the comparison of NIDCAP quantitative indicators, the NIDCAPl group scored higher in observation time, parental involvement in care time, environmental noise, environmental light, number of patients in the ward, number of incubator openings in 4 hours, and number of pacifier users compared to the control group, showing a statistically significant difference (P<0.05).

Table 2 Comparison of NIDCAP related indicators between the two groups of subjects.

GroupFCC	FCC	Ward noise	Environmental lightnumber of patients per ward4-hour incubator door opening	number of patients per ward	4-hour incubator door opening times	Pacifier user
NG.（n=103）	6.00(0.00,10.00)	54.00(50.00,58.30)	0.00(0.00,0.00)9.00(9.00,10.00)6.00(4.00,7.00)77(74.76)CG.（n=99）0.00(0.00,3.00)58.00(52.00,64.00)0.00(0.00,5.00)13.00(11	9.00(9.00,10.00)6.00(4.00,7.00)	6.00(4.00,7.00)77(74.76)CG.（n=99）0.00(0.00,3.00)58.00(52.00,64.00)0.00(0.00,5.00)13.00(11.00,15.00)7.00(5.	77(74.76)

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P<0.001	<0.010.004	0.004	0.001	<0.001<0.001<0.0013.3 Growth and Development Indicators of the Two Groups of Subjects: See Table 3. In the comparison of growth indicators, the gestational age at which infants in the NIDCAPl group were fully orally fed and their average daily weight gain were higher than those in the control group, showing a statistically significant difference (P<0.05). The comparison of the number of days hospitalized and weight at discharge between the two groups showed no statistically signif	<0.001<0.001<0.0013.3 Growth and Development Indicators of the Two Groups of Subjects: See Table 3. In the comparison of growth indicators, the gestational age at which infants in the NIDCAPl group were fully orally fed and their average daily weight gain were higher than those in the control group, showing a statistically significant difference (P<0.05). The comparison of the number of days hospitalized and weight at discharge between the two groups showed no statistically signif	<0.001

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3.3 Growth and Development Indicators of the Two Groups of Subjects: See Table 3. In the comparison of growth indicators, the gestational age at which infants in the NIDCAPl group were fully orally fed and their average daily weight gain were higher than those in the control group, showing a statistically significant difference (P<0.05). The comparison of the number of days hospitalized and weight at discharge between the two groups showed no statistically significant difference (P>0.05).

Table 3 Growth and development indicators

Group	Days Hospitalized $\bar{x}$±sGestational Age with Oral Fed M(Q1,Q3）Weight at Discharge（g）M(Q1,Q3）Average Daily Weight Gain（g）M(Q1,Q3）NG.（n=103）49.52±14.9035.14	Gestational Age with Oral Fed M(Q1,Q3）Weight at Discharge（g）M(Q1,Q3）Average Daily Weight Gain（g）M(Q1,Q3）NG.（n=103）49.52±14.9035.14	Weight at Discharge（g）M(Q1,Q3）Average Daily Weight Gain（g）M(Q1,Q3）NG.（n=103）49.52±14.9035.14	Average Daily Weight Gain（g）M(Q1,Q3）NG.（n=103）49.52±14.9035.14
NG.（n=103）49.52±14.90	49.52±14.9035.14	35.14 (34.43,36.00)2270.00	2270.00 (2100.00,2500.00)22.94	22.94 (20.41,24.39)CG.（n=99）50.46±14.9236.00
CG.（n=99）50.46±14.9236.00	50.46±14.9236.00	36.00 (35.40,37.10)2305.00	2305.00 (2130.00,2550.00)21.69	21.69 (19.08,23.97)t/Z-0.4484.2761.347-2.962P0.655＜0.001
t/Z-0.448	-0.4484.2761.347-	4.2761.347-2.962P0.655＜0.001	1.347-2.962P0.655＜0.001	-2.962P0.655＜0.001
P0.655＜0.0010.1770.003	2.962P0.655＜0.001 0.655＜0.0010.1770.003	55＜0.001 ＜0.0010.1770.003	0.1770.003	0.003

3.4 TIMP Neurobehavioral Scores of the Two Groups of Subjects: See Table 4. In the TIMP scores, the score of the NIDCAPl group was 36.1±2.57 at the corrected gestational age of 36 weeks, which was higher than the 33.58±2.37 of the control group, showing a statistically significant difference (P<0.05).

Table 4 Neurobehavioral scores (corrected to 36 weeks gestational age).

GroupTimp（score）NG.（n=103）36.1±2.57CG.（n=99）	Timp（score）NG.（n=103）36.1±2.57
NG.（n=103）36.1±2.57CG.（n=99）33.58±2.37t7.235PP＜0.0013.5 Comparison of Complications in the Two Groups of Subjects: See Table 5. In the comparison of complications, 13 children in the NIDCAPl group had intraventricular hemorrhage, compared with 25 in the control group. The difference in the occurrence of intraventricular hemorrhage between the two groups showed statistical significance (P<0.05). There was no significant difference between the two groups in the occurrence of late-onset sepsis, NEC (necrotizing enterocolitis), and PDA (patent ductus arteriosus) (P>0.05).	36.1±2.57CG.（n=99）33.58±2.37t7.235PP＜0.0013.5 Comparison of Complications in the Two Groups of Subjects: See Table 5. In the comparison of complications, 13 children in the NIDCAPl group had intraventricular hemorrhage, compared with 25 in the control group. The difference in the occurrence of intraventricular hemorrhage between the two groups showed statistical significance (P<0.05). There was no significant difference between the two groups in the occurrence of late-onset sepsis, NEC (necrotizing enterocolitis), and PDA (patent ductus arteriosus) (P>0.05).
CG.（n=99）33.58±2.37t7.235PP＜0.001	33.58±2.37t7.235PP＜0.0013.5 Comparison of Complications in the Two Groups of Subjects: See Table 5. In the comparison of complications, 13 children in the NIDCAPl group had intraventricular hemorrhage, compared with 25 in the control group. The difference in the occurrence of intraventricular hemorrhage between the two groups showed statistical significance (P<0.05). There was no significant difference between the two

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groups in the occurrence of late-onset sepsis, NEC (necrotizing enterocolitis), and PDA (patent ductus arteriosus) (P>0.05).

t7.235PP＜0.0013.5 Comparison of Complications in the Two Groups of Subjects: See Table 5. In the comparison of complications, 13 children in the NIDCAPl group had intraventricular hemorrhage, compared with 25 in the control group. The difference in the occurrence of intraventricular hemorrhage between the two groups showed statistical significance (P<0.05). There was no significant difference between the two groups in the occurrence of late-onset sepsis, NEC (necrotizing enterocolitis), and PDA (patent ductus arteriosus) (P>0.05).

7.235PP＜0.0013.5 Comparison of Complications in the Two Groups of Subjects: See Table 5. In the comparison of complications, 13 children in the NIDCAPl group had intraventricular hemorrhage, compared with 25 in the control group. The difference in the occurrence of intraventricular hemorrhage between the two groups showed statistical significance (P<0.05). There was no significant difference between the two groups in the occurrence of late-onset sepsis, NEC (necrotizing enterocolitis), and PDA (patent ductus arteriosus) (P>0.05).

PP＜0.0013.5 Comparison of Complications in the Two Groups of Subjects: See Table 5. In the comparison of complications, 13 children in the NIDCAPl group had intraventricular hemorrhage, compared with 25 in the control group. The difference in the occurrence of intraventricular hemorrhage between the two groups showed statistical significance (P<0.05). There was no significant difference between the two groups in the occurrence of late-onset sepsis, NEC (necrotizing enterocolitis), and PDA (patent ductus arteriosus) (P>0.05).

P＜0.0013.5 Comparison of Complications in the Two Groups of Subjects: See Table 5. In the comparison of complications, 13 children in the NIDCAPl group had intraventricular hemorrhage, compared with 25 in the control group. The difference in the occurrence of intraventricular hemorrhage between the two groups showed statistical significance (P<0.05). There was no significant difference between the two groups in the occurrence of late-onset sepsis, NEC (necrotizing enterocolitis), and PDA (patent ductus arteriosus) (P>0.05).

3.5 Comparison of Complications in the Two Groups of Subjects: See Table 5. In the comparison of complications, 13 children in the NIDCAPl group had intraventricular hemorrhage, compared with 25 in the control group. The difference in the occurrence of intraventricular hemorrhage between the two groups showed statistical significance (P<0.05). There was no significant difference between the two groups in the occurrence of late-onset sepsis, NEC (necrotizing enterocolitis), and PDA (patent ductus arteriosus) (P>0.05).

Table 5 Comparison of complications [number (%)]

GroupIntraventricular HemorrhageDelayed SepsisNECPDANG.（n=103）13（12.62）17（16.50）12（11.65）48（46.60）CG.（n=99）25（25.25）14（14.14）10（10.10）56（56.57）χ25.2730.217	Intraventricular HemorrhageDelayed SepsisNECPDANG.（n=103）13（12.62）17（16.50）12（11.65）48（46.60）CG.（n=99）25（25.25）14（14.14）10（10.10）56（56.57）χ25.2730.217	Delayed SepsisNECPDANG.（n=103）13（12.62）17（16.50）12（11.65）48（46.60）CG.（n=99）25（25.25）14（14.14）10（10.10）56（56.57）χ25.2730.217	NECPDANG.（n=103）13（12.62）17（16.50）12（11.65）48（46.60）CG.（n=99）25（25.25）14（14.14）10（10.10）56（56.57）χ25.2730.2170.1252.006	PDANG.（n=103）13（12.62）17（16.50）12（11.65）48（46.60）CG.（n=99）25（25.25）14（14.14）10（10.10）56（56.57）χ2
NG.（n=103）13（12.62）17（16.50）12（11.65）48（46.60）CG.（n=99）	13（12.62）17（16.50）12（11.65）48（46.60）CG.（n=99）	17（16.50）12（11.65）48（46.60）CG.（n=99）25（25.25）14（14.14）10（10.10）56（56.57）χ25.2730.217	12（11.65）48（46.60）CG.（n=99）25（25.25）14（14.14）10（10.10）56（56.57）χ25.2730.2170.1252.006	48（46.60）CG.（n=99）25（25.25）14（14.14）10（10.10）56（56.57）χ25.2730.2170.1252.006P0.0220.6410.7240.157
CG.（n=99）25（25.25）14（14.14）10（10.10）56（56.57）χ25.2730.2170.1252.006P	25（25.25）14（14.14）10（10.10）56（56.57）χ25.2730.217	14（14.14）10（10.10）56（56.57）χ25.2730.2170.1252.006P	10（10.10）56（56.57）χ25.2730.2170.125	56（56.57）χ25.2730.2170.1252.006P0.0220.6410.7240.157
χ25.2730.2170.125	5.2730.2170.1252.006P0.022	0.2170.1252.006P0.0220.641	0.1252.006P0.022	2.006P0.0220.641

P0.0220.6410.7240.157	0.0220.6410.7240.157	0.6410.7240.157	0.7240.157	0.157

3.6 Evaluation of Nursing Satisfaction in the Two Groups of Subjects: See Table 6. In terms of satisfaction, the nursing satisfaction rate in the was 89.32% (92/103), which was higher than that of the control group at 70.71% (70/99), and the difference was statistically significant (P<0.05).

Table 6 Evaluation of nursing satisfaction [number (%)]

GroupVery Satisfied	Very Satisfied	More Satisfied	Not SatisfiedSatisfactionNG.（n=103）37（35.92）55（53.40）11（10.68）92（89.32）CG.（n=99）	SatisfactionNG.（n=103）
NG.（n=103）37（35.92）55（53.40）11（10.68）92（89.32）CG.（n=99）	37（35.92）55（53.40）11（10.68）92（89.32）CG.（n=99）	55（53.40）11（10.68）92（89.32）CG.（n=99）24（24.24）46（46.46）29（29.29）70（70.71）χ211.013P0.001	11（10.68）92（89.32）CG.（n=99）24（24.24）46（46.46）29（29.29）70（70.71）χ211.013P0.001	92（89.32）CG.（n=99）24（24.24）46（46.46）29（29.29）70（70.71）χ211.013P0.001
CG.（n=99）24（24.24）46（46.46）29（29.29）70（70.71）χ211.013P0.001	24（24.24）46（46.46）29（29.29）70（70.71）χ211.013P0.001	46（46.46）29（29.29）70（70.71）χ211.013P0.001	29（29.29）70（70.71）χ2	70（70.71）χ211.013P0.001
χ211.013	11.013P0.001	11.013P0.001	11.013P0.001	11.013P0.001
P0.001	0.001	0.001	0.001	0.001

4. The Discussion

Compared with the control group, the implementation of the NIDCAP care plan resulted in a significant improvement in NIDCAP quantitative indices for the NIDCAPl group. The duration for infants in the NIDCAPl group to achieve complete oral feeding was shortened, with better daily weight gain. The NIDCAPl group also achieved higher TIMP scores and had a lower incidence of ventricular hemorrhage, indicating that a nursing intervention program based on the NIDCAP philosophy has positive effects in the early life of extremely low birth weight infants.

4.1 The Implementation of a nursing intervention program based on NIDCAP principles can shorten the time to complete oral feeding and accelerate weight gain

In this study, the NIDCAPl group achieved complete oral feeding at 35.14w of gestational age, earlier than the control group at 36w, proving that the NIDCAP nursing intervention program can effectively shorten the time for extremely low birth weight infants to reach full oral feeding. The reasons may be as follows: previous NICU care modes often follow medical tasks and diagnostic routines[10], with many atypical stimuli in this specific environment, such as sudden changes in body position, sudden aspiration, blood collection, excessively high sound and light, all of which can cause changes in cerebral blood flow[11], leading to abnormal vital signs, which are not conducive to the growth and development of extremely low birth weight infants[12]. The implementation of the NIDCAP nursing intervention program allows healthcare professionals to develop individualized nursing plans based on the actual situation of the infant, optimizing the ward environment, controlling sound and light within an ideal range, improving the sleep quality of the infant, as much as possible implementing individualized nursing operations, performing operations during the infant's awake state[13], combining non-nutritional sucking during feeding, active breastfeeding strategies[14,15], to a large extent, accelerating the process of complete oral feeding and achieving better weight gain. This is consistent with the results of Griffiths、Park J[16,17], , who believe that optimization of the environment and a better grasp of the infant's sleep behavior state can better promote oral feeding of preterm infants.

4.2 The Implementation of a nursing intervention program based on NIDCAP principles can reduce the incidence of intraventricular hemorrhage and effectively protect the infant's nervous system

Research has shown[18] that the incidence of severe intraventricular hemorrhage is high in extremely low and very low birth weight infants, prone to brain injury, and the smaller the gestational age and weight, the higher the incidence. The immaturity of preterm infants makes them susceptible to peripheral environmental influences, such as sound and light stimulation, causing crying and restlessness, which also increases the incidence of ventricular hemorrhage. In this study, after implementing the NIDCAP nursing intervention program, the incidence of intracranial hemorrhage in the NIDCAPl group was 13 cases, lower than the 25 cases in the control group (P < 0.05). The reason for the reduced incidence of intraventricular hemorrhage may be the use of nest wrap, frog-shaped pillows, girdle, and other auxiliary tools to provide positional support, comforting the infant through wrapping or bundling to maintain calmness, thereby achieving more stable self-regulation[19]; through double-person operations, one person comforting and one operating, minimizing the infant's pain experience, reducing fluctuations in cerebral blood flow in preterm infants, reducing the stimulus of the environment on preterm infants, conducive to the development of neurological behavior in preterm infants. The smell of breast milk is given to stimulate the infant's

sense of smell, ensuring the stability of vital signs as much as possible. Research has shown[20] that the smell of the mother can also lower various scores of physiological and behavioral evaluations in newborns, and by familiar smell treatment, newborns are more likely to return to a calm state in a short time, thus stabilizing cerebral blood flow and reducing the occurrence of intracranial hemorrhage or sequelae. In terms of TIMP scores, infants in the NIDCAPl group performed better than the control group in motor abilities, including muscle tone, coordination, balance, head control, trunk control, and limb control. This indirectly indicates that the implementation of the NIDCAP nursing intervention program can effectively protect the nervous system of the infant, realizing early detection and early intervention of the nervous system in extremely low birth weight infants, effectively inhibiting the occurrence and development of neurological sequelae in extremely low birth weight infants, to achieve better long-term prognosis.

4.3 The Implementation of a nursing intervention program based on NIDCAP principles can improve nursing satisfaction

This study shows that the nursing satisfaction in the NIDCAPl group was higher than in the control group. The reason may be that the NIDCAP method is infant-centered, i.e., individualized nursing plans are formulated according to the behavioral performance and needs of each infant. Research has shown[21] that this kind of individualized nursing program makes parents feel that their child is getting more professional and meticulous attention. Secondly, the NIDCAP nursing program strives to reduce the discomfort and pain of the infant, making parents feel satisfied and trust the hospital and medical staff's care. Lastly, the NIDCAP nursing program strengthens parental involvement and communication, allowing parents to actively participate in the nursing process, and also better understand, learn, and master the health status of their children, thereby increasing parental satisfaction.

In summary, the nursing intervention program under the NIDCAP philosophy plays a positive role in the early life of extremely low birth weight infants, shortens the time to achieve complete oral feeding, accelerates weight gain, reduces the incidence of intraventricular hemorrhage, effectively protects the infant's nervous system, and also achieves good nursing satisfaction ratings.

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