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ORIGINAL RESEARCH

Development and Validation of Clinical Practice Standards for Physical Restraint in Hospitalized Patients: A Multi-Method Study

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Background: Physical restraint is commonly used in clinical settings to ensure patient safety, yet its application lacks standardization and may lead to adverse physical and psychological effects. There remains a significant gap in evidence-based guidelines tailored to nurses practices.

Objective: This study aimed to develop and validate clinical practice standards for physical restraint in hospitalized patients from a nurses staff perspective and to evaluate their impact on nurses knowledge, attitude, behaviors, and patient outcomes.

Methods: A multi-stage design was employed, including a cross-sectional survey, semi-structured interviews, a Delphi expert consultation, and a controlled trial. The study involved 202 nurses and 100 patients from a tertiary hospital in Chongqing, China. The intervention group received standardized training based on the newly developed restraint criteria, while the control group followed routine protocols.

Results: The expert consultation achieved high consensus (Cr = 0.85). Post-training, the intervention group showed significant improvements in knowledge, attitude, and practice scores ($P < 0.05$), and a reduction in restraint use and duration ($P < 0.05$). Although adverse event rates decreased in the intervention group, the differences were not statistically significant.

Conclusion: The developed standards effectively enhance nurses practice, reduce unnecessary restraint use, and maintain patient safety, supporting their integration into clinical nurses management.

Keywords: physical restraint, know-trust-behaviour score, observational study standard, nurses staff

Introduction

Physical restraint of inpatients is one of the common nurses interventions in the process of clinical care, especially in intensive care, psychiatry, geriatrics, and other special departments with wide application. In modern healthcare practice, Physical restraint of inpatients has been a topic of great concern and controversy. Physical restraint refers to the use of any device, material, or instrument that restricts a patient's free movement. Although physical restraint is considered a protective measure in some cases for preventing adverse events such as falls and bed falls, its use may have a range of adverse physiological and psychological effects on patients, such as skin lesions, pressure sores, unplanned extubation, anxiety and depression.[1] According to recent studies, the incidence of restraint-related complications among hospitalized patients ranges from 5% to 30%, highlighting the significant clinical burden associated with inappropriate restraint use.[2] Therefore, how to use physical restraint in a reasonable and standardized way while ensuring patient safety is an urgent problem in the current nurses field.

In recent years, clinical practice guidelines for physical restraint in hospitalised patients have been extensively researched and developed both at home and abroad. However, existing guidelines are still deficient in the clarity and

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timely updating of recommendations, which may lead to the irrational application of physical restraints.[3] Moreover, previous studies and systematic reviews have indicated that caregivers often have insufficient knowledge and inconsistent attitudes towards restraint use, which may increase the risk of adverse events and ethical dilemmas.[4] For example, a study of physical restraint use among Chinese psychiatric patients found that restraint use rates varied significantly between hospitals and lacked uniformity. For example, a study of physical restraint use among Chinese psychiatric patients found that restraint use rates varied significantly between hospitals and lacked uniformity.[5] In addition, previous studies have lacked uniform standards and norms for the clinical practice of physical restraint, and there is a wide variation in caregivers' perceptions, attitudes and behaviours towards restraint.

In current clinical practice, physical restraints are commonly used in hospitalised patients, especially when dealing with patients who are unable to care for themselves, and they are considered a "protective" measure. However, existing studies have shown that the use of physical restraints varies widely among different healthcare institutions and caregivers, with a lack of uniformity in the indications, procedures, and duration of restraints.[6,7] Certain hospitals still rely on physical restraints to ensure patient safety in the absence of sufficient clinical evidence, which may lead to overuse or even misuse of physical restraints.[8,9] During the application of physical restraints, nurses staff face not only operational challenges but also ethical and psychological concerns, such as fear of causing harm, moral distress, and uncertainty about legal responsibilities. The lack of adequate training and knowledge regarding ethical decision-making further complicates these challenges.[10]

Nonetheless, previous studies are still inadequate in terms of clinical practice standards for physical restraint in hospitalised patients. From the perspective of nurses theory, the development of clinical standards can be guided by conceptual frameworks that emphasize patient safety, ethical nurses practice, and evidence-based decision-making, which can enhance the quality of care and clinical outcomes.[11] Therefore, it is of great practical significance to construct a set of clinical experimental standards for physical restraint of inpatients that is suitable for the national conditions of previous studies and to conduct applied research from the perspective of nurses staff to improve the quality of nurses care and ensure patient safety. The aim of this study is to construct a set of scientific, reasonable and operable clinical experimental standards for physical restraint of inpatients by systematically analysing relevant guidelines and literature at home and abroad, combining with the clinical reality of previous studies, and to assess the application effect of the standards in clinical practice from the perspective of nurses staff.

Data and Methods

Research Subjects

This study selected 202 clinical frontline nurses from October 2024 to March 2025 in a tertiary-level A hospital in Chongqing City as the study subjects. A concurrent parallel control study was used, control group: nurses who had not received training before March 2025 (n = 101), intervention group: nurses who received training in March 2025 (n = 101). The control group completed the Physical Restraint Knowledge and Attitude Practices Questionnaire for nurses in December 2024, and the intervention group administered the Physical Restraint Knowledge and Attitude Practices Questionnaire for nurses by the 30th of the month following training. Inclusion criteria: ① nurses who have obtained the certificate of nurses practice through practice registration and are engaged in the clinical front line; ② nurses who have no mental or intellectual disabilities, have a certain degree of comprehension and language skills, and are able to complete the questionnaire independently; ③ nurses who have given informed consent and voluntarily participated in the study; and ④ nurses who were on duty during the study period. Exclusion criteria: ① Nurses who have not obtained the certificate of nurse practice or whose place of practice is not in our hospital; ② Internship and further training nurses; ③ Nurses during the probationary period.

One hundred patients, 58 males and 42 females, with an average age of (62.2 ± 7.9) years old and an average number of hospitalisation days of (12.6 ± 3.4) days, who were physically restrained in a tertiary-level A hospital in Chongqing from April 2025 to June 2025 were selected. In the control group, the routine protocol of physical restraint was used, cared for by nurses who were not trained in the standards of physical restraint practice; in the intervention group, the patients were restrained by the standards of physical restraint practice for inpatients, cared for by trained nurses.

Inclusion criteria: (1) the patients had experienced physical restraint at least once during hospitalisation, and the skin at the restraint site was intact; (2) they were in a clear state of mind or had the consent of their family members; (3) they could cooperate in completing the relevant surveys and interviews. Exclusion criteria: ① transferring to another hospital in the middle of the day; ② no guardian during hospitalisation and unable to express their wishes; ③ unable to continue to participate due to changes in their condition.

The sample size for the patient controlled trial was calculated using the formula for comparing two independent means:[12] through the formula: $n1 = n2 = \frac{2\left(Z_{1-\alpha/2} + Z_{1-\beta}\right)^2}{\Delta^2} + \frac{1}{4}Z^2_{1-\alpha/2}$ n1 and n2 are the sample sizes for the intervention and control groups. $Z_{1-\alpha/2}$ = 1.96 (for a two-sided significance level α of 0.05). $Z_{1-\beta}$ = 1.282 (for a power (1-β) of 90%). Δ = δ/σ = 0.62 (the standardized effect size, estimated from pilot data). The calculation yielded 40 patients per group. Accounting for a potential 20% attrition rate, the final sample size was set to 50 per group (100 total).

In the control group, there were 28 males and 22 females, with an age range of 48 to 78 years old, average age (60.21 ± 8.17), and a range of 7 to 20 days of hospitalisation, with an average of (12.15 ± 3.09) days of hospitalisation. In the intervention group, there were 30 males and 20 females, age range 50–75 years, mean age (61.44 ± 7.90) years, range of hospitalisation days 8–18 days, mean hospitalisation days (12.44 ± 3.57) days. Comparison between the two groups of patients in terms of gender, age, hospitalisation days and other general information, the difference was not statistically significant (P > 0.05) and is comparable.

Study setting: The study was conducted in a tertiary-level hospital with a high patient volume, diverse clinical population, and an established nurses management system. These characteristics provide a suitable environment for evaluating both nurses practices and patient outcomes related to inpatient physical restraint.

Ethics Approval and Consent to Participate: This study was reviewed and approved by the Institutional Review Board of the Third Affiliated Hospital of Chongqing Medical University (IRB No. 2025–30). All participants, including nurses and patients, provided written informed consent prior to participation. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Research Methods

This study adopts a multi-stage research design combining cross-sectional survey, semi-structured interviews, Delphi method, and controlled experimental study divided into three stages (See Figure 1).

Phase 1: Status Quo Survey (April 2024 to September 2024)

To understand the current status of nurses staff's knowledge, attitude, and behaviours regarding physical restraints for inpatients, as well as the use of physical restraints, quality compliance rate, and incidence of adverse events.

Data collection methods:

a. Nurses' knowledge, attitude, and behaviours: Data were collected using questionnaires via Questionnaire Star software. Head nurses guided the process, and questionnaires were distributed electronically to clinical nurses staff. The questionnaire was anonymous and took 15–20 minutes to complete.
b. Inpatient physical restraint survey: Retrospective review and on-site observation were conducted to collect data on the use of restraints, rate of quality compliance, and incidence of adverse events.

Phase 2: Construction of Inpatient Physical Restraint Practice Standards

(1) Purpose: Construct clinical practice standards for inpatient physical restraint based on Phase 1 results.
(2) Data collection methods:

a. Semi-structured interviews: Conducted with nurses administrators and nurses backbones to explore salient problems, suggestions for improvement, implementation dilemmas, and their inner feelings and thoughts during restraint application. The thematic analysis of these interviews informed the initial framework.

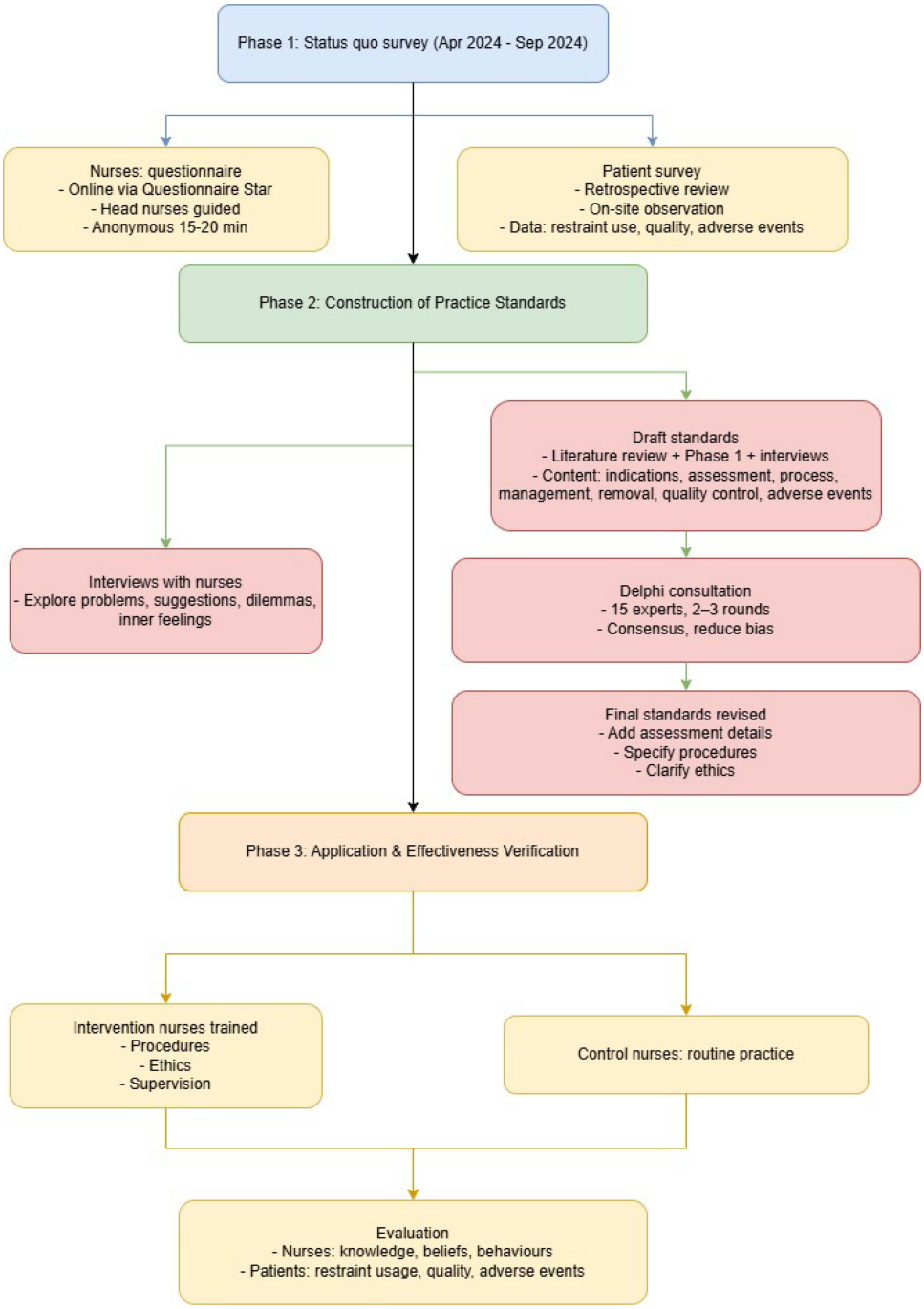

Figure 1 Research Methodology Design Flowchart.

b. Initial drafting of practice standards: Literature review, status quo survey, and interviews were synthesised to formulate preliminary standards, covering indications/contraindications, assessment, restraint process, nurses management, removal, follow-up, quality control, and adverse event management.
c. Delphi expert consultation: Fifteen experts in nurses management, clinical nurses, psychology, and ethics conducted 2–3 rounds of Delphi consultation to refine the standards. Delphi was chosen to obtain expert consensus, reduce bias, and standardize complex clinical procedures, ensuring the scientific validity of the standards.

(3) Standard formulation: The preliminary draft was revised based on Delphi feedback. Changes included adding more detailed assessment criteria, specifying procedural steps, and clarifying ethical considerations. The final "Inpatient Physical Restraint Practice Standards (Formal Version)" was established.

Phase 3: Application of Standards and Effectiveness Verification

The effect of the standards on nurses' knowledge, Attitude, and behaviours, as well as patient outcomes, was assessed. Intervention nurses received training on the standards, including operational procedures, ethical decision-making, and supervision mechanisms. Control nurses continued routine practice. Patients in both groups were monitored for restraint usage, quality compliance, and adverse events.

Consent Process

All nurses and patients (or guardians) were provided with written information about the study and gave signed informed consent prior to participation. The process was approved by the hospital ethics committee (Approval No. 2025–30).

Evaluation Indicators

Assessment of Changes in Nurses' Knowledge, Attitude and Behaviour

The changes in the level of knowledge, attitude and behaviour of the nurses in the two groups before and after the training were compared by means of questionnaires, including the knowledge dimension, attitude dimension and behaviour dimension, and the surveys were multiple choice questions, with the options for the knowledge dimension being: right and wrong; the options for the attitude dimension being: strongly disagree, disagree, generally, agree and strongly agree; and the options for the behaviour dimension being: never, occasionally, sometimes, often and always. The results of the study from the three dimensions of nurses' knowledge, attitude and behaviours of physical restraints. (Supplementary Box 1).

Patient Physical Restraint Utilisation Rate

Inpatient physical restraint utilisation rate = number of inpatients using physical restraints/total number of inpatients during the same period*100%. Each month, the intervention and control groups extracted the number of inpatients physically restrained in that care unit for the month from the electronic medical record based on medical orders and nurses records, as well as the total number of inpatients for the same period. The rate of restraint use was compared between the two groups.

Quality of Physical Restraint Pass Rate

According to the hospital's "Evaluation Criteria for the Quality of Restraint for Inpatients", it mainly includes the rate of signing the informed consent for restraint, the qualified rate of prescribing medical instructions for restraint, the timely rate of releasing physical restraint, the rate of consistency between the results of the physical restraint assessment and the actual restraint, and the rate of correctly writing the physical restraint records.

Incidence Rate of Physical Restraint Adverse Events

Record the patients' adverse events of physical restraint, including swelling and ulceration of the restrained limb, bleeding thrombus, falling out of bed, self-injury or other injuries, the emergence of delirium, unplanned extubation, restraint-related complaints and other restraint-related events. The incidence rate of inpatient physical restraint adverse events = (the number of inpatient restraint adverse events/the total number of inpatients in the same period) × 100%.

Statistical Methods

Data were entered into the database using EpiData 3.1, and double-checked independently by two researchers to ensure accuracy. Statistical analyses were performed using SPSS 26.0. Continuous variables were tested for normality using the Shapiro–Wilk test. Normally distributed variables are presented as mean ± standard deviation (SD) and compared using independent-sample t-tests (for two groups) or one-way ANOVA (for multiple groups). Non-normally distributed or ordinal variables are presented as median (interquartile range, IQR) and compared using the Kruskal–Wallis rank-sum

test. Categorical variables are expressed as counts and percentages and compared using the chi-square test. Multiple linear regression analysis was conducted to identify factors influencing nurses' knowledge, attitude, and practices regarding physical restraint. A two-sided $p < 0.05$ was considered statistically significant.

Results

Results of Expert Correspondence

A total of 15 experts were invited to participate in the expert consultation, including 10 (66.7%) with senior titles and 5 (33.3%) with intermediate titles; 5 (33.3%) with PhDs, 7 (46.7%) with master's degrees, and 3 (20.0%) with bachelor's degrees; and they had been working in nurses or related medicine for an average of (15.6 ± 4.2) years. Two rounds of Delphi correspondence were conducted in this study, and the recovery rates of the expert questionnaires in the two rounds were 100% (15/15) and 100% (15/15), respectively, with a high response rate of the experts' opinions, indicating that the experts had a high degree of recognition of this study.

In this study, the authority coefficient Cr value of the experts was 0.85, indicating that the credibility of the results of the expert correspondence consultation was high. In the first round of expert consultation, the average importance rating of each entry was 4.04 ± 1.19, and the Kendall's coefficient $W = 0.499$, $P < 0.01$, indicating that the experts' opinions are consistent, but still need to be revised and improved. After the second round of expert consultation, the average importance rating was raised to 4.06 ± 1.19, with Kendall coefficient $W = 0.512$, $P < 0.01$, indicating that the experts reached a high level of consensus on the final revised standard.

Interview Results

A total of 10 nurses staff were interviewed, including 3 nurses managers (1 director of the nurses department and 2 heads of departmental nurses) and 7 clinical nurses backbones (nurses backbones of psychiatry, ICU, infectious diseases, and other departments), with an average of (11.2 ± 3.8) years of work experience. A total of 10 questionnaires were distributed and 10 valid questionnaires were recovered, with a validity rate of 100%. By analysing and collating the content of the interviews, 3 main problems and suggestions for improvement were summarised (Table 1).

Findings of the Current Status of Nurses' Knowledge and Trust Behaviour

After the training, the knowledge dimension, attitude dimension, practice dimension and total score of the nurses' knowledge and trustworthiness scores in the intervention group were higher than those in the control group ($P < 0.05$) (Table 2).

Multiple Linear Regression to Analyse the Influencing Factors of Nurses' Physical Constraints Knowledge and Trust Behaviour

A total of 202 nurses were included in this study. The data showed that 25 cases were male and 177 cases were female; 46 cases were 21–25 years old, 63 cases were 26–30 years old, 51 cases were 31–35 years old, and 42 cases were ≥36 years old; 55 cases were ≤5 years old, 60 cases were 6–10 years old, 47 cases were 11–20 years old, and 40 cases were >20 years old; 110 cases were in primary titles, 68 cases were in intermediate titles, and 24 cases were in senior titles;

Table 1 Interview Results

Main Issues	Interview Results	Suggestions for Improvement
Inadequate standardization of restraint training procedures	Variations in nurses operation steps across departments; some nurses do not strictly follow documentation requirements	Establish a unified restraint operation procedure and standardized record form
Unclear indications for restraint	Lack of clear criteria for determining whether patients need to be restrained	Refine indications for restraint and provide decision support tools
Insufficient restraint training and low compliance in execution	Nurses generally report not having received systematic training on physical restraints	Develop a training program to enhance nurses' operational standards

Table 2 Comparison of Nurses' Knowledge and Trust Behaviour Scores

Indicator	Group	Sample Size (n)	Baseline Score	Post-Training /Follow-Up Score	Mean Difference (Post- vs Baseline)	Pooled Standard Deviation	Cohen's d	Effect Size Magnitude	t Value (Intergroup Post-Comparison)	P Value (Intergroup Post-Comparison)
Knowledge Dimension	Control Group	101	6.70 ± 1.45	6.43 ± 1.24	−0.27	1.35	—	—	−0.059	0.953
	Intervention Group	101	6.42 ± 1.14	8.42 ± 1.12	2	1.13	1.77	Large (d > 0.8)	9.396	<0.001
Attitude Dimension	Control Group	101	25.44 ± 2.80	24.72 ± 3.43	−0.72	3.12	—	—	0.233	0.816
	Intervention Group	101	24.84 ± 3.80	28.27 ± 2.61	3.43	3.21	1.07	Large (d > 0.8)	7.416	<0.001
Practice Dimension	Control Group	101	22.85 ± 4.18	22.11 ± 4.33	−0.74	4.26	—	—	0.254	0.800
	Intervention Group	101	22.25 ± 3.97	26.86 ± 3.76	4.61	3.87	1.19	Large (d > 0.8)	7.168	<0.001
Total Score	Control Group	101	54.99 ± 5.59	53.26 ± 5.79	−1.73	5.69	—	—	0.324	0.746
	Intervention Group	101	53.51 ± 5.49	63.54 ± 5.00	10.03	5.25	1.91	Large (d > 0.8)	11.462	<0.001

Notes: 1. Data Source: The control group's data were collected from questionnaire surveys in December 2024 (baseline) and March 2025 (follow-up without training); the intervention group's data were from surveys in December 2024 (baseline) and March 2025 (one month after training on physical restraint practice standards). 2. Effect Size Calculation: Cohen's d was computed using the formula "d = Mean Difference/Pooled Standard Deviation", where the pooled standard deviation was derived from the baseline and post-training standard deviations of the intervention group. 3. Effect Size Magnitude Criteria: d < 0.2 = very small; 0.2–0.5 = small; 0.5–0.8 = medium; d > 0.8 = large.

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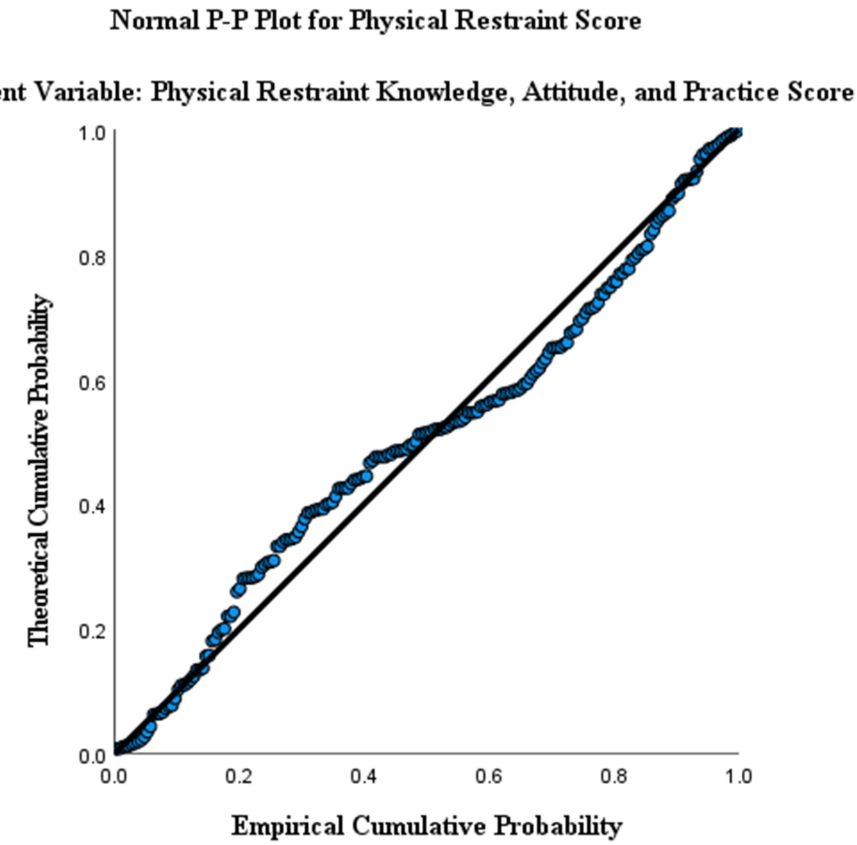

Figure 2 Normal Probability Plot of Standardized Residuals for Regression.

143 cases of nurses, 41 cases of charge nurses, 18 cases of nurses managers; 83 cases of college, 104 cases of bachelor's degree, 15 cases of postgraduate and above.

Gender, age, years of working experience, title, position, highest education, and whether or not they received training in knowledge related to physical restraint were used as independent variables, and physical restraint knowledge and attitude behaviour scores were used as dependent variables. The results of the analysis using multiple linear regression showed that the regression equation was significant, $F = 150.193$, $P < 0.001$ (Figure 2). Among them, age, highest educational level and whether or not they received training on knowledge related to physical restraints were the factors affecting nurses' physical restraints knowledge and attitude behaviour scores ($P < 0.001$) (Table 3).

Effect of Inpatient Restraint Observational Study Standards on Patient Physical Restraints

Both the intervention and control groups of patients were selected from four key departments of the hospital, consistent with the departments where the researchers are located: Department of Infectious Diseases, Department of Urology,

Table 3 Multiple Linear Regression Analysis of Factors Influencing Nurses' Physical Restraint Knowledge and Attitude Behaviour

Project	B	β	t	P	F	Adjusted R^2
Gender	−0.595	−0.029	−0.960	0.338	150.193	0.839
Age	−0.714	−0.111	−3.785	0.000		
Years of Work Experience	0.022	0.004	0.059	0.953		
Professional Title	−0.115	−0.012	−0.168	0.867		
Position	0.269	0.025	0.473	0.637		
Highest Educational Level	7.178	0.644	22.210	0.000		
Received Training on Physical Restraint Knowledge	8.393	0.618	21.138	0.000		

Table 4 Comparison of Physical Restraints Between the Two Groups

Group	n	Restraint Utilisation (%)	Average Restraint Time (h)
Control Group	50	40 (80.0%)	13.45 ± 3.49
Intervention Group	50	26 (52.0%)	8.00 ± 2.64
x^2/t		8.734	8.728
P		0.003	0.000

Table 5 Comparison of Safety Indicators Between the Two Groups (n, %)

Group	n	Fall Rate	Incidence of Pressure Ulcers	Incidence of Delirium	Unplanned Extubation Rate
Control Group	50	6 (12.0%)	5 (10.0%)	9 (18.0%)	4 (9.0%)
Intervention Group	50	3 (6.0%)	2 (4.0%)	5 (10.0%)	2 (3.5%)
x^2		1.099	1.382	1.329	0.709
P		0.295	0.240	0.249	0.400

Department of Emergency and Critical Care Medicine, and Center for Neurological Diseases in the control group (n = 50), the number of patients from the Department of Infectious Diseases, Department of Urology, Department of Emergency and Critical Care Medicine, and Center for Neurological Diseases was 12 cases (24.0%), 11 cases (22.0%), 15 cases (30.0%), and 12 cases (24.0%), respectively; in the intervention group (n = 50), the number of patients from the above four departments was 13 cases (26.0%), 10 cases (20.0%), 14 cases (28.0%), and 13 cases (26.0%), respectively. Statistical analysis showed no significant difference in the departmental distribution of patients between the two groups ($\chi^2 = 1.23$, $P = 0.745$), confirming that departmental factors did not interfere with the study results. The rate of restraint use in patients in the intervention group was significantly lower than that in the control group ($P < 0.05$), and the average restraint time was shorter than that in the control group ($P < 0.05$). (Table 4).

Impact of Inpatient Restraint Observational Study Standards on Patient Safety

The fall rate, pressure ulcer incidence rate, delirium incidence rate, and unplanned extubation rate of the intervention group decreased, but there was no significant difference ($P > 0.05$). (Table 5).

Discussion

Physical restraints are often used in clinical care to prevent patients from extubation, falls or self-injury, and are particularly common in intensive care, geriatric care and psychiatric wards.[13,14] However, the use of physical restraints may not only have negative effects on patients' physical and mental health, such as pressure sores, muscle atrophy, anxiety and depression, but may also lead to ethical and legal controversies.[15] Currently, most studies on physical restraint in hospitalised patients have focused on its indications, implementation and adverse effects, while relatively few studies have been conducted on nurses staff perspectives.[16] As the direct implementers of physical restraints, nurses staff's knowledge, attitude and practice of restraints directly affect the clinical implementation effect. Therefore, constructing clinical practice standards for physical restraint in hospitalised patients based on nurses staff perspectives not only helps to improve nurses staff's cognitive level and optimise the decision-making process but also minimises unnecessary restraints and improves the quality of care while ensuring patient safety.[17] The aim of this study is to construct clinical practice standards for physical restraint of inpatients from the perspective of nurses staff, and to verify its effect in clinical application, with a view to providing a basis for standardised and scientific management of physical restraint, and promoting the optimisation and development of nurses practice.

Improvement of Nurses Staff's Level of Knowledge, Attitude and Behaviour

This study found that nurses who received standardized training based on the new practice standards showed significant improvements in their KAP scores during the post-intervention assessment compared to the control group. The large

effect sizes (Cohen's d >0.8 for all KAP domains) confirm the substantial practical significance of the intervention. It is noteworthy that the control group, which did not receive the intervention, exhibited a slight decrease in scores over the same period. This trend underscores that the improvement in the intervention group was a direct result of the training. The decrease in the control group may be attributed to external factors, such as routine work pressure or seasonal variations in workload, which can subtly impact unguided practice over time. This finding aligns with previous research indicating that systematic training and standardized guidance are essential for improving caregivers' correct application of physical restraints and reducing inappropriate use.[18] Specifically, although nurses had knowledge about physical restraint and understood its role and associated risks, in actual care, many nurses still relied on experience rather than standardised processes to make judgements and decisions due to a lack of adequate training and standardised guidance. This inconsistency between knowledge and practice is more common in clinical care, especially in the use of physical restraints, where nurses' understanding of the criteria for its use and alternatives varies widely.[19,20]

Furthermore, the multiple linear regression analysis demonstrated that age was statistically significantly associated with knowledge, attitude, and behaviour scores ($\beta = -0.111$, $P < 0.001$). Younger nurses had significantly higher levels in these domains, which may be explained by their stronger learning capacity and quicker adaptation to new knowledge and skills, consistent with previous findings.[21] In addition, the highest level of education was the strongest significant predictor ($\beta = 0.644$, $P < 0.001$). Nurses with higher educational qualifications achieved significantly better theoretical mastery and clinical application, which reflects the role of academic preparation in enhancing professional competence.[22] Moreover, receiving systematic training was also significantly associated with higher scores ($\beta = 0.618$, $P < 0.001$). Those who had undergone structured training showed markedly improved professional knowledge and practice, further confirming the effectiveness of targeted educational interventions.[23] Taken together, these results suggest that future training programmes should be tailored to nurses' age, educational background, and training experience. In particular, more individualised training support should be provided for nurses with lower educational attainment or less prior training, to maximise training effectiveness and ultimately improve the quality of care.

Improvement in the Use of Physical Restraints in Hospitalised Patients

In terms of reducing the use of physical restraints, it has been shown that providing training and implementing standardised management can be effective in reducing unnecessary restraints and ensuring that restraints are only used when really necessary.[24,25] In this study, we found that after training, patients in the intervention group had significantly lower rates of physical restraint use and shorter restraint durations than those in the control group. This result suggests that the implementation of physical restraint clinical practice standards can effectively reduce unnecessary physical restraint use and optimise the patient care experience.

Previous studies have noted that excessive use of physical restraints may cause negative physiological and psychological effects on patients, such as muscle atrophy, anxiety, and depression.[26,27] In addition, the results of this study further validate the importance of standardised physical restraint management, where standardised physical restraint practice standards enable nurses to understand when physical restraint is necessary and when patient behaviour can be effectively controlled by non-restraint means by providing systematic training. The training not only raised nurses' awareness of the risks of physical restraints but also helped equip them with alternatives and better care strategies to avoid overuse of physical restraints. Through the guidance of the standardised process, nurses were able to more accurately judge the indications and timing of restraints in actual practice, thus reducing the unnecessary use of restraints. Particularly in terms of patient safety and comfort, standardised criteria can help nurses ensure patient safety while minimising physical and psychological harm to patients[28] This finding is consistent with previous research, which has shown that overuse of physical restraints may have negative physiological and psychological effects on patients[29] For example, long-term restraint may lead to muscle atrophy, joint stiffness, or even trigger pressure sores; psychologically, patients may develop negative emotions such as anxiety and depression as a result, or even behavioural problems.

Changes in Patient Safety Indicators

In the past, the use of physical restraints in hospitalized patients has been associated with increased adverse events and complications.[2] In this study, the fall rate, incidence of pressure ulcers, delirium, and unplanned extubation rate in the

intervention group were reduced by 50%, 60%, 44%, and 50%, respectively, compared with the control group (falls: 12.0% → 6.0%; pressure ulcers: 10.0% → 4.0%; delirium: 18.0% → 10.0%; unplanned extubation: 9.0% → 3.5%), although these differences were not statistically significant (all $P > 0.05$). These findings are consistent with previous studies demonstrating that structured physical restraint management does not increase patient risk while allowing reductions in restraint use.[30] The lack of statistical significance in our study may be attributable to the limited sample size and relatively short study period. Nonetheless, these results are clinically meaningful, as they indicate that the implementation of standardized restraint protocols—including improved nursing assessment, closer patient monitoring, and the use of alternative strategies—can reduce unnecessary physical restraints without compromising patient safety.[31] These findings highlight the potential value of implementing inpatient restraint observational standards and reinforce the importance of targeted nurse training and guideline adherence to optimize patient outcomes and minimize restraint-related harm.

Strengths and Limitations of the Study

The strength of this study lies in its multi-stage research design, which combines a variety of research methods such as cross-sectional surveys, semi-structured interviews, the Delphi method, and controlled experiments, in order to ensure that the results of the study are scientific and generalisable. In addition, this study not only focuses on the changes in knowledge, attitude and behaviours of caregivers but also evaluates the use and safety of physical restraints in hospitalised patients, providing a more comprehensive evidence support.

However, this study still has some limitations. Firstly, the study sample came from a tertiary hospital in Chongqing, so the representativeness of the sample may be somewhat limited, and the generalisability of the findings still needs to be further verified. Second, the follow-up period of this study was short, and the long-term effects of the implementation of the standards have not yet been assessed; future studies may consider extending the observation period to further validate the stability and sustainability of the standards. In addition, the study only focused on some of the adverse event indicators, and the effects of physical restraints on patients' psychological status, quality of life and functional rehabilitation could be further explored in the future to provide a more comprehensive nurses intervention strategy.

Clinical Significance and Future Prospects of the Study

The clinical practice standard of physical restraint for inpatients constructed in this study provides scientific and standardised guidance for clinical care, and fills the standardised gap in the management of physical restraint for inpatients in China. The results of the study show that the standard can effectively improve the professional level of nurses staff, reduce unnecessary physical restraints, while safeguarding patient safety, and has high clinical application value. In the future, the standard can be promoted on a wider scale and combined with information technology (eg, electronic nurses record system, intelligent monitoring devices, etc.) to further optimise the management of physical restraints and improve the accuracy and safety of clinical care. In addition, training of nurses staff on alternative restraint measures, such as environmental optimisation and non-pharmacological interventions, should be strengthened to achieve more humane care goals.

Conclusion

By constructing and validating clinical practice standards for physical restraint in inpatient settings, this study successfully enhanced the knowledge, attitudes and behaviours of nurses staff, significantly reducing unnecessary use of physical restraints and optimising the patient's experience of care. The findings suggest that standardised training and management can improve the quality of care without increasing the risk of adverse events for patients. The standard provides a scientific basis for the standardised management of physical restraints for inpatients, has important clinical application value, and can be further promoted and optimally implemented with information technology in the future.

Data Sharing Statement

The data used and/or analyzed during the current study are available from the corresponding author.

Human Ethics and Consent to Participate Declarations

This study was approved by the Human Ethics Committee of Third Affiliated Hospital of Chongqing Medical University (Ethics Approval Number: 2025-30). All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Consent to Publish Declaration

All participants agreed to publish.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare no conflict of interest, financial or otherwise.

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