Application Effect of Stratified Nursing Intervention for ICU Mechanically Ventilated Patients in the Context of Aspiration Risk Assessment

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Abstract: *Objective:* To explore the application effect of stratified nursing intervention based on the background of misinspiration risk assessment in mechanically ventilated patients in intensive care unit (ICU). *Methods:* 100 cases of mechanically ventilated patients who were admitted to the ICU of our hospital from March 2022 to March 2023 were selected and divided into an observation group and a control group according to the random number table method, with 50 cases in each of the two groups. The control group was given routine care in ICU, and the observation group was given stratified nursing interventions based on the background of the risk of aspiration assessment on the basis of the control group, and both groups were cared for until they were transferred out of the ICU, and the mechanical ventilation time, ICU stay time, muscle strength score, complication rate, adherence, and satisfaction were observed and compared between the two groups. *Results:* The mechanical ventilation time and ICU stay time of the observation group were shorter than that of the control group after the intervention; the muscle strength score, compliance and satisfaction of the observation group were higher than that of the control group after the intervention; and the complication rate of the observation group was lower than that of the control group after the intervention, all of which were *P* < 0.05. *Conclusion:* The application of stratified nursing intervention based on the background of misaspiration risk assessment in ICU mechanically ventilated patients can improve the patient's muscle strength, shorten the time of mechanical ventilation, promote the patient's recovery, reduce the occurrence of complications, and improve the patient's compliance and satisfaction.

Keywords: Mechanical ventilation; Aspiration risk assessment; Stratified care; Muscle strength; Complication

1. Introduction

Mechanical ventilation refers to the improvement of respiratory function with the help of a ventilator, which can help people with respiratory difficulties to keep the airway open and is an important means of rescuing patients in the intensive care unit (ICU), but long-term mechanical ventilation may lead to the occurrence of ventila-

tor-associated pneumonia in patients, the loss of the upper respiratory tract barrier function, which threatens the life safety of patients, of which misaspiration is an important factor in the predisposition of ventilator-associated pneumonia [1,2]. Routine nursing care in ICUs The management of the patient's airway measures can prevent the occurrence of aspiration to a certain extent, but the targeting of the nursing measures is not strong, and the prevention effect of aspiration is relatively limited, which affects the speed of patient's recovery [3]. Stratified nursing intervention based on the risk of aspiration is stratified according to the physiological state of the patient, timely identification of the risk of aspiration, and targeted care is given to patients at different risk levels to prevent the incidence of adverse events effectively. The aim of this study is to investigate the application effect of stratified nursing intervention based on the background of aspiration risk assessment in mechanically ventilated patients in the intensive care unit (ICU), which is now reported as follows.

2. Information and methods

2.1. General information

100 cases of mechanically ventilated patients who were hospitalised in the ICU of the hospital from March 2022 to March 2023 were selected and divided into observation groups and control groups according to the random number table method, with 50 cases in each of the two groups. In the observation group, there were 31 males and 19 females; age was 36–72 years old, with an average of 61.72 ± 5.36 years old; acute physiology and chronic health status score (APACHE II) was 16–28 points, with an average of 23.62 ± 2.73 points; and primary diseases were: respiratory diseases in 15 cases, craniocerebral injuries in 11 cases, strokes in 18 cases, and 6 cases were kept in the hospital after surgery.

In the control group, there were 30 males and 20 females; age was 35–73 years old, with an average of 62.17 ± 5.44 years old; APACHE II score was 15–29 points, with an average of 22.94 ± 2.69 points; primary diseases: respiratory diseases were 14 cases, craniocerebral injuries were 12 cases, strokes were 17 cases, and postoperative observation was kept in 7 cases.

Compared with the general information of the two groups of patients, the difference was not statistically significant ($P > 0.05$) and was comparable.

Inclusion criteria: ICU admissions and mechanical ventilation; mechanical ventilation time > 48 hours; age < 80 years old; all patients and their families were aware of the study and participated voluntarily. Exclusion criteria: patients with other types of infections; patients with psychiatric diseases, speech disorders, etc., who could not cooperate with the study; patients in critical condition who could not be evaluated; patients who died within 72 hours of receiving mechanical ventilation. This study was submitted to the Medical Ethics Committee of the hospital for approval and implementation.

2.2. Methods

The control group adopted routine ICU nursing care, which mainly included monitoring changes in vital signs, regular suction, humidification of the airway, and nasal feeding tube care.

On this basis, the observation group was combined with stratified nursing intervention based on the context of the risk assessment of aspiration. Firstly, the patients' risk of aspiration was assessed, and according to the risk level, the nursing staff were allocated to carry out stratified nursing care in accordance with the nurse-patient ratio of 0.5:1 (low-risk), 1:1 (medium-risk), and 2:1 (high-risk). Low-risk patients should strengthen their feeding management and health education related to aspiration, eat fewer and more frequent meals, choose non-irritating semi-liquid food, control the speed of eating, clean the mouth after eating, and elevate the head of the bed appropriately. Medium-risk patients need to strengthen the feeding patrol guidance, control the amount

of food per spoon and feeding speed, and encourage patients to chew on their own; nasal feeders need to control the amount of nasogastric feeding, elevate the angle of the head of the bed and check the amount of gastric residue before perfusion. High-risk patients need to carry out sputum suction, use a nebulizer, back patting to remove phlegm, etc., before nasogastric feeding, need to suspend nasal feeding when turning over, nasal feeding 1 hour cannot move the patient, regular monitoring of the tracheal tube balloon pressure, control the temperature of the nasal feeding solution, nasal feeding before the completion of the 30 min after the head of the bed to keep the head elevated for the gastrointestinal tolerance function of the patient can use the infusion pump for the infusion of a uniform speed, every 4 hours for the gastric remnants of the volume of a pumping back to ensure that the gastric residual volume of less than 150 mL, strengthen oral care, dynamic assessment of the risk of aspiration, and timely adjustment of the nursing intervention programme. Both groups were cared for until they were transferred out of the ICU.

2.3. Observation indicators

    (1) Mechanical ventilation time, ICU stay time, and muscle strength score. Record and compare the mechanical ventilation time and ICU stay time of the two groups of patients, and the muscle strength score adopts the British Medical Research Council muscle strength assessment method to assess the muscle strength of the two groups of patients, with the score ranging from 0 to 60 years old, and the higher the score indicates that the patient's muscle strength is better.

    (2) Complication rate. Record and compare the complication rates of aspiration, regurgitation, and aspiration pneumonia during the care of patients in the two groups.

    (3) Patient compliance and satisfaction. Patient compliance and satisfaction were assessed after the intervention. Adherence was assessed using the hospital's own adherence assessment scale, with a total score of 10; a score of 8–10 was recorded as full adherence, 5–7 as extremely basic adherence, and a score of less than 5 was recorded as non-adherence, with a total adherence rate of 1 as non-adherence rate. Satisfaction using a self-designed satisfaction questionnaire, the questionnaire full score of 100 points, a score of 90 points or more is recorded as fully satisfied, 80–75 is recorded as basically satisfied, 75 points or less recorded as dissatisfied, and the total satisfaction is rate is calculated by, 1 - dissatisfaction rate.

2.4. Statistical methods

SPSS 26.0 statistical software was used for data processing, and the count data were expressed as [n (%)] and compared using the χ^2 test; the measurement data were tested by the K-S method to be in line with the normal distribution and were expressed as the mean ± standard deviation (SD), and the independent samples t-test was used for comparison between groups, and the paired t-test was used for comparison within groups. $P < 0.05$ was used to indicate that the difference was statistically significant.

3. Results

3.1. Comparison of mechanical ventilation time, ICU stay time and muscle strength score between the two groups

The mechanical ventilation time and ICU stay time of the observation group were shorter than that of the control group after intervention, and the muscle strength score of the observation group was higher than that of the control group after intervention, with $P < 0.05$ indicating that the difference was significant, refer **Table 1**.

Table 1 Comparison of mechanical ventilation time, ICU stay time, and muscle strength score between two groups (Mean ± SD)

Groups	Duration of mechanical ventilation (d)	Length of ICU stay (d)	Muscle strength score (points)
Control group ($n = 50$)	10.35 ± 1.54	12.61 ± 3.17	42.39 ± 4.27
Observation group ($n = 50$)	7.42 ± 1.18	10.95 ± 2.64	49.66 ± 5.24
t-value	10.679	2.845	7.605
P-value	< 0.001	0.005	< 0.001

3.2. Comparison of the complication rate of the two groups

The complication rate of the observation group was lower than that of the control group after intervention and P < 0.05 indicated that the difference was significant, refer **Table 2**.

Table 2 Comparison of the complication rates of the two groups [n(%)]

Group	Misaspiration	Regurgitation	Aspiration pneumonia	Total incidence
Control group ($n = 50$)	4 (8.00)	2 (4.00)	3 (6.00)	9 (18.00)
Observation group ($n = 50$)	0 (0.00)	1 (2.00)	1 (2.00)	2 (4.00)
χ^2-value				5.005
P-value				0.025

3.3. Comparison of compliance and satisfaction between the two groups

The compliance and satisfaction of the observation group were higher than that of the control group after the intervention, and P < 0.05 suggests that the difference is significant, refer **Table 3**.

Table 3 Comparison of adherence and satisfaction between the two groups [n(%)]

Groups	Compliance				Satisfaction			
	Fully compliant	Basic adherence	Non-adherence	Total adherence rate	Fully satisfied	Basically satisfied	Dissatisfied	Total satisfaction
Control group ($n = 50$)	20 (40.00)	23 (46.00)	7 (14.00)	43 (86.00)	17 (34.00)	23 (46.00)	10 (20.00)	40 (80.00)
Observation group ($n = 50$)	24 (48.00)	25 (50.00)	1 (2.00)	49 (98.00)	26 (52.00)	22 (44.00)	2 (4.00)	48 (96.00)
χ^2-value				4.891				6.061
P-value				0.027				0.014

4. Discussion

Misaspiration refers to the entry of liquid or solid into the patient's airway below the vocal folds. ICU mechanical ventilation patients often need to undergo tracheal intubation, indwelling gastrointestinal tube and other operations. When a gastrointestinal function has decreased, there is a high risk of misaspiration, which in turn triggers aspiration pneumonia, which can lead to the death of the patient in severe cases. Thus, the ways to identify the risks associated with misaspiration and effectively prevent it is an important topic in ICU nursing [4–6]. In routine care, nursing staff divide the nursing care according to the bed, and the ability of nursing staff is not equal to the risk of patient's aspiration, which makes it difficult to meet the needs of clinical care, and the patients are prone

to aspiration events [7–8].

Stratified nursing intervention based on the background of the risk of aspiration assessment of different risk levels of patients with different nursing staff configurations, focusing on the intervention of high-risk personnel and patients with different risk levels based on stratified care, to ensure that nursing resources are reasonably allocated to give patients targeted care measures to reduce the occurrence of complications such as aspiration, reflux, aspiration pneumonia, etc., and at the same time, to guide the low-risk patients to eat, to give patients with high and medium risks early nutritional support. These are done to maintain the nutritional status of patients, the appropriate elevation of the head of the patient's bed, prompting their diaphragm to fall, further improve the ventilation status of the lungs, stimulating the function of respiratory muscles, improving the level of muscle strength, and thus promoting the recovery of patients' independent breathing, achieving early extubation and withdrawal of the machine, and promoting the recovery of patients [9]. In this study, the observation group had shorter mechanical ventilation time and ICU stay, higher muscle strength scores, and lower complication rates, suggesting that the application of stratified nursing interventions based on the background of mal-aspiration risk assessment in ICU mechanically ventilated patients can effectively shorten the time of mechanical ventilation, promote the recovery of the patients, and reduce the occurrence of complications. The results are more consistent with the findings of Li X *et al.* (2019) [10].

In the stratified nursing intervention based on the risk assessment of aspiration, nursing staff are allocated according to the patient's risk level, nursing resources are maximally and reasonably allocated to meet the nursing needs of different patients, and the probability of patients experiencing complications such as aspiration and regurgitation decreases significantly, the comfort of patients in the recovery process improves, the trust in healthcare personnel rises, the degree of cooperation increases, the speed of patients' recovery improves, and the degree of satisfaction increases as well. The speed of patients' recovery was improved and their satisfaction was also increased. In this study, the compliance and satisfaction of the observation group were higher, suggesting that the tiered nursing intervention based on the risk assessment of aspiration can effectively improve their compliance and satisfaction.

In conclusion, stratified nursing intervention based on the assessment of the risk of aspiration in ICU mechanical ventilation patients can improve the patient's muscle strength, shorten the time of mechanical ventilation, promote patient recovery, reduce the occurrence of complications, and improve patient adherence and satisfaction, which is significant for clinical promotion and application.

Disclosure statement

The authors declare no conflict of interest.

Reference

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