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Clinical Application Study of Airway Management Team Applying Evidence-Based Nursing Model in Early Rehabilitation Treatment of Elderly Patients with ARDS

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Abstract: *Objective*: To explore the application effect of the airway management team combined with the evidence-based nursing model in the early rehabilitation of patients with acute respiratory distress syndrome (ARDS). *Methods*: A total of 76 elderly patients with ARDS admitted from January 2024 to January 2025 were selected and randomly divided into a control group (receiving conventional nursing) and an observation group (receiving airway management team combined with evidence-based nursing). Blood gas indicators such as arterial partial pressure of oxygen (PaO_2) and oxygenation index (PaO_2/FiO_2) before and after intervention were compared between the two groups. The quality of life of patients after intervention was evaluated using the Short Form Health Survey (SF-36), and satisfaction with nursing services was assessed using a self-made questionnaire. *Results*: After intervention, both PaO_2 and PaO_2/FiO_2 in the observation group were significantly higher than those in the control group (both $p < 0.05$). The scores of the observation group in the 11dimensions of physical functioning, role-physical, role-emotional, and social functioning on the SF-36 scale were significantly higher than those of the control group ($p < 0.05$). The overall satisfaction rate with nursing services in the observation group was 94.74%, significantly higher than the 76.32% in the control group ($p < 0.05$). *Conclusion*: The intervention model of the airway management team combined with evidence-based nursing can effectively improve the oxygenation status and quality of life of elderly patients with ARDS and enhance their satisfaction with nursing services. It is an optimized critical care nursing plan worthy of clinical promotion.

Keywords: Airway management team; Evidence-based nursing; ARDS; Early rehabilitation; Quality of life; Nursing satisfaction

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1. Introduction

Acute Respiratory Distress Syndrome (ARDS) is an acute diffuse inflammatory lung disease caused by various intra-pulmonary or extra-pulmonary factors, clinically characterized by refractory hypoxemia, respiratory distress, and respiratory failure [1]. Despite continuous advancements in respiratory support technology in recent years, the incidence and mortality rates of ARDS in the intensive care unit (ICU) remain high, imposing a heavy burden on patients' families and the healthcare system [2]. ARDS is characterized by refractory hypoxemia, progressive dyspnea, and decreased lung compliance [3]. The pathophysiological process of this disease is complex, and despite continuous innovations in respiratory support technology, its mortality rate remains high. Traditional nursing models focus on basic life support and symptom management. Studies have shown that the incidence of ARDS in Chinese ICUs is 3.57%, with moderate to severe cases accounting for 90.3% and a mortality rate as high as 17.5%, posing a significant burden on China's healthcare system [4]. Epidemiological surveys of elderly patients with ARDS indicate that the incidence of ARDS in China is as high as 8.1%, with a mortality rate of 32.7% among ICU patients, 60% among hospitalized patients, and 20–40% among elderly ARDS patients at home [5]. Moreover, the epidemiological incidence of ARDS among the elderly in China is characterized by high incidence rates, heavy disease burdens, and high rates of adverse outcomes such as death. Although traditional nursing models can partially alleviate symptoms, they lack standardized and individualized intervention plans, making it difficult to continuously improve patient prognosis [6]. In recent years, the introduction of airway management teams has integrated multidisciplinary nursing resources. Studies have shown that after implementing nursing interventions by airway management teams, patient prognosis has been effectively improved [7]. Evidence-based nursing (EBN) refers to providing a basis for formulating scientific, systematic, and individualized nursing strategies by integrating the best scientific research evidence, clinical expertise, and patient values. This study aims to explore the application effect of the airway management team combined with evidence-based nursing in the early rehabilitation of patients with ARDS, with a view to providing clinical references.

2. Materials and methods

2.1. General information

Seventy-six patients with ARDS admitted to the ICU of Liangzhou District Integrated Traditional Chinese and Western Medicine Hospital from January 2024 to June 2025 were selected.

2.1.1. Inclusion criteria

(1) All patients met the diagnostic criteria outlined in the "Chinese Guidelines for the Diagnosis and Non-Mechanical Ventilation Treatment of Adult Acute Respiratory Distress Syndrome (ARDS) (2023)" and the indications for mechanical ventilation therapy [2];
(2) Age ≥ 60 years;
(3) Expected ICU stay > 72 hours;
(4) Both patients and their families provided informed consent for the study.

2.1.2. Exclusion criteria

(1) Complicated with severe cranial injury, thoracic trauma, or active bleeding;
(2) History of mental illness or severe cognitive impairment;
(3) Accompanied by advanced malignant tumors or other irreversible end-stage diseases;

(4) Incomplete clinical data.

2.1.3. Study design

A total of 76 patients were included and randomly divided into a control group and an observation group using a random number table method, with 38 patients in each group. There were no statistically significant differences in baseline data such as age, gender, and Acute Physiology and Chronic Health Evaluation II (APACHE II) scores between the two groups ($p > 0.05$), as shown in **Table 1**.

Table 1. Comparison of general information between the two groups of patients (n = 38)

Item	Control group	Intervention group	t/χ^2 value	p value
Age (years)	71.05 ± 4.74	70.92 ± 4.61	0.124	0.902
Gender (Male/Female)	20/18	21/17	0.053	0.818
APACHE II score	22.47 ± 3.63	21.82 ± 3.95	0.721	0.473

2.2. Methods

2.2.1. Intervention methods for the control group

The control group received routine ICU care, which included continuous monitoring of vital signs and ventilator parameters; airway humidification and closed suctioning as needed; standardized implementation of prone positioning ventilation procedures with enhanced skin care; sedation and analgesia management as prescribed by the physician; and routine weaning assessment and attempts under medical guidance.

2.2.2. Intervention methods for the observation group

On the basis of routine care, the airway management team implemented evidence-based nursing interventions.

(1) Establishment of a multidisciplinary airway management skills team

An airway management team was established with joint guidance and assistance from medical experts and specialist nurses from the Department of Critical Care Medicine at the First Hospital of Lanzhou University. The core members included respiratory therapists, dietitians, critical care nurses, psychiatric specialist nurses, and respiratory nurses. The team developed personalized nursing plans based on patient assessment results. After patient enrollment, all team members participated in patient assessments and organized patient case study meetings twice a week to develop and adjust personalized nursing plans. During each meeting, the effectiveness of the previous stage's nursing plan was evaluated to further refine the subsequent personalized nursing approach.

(2) Implementation of systematic evidence-based nursing interventions

① Evidence-based respiratory rehabilitation training management: Daily checks of the patient's respiratory and conscious states were conducted, strictly adhering to the standards and procedures of the spontaneous breathing trial (SBT). Bedside ultrasound was used to monitor diaphragm thickness and mobility, providing reliable clinical evidence for respiratory muscle rehabilitation guidance and weaning timing assessment. Through the SBT process, combined with bedside ultrasound monitoring of diaphragm function, weaning rehabilitation training was gradually implemented. Before and after weaning, patients were instructed to perform abdominal breathing exercises and use respiratory trainers for muscle strength training, gradually increasing inspiratory pressure to enhance respiratory function and achieve improved early rehabilitation outcomes in

elderly ARDS patients. ② Evidence-based physical rehabilitation management: Rehabilitation exercises were initiated within 24 to 48 hours of patient admission, conducted through multidisciplinary collaboration involving rehabilitation experts, critical care physicians, and medical staff. A personalized rehabilitation plan was developed based on the patient's respiratory function and muscle strength, in addition to early rehabilitation activities. During the acute phase, our nursing team performed passive rehabilitation training in conjunction with patient positioning management, typically changing the patient's position every 2 hours. If the patient was undergoing prone positioning ventilation, rehabilitation therapists assisted with ankle, knee, hip, and elbow flexion and abduction, usually performing each movement gently about 10 times, twice a day [8]. Once the patient's condition stabilized and consciousness cleared, we encouraged them to attempt active limb exercises, such as clenching fists or lifting legs, gradually increasing the intensity based on their tolerance. Additionally, we recommended using resistance bands for upper and lower limb muscle strength training, approximately 10 times a day [9]. ③ Evidence-based nutritional management: Nutritional risk screening was conducted on the day of patient admission, followed by dynamic assessments twice a week. Based on measurements of energy expenditure, assessment data, and indicators such as liver and kidney function, dietitians formulated an enteral nutrition support plan, which was continuously adjusted throughout the process, with a focus on adequate protein supplementation to maintain a positive nitrogen balance. ④ Evidence-based airway management and infection control: Closed suctioning combined with subglottic suctioning was applied, with attention to sputum characteristics every 4 to 6 hours. The volume and temperature of airway humidification fluids were no longer rigid standards but were individually adjusted according to evidence-based guidelines [10]. Strict hand hygiene and aseptic techniques were implemented throughout the process, and the team reviewed daily for risk factors associated with ventilator-associated pneumonia. ⑥ Evidence-based psychological support: Psychological nursing staff assessed the patient's mental state on the day of admission, employing supportive psychological intervention methods and encouraging family members to communicate more with the patient. Once hemodynamic stability was achieved, a phased activity plan was established, gradually transitioning from passive bed activities to sitting and standing. ⑦ Evidence-based health education: We used specialized graphic materials and videos to educate patients and their families about the basics of ARDS, treatment goals, the significance of rehabilitation exercises, and post-discharge precautions. After the explanation, the "teach-back" method was used to have them repeat the information to ensure comprehension.

2.3. Observation indicators

2.3.1. Quality of life

Assessed using the SF-36 scale, which covers eight dimensions including physical functioning, role-physical, role-emotional, and social functioning. Higher scores indicate better quality of life.

2.3.2. Arterial blood gas analysis and oxygenation index

Arterial blood gas analysis was performed using a blood gas analyzer to detect arterial blood samples, obtaining data on arterial oxygen partial pressure (PaO_2) and carbon dioxide partial pressure ($PaCO_2$). The oxygenation index was calculated based on these values, and the indicators were compared between the two groups.

2.3.3 Nursing satisfaction

Evaluated using a self-designed questionnaire, with results categorized into three levels: very satisfied, basically

satisfied, and dissatisfied. The overall satisfaction rate was then calculated accordingly.

2.4. Statistical methods

Continuous data obtained in this study were expressed as ($\overline{x} \pm s$), and subjected to t-tests; categorical data were expressed as (n, %), and subjected to χ^2 tests. The data were analyzed using SPSS 28.0 software. During data analysis with SPSS 28.0, differences between data were assessed using *p*-values. A *p*-value < 0.05 indicated a statistically significant difference.

3. Results

3.1. Comparison of blood gas indicators between the two groups of patients

Before the intervention, there were no statistically significant differences in PaO_2 and PaO_2/FiO_2 between the two groups ($p > 0.05$).

After the intervention, both groups showed significant improvements in these indicators compared to before the intervention ($p < 0.05$). Moreover, the PaO_2 and PaO_2/FiO_2 levels in the observation group were significantly higher than those in the control group, with statistically significant differences ($p < 0.05$). See **Table 2** for details.

Table 2. Comparison of blood gas indicators before and after intervention between the two groups of patients ($\overline{x} \pm s$)

Indicator	Time point	Control group (n = 38)	Observation group (n = 38)	Inter-group comparison *t*-value (Post-intervention)	*p* value
PaO_2 (mmHg)	Pre-intervention	62.52 ± 8.37	63.12 ± 7.95	-	0.739
	Post-intervention	78.61 ± 9.43*	85.26 ± 8.72*	3.213	0.002
PaO_2/FiO_2 (mmHg)	Pre-intervention	152.44 ± 21.64	154.8 ± 20.38	-	0.618
	Post-intervention	215.76 ± 25.82*	248.3 ± 28.54*	5.346	< 0.001

Note: * indicates $p < 0.05$ compared with the same group before intervention.

3.2. Comparison of quality of life between the two groups of patients

After the intervention, the scores of all dimensions of the SF-36 in the intervention group were significantly higher than those in the control group ($p < 0.05$), as shown in **Table 3**.

Table 3. Comparison of SF-36 scores between the two groups after intervention ($\overline{x} \pm s$, points)

Dimension	Control group (n = 38)	Intervention group (n = 38)	*t* value	*p* value
Physical functioning	58.24 ± 6.36	72.46 ± 7.13	9.324	< 0.001
Role-physical	55.65 ± 5.84	70.82 ± 6.57	10.521	< 0.001
Bodily pain	61.53 ± 6.07	73.23 ± 6.85	7.982	< 0.001
General health	59.82 ± 5.79	71.94 ± 6.49	8.765	< 0.001
Vitality	57.31 ± 6.14	69.57 ± 7.06	8.241	< 0.001
Social functioning	59.49 ± 6.21	73.66 ± 7.03	9.843	< 0.001
Role-emotional	60.12 ± 5.92	75.39 ± 6.82	10.876	< 0.001
Mental health	58.96 ± 6.05	72.14 ± 6.96	9.012	< 0.001

3.3. Comparison of nursing satisfaction between the two groups of patients

The overall satisfaction rate with the intervention nursing was 94.74% (36/38), significantly higher than the 76.32% (29/38) in the control group, with a statistically significant difference ($p < 0.05$). See **Table 4**.

Table 4. Comparison of satisfaction between the two groups after intervention

Group	Number of cases	Very satisfied	Satisfied	Dissatisfied	Overall satisfaction rate
Control group	38	15 (39.47)	14 (36.84)	9 (23.68)	29 (76.32)
Intervention group	38	23 (60.53)	13 (34.21)	2 (5.26)	36 (94.74)

4. Discussion

The results of this study indicate that the application of an evidence-based management protocol by the airway management team has a notably significant effect on elderly patients with ARDS. Patients' oxygenation status indeed improved, with marked increases in indicators such as PaO_2 and PaO_2/FiO_2. Additionally, their quality of life upon discharge from the ICU was better than before, and nursing satisfaction levels were considerably higher. This provides practical validation for comprehensive rehabilitation treatment for critically ill patients in the early stages.

4.1. The multidisciplinary collaborative nursing model demonstrates positive effects in improving patients' oxygenation status

Oxygenation dysfunction is the primary pathophysiological change in acute respiratory distress syndrome. The ratio of arterial oxygen partial pressure to inspired oxygen concentration (PaO_2/FiO_2) serves as a critical indicator for assessing disease severity and prognosis. In this study, the improvement in PaO_2 and PaO_2/FiO_2 in the observation group after intervention was significantly better than that in the control group. This result may be attributed to the synergistic effects of multiple intervention measures under the collaborative nursing model. Firstly, precise respiratory management led by respiratory therapists, such as dynamically adjusting positive end-expiratory pressure (PEEP) based on blood gas analysis and waveform monitoring, directly promoted the improvement of the ventilation-perfusion ratio. Secondly, the implementation of evidence-based airway management measures, including appropriate humidification and closed suctioning, helped maintain airway patency and reduced the risk of atelectasis and decreased oxygenation caused by secretion retention. Additionally, early mobilization interventions facilitated respiratory system expansion and improved circulatory efficiency, while adequate nutritional support provided the necessary energy foundation for maintaining respiratory muscle function. The synergistic effects of these measures through multiple pathways collectively promoted lung function improvement and enhanced oxygen uptake efficiency.

4.2. The characteristic of the airway management team nursing model lies in multidisciplinary team collaboration

The airway management team established in this study exemplifies this point, breaking away from the relatively independent work mode of various specialties in traditional nursing. Within the team, respiratory therapists are responsible for precise respiratory rehabilitation, dietitians provide personalized nutritional support, psychological nurses undertake emotional regulation tasks, and specialist nurses organize early mobilization activities, all parties collaborate to form a closely interconnected intervention system. This collaborative approach ensures the continuity and integrity of nursing from the acute phase of the disease to the rehabilitation phase, while also making nurs-

ing measures more systematic and comprehensive. This concept aligns with the idea emphasized in the diverse nursing models for chronic heart failure patients that "comprehensive nursing is more conducive to addressing complex conditions" [11].

4.3. Evidence-based practice is crucial for ensuring the scientific validity and effectiveness of nursing measures

All intervention measures adopted in this study are based on the best available evidence currently. For example, the use of ultrasound technology to assess diaphragm function provides critical data support for ventilator weaning decisions; the integration of ventilator-associated pneumonia (VAP) prevention strategies based on relevant guidelines helps reduce the risk of infection. Structured psychological support and early mobilization plans represent extensions and applications of the Enhanced Recovery After Surgery (ERAS) concept in the intensive care unit. This evidence-centered approach significantly reduces subjectivity and reliance on personal experience in nursing operations, while enhancing the precision and safety of intervention measures. Numerous studies have confirmed that evidence-based nursing has distinct advantages in the management of respiratory diseases, such as effectively improving lung function in patients with Mycoplasma pneumoniae infection complicated by asthma. In this study, the improvement in blood gas analysis indicators is also closely related to these mechanisms.

4.4. Meeting patients' multifaceted needs are key to achieving comprehensive rehabilitation

This intervention protocol not only focuses on improving patients' physiological function and oxygenation status but also actively responds to their emotional and social support needs through psychological counseling, health education, and encouraging family involvement. From the results, the simultaneous improvement in dimensions such as physiological and emotional functioning in the quality-of-life scores, as well as the significant increase in nursing satisfaction, indicate that a "patient-centered" comprehensive nursing model is of great significance for improving patients' subjective rehabilitation experiences. Improvements in physiological indicators lay the foundation for enhancing quality of life, while psychosocial support further strengthens patients' rehabilitation confidence and compliance, creating a virtuous cycle where the two mutually reinforce each other.

4.5. Study limitations and prospects

This study employed a single-center design with a relatively limited sample size and primarily focused on short-term intervention effects. Due to the multifaceted nature of the intervention measures, it is challenging to quantify the independent contributions of each component to the final outcomes. Subsequent studies could consider conducting multi-center, large-sample randomized controlled trials with appropriately extended follow-up periods to further clarify the impact of this model on patients' long-term prognosis, such as readmission rates and changes in long-term quality of life. Additionally, future research could delve deeper into exploring multidisciplinary team collaboration processes based on information platforms and incorporate health economic analyses to provide more comprehensive evidence-based support for clinical practice.

5. Conclusion

The airway management team model, formed by integrating multidisciplinary team collaboration with evidence-based nursing, can effectively improve the oxygenation status of elderly patients with ARDS, promote their early physical and mental rehabilitation, and significantly enhance their quality of life and healthcare experience in

the short term. This approach not only aligns with the development trends of modern critical care nursing but also possesses strong clinical practical value, warranting broader promotion and application.

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Disclosure statement

The authors declare no conflict of interest.

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