

Application of Body Restraint Reduction Program in Clinical Treatment of Severe Neurological Patients

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Abstract: *Objective:* To analyze the clinical application and effects of the body restraint reduction program for severe neurological patients. *Methods:* A total of 206 patients admitted to the neurology department of the hospital from January 2022 to May 2025 were selected as the research subjects. Among them, 102 patients from January 2022 to May 2025 were assigned to the observation group, and 104 patients during the same period served as the control group. In practice, the control group received conventional body restraint, while the observation group adopted the reduction program. The incidence of unplanned extubation and restraint-related complications were compared between the two groups. *Results:* The body restraint rate and complication rate in the observation group were significantly lower ($P < 0.05$). After nurse training, their knowledge mastery and operational ability were significantly higher than before training ($P < 0.01$). *Conclusion:* The body restraint reduction program for severe neurological patients can effectively reduce the restraint rate and complication incidence, while helping improve nurses' restraint management capabilities, serving as an effective means to enhance overall nursing quality.

Keywords: Neurology department; Severe patients; Body restraint; Reduction program; Clinical application

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1. Introduction

Body restraint refers to medical auxiliary measures that restrict a person's activities or prevent them from contacting themselves through manual methods, physical devices, mechanical devices, materials, etc., playing a vital role in treatment^[1]. In the clinical treatment of severe neurological patients, body restraint is a common intervention to prevent accidental events such as extubation and falls in patients with consciousness disorders. However, body restraint can also cause many adverse effects, such as muscle atrophy and skin damage, affecting patients' quality of life and potentially hindering the treatment process, making restraint reduction highly necessary. Especially with the change in medical concepts, patient-centered care has become an important

principle in the development of nursing models, further emphasizing the importance of restraint reduction^[2]. Currently, an increasing number of countries, such as Canada, have introduced guidelines on body restraint to minimize it, focusing on improving patient comfort and quality of life^[3]. This paper analyzes the body restraint reduction program and its effective application in the clinical treatment of severe neurological patients, gradually deepening from current situation analysis to application effects, aiming to provide references for other researchers and contribute to the effective implementation of the restraint reduction program.

2. Research subjects and methods

2.1. Research subjects

From January 2022 to May 2025, patients admitted to the neurological intensive care unit of the hospital who met the criteria (hospitalization time ≥ 8 hours, age ≥ 18 years) are selected. Patients are excluded if they were discharged or deceased, had a history of mental illness, or showed limb swelling upon admission that hindered comparative observation. A total of 206 patients met the criteria. Among them, 102 patients admitted from January 2022 to May 2025 are the control group, and the remaining 104 patients during the same period are the observation group. As shown in **Table 1**, there was no statistically significant difference in general data between the two groups ($P > 0.05$), indicating comparability.

Table 1. Comparative analysis of basic information between control group and observation group patients

Group	n	Gender		Age (years)	Diagnosis				GCS Score
		Male	Female		Stroke	Encephalitis	Epilepsy	CNS Infection	
Control	102	73	29	64.46 \pm 14.33	46	32	12	6	12.75 \pm 2.61
Observation	104	64	40	63.95 \pm 14.58	48	30	13	5	12.71 \pm 3.06
Statistical value		X ² = 2.326		t= 0.253	X ² = 0.504				t= 1.466
P		0.127		0.801	0.973				0.144

Note: GCS = Glasgow Coma Scale.

2.2. Methods

2.2.1. Control group and observation group

Patients in the control group received conventional physical restraints. The specific steps are as follows: After a comprehensive assessment by the responsible nurse, an informed consent form for restraints is signed. When patients showed non-cooperation with treatment, appropriate restraining tools such as restraint straps and restraining gloves are selected based on their actual conditions, with the tightness adjusted to allow the insertion of one finger. The condition of the restrained site is checked during shift handovers, and intermittent release is carried out. Patients in the observation group implemented the physical restraint reduction program. A 5-member team of nurses from the neurology department is formed to implement the restraint reduction program. The team leader is responsible for the overall planning, 2 members are responsible for data collection, and the other 2 members are responsible for searching for information to formulate a targeted restraint reduction program for severe neurology patients.

(1) Analysis

During the implementation of conventional body restraint and the reduction program, potential issues

included: (a) Nurses showed strong subjectivity in execution, with incomplete assessment of patient restraint needs and possible lack of corresponding knowledge support; (b) Restraint measures were applied directly without considering alternative methods; (c) Improper use of restraint tools, failing to flexibly select based on the patient's condition, which was unfavorable to patient safety; (d) Non-standardized processes, including both restraint and recording procedures.

(2) Process and implementation of body restraint reduction program

The process of the body restraint reduction program is as follows: First, preliminary judgment is made based on indicators such as Glasgow Coma Scale (GCS) ≤ 8 points, muscle strength $<$ Grade 3, and Richmond Agitation-Sedation Scale (RASS) ≤ -4 points. If the indicators are met, no restraint is applied; if not, a CAM-ICU assessment (for delirium assessment) is conducted. When the CAM-ICU assessment is negative and there is no support for restraint alternatives, no restraint is applied; if there is support for restraint alternatives, restraint alternative measures are considered. When the CAM-ICU assessment is positive and there is no support for restraint alternatives, restraint is applied; if there is support for restraint alternatives, restraint alternatives should be considered. After determining to apply restraint, the informed consent form should be signed, medical orders issued, restraint classified, and then restraint implemented. After implementing restraint, continuous dynamic assessment is carried out to check if the conditions for releasing restraint are met, and if so, the restraint is released.

The implementation of the body restraint reduction program is as follows: First, a restraint assessment is conducted. After the patient is admitted to the department, the attending physician and nurse should comprehensively assess the patient's muscle strength, consciousness, etc. After determining that restraint is necessary, an informed consent form should be signed and long-term medical orders issued. In emergency situations, restraint can be applied first and then the family members informed, that is, when the patient is abnormally agitated with RASS ≥ 3 points, measures are directly taken. Second, when implementing the restraint program, the checking system should be implemented for identity verification. Appropriate restraint tools should be selected based on the patient's actual condition. For example, when a patient with normal muscle strength is agitated and a single restraint tool is insufficient to prevent unplanned extubation and other behaviors, multiple tools should be used in combination to ensure the patient's safety. It should be noted that restraint tools should be restraint straps with soft sponges and appropriate width to ensure that the skin at the restrained site is protected. The restrained limb should retain a certain range of motion, with the standard that one to two fingers can be inserted into the restraint strap. When performing routine nursing every two hours, the responsible nurse should observe the skin for damage and apply appropriate pressure-relieving pads to reduce skin damage.

(3) Body restraint alternative measures

Based on literature review, analysis, and clinical practice, restraint alternatives were categorized as follows: Based on literature review, analysis, and clinical practice, the alternative measures to physical restraints can be categorized as follows: First, understanding the patient's preferences through family members and selecting corresponding recreational activities to distract the patient. Second, conducting short conversations with conscious patients, strengthening health education, and providing psychological comfort. Third, creating a quiet and comfortable inpatient environment for patients and providing sleep-aid items such as eye masks. Fourth, enhancing ward rounds to ensure the effectiveness of catheters and minimizing their retention time as much as possible. Fifth, providing suitable rehabilitation tools for

patients. Sixth, involving family members in communicating with uncooperative patients to alleviate their resistance. Seventh, using music to create a simulated family atmosphere in the ward ^[4].

(4) Recording of patient body restraint

The neurology department developed a body restraint record form covering restraint assessment, reasons, tools, sites, methods, complications and treatments, and restraint removal time, providing clear procedures and standardized regulations for nursing staff to improve nursing quality. Responsible nurses are required to record assessments of the patient's consciousness, muscle strength, RASS score, and the presence of life-supporting treatments/equipment. Additionally, the assessment time, frequency, and data collection methods are specified to ensure data completeness.

(5) Training and assessment

Training for all neurology department members is provided through pocket books, online courses, and offline lectures. Regular assessments are conducted, such as weekly evaluations of all nurses on body restraint reduction knowledge, skill operation, and communication skills to inspect their competency development.

2.2.2. Observation indicators

- (1) Body restraint rate: Calculated as (number of body restraint days of inpatients during the same period / total number of inpatient days during the same period) \times 100%.
- (2) Unplanned extubation rate: Calculated as (number of unplanned extubation cases during the same period / total number of ICU inpatients during the statistical period) \times 100%.
- (3) Restraint site complications: Skin damage, bruising, limb edema.
- (4) Nurses' restraint management ability: The neurology department designed questionnaires and assessment methods based on relevant regulations. Questionnaires covered three dimensions: basic knowledge, operational skills, and communication ability, with corresponding scoring criteria to test nurses' competency development through scores ^[5].

3. Results

The body restraint rate, unplanned extubation rate, and incidence of restraint site complications in the control and observation groups, as well as the development of restraint-related capabilities, are shown in **Table 2** and **Table 3**.

Table 2. Comparison of restraints and related conditions between the control group and the observation group

Group	Number of cases	Total hospitalization days (d)	Date of physical restraint (d, %)	Cases of unplanned extubation (%)	Cases of complications at restraint sites
Control group	102	1016	525 (51.67)	9 (8.82)	13 (12.75)
Observation group	104	1024	355 (34.67)	3 (2.88)	4 (3.85)
χ^2 value			59.914	3.311	5.386
<i>P</i>			< 0.001	0.069	0.020

Table 3. Comparison of nurses' restraint-related abilities before and after program training (in points)

Time	Number of people	Knowledge mastery ability	Operational ability	Communication ability
Before training	20	74.67 ± 5.16	86.40 ± 2.47	84.33 ± 4.17
After training	20	95.33 ± 5.16	95.53 ± 2.13	93.67 ± 2.97
<i>t</i> -value		-10.96	-10.831	-7.063
<i>P</i> -value		< 0.001	< 0.001	< 0.001

4. Discussion

4.1. Body restraint reduction program helps reduce body restraint rate in severe neurological patients

Severe neurological patients often suffer from consciousness disorders and agitation due to their condition. Coupled with the heavy workload and limited staff in intensive care units, timely care is difficult, making body restraint an auxiliary treatment^[6]. In neurological ICUs, patients' conditions may change (e.g., from deep coma to cooperative status), but nurses may continue existing restraint measures without re-evaluation due to time and energy constraints, potentially leading to over-restraint^[7]. Based on this, this study emphasizes comprehensive and timely assessment by medical staff to determine whether patients need body restraint or can be intervened with alternative measures, aiming to reduce the restraint rate, improve nursing quality, and provide better care^[8]. The study data showed that the body restraint rate in the observation group was 34.67%, significantly lower than 51.67% in the control group ($P < 0.05$), while there was no statistically significant difference in the impact of body restraint on preventing unplanned extubation ($P > 0.05$). Specifically, the restraint reduction program should be formulated by evaluating the patient's actual condition, using scoring scales to assess and screen from aspects such as muscle strength and consciousness, avoiding discomfort for patients who do not require restraint. It is also important to dynamically evaluate the patient's condition progression from admission, consider restraint alternatives first when applying restraint, and reduce restraint time through real-time observation^[9].

4.2. Body restraint reduction program helps reduce incidence of restraint site complications

During body restraint, differences in patient cooperation and improper use of restraint straps by nursing staff when handling manic or delirious patients can lead to complications^[10]. If the restraint strap is too loose, it fails to effectively restrict the patient's activities; if too tight, it may affect blood circulation or even cause psychological stress, leading to struggling and injury^[11]. Additionally, the duration of restraint is another factor increasing complication rates. This study found that the incidence of restraint site complications in the observation group was lower than in the control group ($P < 0.05$). Through continuous dynamic assessment based on the patient's condition, the timing and duration of restraint were optimized, and regular checks of local skin conditions helped detect and prevent potential risks, thus reducing the complication rate^[12]. During the implementation of the restraint reduction program, the complication rate caused by body restraint in the neurology department decreased from 12.75% to 3.85%, achieving the goal of providing higher-quality nursing services.

4.3. Body restraint reduction program helps improve nurses' related capabilities

In this study, after training, medical staff showed significant improvements in basic knowledge, operational ability, and communication skills ($P < 0.01$). Previously, nurses mainly relied on their own cognition and work experience

to determine whether patients needed body restraint, which might be influenced by subjective awareness. Compared with comprehensive assessment and specific scoring, nurses' independent judgment was more arbitrary and blind, leading to unreasonable restraint measures^[13]. After systematic training and assessment, nurses' understanding of restraint reduction deepened, operational processes were refined and standardized, and unified evaluation criteria were established, reducing the probability of unreasonable and excessive restraint^[14].

5. Conclusion

Neurological intensive care units mainly admit patients with severe stroke, encephalitis, etc., who may show external symptoms such as agitation and delirium, posing safety risks to themselves or others. Therefore, body restraint has become an important clinical treatment measure^[15]. However, the negative impacts of body restraint are obvious, affecting patients' physical and mental health (e.g., skin damage, fractures, fear), which in turn hinder recovery. This department explored the body restraint reduction program and its application effects, aiming to implement it in the future care of severe neurological patients to alleviate their suffering and improve quality of life. Meanwhile, due to possible differences in sample size and assessment methods in this study, the accuracy of results may be affected, warranting continuous improvement in the future.

Disclosure statement

The authors declare no conflict of interest.

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