

Application of Proactive Risk Intervention Combined with Meticulous Nursing in Neonates with Respiratory Distress Syndrome

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Abstract: *Objective:* To analyze the value of proactive risk intervention combined with meticulous nursing in neonates with respiratory distress syndrome (NRDS). *Methods:* 62 NRDS neonates who visited the hospital from August 2024 to August 2025 were selected as samples and randomly divided into groups. Group A received proactive risk intervention combined with meticulous nursing, while Group B received routine intervention. Treatment indicators, blood gas indicators, respiratory rate, heart rate, SNAP-II score, and complications were compared between the two groups. *Results:* The oxygen inhalation time, mechanical ventilation time, time to restore body temperature, and hospitalization time in Group A were shorter than those in Group B ($P < 0.05$). The arterial oxygen partial pressure (PaO₂), oxygen saturation (SaO₂), and carbon dioxide partial pressure (PaCO₂) in Group A were better than those in Group B ($P < 0.05$). The respiratory rate, heart rate, and SNAP-II score in Group A were better than those in Group B ($P < 0.05$). The complication rate of NRDS in Group A was lower than that in Group B ($P < 0.05$). *Conclusion:* NRDS neonates who received proactive risk intervention combined with meticulous nursing had stable heart rate and respiratory rate, improved blood gas indicators, shortened disease duration, and were highly effective and feasible.

Keywords: NRDS; Meticulous nursing; Proactive risk intervention; Nursing value

Online publication: September 8, 2025

1. Introduction

NRDS is a respiratory disease, and its common symptom is dyspnea. Severe cases can lead to secondary CO₂ retention and hypoxemia, which seriously threaten the health of neonates^[1]. Additionally, due to the poor immunity and compliance of neonates, the difficulty of diagnosis and treatment of NRDS increases, requiring efficient nursing solutions. Conventional NRDS nursing has limitations in reducing NRDS complications due to its passive and singular approach^[2]. Proactive risk nursing focuses on risk prevention, predicting potential risk factors during diagnosis and treatment to ensure patient safety. Meticulous nursing provides patients with services from

various aspects, which can help shorten recovery time. This article explores the value of proactive risk intervention combined with meticulous nursing using 62 NRDS neonates as samples from August 2024 to August 2025 ^[3].

2. Inclusion and exclusion criteria, methods, observations, and statistical analysis for a study on neonatal respiratory distress syndrome (NRDS)

2.1. Materials

62 NRDS neonates who visited the hospital from August 2024 to August 2025 were selected as samples and randomly divided into groups. The baseline data of NRDS neonates in Group A were compared with those in Group B ($P > 0.05$), as shown in Table 1.

Table 1. Analysis of baseline data of children with NRDS

Group	n	Gender (%)		Gestational Age (weeks)		Birth Weight (g)	
		Male	Female	Range	Mean \pm SD	Range	Mean \pm SD
Group A	31	16 (51.61%)	15 (48.39%)	30-37	33.36 \pm 1.28	2329-2421	2371.51 \pm 11.29
Group B	31	17 (54.84%)	14 (45.16%)	31-38	33.39 \pm 1.31	2331-2424	2373.68 \pm 11.32
χ^2/t		0.0648 (χ^2)		0.0912 (t)		0.7557 (t)	
P-value		0.7991		0.9276		0.4528	

2.2. Inclusion and exclusion criteria

Inclusion Criteria: (1) Imaging, blood gas indicators, and blood biochemical indicators suggestive of NRDS; (2) Parental informed consent; (3) Presence of mechanical ventilation indications.

Exclusion Criteria: (1) Abnormal liver and kidney function; (2) Congenital heart disease; (3) Shock; (4) Systemic infection.

2.3. Methods

Group A: (1) Active Risk Intervention: 1) Admission assessment: Monitoring heart rate, respiratory rate, blood oxygen saturation, and evaluating Apgar score. If Apgar < 7 , the patient is considered high-risk. 2) Early Warning System grading: NEWBORN-EWS system for grading assessment. Scores ≤ 1 , 2–4, and ≥ 5 are recorded as low, medium, and high risk, respectively. 3) Warning intervention: a. Oxygen therapy: Initial oxygen concentration $\geq 40\%$, subsequently adjusted based on physiological indicators. For medium and high-risk patients, nurses monitor respiratory rate and blood oxygen saturation every 15 minutes and blood pressure every 30 minutes, adjusting ventilator parameters accordingly. 4) Risk prevention and control intervention: For medium and high-risk patients, administration of pulmonary surfactant at 100mg/kg and maintenance of positive pressure ventilation at 5–8 cmH₂O. Some high-risk patients may require endotracheal intubation due to a critical condition. (2) Refined nursing care: 1) Education: Educating parents of NRDS patients on the dangers of the disease, diagnosis and treatment methods, and nursing procedures through graphics, videos, and verbal communication. Answering parents' questions and enhancing their understanding. 2) Psychological support: Nurses timely share disease management information with parents, explain the necessity of medical procedures in layman's terms, and guide parents to sign consent forms. Deep communication with parents to identify and address negative emotions, sharing successful NRDS management cases to boost confidence. 3) Monitoring signs: Regular monitoring of

arterial blood gas indicators, respiratory and circulatory status. For patients requiring chest drainage, ensure proper drainage tube fixation and bag replacement to prevent retrograde infection. 4) Ventilator management: Checking ventilator connections, adjusting blood gas indicators, and promptly addressing loose connections or leaks. Synchronizing ventilator parameters with the patient's respiratory rate. Changing humidification fluid as prescribed to ensure stable humidification. Additionally, managing skin care for patients with prolonged mechanical ventilation to prevent skin pressure injuries. 5) Airway management: Placing a soft pillow under the shoulders of NRDS patients and elevating the head of the bed in a supine position. Observing excessive phlegm secretion and preparing 0.9% sodium chloride solution for phlegm thinning and suctioning. 6) Complication management: Regular cleaning of respiratory secretions, replacing tubing, and strictly controlling endotracheal intubation indications to prevent ventilator-associated pneumonia during mechanical ventilation.

Group B: Following standard medical practices such as mechanical ventilation, medication, oxygen administration, suctioning, and providing services like turning and draining patients. Cleaning oral secretions with sterile cotton swabs and normal saline.

2.4. Observation indicators

Treatment indicators: Recording oxygen inhalation time, mechanical ventilation time, time to restore body temperature, and hospital stay.

Blood gas indicators: Detecting PaO₂, SaO₂, PaCO₂, and other indicators using a blood oxygen analyzer.

Clinical indicators: Recording respiratory rate, heart rate, and evaluating SNAP-II score. The SNAP-II scale ranges from 0–25, with scores positively correlated to the severity of NRDS.

Complications: Recording cases of pneumothorax, pulmonary hemorrhage, nasal mucosa injury, and ventilator-associated pneumonia.

2.5. Statistical analysis

Data were processed using SPSS 23.0. Count data were recorded as percentages and analyzed using the chi-square test. Measurement data were recorded as mean \pm standard deviation and analyzed using the t-test. Statistical differences were considered significant at $P < 0.05$.

3. Results

3.1. Treatment indicators

Group A showed superior treatment indicators compared to Group B, with $P < 0.05$. Details are presented in **Table 2**.

Table 2. Comparison of treatment indicators (Mean \pm SD)

Group	Oxygen Therapy Duration (h)	Mechanical Ventilation Duration (h)	Time to Normothermia (h)	Hospital Stay (d)
Group A (n=31)	91.28 \pm 3.82	70.21 \pm 2.79	3.39 \pm 1.06	8.87 \pm 1.45
Group B (n=31)	121.67 \pm 4.29	87.43 \pm 3.11	5.62 \pm 1.18	11.26 \pm 1.68
t-value	29.4563	22.9477	7.8276	5.9963
P-value	<0.0001	<0.0001	<0.0001	<0.0001

3.2. Blood gas indicators

After nursing, the indicators such as PaO₂, SaO₂, and PaCO₂ in Group A were better than those in Group B, with $P < 0.05$ (Table 3).

Table 3. Comparison of blood gas indicators (Mean \pm SD)

Parameter	Time	Group A (n=31)	Group B (n=31)	t-value	P-value
PaO ₂ (mmHg)	Before care	51.88 \pm 1.82	51.92 \pm 1.79	0.0872	0.9308
	After care	60.93 \pm 2.26	57.33 \pm 2.05	6.5691	<0.0001
SaO ₂ (%)	Before care	84.28 \pm 3.26	84.33 \pm 3.31	0.0599	0.9524
	After care	94.51 \pm 4.11	90.59 \pm 4.06	3.7779	0.0004
PaCO ₂ (mmHg)	Before care	61.29 \pm 2.49	61.33 \pm 2.51	0.0630	0.9500
	After care	47.62 \pm 1.29	55.11 \pm 1.67	19.7622	<0.0001

3.3. Respiratory rate, heart rate, and SNAP-II score

After nursing, the respiratory rate, heart rate, and SNAP-II score in Group A were better than those in Group B, with $P < 0.05$ (Table 4).

Table 4. Comparison of respiratory rate, heart rate, and SNAP-II score (Mean \pm SD)

Group	Respiratory rate (times/min)		Heart Rate (times/min)		SNAP-II Score (points)	
	Before care	After care	Before care	After care	Before care	After care
Group A (n=31)	61.79 \pm 2.11	40.25 \pm 1.78	152.59 \pm 18.42	138.59 \pm 11.26	13.28 \pm 1.89	4.71 \pm 0.72
Group B (n=31)	61.72 \pm 2.13	50.49 \pm 2.06	152.63 \pm 18.39	145.68 \pm 15.43	13.33 \pm 1.92	6.26 \pm 1.43
<i>t</i>	0.1300	20.9418	0.0086	2.0666	0.1033	5.3903
<i>P</i>	0.8970	0.0000	0.9932	0.0431	0.9180	0.0000

3.4. Complication indicators

The complication rate in Group A was lower than that in Group B, with $P < 0.05$ (Table 5).

Table 5. Comparison of complications (n,%)

Group	Pneumothorax	Pulmonary hemorrhage	Nasal mucosal injury	Ventilator-associated pneumonia	Total incidence
Group A (n=31)	0 (0.00)	0 (0.00)	1 (3.23)	0 (0.00)	1 (3.23)
Group B (n=31)	1 (3.23)	1 (3.23)	3 (9.68)	1 (3.23)	6 (19.35)
χ^2	-	-	-	-	4.0260
P	-	-	-	-	0.0448

4. Discussion

Neonatal respiratory distress syndrome (NRDS) has a high clinical incidence, manifesting as progressive dyspnea, which requires early diagnosis and treatment. Otherwise, secondary ischemia and hypoxic encephalopathy may occur, affecting the intellectual development of the child. The common pathogenesis of NRDS is the deficiency of pulmonary surfactant (PS), which leads to a decrease in alveolar surface tension at the intersection of alveolar walls. Premature infants, especially, have a lower PS secretion and are at higher risk of developing NRDS^[4]. Additionally, newborns delivered via cesarean section without passing through the birth canal may have residual fluid in their lungs, affecting the distribution of PS. Moreover, newborns of mothers with diabetes may have increased blood glucose levels and insulin secretion, and insulin can antagonize adrenocortical hormones, damaging lung function and further increasing the risk of NRDS. Clinically, NRDS is often treated with replacement therapy, respiratory support therapy, and nursing intervention to alleviate symptoms. However, conventional nursing, which passively completes various operations with a single content and fails to address the individualized needs of patients, is inadequate. Exploring new and efficient nursing programs is crucial^[5]. Fine nursing, based on the “people-oriented” concept, provides comprehensive services to NRDS patients from multiple aspects, fully meeting their needs. Active risk intervention, based on the “risk management” concept, requires nurses to proactively assist NRDS patients, assess risks, and improve targeted management strategies^[6]. The combination of active risk intervention and fine nursing services can effectively alleviate NRDS symptoms and shorten the course of the disease.

Based on the data analysis in this article, the improvement time of symptoms in children after active risk intervention combined with fine nursing is shortened. The reason for this is that during the combined nursing period, emphasis is placed on risk prediction in various aspects of diagnosis and treatment for the children, and nursing strategies are improved based on risk factors that may affect the children’s recovery, which can accelerate their rehabilitation. In addition, during active risk intervention, nurses are required to conduct a comprehensive assessment of newly admitted children, which can cultivate their awareness of risk management and enhance their ability to identify risks. Therefore, the quality of NRDS nursing is improved, and the duration of children’s symptoms is shortened^[7]. Another set of data indicates that the blood gas indicators of children improve after active risk intervention combined with fine nursing. The reason is that during active risk intervention, real-time monitoring of the child’s physiological state, adjustment of ventilator parameters, and implementation of different standard nursing services can meet the actual nursing needs of different children, thereby reducing airway damage and reducing the risk of respiratory complications. Hence, the blood gas indicators of the children improve^[8]. Another set of data shows that the physiological state and SNAP-II score of children improve after active risk intervention combined with fine nursing. The reason is that during fine nursing, emphasis is placed on educating the parents of the children, and services such as psychological and emotional counseling, vital sign monitoring, ventilator management, airway management, and complication management are provided, which can improve the safety of diagnostic and therapeutic operations, reduce the harmfulness of NRDS, and shorten the time of weaning from the ventilator^[9]. Combined with active risk intervention, precise prevention and control of various risk events are conducive to stabilizing the child’s vital signs and delaying the progression of NRDS. The final set of data indicates that complications in children decrease after active risk intervention combined with fine nursing. The reason is that children with NRDS have critical illnesses and complex medical procedures. Based on fine nursing, combined with active risk intervention, analyzing the source of potential risks and carrying out graded management and symptomatic intervention based on the child’s condition can reduce the risk of NRDS

complications^[10].

5. Conclusion

In summary, children with NRDS who receive active risk intervention combined with fine nursing experience improved blood gas indicators, shortened duration of symptoms, and reduced complications, which has promotional value.

Disclosure statement

The author declares no conflict of interest.

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