ORIGINAL RESEARCH

Protective Restraint Nursing Interventions in ICU Patients: Assessing their Influence on Unplanned Extubation and Skin Injury Incidence

Meiyun Zuo, BSc; Hongmei Chu, BSc; Xiaoli Qian, BSc

ABSTRACT

Objective • This study aims to investigate the application of protective restraint nursing interventions in intensive care unit (ICU) patients and their impact on the incidence of unplanned extubation and skin damage.

Methods • A total of 90 ICU patients admitted to Hai'an People's Hospital between January 2019 and December 2020 were randomly assigned to either the experimental group or the control group in a 1:1 ratio. The control group received conventional nursing care, while the experimental group received protective restraint nursing interventions. The Hospital Anxiety and Depression (HAD) scale, a clinical tool used to assess patients' levels of anxiety and depression, was employed to evaluate patients' emotional states before and after the intervention. A Patient Clinical Satisfaction Survey Questionnaire developed by our department was used to assess patient satisfaction after nursing. Compliance and the incidence of adverse reactions were compared between the two groups.

Results • The experimental group exhibited significantly lower HADS scores, higher nursing satisfaction, and a lower incidence of unplanned extubation, skin damage, and adverse reactions compared to the control group (all $P < .05$).

Conclusions • Protective restraint care demonstrates substantial benefits for ICU patients by reducing the incidence of unplanned extubation, preventing skin damage during treatment, improving compliance, and facilitating recovery. These findings support the clinical application and promotion of protective restraint nursing interventions. (*Altern Ther Health Med.* 2024;30(5):264-269)

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INTRODUCTION

In intensive care medicine, where the critical health and well-being of patients are paramount, the application of nursing interventions takes great significance. Patients admitted to the intensive care unit (ICU) represent a vulnerable population, often having undergone major surgical procedures or lifesaving treatments. Their medical condition demands precise medical attention and comprehensive nursing care. Additionally, these ICU patients frequently experience psychological distress resulting from their reliance on life support systems, which renders them incapable of even the most basic self-care tasks.[1]

This heightened vulnerability can lead to a range of negative emotional states, including depression and irritability. Furthermore, the ICU environment is fraught with potential risks, including the possibility of falls, skin lesions, and the precarious occurrence of unplanned extubation. These factors have the potential to hinder the patient's path to recovery significantly.[2-3]

Unplanned extubation, often referred to as accidental extubation, denotes the premature removal of an endotracheal catheter, resulting from a variety of factors, such as catheter blockage or dislodgement due to errors in medical staff procedures. This incident not only disrupts the treatment but can also result in severe repercussions, including patient harm and the trauma induced by extubation-related distress. Therefore, there is an urgent imperative for healthcare practitioners to administer thoughtful care to ICU patients and adopt effective nursing strategies.[4]

The protective restraint care model has been extensively documented for its substantial efficacy in reducing adverse events within the ICU.[5] It significantly mitigates the risk of unintended scratching, bruising, and falling from the bed, thereby ensuring continuous treatment.[4-6] The primary objective of protective restraint care is to prevent inadvertent

behaviors such as scratching, collisions, and other potentially hazardous actions by patients. This strategy not only ensures the safe delivery of treatment but also facilitates the uninterrupted flow of nursing procedures.

Protective restraint nursing demands a comprehensive consideration of the patient's psychological and physical well-being from the patient's own perspective. This approach not only mitigates the potential for self-inflicted harm or harm to others but also serves as a pivotal element in enhancing the overall safety of nursing care. This study involves analyzing the application of protective restraint nursing interventions in ICU patient care and assessing their effects on unplanned extubation and skin injuries. This study aimed to enhance the safety and well-being of ICU patients through the evaluation of protective restraint nursing interventions and contribute to improved patient care in critical medical settings.

METHODS

Study Design

A total of 90 ICU cases admitted to our hospital between January 2019 and December 2020 underwent randomization into either the experimental or control group. This study received prior approval from the Medical Ethics Committee of Hai'an People's Hospital under reference No. H87788. The allocation of patients to the experimental and control groups adhered to a rigorous randomization process. A computer-generated randomization approach was employed to ensure an impartial and equitable distribution of patients. This method assigned patients to either the experimental or control group without any preconceived bias.

Inclusion and Exclusion Criteria

Inclusion criteria were as follows: (1) patients admitted to the ICU of our hospital; (2) met the criteria for mechanical ventilation and tracheal intubation; (3) absence of extremity skin pressure ulcers and infections; (4) absence of severe circulatory diseases; (5) obtained ethics approval before enrollment; and (6) signed informed consent forms patients or their family members. Exclusion criteria were as follows: (1) the presence of severe brain damage or severe brain injury; (2) coagulation dysfunction; (3) the presence of mental illness or neurological dysfunction.

Nursing Interventions for Control Group

The control group received conventional nursing care. Medical staff closely monitored patients' vital signs and observed any changes in their condition. In the case of abnormal conditions, appropriate measures were promptly initiated.

Protective Restraint Care for Experimental Group

In the experimental group, protective restraint care was administered by a dedicated team of well-trained nurses. This model has different steps and strategies, as described in the following.

Initial Assessment. Before commencing nursing care, a thorough assessment of the patient's clinical symptoms was conducted. This evaluation determined whether the patient required intervention and treatment. Observations of the patient's level of consciousness and physical activity continued throughout the nursing process.

Patient and Family Education. Patients and their families were educated about the mechanisms and effects of protective restraint care as part of early-knowing management. They were informed about the potential adverse consequences of failed restlessness management. Questions from family members and patients were addressed, providing practical insights into the application of protective restraint in early-knowing management. Detailed information on the use of protective restraint devices and precautions was also provided.[7-8]

Restraint Techniques. During the protective restraint management process, soft materials and appropriately sized restraint tools were selected. Individual restraint tools, such as restraint gloves and limb restraint belts, were used to ensure proper ventilation and optimal tightness, allowing enough space to insert a finger. Medical staff continuously monitored the comfort of the patient after restraint and made necessary adjustments based on the patient's feedback. Patients and their family members were instructed to observe the restrained areas. When using restraint gloves, careful attention was given to the patient's fingertip movement and blood supply to prevent adverse events.

Optimal Ward Environment. The ward environment was maintained at approximately 25°C with a humidity level of 55%. Effective measures were taken to reduce noise within the ward, ensuring a quiet, well-ventilated atmosphere for patients.

Psychological Intervention. Considering the prolonged treatment duration in the ICU, patients often experience negative emotions. To address this, medical staff actively engaged with patients, providing emotional support and assisting them in managing psychological stress. These efforts aimed to help patients channel their negative emotions, foster a positive attitude, and build confidence in their ability to combat their illnesses, ultimately improving patient compliance,[9-12]

Traditional Chinese Medicine (TCM) Rehabilitation Acupoint. Acupoint massage was conducted twice daily for 20 minutes each session, targeting acupoints such as Hegu, Yanglingquan, and Quchi. Additionally, acupuncture was performed once daily for 30 minutes, focusing on Zusanli, Neiguan, and Hegu points.

Outcome Measures

Assessing Anxiety and Depression Levels with the Hospital Anxiety Depression (HAD) Scale. In our study, we employed the Hospital Anxiety Depression (HAD) scale,[25] a widely recognized clinical instrument for assessing levels of anxiety and depression in patients. The HAD scale comprises a series of questions that participants must answer based on their emotional states and feelings. Each response to the questions carries specific scores, and the cumulative score serves as a measure of the patient's anxiety and depression levels, with higher scores indicating more pronounced anxiety and depression. We utilized the HAD scale in our

study to assess the emotional state of patients both before and after the nursing intervention. The HAD scale[13] encompasses a scoring range from 0 to 42 points. A higher score on this scale indicates a greater severity of anxiety and depression.

The Patient Clinical Satisfaction Survey Questionnaire. The patient clinical satisfaction survey questionnaire developed by our department features a total score of 100 points. Within this questionnaire, a higher score correlates with an elevated level of patient satisfaction.

Analysis of Patient Compliance. We conducted a comparative analysis of patient compliance and the incidence of adverse reactions between the two groups.

Statistical Analysis

Descriptive Analysis. All statistical analyses were conducted using IBM SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, NY, USA). Descriptive analysis was presented as the mean ± standard deviation ($\bar{x} \pm s$) for continuous variables and as [n (%)] for categorical variables. Subgroup differences were evaluated using the *t* test for continuous variables and the chi-square test for categorical variables. *P* values less than .05 were considered statistically significant.

The *t* test for Continuous Variables. The *t* test is a statistical method employed to compare the means of two groups of continuous variables. It operates by calculating the means and variances of the two datasets and subsequently determining whether the observed differences are statistically significant.

Chi-Square Test for Categorical Variables. The chi-square test (χ^2) was used to assess differences among categorical variables. The chi-square test was applied to analyze potential disparities within categorical variables. Specifically, we assessed whether the observed frequency distributions across different groups aligned with the expected distributions.

Normality Test for Data Distribution. We conducted a normality test to determine whether the data of continuous variables adhered to a normal distribution. A normal distribution is characterized by symmetrical data distribution, with the mean, median, and mode all being equal. For the normality test, we employed methods, including the Shapiro-Wilk test or the Kolmogorov-Smirnov test, to evaluate data normality. Where the data exhibited a normal distribution, we employed parametric statistical methods, including the *t* test.

RESULTS

Baseline Data Comparison Between Groups

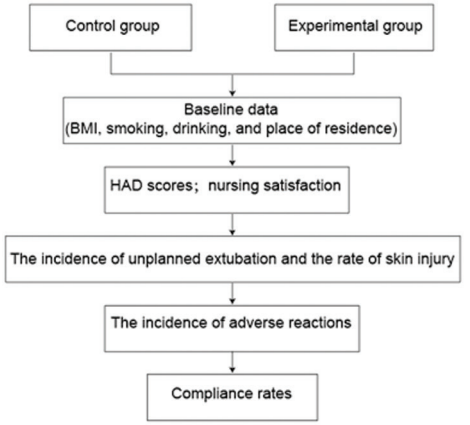
The baseline data were assessed to evaluate the comparability between the two groups. Factors including BMI, smoking habits, drinking habits, and place of residence were examined. The analysis revealed that there were no statistically significant differences between the two groups ($P > .05$), Refer to Table 1. This comparison indicates that, at the outset of the study, the groups were well-matched in terms of these demographic and lifestyle characteristics, ensuring a solid foundation for subsequent analyses. Figure 1 outlines the comprehensive flowchart of the analysis conducted within the current study.

Table 1. Comparison of General Information [n (%)]

Variables	Experimental Group (n = 45)	Control Group (n = 45)	χ^2 or *t*	*P* value
Age (year)	46.75±3.32	46.69±3.29	0.086	.932
Gender			0.178	.673
Male	23(51.11)	21(46.67)		
Female	22(48.89)	24(53.33)		
BMI (kg/m^2)	26.27±1.59	25.89±1.63	1.119	.266
Smoking			0.045	.832
Yes	20(44.44)	21(46.67)		
No	25(55.56)	24(53.33)		
Drinking			0.178	.673
Yes	22(48.89)	24(53.33)		
No	23(51.11)	21(46.67)		
Place of Residence			0.051	.822
Township	31(68.89)	30(66.67)		
Rural area	14(31.11)	15(33.33)		

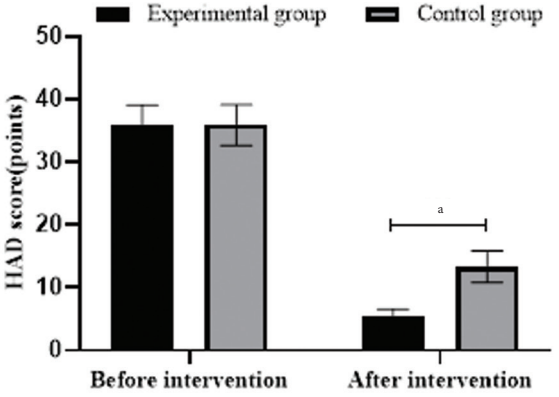
Note: This table compares participants' general characteristics in the experimental group (n = 45) and the control group (n = 45). The data includes age, gender distribution, body mass index (BMI), smoking status, drinking habits, and place of residence.

Figure 1. Flow Chart of Analysis in the Current Study



Note: This figure depicts the flow chart illustrating the analysis process employed in the current study.

Figure 2. Comparison of HAD Scores

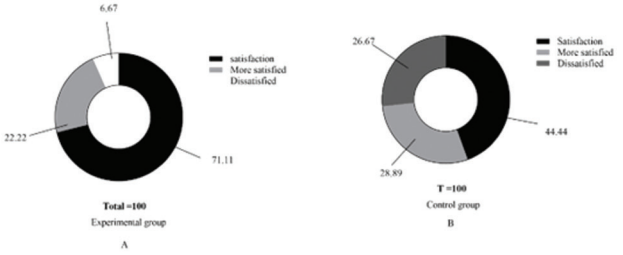


[a]indicates a significant *P* value of less than .001, signifying strong statistical significance.

Comparison of HADS Scores

The HADS scores in the experimental group were significantly lower compared to the control group ($P < .05$), as illustrated in Figure 2.

Figure 3. Comparison of Satisfaction [n (%)]



Note: In Figure 3, Figure A represents the expression of nursing effect in the experimental group, while Figure B represents the expression of nursing effect in the control group. The satisfaction rates are as follows: In the experimental group, the satisfied rate was 71.11% (32/45), the relatively satisfied rate was 22.22% (10/45), the unsatisfied rate was 6.67% (3/45), and the overall satisfaction rate was 93.33% (42/45). In the control group, the satisfied rate was 44.44% (20/45), the relatively satisfied rate was 28.89% (13/45), the unsatisfied rate was 26.67% (12/45), and the overall satisfaction rate was 73.33% (33/45). There was a significant difference in the satisfaction rate between the two groups of patients (χ^2=6.480, $P < .05$).

Table 2. Comparison of Incidence of Unplanned Extubation and Skin Damage Rate [n (%)]

Group	n	Incidence Of Unplanned Extubation	Skin Damage Rate
Experimental Group	45	2(4.44)	6(13.33)
Control Group	45	11(24.44)	16(35.56)
χ^2		7.283	6.016
P value		.007	.014

Table 3. Comparison of the Incidence of Adverse Reactions [n (%)]

Group	n	Unplanned Extubation	Wound Infection	Drug Contamination	Falling Off Bed	Incidence of Adverse Symptoms
Experimental Group	45	0(0.00)	2(4.44)	0(0.00)	0(0.00)	2(4.44)
Control Group	45	4(8.89)	2(4.44)	3(6.67)	2(4.44)	11(24.44)
χ^2						7.283
P value						.007

Table 4. Comparison of Patient Compliance Rates [n (%)]

Group	n	Good	Moderate	Poor	Total Compliance Rates
Experimental Group	45	35(77.78)	10(22.22)	0(0.00)	45(100.00)
Control Group	45	30(66.67)	10(22.22)	5(11.11)	40(89.89)
χ^2					5.294
P value					.021

Comparison of Nursing Satisfaction

The experimental group exhibited significantly higher nursing satisfaction in comparison to the control group ($P < .05$), as depicted in Figure 3.

Comparison of Unplanned Extubation Incidence and Skin Injury Rate

The experimental group displayed a reduced incidence of unplanned extubation and a lower skin damage rate (all $P < .05$), as shown in Table 2.

Comparison of Adverse Reaction Incidence

The experimental group experienced a diminished incidence of adverse reactions ($P < .05$), as indicated in Table 3.

Comparison of Compliance Rates

A significantly higher level of compliance was observed in the experimental group compared to the control group ($P < .05$), as outlined in Table 4.

DISCUSSION

ICU patients are often critically ill, and their conditions can deteriorate rapidly. While undergoing treatment and care, they frequently experience negative emotions such as fear and anxiety, which can worsen their condition and even become life-threatening.[14-17] Furthermore, the presence of medical equipment in the ICU ward can add to patients' discomfort. The stress and pain response during treatment can also lead to negative emotions, hindering the patient's recovery process. Furthermore, in certain ICU cases, the occurrence of unplanned extubation rises when appropriate measures are not employed. The application of protective restraints on patients has demonstrated a significant reduction in the incidence of unplanned extubation.[18]

Protective restraint nursing interventions, often referred to as a care model, involve the strategic use of restraints to ensure the safety and well-being of patients, particularly in the ICU. This approach entails securing a patient's body and limbs to prevent self-injurious behaviors, aiming to protect the patient from harm. Strategies encompass close observation of patients, communication with both patients and their families about the rationale and potential consequences of restraint use, selecting appropriate restraint tools, ensuring patient comfort and monitoring, maintaining a comfortable environment, implementing psychological interventions, and, in some cases, employing rehabilitation techniques like acupoint massage and acupuncture.[19-22]

Lukes et al.[23] discussed that the careful application of positive protective restraints can effectively prevent safety incidents like falls and unintended collisions with the bed, thereby enhancing patient safety. The results of this study highlight the significant impact of protective restraint nursing intervention in the care of ICU patients.

Our study utilized the HAD scale, a clinical tool designed to evaluate the levels of anxiety and depression in patients. The observed reduction in HAD scores within the experimental group, reflecting lower levels of anxiety and depression, signifies a potential enhancement in the emotional well-being of patients. This improvement in emotional states corresponds with previous research,[15-17] reinforcing the critical role of addressing negative emotions in critically ill patients to prevent further deterioration.

Furthermore, the notably higher nursing satisfaction in the experimental group suggests the feasibility and effectiveness of this nursing approach, aligning with prior studies that emphasize the significance of positive nurse-patient relationships in healthcare settings.[18-22] The reduced occurrence of adverse reactions further contributes to the overall safety and positive patient experiences. In alignment with our findings, a previous study[24] demonstrated a notable increase in nursing satisfaction within the experimental

group (97.94% vs. 85.27%). These results further reinforce the effectiveness of protective restraint nursing over the conventional nursing model.

The decreased incidence of unplanned extubation and skin injuries among the experimental group underscores the protective role of restraint interventions, diminishing risks related to patient safety. Additionally, the increased compliance rates observed within the experimental group are an indication of the positive influence of protective restraint nursing, as it fosters cooperation between patients and medical staff.[25]

These findings collectively support the broader implementation of protective restraint nursing interventions in ICU settings to improve patient outcomes, enhance safety, and foster collaborative nurse-patient relationships.

Study Limitations

We acknowledge a few limitations in our study. Although our findings imply potential benefits of protective restraint nursing, we acknowledge that this approach may not be universally applicable to all patients and scenarios. Future research should prioritize the identification of patient-specific criteria and situational contexts where protective restraint nursing proves most effective and safe. Additionally, a more extensive investigation into the potential challenges and ethical considerations tied to restraint utilization in the ICU setting is essential. These limitations highlights the need for a nuanced approach in implementing protective restraint nursing, considering the diversity of patient needs and ethical concerns.

CONCLUSION

In conclusion, our research improves the existing body of knowledge by highlighting the potential value of protective restraint nursing interventions in ICU settings. In addition to reducing unexpected tube removal, our results also show that this approach has other advantages. It improves how satisfied nurses are with their work and how well patients follow instructions. These outcomes foster strong nurse-patient relationships, mitigate medical disputes, and expedite overall patient recovery. Our study emphasizes the practical significance of protective restraint nursing in extending the care and well-being of critically ill ICU patients. Protective restraint care emerges as a promising avenue for ICU patients, effectively reducing unplanned extubation rates, preventing skin damage during treatment, enhancing patient compliance, and expediting the recovery process. These outcomes underscore the clinical applicability and promotion of protective restraint care.

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None

CONFLICT OF INTERESTS

The authors report no conflict of interest.

AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of this study are available from the corresponding author upon request, subject to reasonable conditions.

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APPENDIX 1: SUPPLEMENTARY DATA

Table 1. Comparison of Literature Reviews

Features	Literature Review 1	Literature Review 2	Literature Review 3
Research Field	Evidence-based cluster nursing intervention	Oral care and mechanical ventilation of ICU patients	Tracheal catheter in intensive care unit
Purpose of Research	The effect of evidence-based cluster nursing intervention on the incidences of delirium and the prognoses of ICU patients	The effect of oral comprehensive nursing intervention on mechanically ventilated patients in ICU	Evaluate a new fixation band for the tracheal. catheter in the intensive care unit
Sample Size	108	76	90
The Number of Literature	25	26	21
Conclusion and Discovery	Evidence-based cluster nursing intervention can conspicuously reduce the incidence of delirium, shorten the patients' mechanical ventilation durations and ICU stays, and improve their prognoses, so it is worthy of clinical application.	The effect of oral comprehensive nursing intervention on patients with ICU mechanical ventilation is significant. The application of nursing intervention can effectively promote the recovery of patients, improve the hygiene problems of patients' oropharynx, and adjust the pH and blood gas-related indicators in patients. Reduce the risk of VAP occurrence and death in patients.	The new tracheal catheter fixation band had good stability, a simple operation procedure, a lower incidence of mucosal pressure injury, and a significantly decreased cost of medical consumables. All of these advantages suggest that it should be used in clinical practice. Furthermore, using the fixation band could fully expose the patient's oral cavity, which helped the nursing staff to observe the oral mucosa promptly and effectively clean up the airway secretions.
Limitations	The small sample size and the lack of evidence-based conversion	Sample size; differences in patient characteristics; implementation of both interventions;	Some toothless elderly patients were excluded
Range of the Years of The Cited References	2016-2020	2016-2021	2013-2020
PMID	34377321	37641069	36480230

Note: This table provides a comparison of three literature reviews within different research fields. Each review focuses on a specific area, with variations in sample size, the number of literature sources, conclusions, and limitations. The range of years for the cited references and corresponding PMID (PubMed ID) are also indicated.