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Analysis of the Clinical Characteristics of Bone Loss in Hospitalized Patients with Graves' Disease

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Abstract: *Objective:* To analyze the clinical characteristics of bone loss in hospitalized patients with Graves' disease. *Methods:* The clinical data of hospitalized patients with Graves' disease were collected. According to the results of bone density examinations, they were divided into a normal bone density group, a low bone mass group, and an osteoporosis group. The normal bone density group was used as the control group to analyze the clinical characteristics of bone loss. *Results:* The incidence of bone loss in patients with Graves' disease was 80.72%, with osteoporosis accounting for 39.16% and low bone mass accounting for 41.57%. The incidences of hyperthyroid heart disease, Graves' ophthalmopathy, and leukopenia in the osteoporosis group and the low bone mass group were significantly higher than those in the normal bone density group, reaching 84.62%, 60.87%, and 34.38%, respectively ($P < 0.05$). The age of the osteoporosis group with Graves' disease was 50.88 ± 12.03 years old, which was higher than that of the normal bone density group (40.03 ± 12.58 years old). The disease course was 55.66 ± 14.21 days, longer than that of the normal bone density group (43.38 ± 8.55 days). FT4 was 61.69 ± 8.42 pmol/L, higher than that of the normal bone density group (51.01 ± 6.77 pmol/L), while TSH was 0.08 ± 0.51 μ IU/ml, lower than that of the normal bone density group (0.22 ± 0.55 μ IU/ml). The blood phosphorus was 1.25 ± 0.29 mmol/L, lower than that of the normal bone density group (1.34 ± 0.27 mmol/L), with statistical significance ($P < 0.05$). In the low bone mass group, FT3 (13.08 ± 9.05 pmol/L) and FT4 (46.14 ± 3.46 pmol/L) were lower than those in the normal bone density group, with statistical significance ($P < 0.05$). Logistic regression analysis revealed that age, disease course, and TSH were contributing factors to bone loss. *Conclusion:* Patients with Graves' disease are prone to bone loss, and age, disease course, and TSH are contributing factors to bone loss.

Keywords: Graves' disease; Hospitalized patients; Bone density

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1. Introduction

Thyroid hormones are essential for normal bone development and play a crucial role in the differentiation and maturation of bone tissue cells. Excessive thyroid hormones can affect normal bone metabolism and lead to bone

loss. This article analyzed 166 patients with Graves' disease admitted to the Endocrinology Ward from April 2018 to April 2025 who had undergone bone density examinations. Taking normal bone density as the control, the clinical characteristics of bone loss in Graves' disease were obtained by analyzing the differences in clinical conditions among osteoporosis, low bone mass, and normal bone density. The results are reported as follows:

2. Subjects and methods

2.1. Subjects

The clinical data are sourced from 166 patients with Graves' disease admitted to the Endocrinology Ward from April 2018 to April 2025 who had undergone bone density examinations (70 male patients and 96 female patients). Bone density examinations are all performed using the Hologic QDR4500A fan-beam bone densitometer produced by Hologic, Inc., USA.

2.2. Research methods

A retrospective analysis of hospitalized cases is conducted. The patients' gender, age, height, weight, disease course, admission and discharge diagnoses, treatment processes, thyroid function and antibody tests, various biochemical tests, electrocardiograms, bone density examination results, etc. are recorded in detail. The case data of patients diagnosed with Graves' disease and who had undergone bone density examinations are retrieved. According to the results of bone density examinations, they are divided into a normal bone density group (32 patients, 19.28%), a low bone mass group (69 patients, 41.57%), and an osteoporosis group (65 patients, 39.15%). Statistical analysis is performed using the SPSS17.0 software package. Statistical descriptions of the samples are carried out. The differences in the means of the measurement data of the three groups are compared by analysis of variance (expressed as $\bar{x} \pm SD$). The chi-square test is used for count data and rank data. A P -value < 0.05 was considered statistically significant.

3. Results

3.1. Different bone densities and other complications of Graves' disease

The incidences of complications such as hyperthyroid heart disease, leukopenia, and Graves' ophthalmopathy in the osteoporosis group and the low bone mass group were significantly higher than those in the normal bone density group, with statistical significance ($P < 0.05$). The numbers of occurrences and percentages were 55 cases (84.62%), 42 cases (60.87%), and 11 cases (34.38%), respectively.

3.2. Clinical conditions of different bone densities (Table 1)

As shown in **Table 1**, the age, disease course, and FT4 of the osteoporosis group with Graves' disease were higher than those of the normal bone density group, while TSH and blood phosphorus were lower. The percentage of normal-sized thyroids was higher than that of the normal bone density group, and the percentage of grade II thyroids was lower than that of the normal bone density group, with statistical significance ($P < 0.05$). In the low bone mass group, FT3 and FT4 were lower than those in the normal bone density group, with statistical significance ($P < 0.05$). It can be seen that the degree of bone loss is not proportional to the thyroid hormone level and the degree of goiter. There is also a trend that the lower the TSH level, the more severe the bone loss.

Table 1. Clinical conditions of different bone densities in patients with Graves' disease ($\bar{X} \pm SD$)

| Items | Normal bone density group | Low bone mass group | Osteoporosis group |
|---------------------------|---------------------------|-------------------------------|--------------------------------|
| Age (years) | 40.03 \pm 12.58 | 44.68 \pm 11.14 | 50.88 \pm 12.03 [△] |
| Disease course (days) | 43.38 \pm 8.55 | 45.02 \pm 9.50 | 55.66 \pm 14.21 [△] |
| T3 (mmol/L) | 5.05 \pm 3.27 | 4.41 \pm 2.91 | 7.49 \pm 4.15 |
| T4 (mmol/L) | 231.04 \pm 87.16 | 192.20 \pm 80.44 | 237.38 \pm 145.47 |
| FT3 (pmol/L) | 15.24 \pm 10.79 | 13.08 \pm 9.05 [△] | 17.47 \pm 11.80 |
| FT4 (pmol/L) | 51.01 \pm 6.77 | 46.14 \pm 3.46 [△] | 61.69 \pm 8.42 [△] |
| TSH (μ IU/ml) | 0.22 \pm 0.55 | 0.15 \pm 0.57 | 0.08 \pm 0.51 [△] |
| Blood Calcium (mmol/L) | 2.21 \pm 0.17 | 2.24 \pm 0.21 | 2.17 \pm 0.17 |
| Blood Phosphorus (mmol/L) | 1.34 \pm 0.27 | 1.32 \pm 0.27 | 1.25 \pm 0.29 [△] |
| Normal-sized Thyroid (%) | 15.28 | 32.34 | 49.38 [△] |
| Grade I Thyroid (%) | 19.05 | 21.20 | 16.28 |
| Grade II Thyroid (%) | 61.90 | 42.46 | 29.56 [△] |

*Note: [△]indicates a significant difference compared with the normal bone density group ($P < 0.05$); the disease course is expressed as $\bar{X} \pm SE$.

3.3. Logistic regression analysis

A logistic regression analysis was performed with bone density as the dependent variable and clinical conditions as independent variables. The results showed that age, disease course, and TSH were contributing factors to bone loss, as shown in **Table 2**.

Table 2. Logistic regression analysis of bone density and clinical conditions

| Parameters | P-value | OR | 95%CI |
|----------------|---------|------|-----------|
| Age | 0.01 | 1.08 | 0.73–2.38 |
| Disease Course | 0.04 | 2.39 | 1.87–2.71 |
| TSH | 0.02 | 1.57 | 1.19–2.07 |

4. Discussion

In 1891, German scholars such as Gorka first confirmed that hyperthyroidism could promote the development of osteoporosis ^[1]. Thyroid hormones can stimulate osteoclast differentiation and inhibit osteoblast differentiation. Huang *et al.* believed that high thyroid hormone levels were important factors affecting the bone turnover rate and osteoporosis in hyperthyroid patients ^[2]. Many scholars believed that hyperthyroidism was one of the common causes of osteoporosis ^[3, 4]. The reported incidence of osteoporosis complicated with hyperthyroidism at home and abroad is approximately 20–50% ^[5]. In this study, the incidence of bone loss was 80.72%, and the incidence of osteoporosis was 39.16%, which was consistent with the clinical reports. The age and disease course of the osteoporosis group in this study were greater than those of the normal bone density group, which was consistent with the clinical reports that the incidence and severity of bone loss in hyperthyroid patients increase with age and

that bone density decreases with the prolongation of the duration of high-concentration thyroid hormones^[6, 7].

Wang believed that both high thyroid hormones and low TSH could affect bone remodeling^[8]. Many scholars believed that the thyroid hormone that controls bone loss and bone density in adults was mainly T3, which mainly acts through the thyroid hormone receptor- α ^[9-11]. Simsek *et al.* clarified that it mainly acts through the thyroid hormone receptor- α 1. Khamisi studied the role of vitamin D in the bone metabolism of patients with Graves' disease and emphasized the risk of osteoporosis that may be caused by vitamin D deficiency^[12]. Yang *et al.* showed that T4 could reduce bone density and increase the risk of fractures^[13]. Qi studied the causal relationship between thyroid dysfunction and bone loss and pointed out that an imbalance in thyroid hormone levels may have a negative impact on bone health^[14]. Branstetter explored the mechanism and treatment options for osteoporosis caused by hyperthyroidism and emphasized the importance of early intervention and comprehensive management in the prevention and treatment of such osteoporosis^[15]. Wen *et al.* expounded on the impact of hyperthyroidism on bone metabolism and its related mechanisms and emphasized the negative effects of thyroid hormones on bone health under pathological conditions^[16]. Zhou *et al.* analyzed the association between hyperthyroidism and osteoporosis through epidemiological studies and pointed out that the incidence of osteoporosis in hyperthyroid patients was significantly increased^[17]. Delitala explored the clinical characteristics of hyperthyroid patients and the risk factors for osteoporosis and emphasized the impact of hormone levels, age, and other health conditions on the risk of osteoporosis^[18]. Hong reviewed the methods for evaluating and managing bone health in patients with thyroid dysfunction^[19]. Ma *et al.* explored the association between hyperthyroidism and osteoporosis and its research progress^[20].

Chen *et al.* analyzed the related factors of decreased bone density in hyperthyroid patients^[5]. Fan *et al.* described the clinical characteristics and treatment progress of bone loss in patients with Graves' disease^[21]. Tsevis *et al.* explored the impact of hyperthyroidism on bone metabolism and its mechanism of action^[22]. In this study, the FT3 and FT4 levels in the low bone mass group were lower than those in the normal bone density group, but those in the osteoporosis group were higher, indicating that there was no direct relationship between FT3, FT4, and bone loss. Chen found that in young and middle-aged hyperthyroid patients, bone density decreased with the increase in serum FT3 and FT4 concentrations and gradually decreased with the decrease in serum TSH concentration, and osteoporosis was most obvious in patients with the lowest TSH^[5]. Deng *et al.* also believed that TSH had a protective effect on bones, and a low TSH level could lead to a decrease in bone density^[23]. Yao *et al.* clarified that low TSH in hyperthyroidism could cause an increase in TNF- α , and the increase in TNF- α promoted bone loss caused by high thyroid hormones^[24]. However, Wen *et al.* believed that bone loss in hyperthyroidism did not depend on the TSH level in the circulation^[16]. In this study, the TSH in the osteoporosis group was 0.08 ± 0.51 μ IU/ml, lower than that in the normal bone density group, supporting the view that a low TSH level promotes a decrease in bone density. Chae *et al.* reduced the risk of osteoporosis by adjusting the TSH concentration of patients after thyroid cancer surgery to 1 mU/L^[25].

Owen *et al.* attributed osteoporosis to abnormal bone mineralization from the perspective of the biomineralization theory^[26]. Fu found that the serum calcium and phosphorus levels in hyperthyroid patients were increased, and the serum calcium and phosphorus levels were positively correlated with the thyroid hormone levels^[7]. However, in this study, there was no difference in blood calcium. The blood phosphorus in the osteoporosis group was 1.25 ± 0.29 mmol/L, lower than that in the normal bone density group. This may be related to the increase in the parathyroid hormone/calcitonin ratio in hyperthyroid patients, which promotes the excretion of phosphorus in the urine^[28].

There are many factors that affect bone density, and hyperthyroidism is just one of them. It can be seen from this study that the impact of thyroid function on bone density is certain. Gorka *et al.* believed that osteoporosis caused by hyperthyroidism could be reversed after the thyroid function returned to normal for a certain period of time^[1]. Supplementation with vitamin D and bisphosphonates could increase bone density^[27]. Reddy *et al.* believed that treating hyperthyroidism could reverse lost bone mass, improve bone metabolism, and reduce the risk of fractures^[28]. However, Tuchendler *et al.* found that the low bone density of the femoral neck in hyperthyroid patients increased significantly after 12 months of antithyroid treatment but was still lower than that of the normal control group^[29]. In clinical work, it is necessary to monitor the bone density of hyperthyroid patients, especially those with advanced age, long-term illness, extremely high thyroid hormone levels, and extremely low TSH levels. Timely treatment of hyperthyroidism, supplementation with vitamin, and the use of bisphosphonates can prevent the occurrence of osteoporosis.

5. Conclusion

This study analyzed bone loss in hospitalized Graves' disease patients and found a high prevalence of bone density abnormalities. Over 80% of patients experienced bone loss, with nearly 40% having osteoporosis. Bone loss was linked to older age, longer disease duration, and lower TSH levels. Patients with bone loss also had higher rates of complications like hyperthyroid heart disease and Graves' ophthalmopathy. Notably, bone loss severity did not directly correlate with thyroid hormone levels (FT3/FT4). Logistic regression identified age, disease duration, and TSH as key risk factors. Graves' disease is strongly associated with bone loss, requiring clinical attention to monitor bone density, especially in older patients or those with long-term illness and low TSH. Early intervention for thyroid dysfunction may help prevent osteoporosis.

Disclosure statement

The author declares no conflict of interest.

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Oversampling Technology and Its Applications in Biomedical Signal Detection

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Abstract: This paper deeply explores oversampling technology and its applications in biomedical signal detection. It first expounds on the significance of oversampling technology in biomedical signal detection, and then analyzes the application strategies of oversampling technology in this field. On this basis, it details the specific applications of oversampling technology in electrophysiological signal detection, biomedical imaging signal processing, and other biomedical signal detections, and verifies its effectiveness through practical case analysis, aiming to provide certain references for relevant researchers.

Keywords: Oversampling technology; Biomedical signal detection; Application strategies

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1. Introduction

To advance biomedical innovation, it is essential to strengthen support systems for both basic and applied basic research. This includes promoting original breakthroughs in core theoretical areas and key enabling technologies, particularly in cutting-edge fields. Strategic scientific and technological institutions, such as universities, research institutes, innovation platforms, and leading tech enterprises in Wuxi, are encouraged to deepen their presence in foundational biomedical disciplines and actively participate in major national initiatives and key R&D programs.

Support will be directed toward pre-clinical R&D of innovative medical devices and drugs with independent intellectual property, especially those addressing critical clinical and market needs. Emphasis will be placed on the development of core technologies in cell and gene therapy, modern traditional Chinese medicine, antibody and immune therapies, proteomics, metabolomics, synthetic biology, AI-driven drug discovery, isotope pharmaceuticals, as well as medical imaging, in-vitro diagnostics, intelligent healthcare, implants, surgical robotics, and skin health.

Priority will be given to high-tech research projects with strong industrial relevance and significant economic and social impact. A quarterly joint meeting system will be established to promote the integrated development of biomedical research institutions and enterprises in Wuxi. Medical and health institutions will be encouraged to

build cooperative mechanisms with universities, research organizations, and pharmaceutical leaders. Additionally, the development of integrated “industry–medicine–research–application” research hospitals or model wards will be supported, leveraging qualified medical institutions ^[1].

Researchers are expected to align with national policy guidelines and strategic development goals to better cultivate scientific talent and drive innovation.

2. Significance of oversampling technology in biomedical signal detection

2.1. Reconstructing the physiological signals’ temporal-spatial resolution boundary to achieve precise deconstruction of micro-pathological features

The transience of biomedical signals and tissue heterogeneity requires detection technologies to have sub-millisecond-level time-capturing capabilities and micron-level spatial-positioning accuracy. Taking neural electrical activity as an example, epileptic focus discharges often present as sharp-wave-spike-wave complexes with amplitudes in the μV range and durations in the millisecond range. Traditional devices are prone to aliasing high-frequency oscillations (HFOs) as baseline noise due to sampling rate limitations. However, oversampling technology can clearly separate the multiple-frequency components generated by the synchronous discharges of neuron clusters by increasing the sampling density, revealing their topological relationships with brain-region functional networks and providing electrophysiological markers beyond MRI morphological images for epileptic focus localization ^[2].

In hemodynamic monitoring, the reconstruction of the spatio-temporal trajectory of the pulse wave conduction depends on the precise analysis of the differences in pressure wave propagation speeds (such as primary waves and reflected waves). Oversampling technology, through high-frequency continuous acquisition and combined with multi-scale wavelet analysis, can separate the waveform distortions caused by micro-structural changes such as vascular wall elasticity and branch angles. This detailed description of hemodynamic details enables the early diagnosis of arteriosclerosis to shift from blood vessel lumen diameter measurement to the assessment of vascular wall mechanical properties. Furthermore, in cell calcium signal detection, oversampling technology can capture calcium spark events triggered by a single action potential. These events last only tens of milliseconds and have a spatial diffusion range of less than $10\ \mu\text{m}$. This super-resolution detection ability provides direct evidence for revealing pathological mechanisms such as abnormal excitation-contraction coupling in cardiomyocytes and changes in neuronal synaptic plasticity, promoting disease diagnosis from the organ/tissue level to sub-cellular functional units ^[3].

2.2. Solving the problem of cross-coupling of multimodal signals and constructing a full-dimensional digital mirror of physiological states

Modern medicine is evolving from single-parameter detection to the integration of multi-dimensional physiological atlases, and oversampling technology has become the core hub for achieving spatio-temporal decoupling of multimodal signals. In the field of wearable health monitoring, signals such as heart rate, blood oxygen, and motion artifacts severely overlap in the frequency domain. Traditional synchronous sampling leads to parameter interference due to insufficient sampling rates. However, oversampling technology can configure independent high-frequency acquisition modules for each channel, and combined with tensor decomposition and blind source separation algorithms, it can separate independent components such as PPG waveform modulation induced by respiration and baseline drift caused by motion, achieving precise decoupling of multiple parameters in

complex dynamic environments^[4]. This ability is particularly crucial in sleep apnea monitoring. By synchronously sampling electrocardiogram, respiration, and body movement signals, the system can distinguish between the different physiological response patterns caused by central sleep apnea (CSA) and obstructive events (OSA). The former is characterized by a sudden interruption of the respiratory drive signal, while the latter is accompanied by paradoxical chest-abdominal movements. This classification mechanism, based on the temporal characteristics of multimodal signals, increases the diagnostic accuracy by 40% compared to single-channel detection^[5].

In the intensive care scenario, oversampling technology promotes the transformation of hemodynamic monitoring from static parameter measurement to dynamic system modeling. By parallelly collecting multiple signals such as electrocardiogram, arterial pressure, and central venous pressure, and combined with dynamic mode decomposition and manifold learning algorithms, a low-dimensional dynamic model of the cardiovascular system can be constructed, revealing the differences in baroreceptor reflex arcs and volume regulation mechanisms in different types of shock (such as cardiogenic and septic shock), providing real-time decision-making support for individualized fluid resuscitation strategies^[6].

2.3. Driving the evolution of biomedical digital twins and forming a disease prediction-intervention closed-loop

The ultra-dense data stream generated by oversampling technology provides an accurate mapping from the physical world to the digital space for constructing high-fidelity biomedical digital twins. In the field of cardiac electrophysiology, high-density electrode arrays on the body surface are used for high-frequency oversampling. Combined with the boundary element method and deep neural networks, a three-dimensional spatio-temporal map of cardiac activation conduction can be reversely reconstructed. The resolution is sufficient to track the dynamic evolution of a single re-entry loop. This digital reproduction ability of arrhythmia mechanisms transforms radiofrequency ablation from an empirical operation to a precise intervention based on a virtual lesion model. In the monitoring of tumor immunotherapy, oversampling technology has promoted the construction of an early warning system for cytokine storms.

Through continuous high-frequency detection of key factors such as IL-6 and TNF- α using microfluidic chips, and combined with graph neural network analysis of the topological changes in the cytokine network, the critical point of immune response out-of-control can be identified in advance. The prediction model can not only capture the absolute changes in cytokine concentrations but also analyze the dynamic reconstruction of the synergistic/antagonistic relationships between signal molecules. This real-time modeling ability of the immune micro-environment evolution enables doctors to initiate interventions 8–12 hours before the occurrence of cytokine release syndrome (CRS). More profoundly, oversampling technology endows digital twins with self-evolution capabilities. By continuously accumulating individualized patient data, the algorithm can dynamically optimize model parameters, continuously improving the prediction accuracy of virtual organ responses to treatment over time, ultimately forming a complete “detection-modeling-intervention-feedback” closed-loop and promoting the transformation of medicine from passive treatment to proactive health management^[7].

3. Application strategies of oversampling technology in biomedical signal detection

3.1. Applications in electrophysiological signal detection

Users of oversampling technology can improve the detection accuracy and dynamic range by sampling at a rate

far exceeding the Nyquist frequency. For example, in electrocardiogram (ECG) signal detection, users can use a sampling rate of 200 kHz to sample a conventional 1 kHz-bandwidth signal 1024 times. This disperses the noise into the 0–512 kHz frequency band, while the signal energy is concentrated in the 0–1 kHz band ^[8]. The quantization error of 1 LSB (about 0.24 mV) in a traditional 12-bit ADC can minimize minor features such as P-waves and T-waves. However, current oversampling technology can improve the equivalent resolution through sampling superposition and digital filtering, better enabling the detection of ST-segment shifts and capturing pathological features. For example, a team from Tianjin University not only amplified the ECG signal above the quantization threshold of the ADC by superimposing a triangular-wave-shaped signal but also combined 1024-fold oversampling with moving-average filtering to expand the range of the ECG signal to ± 5 mV, effectively suppressing 50 Hz electromyographic noise.

In the coordination of oversampling and noise-shaping technology, their combination can increase the signal-to-noise ratio, which is then applied in epilepsy diagnosis. In implantable neural recording, oversampling technology, with a 16-bit ADC and 4096-fold oversampling, can increase the equivalent resolution to 20 bits while maintaining a power consumption level of μ W, meeting the detection requirements of action potentials (50–100 μ V) of visual cortex neurons for retinal prostheses. In the combination of oversampling and compressive sensing theory, sub-sampling of ECG signals can be achieved through random projection to meet the battery-life requirements of wearable ECG monitoring devices ^[9]. It can be seen that the applications of oversampling technology in electrophysiological signal detection are reflected in different aspects, and only by better developing and utilizing it can the needs of users be met ^[10].

3.2. Applications in biomedical imaging signal processing

Oversampling technology can break through the limitations of physical sampling and reconstruct signals, thus improving the ability of medical images to analyze the micro-structure and pathological features of biological tissues ^[11]. Oversampling technology can achieve rapid performance development through the following methods: First, the combination of oversampling technology and synthetic aperture focusing technology (SAFT) can reduce the resolution of ultrasonic pulses from 6.25 ns to 1.56 ns, improving the detection sensitivity of thyroid nodule imaging and facilitating better treatment. Second, in the lateral direction, the oversampling technology achieves 16-fold oversampling through the time-division excitation of the transmitting sub-arrays, which can be better applied to breast mass detection. Third, users can use complex-domain oversampling technology to better capture the amplitude and position information of echo signals, facilitating the location of hemangiomas and small liver cancers for better treatment. For example, in the field of elastography, users can reduce the measurement standard deviation of shear-wave velocity (SWV) through oversampling and SWV tracking, and better apply it to the grading of liver cirrhosis for better clinical medicine ^[12]. The applications of oversampling technology in biomedical imaging signal processing have expanded in different directions, and only by better using it can the efficiency of users be improved ^[13].

3.3. Applications in other biomedical signal detections

Human blood pressure exhibits multi-scale fluctuation characteristics in circadian rhythms, postural changes, and emotional stress. Traditional blood pressure monitoring devices, limited by sampling rates (usually < 200 Hz) and data compression mechanisms, have difficulty capturing the transient responses of baroreceptor reflex arc regulation (such as the 30 mmHg/s rapid pressure change caused by the Valsalva maneuver) and the subtle

distortions of pressure wave conduction (such as the 0.5-ms-level reflection time-delay difference at the aortic branch) ^[14]. Oversampling technology, by increasing the sampling rate to the kHz level and combined with the steep roll-off characteristics of anti-aliasing filters (blocking attenuation ≥ 80 dB/oct), can analyze the hidden dynamic features in blood pressure signals. In 24-hour dynamic monitoring, high-frequency sampling data can clearly record the sub-second-level transition process of blood pressure from the resting state to the stress state, revealing the real-time shift of the sympathetic-parasympathetic balance in autonomic nerve regulation.

This millisecond-level tracking ability of baroreceptor sensitivity (BRS) enables the analysis of blood pressure variability (BPV) to shift from static parameter statistics to dynamic system modeling. By extracting non-linear features such as the depth change of the pulse notch in the blood pressure waveform and the spatio-temporal distribution of the pulse wave velocity, oversampling technology can quantify the heterogeneity of the elastic modulus of the arterial tree, identifying the early signs of vascular remodeling 12–18 months earlier than traditional methods and providing biomarkers beyond mean arterial pressure for early warning of hypertensive target-organ damage. More importantly, the oversampling data stream supports the construction of a digital twin of the cardiovascular system. By performing multi-modal fusion analysis of continuous blood pressure signals with electrocardiogram and respiration signals, the closed-loop regulatory network of cardio-pulmonary coupling can be reconstructed, revealing the phase-locking relationship between respiratory sinus arrhythmia (RSA) and blood pressure fluctuations. This dynamic modeling ability of the neuro-humoral regulation mechanism enables cardiovascular risk assessment to shift from organ morphological judgment to physiological function network analysis ^[15].

4. Conclusion

This paper deeply explores the significance of oversampling technology in biomedical signal detection and its application strategies, aiming to provide certain references for relevant researchers, contribute to the development of this field, and encourage more people to join the research in this area.

Disclosure statement

The author declares no conflict of interest.

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Effectiveness of Remazolam Combined with Alfentanil for Fiberoptic Bronchoscopy in Elderly Debilitated Patients

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Abstract: *Objective:* To analyze the application value of remazolam compound alfentanil anesthesia regimen in fiberoptic bronchoscopy in elderly debilitated patients. *Methods:* Seventy-two cases of elderly debilitated patients who underwent fiberoptic bronchoscopy in the Department of Respiratory Medicine of a hospital from August 2023 to July 2024 were selected, and were divided into the control group and the observation group using the mean score method, with 36 cases in each group. In both groups, 7–10 µg/kg alfentanil was injected intravenously after oxygen denitration, and 1 min later propofol 1.5 mg/kg was given intravenously in the control group and remazolam 0.3 mg/kg was given intravenously in the observation group. Subsequently, mivacurium chloride 0.1mg/kg IV was given to both groups. Propofol 5mg/(kg-h) was given in the control group and remazolam 0.5mg/(kg-h) was given intravenously pumped in the observation group during anesthesia maintenance. Changes in vital signs such as HR, MAP and SpO₂ and the occurrence of adverse reactions were recorded in the two groups before anesthesia administration (T₁), at the moment of placing fiberoptic bronchoscope (T₂), at the moment of placing the tracheal tube (T₃), and at 1 min after placing the tracheal tube (T₄). *Results:* Compared with T₁, patients in the observation group had lower MAP at T₂, T₃, T₄ and lower SpO₂ at T₃, T₄ ($P < 0.05$); in the control group, HR slowed down at T₂, T₃, T₄ and MAP and SpO₂ decreased at T₂, T₃, T₄ ($P < 0.05$). SpO₂ at T₃ and T₄ was lower in both groups compared with that at T₂ ($P < 0.05$). SpO₂ at T₄ was lower in the control group compared with that at T₃ ($P < 0.05$). Compared with the control group, patients in the observation group suffered from increased HR and elevated MAP at T₂, T₃, and T₄, and increased SpO₂ at T₃ and T₄ ($P < 0.05$). The incidence of intraoperative hypotension and bradycardia in the observation group was lower than that in the control group, and the difference was statistically significant ($P < 0.05$). The incidence of intraoperative choking and coughing, postoperative hypoxemia, nausea and vomiting, and dizziness were found in the patients of both groups, drowsiness and other adverse reactions incidence rate comparison, the difference are not statistically significant ($P > 0.05$). *Conclusion:* Remazolam and alfentanil are used in fiberoptic bronchoscopy for elderly debilitated patients with remarkable effect, which can effectively improve the vital signs of patients, reduce the risk of intraoperative hypotension, bradycardia, and other adverse reactions, and have high anesthetic effectiveness and safety.

Keywords: Debility; Elderly; Alfentanil; Remazolam; Fiberoptic bronchoscopy

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1. Introduction

Fiberoptic bronchoscopy is an important means for the diagnosis and treatment of respiratory diseases. However, as a highly irritating and invasive operation, it can cause strong airway reactions and dramatic fluctuations in hemodynamics, often triggering adverse reactions such as choking, nausea, bradycardia, etc. in patients ^[1]. Due to the poor tolerance of elderly debilitated patients, the risk of associated complications is higher. Therefore, it is important to find a safe and effective sedation and analgesia regimen suitable for elderly debilitated patients. Although traditional propofol sedative drugs can provide some sedative effect, there are adverse effects such as respiratory depression and circulatory fluctuations, and the metabolism of elderly patients slows down, which makes them prone to drug accumulation and increases the risk ^[2]. In recent years, remazolam, as a new type of benzodiazepine, has the advantages of fast onset of action, rapid metabolism, easy to regulate the depth of sedation, and less impact on the respiratory circulation, and has been gradually applied to the field of clinical anesthesia and sedation ^[3]. As an ultra-short-acting opioid, alfentanil has a strong analgesic effect, rapid onset of action, and short duration of action, which can synergistically enhance the effect of sedation and analgesia, reduce the respective dosage, and decrease the incidence of adverse reactions when combined with remazolam ^[4]. Currently, there are few studies on the use of remazolam combined with alfentanil for fiberoptic bronchoscopy in elderly debilitated patients, and this study aims to investigate the effectiveness and safety of this regimen and provide a reference basis for the clinic.

2. Information and methods

2.1. General information

Seventy-two cases of elderly debilitated patients who underwent fiberoptic bronchoscopy in the Department of Respiratory Medicine of a hospital in August 2023–July 2024 are selected and divided into a control group and an observation group, 36 cases each, using the mean score method. In the control group, there are 20 males and 16 females, aged 65–83 (72.3 ± 5.8) years, BMI (22.1 ± 2.3) kg/m², ASA classification: 23 cases of grade II and 13 cases of grade III. The proportion of combined hypertension was 58.3%, the proportion of combined diabetes mellitus was 36.1%, the proportion of combined COPD was 41.7%, and the preoperative pulmonary function test showed FEV1/FVC ratio (0.62 ± 0.08) and oxygenation index PaO₂/FiO₂ (285 ± 35) mmHg. In the observation group, there were 22 males and 14 females, with an age of 67–85 (73.1 ± 6.2) years old, BMI (21.8 ± 2.5) kg/m², 21 cases of ASA class II, and 15 cases of class III. The proportion of combined hypertension was 61.1%, combined diabetes was 33.3%, and combined COPD was 44.4%. Preoperative pulmonary function tests showed FEV1/FVC ratio (0.60 ± 0.09) and oxygenation index PaO₂/FiO₂ (278 ± 40) mmHg. Comparison of the general data of the patients in the two groups did not show any statistically significant difference ($p > 0.05$). The study protocol is approved by the Medical Ethics Committee of our hospital, and all patients voluntarily signed a written informed consent.

The inclusion criteria are: (1) Age ≥ 65 years and meeting Fried's criteria for the debilitating phenotype (including ≥ 3 features such as weight loss, decreased grip strength, and slowed gait speed); (2) American Society of Anesthesiologists (ASA) classification II–III ^[5]; and (3) Diagnostic or therapeutic fiberoptic bronchoscopy was required. Meanwhile, the exclusion criteria include: (1) those with combined severe hepatic and renal insufficiency (Child-Pugh class C or eGFR < 30 ml/min); (2) those with a history of drug allergy; (3) those with recent use of sedative and analgesic medications; (4) those with cognitive dysfunction who were unable to cooperate with the assessment.

2.2. Methodology

All patients are fasted for 8 h and 4 h before surgery, and heart rate (HR), mean arterial pressure (MAP), and blood oxygen saturation (SpO₂) are monitored after admission to the room, peripheral venous access is established, and crystalloid is infused with 10 mL/kg⁻¹/h⁻¹. A reinforced tracheal tube (inner diameter: 6.5–7.0 mm for men and 6.0–6.5 mm for women) and fiberoptic bronchoscope are externally coated with sterile liquid paraffin for backup. No preoperative medication is administered before induction of anesthesia, and after oxygen denitrication treatment, all patients were slowly injected intravenously with 7–10 µg/kg alfentanil (Yichang Renfu Pharmaceutical Co., Ltd., batch no. 33S070111, specification 2 mL: 1 mg) within 30 s. After 1 min, propofol 1.5 mg/kg is given intravenously in the control group, and remazolam (Yichang Renfu Pharmaceutical Co., Ltd.) is given in the observation group. 0.3 mg/kg intravenously.

Subsequently, 0.1mg/kg mivacurium chloride (GSK, Germany) is given intravenously in both groups. When the BIS value reached 40–60, and the respiratory line is connected for mechanical ventilation to maintain PETCO₂ at 35–45 mmHg. During the anesthesia maintenance period, the observation group is continuously pumped with remazolam (0.5 mg/kg/h), and the control group is pumped with propofol (5 mg/kg/h) to maintain the BIS value of 40–60. At the end of the examination, the remazolam or propofol drug pumping is stopped and the patient is transferred to the anesthesia recovery room (PACU). When the patient was awake, PETCO₂ < 45 mmHg, and SpO₂ > 90%, he or she is pulled for mask oxygenation (6–8L/min) and transferred to the ward accompanied by family members. In case of bradycardia (heart rate < 50 beats/min), intravenous atropine (0.3–0.5mg) is administered. In case of hypotension (systolic blood pressure decreased more than 30% of the basal value or < 90mmHg), norepinephrine (8–16µg) is administered.

2.3. Observation indicators

Observation Records Patients Record the changes of vital signs such as HR, MAP and SpO₂ in the two groups before anesthesia administration (T₁), immediately after placement of fiberoptic bronchoscope (T₂), immediately after placement of tracheal tube (T₃) and 1min after placement of tracheal tube (T₄). The changes of hypotension, bradycardia, choking, postoperative hypoxemia, nausea and vomiting, and dizziness during the induction period of anesthesia, dizziness, drowsiness, and other adverse reactions during the induction period of anesthesia are recorded.

2.4. Statistical methods

SPSS23.0 software is applied for statistical analysis, and the measurement information is expressed as mean ± standard deviation ($\bar{x} \pm s$), and t-test is used for comparison, and the count information is expressed as rate (%), and χ^2 test is used for comparison, and $P < 0.05$ is taken as statistically significant difference.

3. Results

3.1. Changes in vital signs in both groups

Compared with T₁, patients in the observation group had lower MAP at T₂, T₃, T₄, and lower SpO₂ at T₃, T₄ ($P < 0.05$); and patients in the control group had slower HR at T₂, T₃, T₄, and lower MAP and SpO₂ at T₂, T₃, T₄ ($P < 0.05$). SpO₂ at T₃ and T₄ was lower in both groups compared with that at T₂ ($P < 0.05$). SpO₂ at T₄ was lower in the control group compared with that at T₃ ($P < 0.05$). Compared with the control group, patients in the observation group

suffered from increased HR and elevated MAP at T₂, T₃, and T₄, and elevated SpO₂ at T₃ and T₄ ($P < 0.05$). **Table 1** shows the results in detail.

Table 1. Changes in vital signs at different anesthesia time nodes in both groups ($\bar{x} \pm s$)

| Groups | Timing | HR (times/minute) | MAP (mmHg) | SpO ₂ (%) |
|------------------------------|----------------|----------------------------|-----------------------------|-----------------------------|
| Control group ($n=36$) | T ₁ | 81.42 ± 12.47 | 79.45 ± 8.39 | 98.66 ± 0.61 |
| | T ₂ | 73.16 ± 11.55 ^a | 70.34 ± 6.21 ^a | 97.70 ± 0.63 ^a |
| | T ₃ | 72.36 ± 11.85 ^a | 69.84 ± 7.12 ^a | 96.14 ± 1.23 ^{ab} |
| | T ₄ | 71.69 ± 12.34 ^a | 68.43 ± 5.44 ^a | 93.25 ± 2.91 ^{abc} |
| Observation group ($n=36$) | T ₁ | 81.49 ± 12.52 | 78.57 ± 8.58 | 98.57 ± 0.72 |
| | T ₂ | 79.56 ± 11.78 ^d | 74.53 ± 6.41 ^{ad} | 98.20 ± 1.09 |
| | T ₃ | 78.85 ± 12.23 ^d | 74.091 ± 7.13 ^{ad} | 97.23 ± 0.85 ^{abd} |
| | T ₄ | 78.19 ± 12.06 ^d | 72.46 ± 6.53 ^{ad} | 97.01 ± 0.91 ^{abd} |

Note: Compared with T₁, ^a $P < 0.05$; compared with T₂, ^b $P < 0.05$; compared with T₃, ^c $P < 0.05$; compared with control group, ^d $P < 0.05$.

3.2. Comparison of the occurrence of adverse reactions between the two groups of patients

The incidence of intraoperative hypotension and bradycardia in patients of the observation group was lower than that in the control group, and the difference was statistically significant ($P < 0.05$); the two Comparison of the incidence of adverse reactions such as intraoperative choking, postoperative hypoxemia, nausea and vomiting, dizziness and drowsiness in patients of the group, the differences were not statistically significant ($P > 0.05$), see **Table 2**.

Table 2. Comparison of the incidence of adverse reactions between the two groups of patients [n (%)]

| Groups | Intraoperative hypotension | Bradycardia | Intraoperative choking | Postoperative hypoxemia |
|------------------------------|-----------------------------------|-------------------------|------------------------|-------------------------|
| Control group ($n=36$) | 14 (38.89) | 10 (27.78) | 6 (16.67) | 6 (16.67) |
| Observation group ($n=36$) | 4 (11.11) | 3 (8.33) | 3 (8.33) | 4 (11.11) |
| χ^2 | 7.407 | 4.599 | 0.508 | 0.465 |
| P | 0.007 | 0.032 | 0.476 | 0.496 |
| Groups | Postoperative nausea and vomiting | Postoperative dizziness | Drowsiness | |
| Control group ($n=36$) | 5 (13.89) | 7 (19.44) | 3 (8.33) | |
| Observation group ($n=36$) | 3 (8.33) | 6 (16.67) | 2 (5.56) | |
| χ^2 | 0.141 | 0.094 | 0.000 | |
| P | 0.708 | 0.760 | 1.000 | |

4. Discussion

Elderly debilitated patients' tolerance to invasive operations is significantly reduced due to multiple organ function

decline, reduced metabolic capacity and complex coexisting diseases^[5]. Fiberoptic bronchoscopy, as an important means of diagnosis and treatment of respiratory diseases, may induce severe choking, hemodynamic fluctuations, and hypoxemia, further increasing the cardiopulmonary burden due to its irritation and uncertainty of operation time^[6]. Existing anesthesia protocols are mostly designed based on the general patient population, whereas elderly debilitated patients have significant differences in drug sensitivity and pharmacokinetics, and routine administration of drugs may increase the risk of hypotension and bradycardia^[7]. Therefore, the management of anesthesia in this population requires a balance between deep sedation and safety to avoid adverse events caused by drug accumulation or respiratory depression. Alfentanil is ideal for suppressing choking during airway maneuvers because its half-life is similar to the length of the examination and its respiratory depression is less severe than that of other opioids^[8].

In contrast, although propofol is widely used for sedation, its respiratory and circulatory depressant effects are more pronounced and may increase cardiopulmonary burden, especially in elderly or debilitated patients^[9]. In recent years, remazolam has been gaining attention for its favorable safety profile^[10]. Studies have shown that in upper gastrointestinal endoscopy, the respiratory and circulatory depressant effects of remazolam are significantly lower than those of propofol, and the incidence of injection pain is much lower, providing a more comfortable anesthetic experience for the patient^[11]. However, the potential synergistic effects of remazolam in combination with opioids need to be guarded against, which may lead to myocardial depression and a decrease in arterial pressure, with some patients requiring antihypertensive drugs to maintain hemodynamic stability.

Further studies have also confirmed that the combination of remazolam and opioids significantly decreases mean arterial pressure (MAP) and heart rate (HR), suggesting the need for increased monitoring and timely intervention in the clinic^[12]. The results of this study showed that MAP decreased at T₂, T₃, T₄ and SpO₂ decreased at T₃, T₄ in patients of the observation group compared with those at T₁ ($P < 0.05$); HR slowed down at T₂, T₃, T₄ in the control group, and MAP and SpO₂ decreased at T₂, T₃, T₄ ($P < 0.05$). SpO₂ at T₃ and T₄ was lower in both groups compared with that at T₂ ($P < 0.05$). SpO₂ at T₄ was lower in the control group compared with that at T₃ ($P < 0.05$). Compared with the control group, patients in the observation group suffered from increased HR and elevated MAP at T₂, T₃, and T₄, and elevated SpO₂ at T₃ and T₄ ($P < 0.05$). The differences in the incidence of adverse reactions, such as intraoperative choking and coughing, postoperative hypoxemia, nausea and vomiting, dizziness, and somnolence, were not statistically significant when compared with the incidence of adverse reactions in the observation group ($P > 0.05$). The incidence of intraoperative hypotension and bradycardia in patients of the observation group was lower than that of the control group, and the difference was statistically significant ($P < 0.05$).

5. Conclusion

In conclusion, remazolam combined with alfentanil has less hemodynamic effects on elderly debilitated patients undergoing fiberoptic bronchoscopy, with mild respiratory depression and a lower incidence of adverse effects, making it a safer and more effective anesthetic regimen, and it is recommended to be promoted in geriatric surgical care.

Disclosure statement

The authors declare no conflict of interest.

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Impact of Spiritual Care Nursing Based on the “Four-full Framework” on Liver Cancer Patients

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Abstract: *Objective:* To explore the impact of spiritual care nursing based on the “Four-full Framework” (whole-person, whole-process, whole-department, whole-society) on the spiritual status, psychological distress, and quality of life of liver cancer patients. *Methods:* A total of 120 terminally ill liver cancer patients admitted to the hospital from January 2022 to December 2023 were divided into a control group (60 cases, receiving routine nursing) and an observation group (60 cases, receiving routine nursing plus spiritual care nursing based on the four-full framework) according to their admission order. Both groups were intervened for 4 consecutive weeks. The two groups were compared in terms of death attitude, spiritual status, psychological distress, and quality of life. *Results:* After intervention, the observation group had lower scores in death avoidance, death fear, escape acceptance, and psychological distress, while higher scores in natural acceptance, approach acceptance, all dimensions of spiritual status, psychological resilience, and all aspects of quality of life compared with the control group, with statistically significant differences ($P < 0.05$). *Conclusion:* Spiritual care nursing based on the four-full framework can effectively help terminally ill liver cancer patients face death positively, improve their spiritual status, reduce psychological distress, and enhance their quality of life.

Keywords: Four-full framework; Spiritual care nursing; Liver cancer; Spiritual status; Psychological distress; Quality of life

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1. Introduction

Liver cancer is a malignant tumor originating in liver tissue, primarily caused by hepatitis B and C viruses. Most patients are diagnosed at advanced stages, severely affecting their prognosis^[1, 2]. Reports show that its incidence has risen to the 4th highest among all malignant tumors in China, with a mortality rate ranking 2nd, posing a serious threat to patients' lives^[3]. Clinical treatments for liver cancer mainly include hepatectomy, interventional therapy, chemotherapy, and immunotherapy^[4]. However, terminally ill patients often suffer from complex symptoms due to physical debilitation and multiple cancer metastases, with incurable conditions. Influenced by

factors such as cancer pain, drug side effects, guilt toward family, and the awareness of impending death, they are prone to negative emotions, significantly reducing their quality of life ^[5]. Therefore, targeted spiritual care is necessary for such patients. Nursing intervention based on the “four-full framework” refers to a holistic care model integrating physical, psychological, social, and spiritual dimensions, which has been partially applied in clinical nursing for cancer patients and can effectively improve their quality of life ^[6, 7]. Spiritual care nursing is a model that implements relevant interventions based on spiritual health theories to enhance patients’ mental health, helping them find meaning in life and improve their hope ^[8]. To explore more effective intervention models for clinical nursing of liver cancer patients, this study investigated the impact of spiritual care nursing based on the four-full framework on their spiritual status, psychological distress, and quality of life.

2. Materials and methods

2.1. General data

The study period is conducted from January 2022 to December 2023. A total of 120 liver cancer patients admitted to the hospital are divided into a control group and an observation group (60 cases each) according to their admission order. There were no statistically significant differences in general data between the two groups ($P > 0.05$), indicating comparability (**Table 1**). This study is approved by the hospital’s ethics committee.

Table 1. Comparison of general data between groups

| Group | Gender (Male/ Female, n) | Age (x±s, years) | Lesion diameter (x±s, cm) | Marital status (n) | | Educational level (n) | | |
|-----------------------|--------------------------------|---------------------|---------------------------------|--------------------|------------------------|------------------------------------|--|----------------------|
| | | | | Married | Unmarried/ Divorced | Junior high school and below | Secondary technical/ High school | College and above |
| Observation (n=60) | 37/23 | 55.25 ± 6.58 | 6.83 ± 1.21 | 49 | 11 | 19 | 17 | 24 |
| Control (n=60) | 32/28 | 54.35 ± 6.42 | 7.05 ± 1.37 | 52 | 8 | 21 | 19 | 20 |
| χ^2/t | 0.853 | 0.758 | 0.932 | 0.563 | 0.575 | | | |
| P | 0.356 | 0.45 | 0.353 | 0.453 | 0.75 | | | |

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

- (1) Diagnosed with primary liver cancer at terminal stage according to clinical standards ^[9].
- (2) Mentally clear and able to communicate normally.
- (3) Not participating in other similar clinical studies.
- (4) Patients or family members voluntarily enrolled and signed informed consent.

2.2.2. Exclusion criteria

- (1) Severe organ failure (brain, heart, kidney, etc.).
- (2) Cognitive impairment
- (3) Illiterate
- (4) Withdrew midway or died during the study

- (5) Expected survival <30 days

2.3. Methods

The control group received routine nursing, including:

- (1) Health education: Providing basic health education after admission, verbally explaining liver cancer-related knowledge, treatment plans, and daily precautions to enhance self-understanding and management, along with dietary guidance.
- (2) Medication nursing: Instructing and supervising patients to take medications as prescribed, promptly reporting adverse reactions, monitoring vital signs, and notifying physicians for obvious discomfort.
- (3) Psychological intervention: Face-to-face communication at least once a week (about 20 minutes each time) to understand patients' inner feelings and provide guidance for poor mental states.

The observation group, however, received routine nursing plus spiritual care nursing based on the four-full framework.

- (1) Physical care: Strengthening communication with patients (2–3 face-to-face interactions weekly), assessing cancer pain scientifically, and relieving pain through scheduled medication, distraction, music therapy, and physical therapy following the three-step analgesic ladder principle; Creating a quiet and comfortable ward environment, providing personalized dietary guidance with high-protein and easily digestible meals to ensure nutritional support.
- (2) Psychological care: Monitoring emotional changes daily, communicating with patients in a friendly and patient manner, encouraging them to express their thoughts, and organizing peer support meetings; Using WeChat, Douyin, etc., to record daily experiences, while advising family members to accept reality, provide companionship, help set and achieve goals, and maintain a meaningful life.
- (3) Social support: Establishing hospice care wards with professional nursing teams and comprehensive medical equipment to provide all-around social support. Training family and friends on visiting skills to offer positive spiritual support and help patients fulfill unmet wishes.
- (4) Spiritual care: Encouraging patients to recall meaningful life experiences to recognize their value; Conducting death education (twice weekly) via films, discussions, and reading materials to foster a healthy attitude toward death; Supporting religious practices for patients with faith to provide spiritual comfort.

Both groups are intervened for 4 weeks.

2.4. Observation indicators

- (1) Death attitude: Assessed using the Death Attitude Profile Scale before and after intervention, including five dimensions: death avoidance, death fear, escape acceptance, natural acceptance, and approach acceptance (scored 1–5, higher scores indicating stronger tendency) ^[10].
- (2) Spiritual status: Evaluated using the Functional Assessment of Chronic Illness Therapy-Spiritual Scale, covering three dimensions (meaning, belief, peace), with 0–4 points per item (total 48 points, higher scores indicating better spiritual health) ^[11].
- (3) Psychological distress: Measured by the Distress Thermometer (0–10 points, ≥ 4 indicating significant distress) and Psychological Resilience Scale (0–40 points, higher scores indicating stronger resilience) ^[12,13].
- (4) Quality of life: Assessed using the WHO Quality of Life Scale, including six domains (psychological, physical, environmental, social relations, overall quality of life, and overall health status), with scores

calculated as the average of items $\times 4$ (higher scores indicating better quality of life)^[14].

2.5. Statistical analysis

Data are analyzed using SPSS 23.0. Measurement data (e.g., clinical characteristics, attitude scores) are expressed as ($\bar{x} \pm s$) and compared via t-test. Count data are expressed as n (%) and analyzed via χ^2 test. A two-tailed $P < 0.05$ was considered statistically significant.

3. Results

3.1. Comparison of death attitudes

After intervention, the observation group had lower scores in death avoidance, death fear, and escape acceptance, and higher scores in natural acceptance and approach acceptance compared with the control group ($P < 0.05$), as seen in **Table 2**.

Table 2. Comparison of death attitudes ($\bar{x} \pm s$, points)

| Group | Time | Observation (n=60) | Control (n=60) | t | P |
|---------------------|-------------------|--------------------|-------------------|-------|-------|
| Death avoidance | Pre-intervention | 20.82 \pm 3.16 | 20.57 \pm 3.13 | 0.435 | 0.664 |
| | Post-intervention | 16.77 \pm 2.82a | 18.33 \pm 3.04a | 2.914 | 0.004 |
| Death fear | Pre-intervention | 30.25 \pm 4.11 | 30.57 \pm 4.13 | 0.425 | 0.671 |
| | Post-intervention | 24.83 \pm 3.49a | 26.65 \pm 3.62a | 2.804 | 0.006 |
| Escape acceptance | Pre-intervention | 21.87 \pm 2.43 | 22.03 \pm 2.51 | 0.355 | 0.723 |
| | Post-intervention | 18.35 \pm 2.18a | 19.40 \pm 2.25a | 2.596 | 0.011 |
| Natural acceptance | Pre-intervention | 14.77 \pm 2.53 | 14.55 \pm 2.51 | 0.478 | 0.633 |
| | Post-intervention | 19.68 \pm 2.93a | 18.28 \pm 2.86a | 2.648 | 0.009 |
| Approach acceptance | Pre-intervention | 30.65 \pm 4.74 | 31.42 \pm 4.76 | 0.888 | 0.376 |
| | Post-intervention | 39.57 \pm 5.56a | 37.08 \pm 5.44a | 2.48 | 0.015 |

*Note: aP<0.05 vs. pre-intervention in the same group.

3.2. Comparison of spiritual status

After intervention, all spiritual status scores increased in both groups ($P < 0.05$), with more significant improvements in the observation group ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of spiritual status ($\bar{x} \pm s$, points)

| Group | Meaning | | Belief | | Peace | |
|--------------------|-----------------|-------------------|------------------|-------------------|-----------------|------------------|
| | Pre | Post | Pre | Post | Pre | Post |
| Observation (n=60) | 9.25 \pm 1.63 | 11.75 \pm 1.93a | 10.17 \pm 1.66 | 12.18 \pm 1.52a | 5.60 \pm 0.95 | 8.03 \pm 1.47a |
| Control (n=60) | 9.07 \pm 1.61 | 10.88 \pm 1.87a | 9.87 \pm 1.64 | 11.53 \pm 1.45a | 5.85 \pm 0.98 | 7.25 \pm 1.39a |
| t | 0.609 | 2.508 | 0.996 | 2.397 | 1.419 | 2.986 |
| P | 0.544 | 0.013 | 0.321 | 0.018 | 0.159 | 0.003 |

*Note: aP<0.05 vs. pre-intervention in the same group.

3.3. Comparison of psychological distress

The observation group had lower distress thermometer scores and higher psychological resilience scores than the control group after intervention ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of psychological distress ($\bar{x} \pm s$, points)

| Group | Distress thermometer | | Psychological resilience | |
|------------------------|----------------------|------------------|--------------------------|-------------------|
| | Pre | Post | Pre | Post |
| Observation ($n=60$) | 6.88 ± 0.86 | $5.43 \pm 0.68a$ | 21.67 ± 3.34 | $32.85 \pm 4.68a$ |
| Control ($n=60$) | 7.03 ± 0.91 | $5.85 \pm 0.71a$ | 22.15 ± 3.38 | $30.63 \pm 4.47a$ |
| <i>t</i> | 0.928 | 3.309 | 0.782 | 2.657 |
| <i>P</i> | 0.355 | 0.001 | 0.436 | 0.009 |

*Note: $aP < 0.05$ vs. pre-intervention in the same group.

3.4. Comparison of quality of life

The observation group had significantly higher scores in all quality of life domains than the control group after intervention ($P < 0.05$), as shown in **Table 5**.

Table 5. Comparison of quality of life ($\bar{x} \pm s$, points)

| Group | Time | Observation ($n=60$) | Control ($n=60$) | <i>t</i> | <i>P</i> |
|-------------------------|------|------------------------|--------------------|----------|----------|
| Psychological | Pre | 5.05 ± 0.76 | 5.13 ± 0.77 | 0.573 | 0.568 |
| | Post | $8.40 \pm 1.28a$ | $7.83 \pm 1.04a$ | 2.677 | 0.008 |
| Physical | Pre | 5.23 ± 0.79 | 5.47 ± 0.82 | 1.633 | 0.105 |
| | Post | $8.83 \pm 1.35a$ | $8.25 \pm 1.27a$ | 2.424 | 0.017 |
| Environmental | Pre | 6.43 ± 0.97 | 6.21 ± 0.94 | 1.262 | 0.21 |
| | Post | $10.42 \pm 1.68a$ | $9.70 \pm 1.55a$ | 2.44 | 0.016 |
| Social relations | Pre | 4.48 ± 0.55 | 4.62 ± 0.57 | 1.369 | 0.174 |
| | Post | $9.28 \pm 1.42a$ | $8.62 \pm 1.31a$ | 2.646 | 0.009 |
| Overall quality of life | Pre | 5.47 ± 0.81 | 5.25 ± 0.79 | 1.506 | 0.135 |
| | Post | $8.93 \pm 1.37a$ | $8.40 \pm 1.29a$ | 2.182 | 0.031 |
| Overall health status | Pre | 5.15 ± 0.78 | 5.02 ± 0.75 | 0.931 | 0.354 |
| | Post | $8.58 \pm 1.29a$ | $8.05 \pm 1.23a$ | 2.303 | 0.023 |

*Note: $aP < 0.05$ vs. pre-intervention in the same group.

4. Discussion

Studies have shown that terminally ill cancer patients face enormous physical and psychological pain due to their condition, and as death approaches, their physiological and psychological stress responses gradually intensify, leading to a sharp decline in their quality of life and suffering in their remaining days^[15]. To effectively alleviate the physical and psychological pain of terminally ill cancer patients and enable them to spend each day with dignity in their final moments, there is an urgent need to find more scientific and reasonable clinical nursing

solutions. Conventional nursing models for cancer patients often focus only on symptom improvement, resulting in single-dimensional nursing measures and suboptimal intervention effects^[16]. Spiritual care nursing based on the “Four Wholes Framework” is a new nursing model that provides more comprehensive spiritual care to patients through four dimensions: physical, psychological, social, and spiritual, significantly improving their physical and mental health and thus their quality of life^[17].

The results of this study show that compared with the control group, the observation group had lower scores in death avoidance, death fear, and escape acceptance on the Death Attitude Description Scale after intervention, while scoring higher in natural acceptance and approach acceptance. This indicates that spiritual care nursing based on the “Four Wholes Framework” can effectively alleviate the fear of death in terminally ill liver cancer patients and help them gradually accept and face death. Terminally ill liver cancer patients often have a strong fear of death due to the dual influence of physical and psychological pain, leading to irrational perceptions of life and death, and thus enormous mental stress^[18]. In this study, the “Four Wholes Framework”-based spiritual care nursing provided multi-faceted nursing interventions such as psychological intervention, social support, and spiritual care. On the one hand, it effectively alleviated their negative emotions and psychological stress responses, thereby reducing their fear of death. On the other hand, it helped patients establish correct views on life and death, enabling them to face death with a more positive attitude and spend their final days meaningfully.

This study also shows that compared with the control group, the observation group had higher scores in all dimensions of spiritual health and psychological resilience, and lower scores in psychological distress, indicating that implementing “Four Wholes Framework”-based spiritual care nursing for terminally ill liver cancer patients can effectively improve their spiritual health and psychological resilience while reducing their psychological pain. Spiritual health is a mental state of harmonious connection with society, others, and nature, rooted in an individual’s affirmation of self-worth and the meaning of life, with inherent strength. This state focuses on the individual’s subjective experience of thoughts, beliefs, and inner emotions, and a higher level of spiritual health helps improve patients’ physical and mental health^[19]. In this study, the spiritual care nursing based on the “Four Wholes Framework” provided spiritual-level nursing interventions to help patients recognize their own value, rediscover the meaning of life, and establish a positive outlook on life, thereby maintaining inner peace before death and improving their spiritual health.

Additionally, by providing psychological care and social support, this study helped patients effectively reduce physical and psychological discomfort, while making them feel the warmth from family, friends, and society, maintaining a positive mental state, thereby enhancing their psychological resilience and reducing psychological pain. In this study, the observation group had higher scores in all aspects of quality of life after intervention compared with the control group, suggesting that “Four Wholes Framework”-based spiritual care nursing helps improve the quality of life of terminally ill liver cancer patients, which may be related to the reduction in psychological pain and the improvement in spiritual health after intervention. Zhang *et al.* found that implementing physical-psychological-social-spiritual nursing for terminally ill cancer patients significantly improved their mental health and quality of life, corroborating the results of this study^[20].

5. Conclusion

In conclusion, implementing “Four Wholes Framework”-based spiritual care nursing for liver cancer patients can effectively alleviate their fear and avoidance of death, improve their spiritual health and psychological resilience,

reduce their psychological pain, and enhance their quality of life.

Disclosure statement

The authors declare no conflict of interest.

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Application and Effects of Lean Management in the Management of Flexible Endoscopes

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Abstract: *Objective:* To evaluate the application value of lean management in the management of flexible endoscopes. *Methods:* From January to December 2023, routine management was implemented, and 200 flexible endoscopes used for examination and treatment were included in the control group; from January to December 2024, lean management was implemented, and 200 flexible endoscopes used for examination and treatment were included in the observation group. The average daily usage frequency, management effectiveness, and failure rate of flexible endoscopes were compared between the two groups. *Results:* The average daily usage frequency of flexible endoscopes in the observation group was higher than that in the control group ($P < 0.05$); the 3S retrieval rate and spot-check qualification rate of endoscopes in the observation group were higher than those in the control group ($P < 0.05$); the failure rate of flexible endoscopes in the observation group was lower than that in the control group ($P < 0.05$). *Conclusion:* Implementing lean management during the management of flexible endoscopes can improve the efficiency of endoscope retrieval, increase the average daily usage frequency of flexible endoscopes, and reduce endoscope failures.

Keywords: Flexible endoscope; Lean management; Management effectiveness

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1. Introduction

Flexible endoscopes are characterized by their flexibility, softness, and versatility, including bronchoscopes, gastroscopes, etc. However, flexible endoscopes are slightly more expensive. Due to the continuous increase in the number of patients undergoing endoscopic diagnosis and treatment, the difficulty of capital turnover in medical institutions has increased. Therefore, attention should be paid to the management of flexible endoscopes, ensuring proper cleaning and disinfection, and improving the operating efficiency of flexible endoscopes as much as possible. However, improper management of flexible endoscopes can lead to problems such as pollution and equipment damage, resulting in increased maintenance costs and wasted medical resources^[1]. Conventional flexible endoscope management has issues such as irregular cleaning and disinfection procedures and incomplete

quality control measures. Lean management is a modern management strategy that requires managers to strive for excellence in every detail of their work. It can scientifically allocate medical resources and improve work efficiency, featuring practicality and inclusivity ^[2]. This article explores the value of lean management using 200 flexible endoscopes in 2023 and 200 flexible endoscopes in 2024 as samples.

2. Materials and methods

2.1. Materials

From January to December 2023, 200 flexible endoscopes for examination and treatment were included in the observation group under routine management. From January to December 2024, 200 flexible endoscopes for examination and treatment were included in the control group under lean management. Inclusion criteria: flexible endoscopes purchased within 6 years; complete records of endoscope manufacturers, usage, cleaning, and disinfection. Exclusion criteria: endoscopes meeting scrap standards; endoscopes purchased over 6 years ago.

2.2. Methods

2.2.1. Observation group

(1) Cultivating lean management awareness:

Regularly organize training for flexible endoscope managers to master lean management methods and stimulate their lean management awareness. Require managers to start with small things and strive for excellence in handling work details. Complete lean management knowledge training, combine it with clinical work situations, improve the flexible endoscope management process, and require all managers to participate in management to provide a basis for later management.

(2) Building a team:

The head nurse serves as the team leader, urging the orderly progress of various flexible endoscope management tasks; instrument nurses and cleaning nurses are team members, responsible for maintenance, cleaning and disinfection, recording endoscope usage and maintenance, etc.

(3) Implementing lean management measures:

(a) Sorting: Endoscope engineers detect all flexible endoscopes in medical institutions, immediately report losses for those with unrepairable faults, obsolete endoscopes, and long-unused endoscopes; timely repair endoscopes with repair value and complete numbering according to the endoscope type.

(b) Rectification: Reasonably plan the placement position of the flexible endoscope, make identifications for convenient location later. Design a material verification table and post it at the entrance of the endoscope storage department. Locate and store each endoscope, such as storing flexible endoscopes by zone according to laryngoscope, bronchoscope, enteroscope, gastroscope, and therapeutic endoscope, and assign a zone leader to manage the endoscope. Additionally, number all endoscopes and store them according to the number after clinical use to ensure consistency between the material verification table and the actual storage location of the endoscope.

(c) Cleaning: Regularly clean the endoscope workplace, immediately report any abnormalities of flexible endoscope equipment to prevent pollution. Perform bedside cleaning immediately after using the flexible endoscope, wipe the external dirt with an enzyme-containing gauze, continuously send water and air for 10s, change the waterproof cap, and then complete cleaning and disinfection

work according to the department's "Endoscope Cleaning and Disinfection Technical Operation Specifications", and draw an operation flowchart for operators to learn. Maintain the endoscope once a week, observe whether the flexible endoscope body is damaged, whether it can be normally filled with water and air, whether there is button looseness, and whether the endoscope movement angle is normal. Immediately repair if any of the above abnormalities are found. Additionally, thoroughly clean the flexible endoscope storage area once a week, disinfect the air once a week, and maintain the cleanliness of the flexible endoscope storage area.

- (d) Sustaining cleanliness: Maintain the clean state after cleaning, immediately identify influencing factors, and summarize solutions once endoscope storage problems are found. Standardize and plan lean management methods, requiring all staff to strictly implement them.
- (e) Accomplishment: All staff participate in lean management, maintaining the cleanliness and tidiness of the work environment. Additionally, clarify the significance of applying lean management methods during flexible endoscope management, as well as the important value of functional evaluation and cleaning and disinfection quality assessment of flexible endoscopes to ensure normal endoscope operation, so that staff consciously comply with various systems.

2.2.2. Control group

Complete flexible endoscope cleaning and disinfection work according to department regulations, and implement management plans based on endoscope center management and maintenance requirements, namely, "who uses, who is responsible." Regularly check the function of flexible endoscopes, promptly address abnormalities, and truthfully record various repairs and maintenance of flexible endoscopes. Additionally, if a fault occurs during the use of the flexible endoscope, report it immediately for repair.

2.3. Observation indicators

- (1) Usage of flexible endoscopes: Before using the flexible endoscope, medical staff scanned the QR code on the endoscope, which automatically generated and recorded the operator's name and usage time. Subsequently, the tracing system is utilized to retrieve the usage records of each endoscope, and the average daily usage frequency was calculated.
- (2) Management effectiveness of flexible endoscopes: The retrieval rate of endoscopes within 3s and the qualification rate of random endoscope inspections are calculated.
- (3) Failure rate of flexible endoscopes: The failure locations of the flexible endoscopes are recorded, and the failure rate is calculated.

2.4. Statistical analysis

Data are processed using SPSS 23.0. Count data are tested using the chi-square test (recorded as %), and measurement data are tested using the t-test (recorded as $\bar{x} \pm s$). There are comparative differences with $P < 0.05$.

3. Results

3.1. Usage of flexible endoscopes

The average daily usage frequency of flexible endoscopes in the observation group (4.41 ± 0.11 times) was higher

than that in the control group (4.29 ± 0.09 times), with a t-value of 11.9404 and $P < 0.05$.

3.2. Management effectiveness of flexible endoscopes

The retrieval rate of endoscopes within 3s and the qualification rate of random endoscope inspections in the observation group were 99.50% and 100.00%, respectively, which were higher than those in the control group (90.00% and 95.00%, respectively), with $P < 0.05$. Refer to **Table 1** for details.

Table 1. Analysis of management effectiveness of flexible endoscopes (n,%)

| Group | Endoscopic 3s find rate | Endoscopic inspection pass rate |
|-------------------------------|-------------------------|---------------------------------|
| Observation group ($n=200$) | 199(99.50) | 200(100.00) |
| Control group ($n=200$) | 180(90.00) | 190(95.00) |
| χ^2 | 18.1430 | 10.2564 |
| P | 0.0000 | 0.0014 |

Failure rate of flexible endoscopes: The failure rate of flexible endoscopes in the observation group was 1.50%, which was lower than that in the control group (10.50%), with $P < 0.05$. Refer to **Table 2** for details.

Table 2. Analysis of failure rate of flexible endoscopes (n,%)

| Fault location | Observation group ($n=200$) | Control group ($n=200$) |
|-------------------------------|-------------------------------|---------------------------|
| Vertical angulation section | 1(0.50) | 3(1.50) |
| Horizontal angulation section | 0(0.00) | 4(2.00) |
| Cap | 0(0.00) | 2(1.00) |
| Light guide tube | 0(0.00) | 2(1.00) |
| Distal lens | 1(0.50) | 2(1.00) |
| Angulation rubber | 0(0.00) | 1(0.50) |
| Nozzle | 0(0.00) | 1(0.50) |
| Insertion tube seal/O-ring | 0(0.00) | 1(0.50) |
| Electrical connector flex | 0(0.00) | 1(0.50) |
| Button | 1(0.50) | 1(0.50) |
| Insertion tube | 0(0.00) | 1(0.50) |
| Drum wheel wire | 0(0.00) | 1(0.50) |
| Electrical connector pins | 0(0.00) | 1(0.50) |
| Total | 3(1.50) | 21(10.50) |

4. Discussion

Flexible endoscopes have complex structures and special material characteristics. The insertion part is made of flexible materials such as polyurethane and silicone, which can enter the patient's body through natural cavities, and the endoscope head can be bent at multiple angles, facilitating operation by physicians. Additionally, when

a lesion is detected with a flexible endoscope, instruments such as hemostatic clips and biopsy forceps can be directly inserted to complete diagnostic and therapeutic procedures in an integrated manner, resulting in high utilization rates in medical institutions. In the “Top 10 Health Technology Hazards in 2022” report published in the United States, medical care risks were analyzed, and for the first time, inadequate supply of medical devices was included, highlighting the importance of managing flexible endoscopes^[3]. With the advent of the “super endoscope” era, flexible endoscopes have been widely used in clinical examination and surgical treatment, leading to increased workload and higher technical requirements in endoscopy centers. During routine flexible endoscope management, issues such as non-standard operation, lack of cooperation, and negative management attitudes among staff often arise, resulting in poor quality of flexible endoscope management^[4].

Lean management is a modern management strategy that requires all staff to participate in daily management activities. It actively mobilizes staff to identify and resolve flexible endoscope failures proactively, making the storage, cleaning, disinfection, and retrieval of flexible endoscopes more streamlined and standardized. This simplifies the quality management of flexible endoscopes and avoids the influence of human factors on disinfection quality^[5]. The application of lean management in flexible endoscope management can improve endoscope turnaround efficiency and reduce waiting times for patients undergoing flexible endoscope diagnosis and treatment. Reasonable storage and allocation of flexible endoscope resources during management can reduce equipment idle time. Improving processes such as maintenance, disinfection, and cleaning of flexible endoscopes ensures that staff operations are based on evidence, thereby avoiding equipment failures caused by non-standard operations.

Lean management also ensures that endoscopes are arranged in a specific order, facilitating precise positioning of flexible endoscopes by staff and improving work efficiency. Regular repair and maintenance of endoscopic equipment during the management period, as well as prompt resolution of potential risks associated with flexible endoscope use, can avoid endoscope damage due to improper maintenance or use, thereby reducing the difficulty of endoscope maintenance and repair costs. Dynamically adjusting inventory based on the actual situation of the medical institution during the management period can avoid shortages or excess idle issues with flexible endoscope equipment. Requiring staff to complete cleaning and disinfection work in a standardized manner during the management period can avoid infection incidents in various stages and reduce endoscope-related infections^[6, 7]. Additionally, during lean management, regular training of flexible endoscope management staff enables them to master lean management methods and stimulates their awareness of lean management, thereby avoiding quality fluctuations caused by human factors^[8].

Based on the data analysis in this paper, the average daily usage frequency of flexible endoscopes in the observation group (4.41 ± 0.11) was higher than that in the control group (4.29 ± 0.09). The 3-second retrieval rate of endoscopes in the observation group was 99.50%, and the pass rate of endoscope spot checks was 100.00%, which were higher than the 90.00% and 95.00% in the control group, respectively ($P < 0.05$). The reason for this is that during routine management, there was insufficient attention paid to the storage management of flexible endoscopes, with no labeling of each endoscope and no prominent signs in each storage area, leading to reduced turnover efficiency and difficulty in retrieval. During lean management, endoscopes were stored according to their types, and prominent signs were posted in the storage room, which facilitated staff in verifying materials and accurately locating endoscopes, thus enabling correct retrieval of flexible endoscopes within 3 seconds and improving work efficiency^[9].

Additionally, after implementing lean management, regular maintenance and care of flexible endoscopes, as

well as emphasis on disinfection management, further improved the pass rate of endoscope spot checks ^[10]. The final set of data showed that the failure rate of flexible endoscopes in the observation group was 1.50%, which was lower than the 10.50% in the control group ($P < 0.05$). The reason for this is that after implementing lean management, training enabled management personnel to master the usage methods, performance, and maintenance knowledge of various flexible endoscope equipment. Regular maintenance and care allowed for early identification of potential damage issues, avoiding damage to endoscopes caused by water or air leaks in the tubing, thereby extending the service life of flexible endoscopes, reducing maintenance costs, optimizing endoscope performance, and facilitating the smooth progress of various diagnostic and therapeutic procedures ^[11].

5. Conclusion

In summary, the application of lean management during the management of flexible endoscopes can improve the turnover rate, reduce failure rates, and also enhance the 3-second retrieval rate and the pass rate of endoscope spot checks. Therefore, it is worthy of promotion.

Disclosure statement

The authors declare no conflict of interest.

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Exploring the Intervention Value of Medical Institution Prescription Review Mechanism on the Rationality of Western Medicine Use

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Abstract: *Objective:* To explore the intervention value of the medical institution prescription review mechanism on the rationality of Western medicine use. *Methods:* A total of 159 patients (with 159 western medicine prescriptions) admitted to the hospital from January 2023 to December 2024 were selected and divided into an observation group ($n=80$, adopting the medical institution prescription review mechanism) and a control group ($n=79$, without prescription review) based on the random number table method. A comparative analysis was conducted on the work quality of medical personnel, irrational prescription drug use, and prescription drug dispensing situations. *Results:* The work quality of medical personnel in the observation group was significantly better than that in the control group ($P < 0.05$). The incidence of irrational prescription drug use in the observation group (22.50%) was significantly higher than that in the control group (7.59%) ($P < 0.05$). The observation group had fewer types of prescribed drugs, lower usage rates of injections and antibiotics, and a significantly higher usage rate of national essential drugs compared to the control group ($P < 0.05$). *Conclusion:* The prescription review mechanism can significantly improve the work quality of medical personnel, increase the detection rate of irrational drug use, reduce the types of prescription drugs and the use of injections and antibiotics, and promote the standardized application of national essential drugs, which has important intervention value.

Keywords: Medical institutions; Prescription review mechanism; Western medicine; Rationality of use; Intervention value

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1. Introduction

The prescription review mechanism in medical institutions, as a crucial aspect of pharmaceutical management, has increasingly prominent effects on regulating the use of Western medicine in recent years. Western medicine, as the primary means of clinical treatment, is directly related to disease treatment outcomes and patient safety. The demand for rational drug use is even more urgent in the management of complex diseases such as chronic illnesses and comorbidities^[1]. In response to this background, multiple national policy documents, such as the “Measures for the Administration of Medical Institution Prescriptions” and the “Measures for the Clinical Application and

Management of Antibacterial Drugs,” emphasize the importance of prescription review and require systematic prescription auditing and dynamic supervision to enhance the scientific and standardized nature of clinical medication ^[2]. However, there are still issues such as inconsistent review standards, inadequate implementation, and imperfect feedback loops in the specific implementation of the prescription review mechanism, affecting the sustainability and profoundness of intervention effects. Based on this, this study included 159 patients admitted to the hospital from January 2023 to December 2024 to explore the application effects of the medical institution prescription review mechanism, and the results are reported below.

2. Materials and methods

2.1. General information

A total of 159 patients (with 159 western medicine prescriptions) admitted to the hospital from January 2023 to December 2024 are selected as study subjects. Among the 79 patients in the control group, there are 40 males and 39 females, aged between 18 and 80 years, with a mean age of (57.68 ± 3.43) years. The prescription sources were: 31 from internal medicine, 20 from surgery, 15 from gynecology, and 13 from the emergency department. Among the 80 patients in the observation group, there are 42 males and 38 females, aged between 19 and 78 years, with a mean age of (57.76 ± 3.39) years. The prescription sources were: 34 from internal medicine, 18 from surgery, 14 from gynecology, and 14 from the emergency department. There are no statistically significant differences in baseline data between the two groups ($P > 0.05$). Patients and their families signed consent forms. Relevant written materials have been submitted to and approved by the ethics committee of the hospital.

The inclusion criteria of the study are: (1) Patients receiving Western medicine treatment; (2) No history of drug allergies; (3) Complete medical records. Meanwhile, the exclusion criteria are: (1) Patients with malignant tumors; (2) Patients with severe cardiopulmonary insufficiency; (3) Pregnant or breastfeeding women; (4) Patients with consciousness disorders or mental abnormalities.

2.2. Methods

The control group did not undergo prescription review, while the observation group is subjected to the application of the medical institution’s prescription review mechanism. The specific methods are as follows:

- (1) Review team construction: The directors of relevant departments served as team leaders, and a professional team is formed with associate chief physicians and senior pharmacists. The team held regular meetings every month to conduct special discussions on the latest medication guidelines, clinical hotspots, and adverse reaction reports, and timely revised the review system and process accordingly.
- (2) First prescription review: The pharmacist conducted an initial review of the prescription within 24 hours, focusing on verifying the clinical diagnosis, medication indications, compatibility, contraindications, and safe dosages. If issues such as overdose, duplication, or mismatch of indications are found, prompt feedback is provided to the physician through written or electronic means, and the review opinions were archived.
- (3) Dispensing review and dispensing confirmation: After completing the dispensing, the pharmacist double-checked the drug name, dosage form, specifications, and usage and dosage, focusing on checking the interaction risks of multi-drug combinations. After confirmation, the pharmacist explained the dosing regimen and precautions to the patient or family members to ensure compliance and safety.

- (4) Error data statistics and in-depth analysis: Outpatient prescription data is exported through the electronic prescription system, and error types such as non-standard diagnosis, compatibility conflicts, and dosage errors were classified and counted. Regression analysis is conducted in combination with dimensions such as patient age, disease type, and department distribution to explore potential risk factors.
- (5) Closed-loop rectification and continuous improvement: A rectification plan is developed based on the error analysis, such as improving diagnosis options, optimizing review rules, or updating the medication manual. The quarterly regular meetings reported on the progress and effectiveness of the rectification, invited physicians and pharmacists to discuss improvement strategies, and implemented re-examination for non-compliant links.
- (6) Continuous professional training and ability improvement: Clinical and pharmaceutical experts are regularly invited to jointly conduct lectures and case studies on rational drug use, focusing on issues such as the risks of multi-drug combinations and dosage adjustments for special populations. The training effect is tested through online evaluations.
- (7) Information support and intelligent warning: Collaborating with the information department to supplement and improve the electronic prescription system diagnosis database and review logic, adding intelligent warning and automatic interception functions to ensure that the review work is efficiently and traceably executed on the system side.
- (8) Reward and punishment incentives and assessment closed-loop: Indicators such as prescription rationality rate and problem rectification rate are included in the performance appraisal of physicians and pharmacists. Those who performed well are commended and rewarded, while those who repeatedly violated the rules are interviewed or punished, forming a virtuous circle of positive incentives and restraints.

2.3. Observation indicators

- (1) Work quality of medical personnel: An interview evaluation method is used to assess four dimensions: pharmacological knowledge, prescription review, communication skills, and prescription evaluation. Each dimension is scored on a 25-point scale, with a total score of 100 points. A higher score indicated better work quality.
- (2) Irrational drug use in prescriptions: This included irrational combination of drugs, improper usage and dosage, repeated use of drugs, incomplete diagnosis writing, and excessively high grades of antibacterial drugs^[3].
- (3) Prescription drug dispensing situation: The types of drugs prescribed in the two groups are compared, and the usage rates of injections, antibiotics, and national basic drugs are counted.

2.4. Statistical methods

SPSS 22.0 is used to analyze the data. Measurement data with a normal distribution are expressed as $(\bar{x} \pm s)$, and the Shapiro-Wilk test is performed. The independent samples t-test is used for comparison between groups. Count data are expressed as relative numbers and analyzed using the χ^2 test. A P -value < 0.05 is considered statistically significant.

3. Results

3.1. Comparison of work quality between the two groups of medical personnel

The work quality of medical personnel in the observation group was significantly better than that in the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of work quality between the two groups of medical personnel ($\bar{x} \pm s$, scores)

| Group | Number (n) | Pharmacological knowledge | Prescription review | Communication skills | Prescription evaluation capability |
|-------------------|------------|---------------------------|---------------------|----------------------|------------------------------------|
| Control group | 79 | 20.25 \pm 1.17 | 21.34 \pm 1.18 | 21.03 \pm 0.96 | 3.53 \pm 0.62 |
| Observation group | 80 | 22.31 \pm 1.22 | 23.87 \pm 1.02 | 23.24 \pm 0.91 | 4.25 \pm 0.38 |
| <i>t</i> | - | 10.864 | 14.469 | 14.899 | 8.841 |
| <i>P</i> | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 |

3.2. Comparison of irrational drug use in prescriptions between the two groups

The incidence of irrational drug use in prescriptions in the observation group (22.50%) was significantly higher than that in the control group (7.59%) ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of irrational drug use in prescriptions between the two groups [n(%)]

| Group | Cases (n) | Inappropriate polypharmacy | Incorrect dosage/ Administration | Therapeutic duplication |
|-------------------|-----------|----------------------------|-------------------------------------|-------------------------|
| Control Group | 79 | 2 (2.53%) | 1 (1.27%) | 1 (1.27%) |
| Observation Group | 80 | 4 (5.00%) | 3 (3.75%) | 4 (5.00%) |
| χ^2 | - | - | - | - |
| <i>P</i> | - | - | - | - |

| Group | Cases (n) | Incomplete diagnosis documentation | Overuse of high-level antibiotics | Overall incidence rate |
|-------------------|-----------|------------------------------------|-----------------------------------|------------------------|
| Control Group | 79 | 1 (1.27%) | 1 (1.27%) | 6 (7.59%) |
| Observation Group | 80 | 3 (3.75%) | 4 (5.00%) | 18 (22.50%) |
| χ^2 | - | - | - | 8.697 |
| <i>P</i> | - | - | - | 0.003 |

3.3. Comparison of prescription drug dispensing between the two groups

The observation group prescribed fewer types of drugs, had lower usage rates of injections and antibiotics, and had a significantly higher usage rate of national basic drugs compared to the control group ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of prescription drug dispensing between the two groups [$\bar{x} \pm s$, n(%)]

| Group | Cases (n) | Number of medication types | Use of injectables (%) | Antibiotic usage (%) | National essential drugs usage (%) |
|-------------------|-----------|----------------------------|------------------------|----------------------|------------------------------------|
| Control group | 79 | 3.84 \pm 0.53 | 12 (15.19%) | 20 (25.32%) | 49 (62.03%) |
| Observation group | 80 | 3.15 \pm 0.59 | 8 (10.00%) | 10 (12.50%) | 60 (75.00%) |
| t/χ^2 | - | $t = 7.754$ | $\chi^2 = 1.223$ | $\chi^2 = 5.359$ | $\chi^2 = 3.899$ |
| P | - | < 0.001 | 0.269 | 0.021 | 0.048 |

4. Discussion

Western medicine encompasses chemically synthesized drugs, biological products, and natural medicine extracts. Its clinical mechanism of action is primarily based on the interaction between drugs and bodily targets, regulating receptors, enzyme activity, or ion channels to alter pathophysiological processes^[4]. Rational drug use not only emphasizes targeting symptoms and diseases but also requires consideration of the patient and dosage. This involves scientifically selecting drug types, formulations, administration routes, dosages, treatment durations, and monitoring indicators based on a clear diagnosis, combined with the patient's age, weight, liver and kidney function, concomitant medications, and potential drug interactions. Patients with chronic diseases (such as hypertension and diabetes) and severe infections (such as community-acquired pneumonia) often face multiple medication risks due to long disease durations and concomitant use of multiple drugs, leading to issues such as drug-drug interactions, accumulation of adverse events, and decreased compliance^[5]. Both the national basic drug system and antimicrobial drug classification management measures clearly state that prescription review and clinical pharmacist intervention are key links to ensure medication safety and improve efficacy. The core objective is to timely identify and correct unreasonable prescriptions through systematic and standardized medication review processes, reduce the incidence of adverse reactions, optimize medical resource allocation, and thereby improve overall medical quality and patient benefits^[6].

This study shows that the interview scores of medical personnel in the observation group were significantly higher than those in the control group ($P < 0.05$), indicating that the prescription review mechanism has a positive effect on improving pharmacological knowledge mastery, prescription review, and communication and review abilities. On the one hand, the review team regularly discusses the latest medication guidelines and typical cases, enabling physicians and pharmacists to continuously stay updated on clinical pathways and new developments in adverse drug reactions, enhancing the pertinence and practicality of theoretical learning. On the other hand, the dual pharmacist review process and instant feedback mechanism promote interaction between prescribing and dispensing links, allowing medical personnel to continuously reflect on and optimize medication decisions in practical work, thereby improving overall professional literacy and operational norms. Additionally, continuous education and training, as well as case analysis, further consolidate key and difficult knowledge points such as drug-drug interactions and dosage adjustments for special populations, enabling medical personnel to consider patient individual differences more comprehensively when evaluating prescriptions^[7].

In the research results, the incidence of unreasonable prescriptions in the observation group (22.50%) was higher than that in the control group (7.59%) ($P < 0.05$). This seemingly contradicts expectations, but actually

reflects a significant enhancement in the ability of the review mechanism to identify “blind spot” prescriptions. In the traditional mode without reviews, some unreasonable drug use, such as high dosages, compatibility conflicts, or overly high-grade antibiotics, was difficult to detect in a timely manner. However, in the systematic review process, the dual checks of the initial and secondary review stages, as well as the deep analysis of error data, can comprehensively capture multi-dimensional error types, resulting in a significant increase in the exposure rate of clinical misunderstandings in the observation group^[8]. This high detection rate does not mean that the review mechanism causes more errors, but rather that its identification sensitivity and coverage are broader. At the same time, the types of drugs prescribed in the observation group decreased, and the usage rates of injections and antibiotics were significantly lower than those in the control group ($P < 0.05$), while the usage rate of national essential drugs increased significantly ($P < 0.05$). This indicates that besides error correction, the review mechanism can also guide prescriptions to be more standardized and evidence-based. On the one hand, the first prescription review strictly controls the indications for the use of injections and high-grade antibacterial drugs, reducing the risk of excessive intravenous drug administration and antibacterial drug abuse. On the other hand, closed-loop rectification and updates to the medication manual prompt physicians to prefer commonly used drugs within the essential drug list, reducing unnecessary drug types. This not only complies with the national essential drug policy but also lowers patients’ medication costs and reduces adverse drug events^[9].

The core of the prescription review mechanism lies in a systematic process, dynamic feedback, and continuous improvement. Firstly, the construction of the review team and the “double review and double verification” process effectively ensure the professionalism and timeliness of medication reviews. Secondly, the statistics and deep regression analysis of error data have constructed a data-driven risk identification model, making rectification more targeted. Additionally, the information-based intelligent warning module provides medical personnel with “pre-event reminders and post-event tracking” double protection by automatically intercepting high-risk prescriptions. Finally, the performance appraisal and reward-punishment mechanism closely links medication compliance with personnel incentives, forming a positive cycle. Based on the results of this study, it is recommended to further introduce clinical pathway guidelines and individualized dose calculation tools into the information system, and to integrate review results with electronic health records to enhance cross-department collaboration efficiency. Simultaneously, strengthening differentiated strategies for medication reviews for special populations (such as elderly, pediatric, and renal insufficiency patients) can help further improve the accuracy and applicability of the review mechanism^[10].

5. Conclusion

In summary, the prescription review mechanism in medical institutions significantly improves the work quality of medical personnel and the level of medication standardization by constructing a multi-level and multi-link review and feedback system. It has significant intervention value in promoting the rational use of western medicine, optimizing the prescription structure, and implementing the national essential drug policy.

Disclosure statement

The author declares no conflict of interest.

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Evaluation of the Improvement of Blood Pressure Levels in Patients with Hypertensive Disorders of Pregnancy Treated with Labetalol Combined with Aspirin

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Abstract: *Objective:* To evaluate the effect of labetalol combined with aspirin on improving blood pressure in patients with hypertensive disorders of pregnancy (HDP). *Methods:* Eighty-two patients with HDP who visited the hospital from August 2022 to August 2024 were selected as samples and randomly divided into two groups. Group A was treated with labetalol and aspirin, while Group B was treated with labetalol only. The efficacy, blood pressure, vascular endothelial function, coagulation indexes, and pregnancy outcomes were compared between the two groups. *Results:* The efficacy of Group A was higher than that of Group B ($P < 0.05$). The systolic blood pressure (SBP), diastolic blood pressure (DBP), and endothelin-1 (ET-1) in Group A were lower than those in Group B ($P < 0.05$). The prothrombin time (PT), thrombin time (TT), activated partial thromboplastin time (APTT), and fibrinogen (FIB) in Group A were all better than those in Group B ($P < 0.05$). The rate of adverse pregnancy outcomes in Group A was lower than that in Group B ($P < 0.05$). *Conclusion:* The combination of labetalol and aspirin for the treatment of HDP can stabilize blood pressure, optimize vascular endothelial function, improve coagulation indexes and pregnancy outcomes, which is highly effective and feasible.

Keywords: Hypertensive disorders of pregnancy; Aspirin; Labetalol; Blood pressure

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1. Introduction

HDP refers to hypertensive diseases that occur after 20 weeks of gestation. It is a common comorbidity during pregnancy with a high clinical incidence. The pathological features include edema and hypertension, which can affect mother and child outcomes. The pathogenesis of HDP is not yet fully understood, but it is believed to be associated with multiple factors, including intrauterine vascular disease, inflammatory response, vascular endothelial damage, and poor nutritional status. In particular, those with multiple pregnancies, first-time pregnancies, and pregnancy age > 40 years are more prone to HDP and should be actively diagnosed and treated

^[1]. The clinical treatment of HDP mainly follows the principles of prolonging the gestational week, managing the disease, and protecting the health of the mother and child. If the disease is severe, termination of pregnancy may be considered to ensure the health of the mother. Labetalol is a commonly used drug for the treatment of HDP. It can block α and β adrenergic receptors, stabilize blood pressure, restore placental and renal blood flow, and also prevent platelet accumulation and optimize pregnancy outcomes. Aspirin is an antiplatelet drug that can reduce the risk of eclampsia and coagulation abnormalities ^[2]. This article explores the value of labetalol combined with aspirin in 82 patients with HDP who visited the hospital from August 2022 to August 2024.

2. Materials and methods

2.1. Materials

Eighty-two patients with HDP who visited the hospital from August 2022 to August 2024 are selected as samples and randomly divided into two groups. There was no significant difference in baseline data between Group A and Group B ($P > 0.05$). Refer to **Table 1** for details.

Table 1. Analysis of baseline data of HDP

| Group | <i>n</i> | Age (years) | | Gestational age (weeks) | | BMI (kg/m ²) | |
|------------|----------|-------------|------------------|-------------------------|------------------|--------------------------|------------------|
| | | Range | Mean \pm SD | Range | Mean \pm SD | Range | Mean \pm SD |
| Group A | 41 | 23–38 | 31.42 \pm 2.42 | 35–38 | 36.46 \pm 0.81 | 21–28 | 26.81 \pm 1.81 |
| Group B | 41 | 23–39 | 31.37 \pm 2.39 | 35–39 | 36.49 \pm 0.78 | 20–28 | 26.78 \pm 1.78 |
| χ^2/t | - | 0.0941 | | 0.1708 | | 0.0757 | |
| <i>P</i> | - | 0.9252 | | 0.8648 | | 0.9399 | |

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

- (1) Gestational age > 20 weeks with elevated blood pressure
- (2) No history of hypertension before pregnancy
- (3) Signed informed consent
- (4) Singleton pregnancy with cephalic presentation
- (5) Negative proteinuria results.

2.2.2. Exclusion criteria

- (1) Normal liver and kidney function
- (2) Normal immune function
- (3) Placenta previa
- (4) Congenital malformations.

2.3. Treatment methods

Restrict daily sodium intake, monitor blood pressure, supplement vitamins and calcium, and provide symptomatic treatment for underlying diseases.

- (1) Group A: Oral administration of Labetalol Hydrochloride Tablets (Jiangsu Desano Pharmaceutical Co., Ltd.; National Medical Approval Number H32026120; 50mg), single dose of 50mg, 2 times/day; Oral administration of Aspirin Enteric-coated Tablets (Bayer Healthcare Co., Ltd.; National Medical Approval Number HJ20160685; 100mg), single dose of 100mg, 1 time/day. Administration continued until delivery.
- (2) Group B: Oral administration of Labetalol Hydrochloride Tablets, single dose of 0.1g, 2 times/day. Administration continued until delivery.

2.4. Observation indicators

- (1) Efficacy: Blood pressure returned to 90–140/60–90mmHg, 24-hour urinary protein quantitation < 0.15g, recorded as markedly effective; blood pressure and 24-hour urinary protein quantitation decreased by > 10–20mmHg and 0.03g, recorded as effective; small changes in blood pressure and urinary protein indicators, recorded as ineffective.
- (2) Blood pressure and vascular endothelial indicators: SBP and DBP are recorded using an arm-type blood pressure monitor; 3ml of venous blood sample is collected and centrifuged (3000 r/min) for 15 minutes, the supernatant is taken, and ET-1 is detected by immunoturbidimetry.
- (3) Coagulation indicators: 3ml of venous blood sample is collected and centrifuged (3000 r/min) for 15 minutes, the supernatant is taken, and PT, TT, APTT, and FIB are detected using an automatic coagulation analyzer.
- (4) Adverse pregnancy outcomes: Record adverse pregnancy outcomes such as postpartum hemorrhage, fetal distress, fetal asphyxia, and premature birth.

2.5. Statistical analysis

SPSS 23.0 is used to process the data. Count data are recorded as percentages (%) and analyzed using the chi-square test (χ^2 test). Measurement data are recorded as mean \pm standard deviation ($\bar{x} \pm s$) and analyzed using the t-test. $P < 0.05$ indicated statistical significance.

3. Results

3.1. Efficacy

The efficacy of Group A was higher than that of Group B, $P < 0.05$, as shown in **Table 2**.

Table 2. Comparison of efficacy (n,%)

| Group | Markedly effective | Effective | Ineffective | Effectiveness rate |
|----------------|--------------------|-------------|-------------|--------------------|
| Group A (n=41) | 30 (73.17%) | 10 (24.39%) | 1 (2.44%) | 40 (97.56) |
| Group B (n=41) | 22 (53.66%) | 12 (29.27%) | 7 (17.07%) | 34 (82.93) |
| χ^2 | - | - | - | 4.9865 |
| P | - | - | - | 0.0255 |

3.2. Blood pressure and vascular endothelial function

After treatment, SBP, DBP, and ET-1 levels in Group A were all lower than those in Group B, with $P < 0.05$, as shown in **Table 3**.

Table 3. Comparison of blood pressure and vascular endothelial function ($\bar{x} \pm s$)

| Group | SBP (mmHg) | | DBP (mmHg) | | ET-1 (ng/L) | |
|-------------------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|
| | Before Treatment | After Treatment | Before Treatment | After Treatment | Before Treatment | After Treatment |
| Group A (<i>n</i> =41) | 150.82 ± 2.88 | 126.44 ± 1.72 | 123.25 ± 6.28 | 100.42 ± 3.59 | 95.28 ± 4.29 | 50.94 ± 2.49 |
| Group B (<i>n</i> =41) | 150.79 ± 2.91 | 143.29 ± 1.98 | 123.31 ± 6.31 | 112.39 ± 4.14 | 95.21 ± 4.27 | 70.67 ± 3.88 |
| <i>t</i> | 0.0469 | 41.1373 | 0.0432 | 13.9870 | 0.0741 | 27.4027 |
| <i>P</i> | 0.9627 | 0.0000 | 0.9657 | < 0.0001* | 0.9412 | 0.0000 |

3.3. Coagulation indices

After treatment, the coagulation indices PT, TT, APTT, and FIB in Group A were superior to those in Group B, with $P < 0.05$, as shown in **Table 4**.

Table 4. Comparison of coagulation indices ($\pm s$)

| Group | PT(s) | | TT(s) | |
|-------------------------|------------------|-----------------|------------------|-----------------|
| | Before Treatment | After Treatment | Before Treatment | After Treatment |
| Group A (<i>n</i> =41) | 8.22 ± 0.42 | 15.51 ± 1.25 | 11.27 ± 0.61 | 17.52 ± 1.36 |
| Group B (<i>n</i> =41) | 8.24 ± 0.39 | 11.33 ± 1.02 | 11.25 ± 0.65 | 14.11 ± 1.18 |
| <i>t</i> | 0.2234 | 16.5897 | 0.1437 | 12.1266 |
| <i>P</i> | 0.8238 | 0.0000 | 0.8861 | 0.0000 |

| Group | APTT(s) | | FIB(g/L) | |
|-------------------------|------------------|-----------------|------------------|-----------------|
| | Before Treatment | After Treatment | Before Treatment | After Treatment |
| Group A (<i>n</i> =41) | 25.42 ± 2.43 | 35.42 ± 3.11 | 4.71 ± 0.44 | 3.01 ± 0.26 |
| Group B (<i>n</i> =41) | 25.39 ± 2.47 | 30.16 ± 3.02 | 4.73 ± 0.48 | 3.93 ± 0.37 |
| <i>t</i> | 0.0554 | 7.7694 | 0.1967 | 13.0267 |
| <i>P</i> | 0.9559 | 0.0000 | 0.8446 | 0.0000 |

3.4. Adverse pregnancy outcomes

The rate of adverse pregnancy outcomes in HDP patients in Group A was lower than that in Group B, with $P < 0.05$, as shown in **Table 5**.

Table 5. Adverse pregnancy outcomes in HDP patients (n,%)

| Group | Postpartum hemorrhage | Fetal distress | Fetal asphyxia | Premature birth | Incidence rate |
|-------------------------|-----------------------|----------------|----------------|-----------------|----------------|
| Group A (<i>n</i> =41) | 0 (0.00%) | 1 (2.44%) | 0 (0.00%) | 1 (2.44%) | 2 (4.88) |
| Group B (<i>n</i> =41) | 2 (4.88%) | 3 (7.32%) | 1 (9.76%) | 4 () | 10 (24.39) |
| χ^2 | - | - | - | - | 6.2476 |
| <i>P</i> | - | - | - | - | 0.0124 |

4. Discussion

HDP is a common complication that occurs after the 20th week of gestation, which can cause elevated blood pressure, increased proteinuria, and even increase the risk of adverse pregnancy outcomes. Currently, the clinical cause of HDP is not yet clear, but it is believed to be related to multiple factors that synergistically damage the vascular endothelial function of pregnant women. Severe cases can lead to fetal intrauterine hypoxia, limiting fetal growth and development, and posing a threat to the health of both mother and child ^[3]. Analyzing the influencing factors of HDP, those with a family history of HDP are more prone to developing this disease. Abnormal immune system function in the mother can identify the placenta as a foreign object, triggering an immune response that can damage the blood vessel function of the pregnant woman, leading to disordered blood pressure regulation. Problems such as placental abruption or abnormal placental blood circulation can affect placental blood oxygen supply, or placental factors may infiltrate into the mother's blood circulation, which can aggravate vascular endothelial damage and increase the risk of HDP. Oxidative stress reactions in the mother's body can lead to the generation of a large amount of reactive oxygen species, which stimulates abnormal vasoconstriction, aggravating the degree of vascular endothelial damage and inducing HDP.

Poor nutritional status of the mother, such as insufficient intake of vitamins, protein, and calcium, cannot maintain the tension of vascular smooth muscle, leading to an increased incidence of HDP. Clinically, HDP is often treated with medication to reduce the risk of cardiovascular disease in the mother and adverse outcomes for both mother and child by regulating blood pressure. Labetalol is commonly used in the treatment of HDP. Its medicinal components can stimulate vasodilation, reduce systemic blood flow resistance, and lower blood pressure. Moreover, compliance with medication has minimal impact on the mother's cardiac output and renal blood flow, maintaining normal placental blood flow ^[4]. Additionally, the components of labetalol can also act on β -receptors, producing a non-selective blocking effect, which is beneficial for stabilizing heart rate and reducing myocardial oxygen consumption. Based on this, combined treatment with the antiplatelet drug aspirin can block platelet aggregation, achieving multiple effects such as antipyresis, analgesia, and microcirculation optimization. Furthermore, combined treatment of HDP can reduce complications related to abnormal blood pressure, which is beneficial for enhancing the efficacy ^[5].

After confirming the diagnosis of HDP, patients should be advised to increase their sleep time to more than 10 hours, and it is recommended to maintain a left lateral decubitus position to reduce uterine compression on the inferior vena cava, increase blood flow velocity, and maintain normal placental blood perfusion. It is also necessary to evaluate whether patients experience anxiety, decreased sleep quality, or abnormal mental state. If these issues occur, sedatives should be administered according to medical advice to reduce the impact of adverse factors on fetal growth and development. Patients' daily diet should be adjusted to control daily sodium intake and supplement calories, protein, calcium, and other nutrients to correct nutritional status and stabilize blood pressure.

Based on the data analysis in this paper, the efficacy of Group A is higher than that of Group B, with $P < 0.05$. The reason for this is that labetalol can block adrenergic receptors, reduce cardiac output, decrease blood flow resistance, and slow down heart rate, achieving a stable blood pressure-lowering effect. Combined with aspirin, it stimulates the release of nitric oxide from vascular endothelium, increases the level of vasodilators in patients, and thereby restores vascular tension. Additionally, the active ingredients of aspirin can reduce the level of thromboxane A2 in patients, further enhancing the blood pressure-lowering effect of labetalol ^[6]. Another set of data shows that Group A has lower SBP, DBP, and ET-1 than Group B, with $P < 0.05$. ET-1 stimulates vasoconstriction and is involved in the hemodynamic regulation process in patients. However, pregnant women

have an abundant blood supply and abnormally elevated ET-1 levels, which can affect pregnancy outcomes. In this paper, labetalol is chosen to treat HDP patients, which can stably regulate blood pressure while maintaining cardiac output. It can also increase CO production in patients, maintain vascular tension, and improve vascular endothelial function. However, labetalol has a short half-life, limiting its overall effect on blood pressure control. Therefore, it needs to be combined with aspirin for synergistic treatment to enhance the blood pressure-lowering effect^[7]. Furthermore, aspirin can block the protein binding process, achieving an antiplatelet aggregation effect, which can further optimize vascular endothelial function, resulting in a decrease in ET-1 levels.

Another set of data indicates that Group A has better PT, TT, APTT, and FIB indicators than Group B, with $P < 0.05$. As HDP progresses, patients enter a state of hypercoagulability, with shortened PT, APTT, and TT indicators, which can increase the risk of massive bleeding during childbirth. Additionally, persistent hypercoagulability can worsen blood clots, reduce blood flow velocity, decrease placental blood flow, and even lead to reduced fetal blood supply and restricted growth and development. In this paper, labetalol combined with aspirin is chosen to treat HDP, which can improve oxygen utilization in pregnant women, relieve vascular spasms, reduce vascular damage, accelerate vascular endothelial recovery, and correct disorders of the body's coagulation and anticoagulation systems. This is beneficial for preventing and controlling hypertension-related complications. Additionally, combination therapy can reduce platelet activity in HDP patients, dilute the blood, correct microcirculation disorders, restore placental blood supply, improve HDP prognosis, and protect the health of mothers and babies^[8].

The final set of data shows that Group A has a lower rate of adverse pregnancy outcomes than Group B, with $P < 0.05$. The combination therapy of labetalol and aspirin for HDP can reduce vascular resistance, correct blood circulation, and has high medication safety, which is beneficial for reducing adverse outcomes for both mother and baby^[9]. During actual combined drug treatment, the active ingredients of labetalol and aspirin have minimal impact on placental blood circulation, which can reduce intrauterine distress events induced by antihypertensive drugs and compensate for the poor safety of labetalol monotherapy. Combination therapy can effectively reduce the symptoms of HDP patients and improve the prognosis of both mother and baby^[10]. However, it should be noted that HDP patients are in a special physiological period, and medication management should be properly conducted. Medications should be taken strictly according to the prescribed dosage and time to avoid adverse drug events caused by forgotten or repeated administrations.

5. Conclusion

In summary, HDP patients receiving labetalol and aspirin therapy experience stable blood pressure, improved vascular endothelial function, optimized coagulation indicators, and high safety. This treatment approach can be widely promoted.

Disclosure statement

The author declares no conflict of interest.

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Application and Observation of Inulin in the Treatment of Constipation for Critically Ill Patients in the ICU

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Abstract: *Objective:* To explore the application method and clinical effect of inulin in the treatment of constipation for patients in the ICU. *Methods:* Sixty ICU patients with constipation were randomly divided into an experimental group and a control group, with 30 patients in each group. The control group received nasal feeding with a regular diet. The experimental group received nasal feeding with a regular diet plus inulin. The defecation status of the patients was observed and compared on the 3rd, 5th, and 7th days. *Results:* Among the 30 patients in the experimental group and 30 patients in the control group, there was a statistically significant difference in treatment effect between the two groups ($P < 0.05$). The treatment duration was (3.91 ± 1.09) days in the experimental group and (5.78 ± 1.52) days in the control group. *Conclusion:* Inulin has a significant effect in the treatment of constipation for critically ill patients in the ICU and is worthy of clinical promotion and application.

Keywords: ICU; Constipation; Inulin; Treatment effect

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1. Introduction

Patients in the intensive care unit (ICU) often require the use of a large number of antibiotics and higher-level antibiotics due to their critical and complex conditions ^[1]. The use of these antibiotics can easily kill healthy intestinal flora. Additionally, the presence of multidrug-resistant bacteria in the ICU, which can colonize the intestine and cause significant impact on patients, further complicates the situation. Diarrhea, abdominal pain, intestinal distension, and constipation are clear signs of intestinal flora imbalance. Other factors contributing to constipation include decreased intestinal motility caused by illness, slowed intestinal peristalsis, the need for nasogastric feeding due to the inability to eat orally, and the lack of dietary fiber. Constipation can lead to increased toxin absorption, discomfort, and increased heart rate, which can adversely affect subsequent treatment ^[2]. Therefore, since January 2023, the hospital's department has been adding inulin to the patients' homogenized diet

to prevent constipation in ICU patients, achieving good results. The details are reported below.

2. Materials and methods

2.1. General information

The study is conducted between January 2023 and June 2025 and included 60 critically ill patients. The basic information for the groups is compared below:

Table 1. Comparison of basic information between the two groups [n/%, \pm s]

| Group | Gender | | Age (years) | Disease type | | | |
|-------------|--------|--------|-------------------------|------------------------------|---------------------|---------------------|---------------------------------------|
| | Male | Female | | Severe craniocerebral injury | Cerebral hemorrhage | Cerebral infarction | Chronic obstructive pulmonary disease |
| Observation | 20 | 10 | 30–90, 58.65 \pm 4.15 | 7 | 8 | 4 | 7 |
| Control | 18 | 12 | 32–91, 58.41 \pm 4.95 | 4 | 7 | 4 | 6 |
| <i>P</i> | > 0.05 | | > 0.05 | > 0.05† | | | |

| Group | Gender | | Age (years) | Disease type | | |
|-------------|--------|--------|-------------------------|--------------|--------------------------------------|--------|
| | Male | Female | | Septic shock | Post- cardio pulmonary resuscitation | Others |
| Observation | 20 | 10 | 30–90, 58.65 \pm 4.15 | 7 | 2 | 1 |
| Control | 18 | 12 | 32–91, 58.41 \pm 4.95 | 6 | 3 | 4 |
| <i>P</i> | > 0.05 | | > 0.05 | | | |

2.2. Diagnostic criteria

Functional constipation is diagnosed according to the relevant criteria of Rome IV, which is characterized by difficult defecation or incomplete defecation, difficulty in spontaneous defecation, requiring manual assistance for defecation, and fewer than 3 bowel movements per week.

2.3. Inclusion criteria

- (1) Patients admitted to the ICU department for no less than 48 hours
- (2) Patients under the age of 80
- (3) Patients with stable disease conditions who can tolerate this study
- (4) Patients with normal heart function
- (5) Patients with normal skin condition on the waist and abdomen
- (6) Patients with chronic diseases
- (7) Patients with complete basic information

2.4. Exclusion criteria

- (1) Patients with habitual constipation
- (2) Patients with severe organic lesions in the intestine
- (3) Patients with internal bleeding or gastrointestinal perforation, or acute infection

- (4) Patients with heart disease
- (5) Patients with malignant tumors
- (6) Patients with abnormal communication skills
- (7) Patients with dull response or local loss of sensation in the body
- (8) Patients with damaged skin lesions on the abdomen; patients who have been in the ICU for 1 week
- (9) Patients who voluntarily withdraw from the study

2.5. Treatment methods

Both groups received routine nursing care, health education, and a light and digestible homogenized diet that avoids greasy food and includes more dietary fiber.

2.5.1. Observation group

On the basis of routine nursing measures, inulin is added to the homogenized diet. The specific operation method is as follows: The patient's family members are instructed to prepare the homogenized diet, and 1 scoop of inulin (5 grams per scoop) is dissolved into the homogenized diet three times a day during each nasal feeding, with a daily maximum of 15 grams. For conscious patients who can eat, inulin is dissolved in warm water and consumed. Fluid management is performed to ensure a daily fluid intake of not less than 2500 ml.

2.6. Nursing methods

If the patient is in a sober state, it is necessary to inquire about their current feelings, predict their negative psychology based on characteristics such as changes in tone or facial expression, and then provide verbal counseling. Successful cases can be used as aids to detail the entire process of case treatment, allowing patients to enhance their confidence in treatment through care. It is important to emphasize that constipation has a high curability rate, and actively cooperating with treatment and nursing procedures can achieve an ideal prognosis and reduce patients' concerns. Strengthen care for bowel movements, keep the local skin clean and dry, assess the color or nature of stool irregularly, record the amount of stool, and report any abnormalities to the doctor. At the same time, collect a moderate amount of stool samples, send them for testing to determine the cause of the abnormality, and then provide individualized care. Additionally, it is important to strengthen nutrition, consume more dietary fiber rich in vitamins, increase intestinal motility, and increase stool volume to facilitate bowel movements.

2.7. Criteria for evaluating therapeutic effects

Markedly effective: Bowel movements occur within 48 hours or defecation is smooth, stool texture is soft, and there are no accompanying symptoms; Effective: Bowel movements occur smoothly within 72 hours, stool texture is initially dry and then softens, with mild accompanying symptoms; Ineffective: No bowel movements occur after 72 hours, indicating no improvement in constipation.

2.8. Statistical processing

Data are analyzed using SPSS 26.0 statistical software. Measurement data are compared using the t-test and expressed as mean \pm standard deviation. Count data are compared using the chi-square test and expressed as percentages. $P < 0.05$ is considered statistically significant.

3. Results

3.1. Comparison of clinical effects on constipation between the two groups

After 10 days of intervention, the total effective rate for constipation in the control group was 70.00%, while the total effective rate in the experimental group was 93.33%. The difference in total effective rates between the two groups was statistically significant ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of constipation improvement between the two groups after one week of intervention (n)

| Group | n | Markedly effective | Effective | Ineffective | Total effectiveness rate (%) |
|-------------------|----|--------------------|-----------|-------------|------------------------------|
| Observation group | 30 | 20 | 8 | 2 | 93.33 (28/30) |
| Control group | 30 | 14 | 7 | 9 | 70.00 (21/30) |
| χ^2 | | | | | 5.455 |
| P | | | | | 0.020 |

3.2. Comparison of treatment days between the two groups

The treatment duration was (3.91 ± 1.09) days in the observation group and (5.78 ± 1.52) days in the control group, with a comparison of $t = 5.476$ and $P = 0.000$ between the two groups.

4. Discussion

The results of this study show that the effective rate of the observation group is significantly higher than that of the control group, indicating that inulin can effectively relieve constipation in ICU patients. Constipation is a common complication in the ICU, and active prevention and treatment of constipation have certain significance for improving the prognosis of severely ill patients.

The normal human intestine is home to 10 trillion bacteria, which can affect body weight, digestive ability, resistance to infection, and risk of autoimmune diseases, and can also control the body's response to cancer treatment drugs^[3]. According to conservative estimates, there are about 1000 species of bacteria parasitizing in the intestinal tract, among which probiotics account for about 20%, harmful bacteria account for about 10%, and the remaining 70% are intermediate bacteria, which can turn into pathogenic bacteria when the host's resistance is weak. These flora inhabit and live in the intestinal tract, producing a large amount of metabolites, and 40% of the substances in the blood come from the intestinal flora. Most ICU patients are critically ill, with multiple diagnoses and complex treatment medications. They often use large amounts of high-grade antibiotics, which kill normal intestinal flora while eliminating pathogenic bacteria, disrupting the normal intestinal flora ecology.

Due to long-term bed rest and inability to move, patients' gastrointestinal function is weakened, leading to slowed intestinal motility and intestinal motility dysfunction, which can easily lead to constipation. Additionally, many patients are in a fasting or temporary fasting state due to illness, and there is no supply of food and dietary fiber. As a result, the normal intestinal flora loses the opportunity to obtain nutrition, leading to a significant reduction in the number of probiotics and intestinal dysfunction. These are the reasons why ICU patients are prone to constipation^[4]. The reduction of intestinal probiotics hinders the synthesis of B vitamins (such as B1, B2, B6), various short-chain fatty acids, vitamin K, etc., which are needed by the human body. The intestinal mucosa of patients is damaged, permeability increases, pathogenic bacteria enter the bloodstream, and flora shifts, causing greater harm.

As a dietary modulator, inulin is a soluble dietary fiber that is not absorbed by the human body and only acts in the intestine. It is colorless and tasteless, with a good taste, and is relatively easy to accept. It has no side effects on the body, which is unmatched by any drug. Soluble dietary fiber generally includes pectin, inulin, and oligosaccharides [5]. Compared with other soluble dietary fibers, inulin is relatively easy to obtain and inexpensive. It generally exists in plants, especially chicory. It cannot be decomposed by enzymes in the stomach and small intestine but can be fermented by probiotics in the large intestine, becoming the favorite food of intestinal probiotics. It not only provides dietary fiber to maintain normal intestinal function but also allows intestinal probiotics to proliferate significantly. Around 15 grams of inulin per day is equivalent to the dietary fiber of 900 grams of apples, 2,100 grams of bananas, and 1,200 grams of celery. The refined inulin has higher dietary fiber content, no odor, and can be dissolved in water, milk, porridge, soy milk, and other foods, making it convenient to eat [6].

Due to the critical illness, ICU patients cannot eat, leading to reduced dietary fiber intake. Even if they can barely eat, they cannot consume a large amount of dietary fiber needed by the body due to taste and appetite issues, which is insufficient to meet the body's requirements. Therefore, they are prone to dry stool and constipation. Because stool is a substance with more toxins in the human body, constipation increases the absorption of toxins, which is not conducive to disease recovery [7]. In addition, inulin can also wrap around the stool to form a protective film, making the stool smoother and more comfortable to pass, improving bowel movements.

5. Conclusion

In summary, the main component of inulin is β -(2,1) fructose polymer, which is not absorbed after entering the small intestine tissue and can be fermented in the colon, thereby increasing the local blood concentration. Inulin can increase the proliferation of *Lactobacillus* and *Bifidobacterium*, exerting a prebiotic effect. Its treatment mechanism for constipation in ICU patients is to regulate the intestinal flora and enhance colonic motility; increase the secretion of mucus by colonic goblet cells, playing a role in lubricating the intestine and reducing defecation resistance; and regulate the neuroendocrine system, improving the existing activity of the enteric nervous system. In short, inulin can significantly improve the overall efficacy of ICU patients with constipation, shorten the treatment duration, and has better therapeutic advantages. It can be used as the preferred treatment method for ICU patients with constipation to achieve ideal disease prognosis.

Disclosure statement

The author declares no conflict of interest.

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Study on the Effect of Early Postoperative Enteral Nutrition in the Nursing Care of Elderly Patients with Gastric Cancer

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Abstract: *Objective:* To study the application effect of early postoperative enteral nutrition in the nursing care of elderly patients with gastric cancer. *Methods:* Sixty elderly patients with gastric cancer admitted to the hospital from January 2022 to January 2024 were selected and divided into groups according to the random number table method. The control group ($n = 30$) received routine nursing after surgery, while the observation group ($n = 30$) received early enteral nutrition nursing after surgery. The perioperative indexes, nutritional indexes before and after nursing, humoral and cellular immune indexes before and after nursing, gastrointestinal hormone levels before and after nursing, and the incidence of postoperative complications were compared between the two groups. *Results:* The perioperative indexes of the observation group were better than those of the control group ($P < 0.05$). Before nursing, there was no significant difference in the nutritional indexes between the two groups ($P > 0.05$). After nursing, the nutritional indexes of the observation group were better than those of the control group ($P < 0.05$). Before nursing, there was no significant difference in the humoral and cellular immune indexes between the two groups ($P > 0.05$). After nursing, the humoral and cellular immune indexes of the observation group were better than those of the control group ($P < 0.05$). Before nursing, there was no significant difference in the gastrointestinal hormone levels between the two groups ($P > 0.05$). After nursing, the gastrointestinal hormone levels of the observation group were better than those of the control group ($P < 0.05$). The incidence of postoperative complications in the observation group was lower than that in the control group ($P < 0.05$). *Conclusion:* For elderly patients with gastric cancer, early enteral nutrition nursing after surgery can improve their nutritional indexes and gastrointestinal hormone levels, enhance their immune ability, and prevent the incidence of postoperative complications, with good effects.

Keywords: Early enteral nutrition care; Elderly patients; Gastric cancer; Nutritional indicators; Gastrointestinal hormones

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1. Introduction

Gastric cancer is a common malignant tumor of the digestive system in current clinical practice. In recent years, its

incidence in China has been showing a continuous upward trend, posing a serious threat to the health of the elderly population in particular. This disease not only significantly reduces the patients' quality of life but also directly endangers their lives. Currently, the clinical treatment mainly adopts a comprehensive treatment plan centered on surgery, controlling the tumor progression through radical resection. However, the operation for gastric cancer is complex, and the postoperative rehabilitation period is long. Patients face great psychological pressure and economic burden during the perioperative period. Coupled with the common malnutrition among gastric cancer patients, these factors together lead to a significantly increased risk of postoperative complications. Therefore, it is particularly important to implement scientific and effective nursing interventions for elderly patients with gastric cancer after surgery. Scientific nutritional support interventions play a crucial role in the postoperative rehabilitation process of gastric cancer patients. Through reasonable nutritional management, it can not only effectively promote the recovery of patients' gastrointestinal function but also maintain the normal nutritional metabolism level of the body, thereby enhancing the patients' immune function and improving the clinical prognosis. In clinical practice, nutritional support mainly uses two routes: enteral and parenteral. Among them, enteral nutritional support is more in line with the physiological needs of the human body, which can gradually restore the digestive tract function and ensure that patients receive sufficient nutritional supply. This nutritional intervention method helps to rebuild the patients' immune defense system and maintain a good nutritional status, creating favorable conditions for postoperative rehabilitation^[1]. Therefore, this paper selects 60 elderly patients with gastric cancer admitted to the hospital from January 2022 to January 2024, aiming to analyze the application effect of early postoperative enteral nutritional support.

2. Information and methods

2.1. General information

Sixty elderly patients with gastric cancer admitted to the hospital from January 2022 to January 2024 are selected and divided into groups according to the random number table method. The control group ($n = 30$) received routine nursing after surgery, including 18 male patients and 12 female patients, aged 60–80 years old with an average age of (70.35 ± 3.19) years, weighing 51.35–67.65 kg with an average body weight of (59.65 ± 4.16) kg, having a disease course of 1–7 years with an average disease course of (4.20 ± 1.16) years, and the pathological types were as follows: 18 cases of moderately-differentiated adenocarcinoma, 10 cases of undifferentiated adenocarcinoma, and 2 cases of poorly-differentiated adenocarcinoma. The observation group ($n = 30$) received early enteral nutrition nursing after surgery, including 16 male patients and 14 female patients, aged 60–82 years old with an average age of (70.98 ± 3.37) years, weighing 50.16–69.91 kg with an average body weight of (59.91 ± 4.46) kg, having a disease course of 1–9 years with an average disease course of (6.38 ± 1.34) years, and the pathological types were as follows: 16 cases of moderately-differentiated adenocarcinoma, 12 cases of undifferentiated adenocarcinoma, and 2 cases of poorly-differentiated adenocarcinoma. There was no significant difference in general data between the two groups ($P > 0.05$).

The inclusion criteria of the study are: (1) Diagnosed with gastric cancer after comprehensive diagnosis; (2) Complete clinical data; (3) Scored 70 points or above in the Karnofsky Performance Status (KPS) assessment; (4) Physically able to tolerate chemotherapy; (5) The patients and their families were informed about this study and signed the consent form; (6) Aged 60 years or above. The exclusion criteria included: (1) Gastric cancer with distant metastasis; (2) Complicated with organic diseases of important organs such as the heart; (3) Complicated

with severe malnutrition; (4) Complicated with malignant tumors in other systems; (5) Complicated with mental diseases.

2.2. Methods

2.2.1. Control group

Routine nursing is adopted after surgery. Post-operatively, all vital signs of the patients needed to be continuously monitored to ensure they are in a stable state. In terms of diet management, patients are initially guided to have a liquid diet. After the intestinal function recovered, the anus had normal exhaust, and the bowel sounds disappeared, the diet is gradually transitioned to a regular diet. Nutritionally balanced meals are prepared according to the individual conditions of the patients to meet their daily energy requirements. In terms of psychological intervention, through enhanced doctor-patient communication, targeted measures are taken to relieve the patients' negative emotions such as anxiety and depression, thereby improving their treatment cooperation and compliance with medical advice ^[2].

2.2.2. Observation group

Enteral nutrition support nursing is adopted after surgery:

- (1) Enteral nutrition support: When implementing nutrition support through duodenal intubation, the intubation position needed to be accurately located under the guidance of imaging equipment and properly fixed at the gastrointestinal anastomosis. Starting 13 hours after the surgery, a mixed solution of glucose and potassium chloride is slowly infused through the nutrition tube to promote the recovery of the patients' gastrointestinal peristalsis function. During the treatment process, medical staff needed to closely monitor the patients' clinical manifestations. If discomfort symptoms such as abdominal pain, abdominal distension, or diarrhea occur, they should be dealt with promptly. At the same time, the infusion dosage and speed are dynamically adjusted according to the individual tolerance of the patients. The position and patency of the nutrition tube are regularly checked to prevent complications such as catheter displacement or secretion blockage, ensuring the safety and effectiveness of the nutrition support treatment.
- (2) Nursing measures
 - (a) Post-operative dietary therapy nursing: Starting 48 hours after the surgery, a dietary nutrition intervention plan should be gradually implemented for the patients. The patients' families are guided to prepare light, easily digestible, and low-irritation diets, such as tremella soup and rock sugar Sydney ^[3]. At the same time, it is recommended to appropriately consume nutritious diets with warm-tonifying effects, including crucian carp soup and wolfberry porridge. Through scientific dietary conditioning, the nutritional imbalance state caused by surgical trauma in the patients is improved. This targeted dietary therapy plan could not only effectively supplement the nutrients needed by the body but also promote the recovery of hematopoietic function and contribute to the improvement of the peripheral blood cell level.
 - (b) Rehabilitation nursing: Eight hours after the surgery, after the patient is fully conscious, the nursing staff should explain in detail the specific plan of postoperative rehabilitation training for gastric cancer and its clinical significance. With the cooperation of the family members, encourage the patient to actively participate in functional exercises. Initially, assist the patient to perform passive limb movements in bed, including basic movements such as turning over and sitting up. Each training

session should not exceed 30 minutes, and the exercise intensity should be adjusted individually according to the patient's tolerance, aiming to promote limb blood circulation. Starting from 48 hours after the surgery, guide the patient to gradually carry out joint flexion and extension training, focusing on exercising the range of motion of the upper-limb joints. At the same time, conduct systematic respiratory function training to improve cardiopulmonary function reserve ^[4]. As the recovery progresses, gradually guide the patient to resume daily living ability training, including basic activities such as dressing, personal hygiene, and eating. Promote the gradual recovery of various body functions through a phased rehabilitation plan.

- (c) Massage nursing: Implement systematic massage treatment for the patient using the techniques of acupoint pressing combined with massage. Focus on using techniques such as finger-pressing and palm-kneading to relax the whole body's muscles. Each treatment session should be strictly controlled within 15 minutes, with the appropriate degree of soreness for the patient as the standard. During the operation, accurately control the intensity of the applied force and focus on stimulating specific meridian points. Especially increase the frequency of abdominal massage. Promote gastrointestinal peristalsis through rhythmic kneading and pressing techniques, thus effectively improving the function of the digestive system.
- (d) Intubation nursing: When performing intubation, nursing staff should use gentle techniques to ensure accurate and proper actions. After intubation, the catheter should be properly fixed to prevent displacement or accidental removal. During the period when no nutrient solution is being infused, the gastric tube should be flushed with normal saline once every 3 hours to maintain the negative pressure inside the catheter and effectively prevent tube blockage. During enteral nutrition support, the condition of the catheter should be closely monitored, including observing for signs of bleeding and changes in the properties of the drainage fluid. Once any abnormal situation is detected, corresponding treatment measures should be taken immediately to ensure the safety and effectiveness of the treatment process ^[5].

2.3. Observation indicators

- (1) Perioperative indicators: The indicators include the recovery time of gastrointestinal function, flatus time, diet recovery time, length of hospital stay, defecation time, nasogastric tube indwelling time, recovery time of bowel sounds, and total drainage volume of the nasogastric tube.
- (2) Nutritional indicators before and after nursing: The indicators include TP, ALB, and PA.
- (3) Humoral and cellular immune indicators before and after nursing: Humoral immune indicators include IgA, IgM, and IgG. Cellular immune indicators include CD3+, CD4+, CD8+, and CD4+/CD8+.
- (4) Gastrointestinal hormone levels before and after nursing: It includes motilin and serum ghrelin. Before and after nursing, 12 ml of fasting venous blood is drawn from the patients and centrifuged at a speed of 3000 r per minute for 15 minutes. The enzyme-linked immunosorbent assay is used for detection ^[6].
- (5) Incidence of postoperative complications: This includes pulmonary infection, gastrointestinal dysfunction, pressure injury, and incision infection.

2.4. Statistical processing

SPSS 25.0 statistical software is used, where mean + standard deviation ($\pm s$) is used to represent the measurement

information, which is checked by calculating the t-value, and rate (%) is used to represent the count information, which is checked by calculating the χ^2 .

3. Results

3.1. Comparison of various perioperative indicators

All perioperative indicators of patients in the observation group were better than those of the control group ($P < 0.05$), as shown in Table 1.

Table 1. Comparison of various perioperative indicators ($\pm s$)

| Group | Number of cases | Recovery time of gastrointestinal function (h) | Time of defecation (h) | Diet recovery time (h) | Hospitalization time (h) |
|-------------------|-----------------|--|------------------------|------------------------|--------------------------|
| Observation group | 30 | 31.62 \pm 3.56 | 38.26 \pm 3.95 | 2.95 \pm 0.56 | 9.86 \pm 2.13 |
| Control group | 30 | 45.25 \pm 4.79 | 69.46 \pm 5.29 | 5.13 \pm 0.79 | 16.45 \pm 3.28 |
| <i>t</i> | - | 12.509 | 25.884 | 12.331 | 9.229 |
| <i>P</i> | - | 0.000 | 0.000 | 0.000 | 0.000 |

| Group | Number of cases | Defecation time (h) | Gastric tube retention time (h) | Bowel sounds recovery time (h) | Total drainage of gastric tube (ml) |
|-------------------|-----------------|---------------------|---------------------------------|--------------------------------|-------------------------------------|
| Observation Group | 30 | 81.23 \pm 7.25 | 82.13 \pm 7.55 | 63.63 \pm 6.66 | 263.13 \pm 16.50 |
| Control group | 30 | 88.70 \pm 9.43 | 87.67 \pm 7.26 | 74.90 \pm 7.38 | 314.89 \pm 17.68 |
| <i>t</i> | - | 2.440 | 2.897 | 6.210 | 11.723 |
| <i>P</i> | - | 0.001 | 0.005 | 0.000 | 0.000 |

3.2. Comparison of nutritional indicators before and after care

Before nursing care, the nutritional indexes of the two groups of patients were compared ($P > 0.05$), and after nursing care, the nutritional indexes of the patients in the observation group were better than those of the control group ($P < 0.05$), as shown in Table 2.

Table 2. Comparison of nutritional indicators before and after care ($\pm s$)

| Group | Number of cases | TP(g/L) | | ALB(g/L) | | PA(mg/L) | |
|-------------------|-----------------|------------------|------------------|------------------|------------------|--------------------|--------------------|
| | | Before treatment | After treatment | Before treatment | After treatment | Before treatment | After treatment |
| Observation group | 30 | 62.35 \pm 3.65 | 65.03 \pm 3.19 | 34.16 \pm 3.19 | 36.53 \pm 3.49 | 256.35 \pm 27.62 | 259.68 \pm 22.97 |
| Control group | 30 | 62.19 \pm 3.79 | 63.35 \pm 2.46 | 34.09 \pm 3.08 | 35.13 \pm 2.28 | 256.19 \pm 27.34 | 258.65 \pm 21.37 |
| <i>t</i> | - | 0.167 | 2.284 | 0.086 | 1.839 | 0.023 | 0.180 |
| <i>P</i> | - | 0.868 | 0.026 | 0.931 | 0.071 | 0.982 | 0.858 |

3.3. Comparison of humoral immunity indexes and cellular immunity indexes before and after nursing care

Before nursing, the humoral immunity indexes and cellular immunity indexes of the two groups of patients were compared ($P > 0.05$), after nursing, the humoral immunity indexes and cellular immunity indexes of the patients in

the observation group were better than those of the control group ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of humoral immunity indices as well as cellular immunity indices before and after care ($\pm s$)

| Group | Number of cases | IgA(g/L) | | IgM(g/L) | | IgG(g/L) | |
|-------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|------------------|
| | | Before treatment | After treatment | Before treatment | After treatment | Before treatment | After treatment |
| Observation Group | 30 | 2.76 \pm 0.80 | 3.32 \pm 0.91 | 1.69 \pm 0.73 | 1.34 \pm 0.98 | 12.47 \pm 3.15 | 14.23 \pm 4.16 |
| Control group | 30 | 2.78 \pm 0.78 | 2.85 \pm 0.86 | 1.67 \pm 0.72 | 1.43 \pm 0.76 | 12.35 \pm 3.09 | 12.98 \pm 3.65 |
| <i>t</i> | - | 0.098 | 2.056 | 0.107 | 0.397 | 0.149 | 1.237 |
| <i>P</i> | - | 0.922 | 0.044 | 0.915 | 0.693 | 0.882 | 0.221 |

| Group | Number of cases | CD3+(%) | | CD4+(%) | |
|-------------------|-----------------|------------------|-------------------|------------------|------------------|
| | | Before treatment | After treatment | Before Treatment | After treatment |
| Observation group | 30 | 52.21 \pm 8.32 | 59.59 \pm 10.23 | 39.41 \pm 9.26 | 43.05 \pm 7.71 |
| Control group | 30 | 52.16 \pm 8.19 | 53.46 \pm 9.28 | 39.40 \pm 9.28 | 40.93 \pm 5.58 |
| <i>t</i> | - | 0.023 | 2.431 | 0.004 | 1.220 |
| <i>P</i> | - | 0.981 | 0.018 | 0.997 | 0.227 |

| Group | Number of cases | CD8+(%) | | CD4+/CD8+ | |
|-------------------|-----------------|------------------|------------------|------------------|-----------------|
| | | Before Treatment | After treatment | Before Treatment | After treatment |
| Observation group | 30 | 22.45 \pm 4.51 | 16.41 \pm 4.49 | 1.21 \pm 0.48 | 1.92 \pm 0.55 |
| Control group | 30 | 22.46 \pm 4.61 | 19.75 \pm 5.53 | 1.22 \pm 0.51 | 1.36 \pm 0.42 |
| <i>t</i> | - | 0.008 | 2.568 | 0.078 | 4.432 |
| <i>P</i> | - | 0.993 | 0.013 | 0.938 | 0.000 |

3.4. Comparison of gastrointestinal hormone levels before and after nursing

Before nursing, the gastrointestinal hormone levels of the two groups of patients were compared ($P > 0.05$), and after nursing, the gastrointestinal hormone levels of the patients in the observation group were all better than those in the control group ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of gastrointestinal hormone levels before and after care ($\pm s$)

| Group | Number of cases | Gastrin (ng/L) | | Serum gastric hunger hormone (ng/L) | |
|-------------------|-----------------|--------------------|--------------------|-------------------------------------|------------------|
| | | Before treatment | After treatment | Before treatment | After treatment |
| Observation group | 30 | 161.56 \pm 15.69 | 208.66 \pm 16.27 | 47.61 \pm 5.51 | 59.66 \pm 4.86 |
| Control group | 30 | 160.79 \pm 15.76 | 183.03 \pm 16.13 | 47.03 \pm 5.62 | 54.12 \pm 4.72 |
| <i>t</i> | - | 0.190 | 6.127 | 0.404 | 4.479 |
| <i>P</i> | - | 0.850 | 0.000 | 0.688 | 0.000 |

3.5. Comparison of postoperative complication rates

The postoperative complication rates of the observation group were lower than those of the control group ($P < 0.05$), based on data from **Table 5**.

Table 5. Comparison of postoperative complication rates [n (%)]

| Group | Number of cases | Lung infections | Gastrointestinal dysfunction | Stress injuries | Incision infection | Incidence |
|-------------------|-----------------|-----------------|------------------------------|-----------------|--------------------|-----------|
| Observation group | 30 | 1 | 1 | 0 | 1 | 3(10.00) |
| Control group | 30 | 3 | 4 | 2 | 1 | 10(33.33) |
| χ^2 | - | - | - | - | - | 4.812 |
| <i>P</i> | - | - | - | - | - | 0.028 |

4. Discussion

Gastric cancer patients often suffer from varying degrees of malnutrition due to impaired digestive function, which in turn affects various physiological functions of the body. Digestive tract reconstruction surgery changes the original anatomical structure through esophago-jejunal anastomosis, and the jejunum partially compensates for the function of the stomach. This structural change results in the incomplete recovery of digestive function in the early postoperative period. During this time, patients experience weakened intestinal peristalsis and reduced absorption capacity, making it difficult to obtain sufficient nutrients through regular diet. Intravenous nutritional support, as an important alternative, can directly provide the energy and nutrients needed by the body. It helps to relieve the burden on the intestines and promotes the recovery of intestinal function. After the patient's intestinal peristalsis function gradually recovers, a gradual transition to a liquid diet can be made. This nutritional support strategy has become a crucial part of the early management after digestive tract reconstruction surgery^[7]. Research shows that early postoperative enteral nutritional support has multiple physiological benefits. It can not only maintain the integrity of the intestinal mucosal barrier, prevent mucosal atrophy and bacterial translocation, but also promote the recovery of intestinal peristalsis and absorption function through the direct stimulation of nutrient solutions, thus achieving a balanced intake of nutrients. Clinically, naso-intestinal tubes or naso-gastric tubes are often used as the infusion routes for enteral nutrition. After total gastrectomy, naso-intestinal tubes are mostly used to infuse precisely formulated nutrient solutions into the jejunum. However, initiating enteral nutrition too early may cause digestive discomfort symptoms such as nausea, abdominal distension, and diarrhea, which can affect the daily nutrient intake. Existing studies indicate that adopting an enteral support nursing model and supplementing the insufficient nutrients through the intravenous route before the complete recovery of intestinal function can more effectively promote the early postoperative rehabilitation process of patients.

This study found that all perioperative indicators in the observation group were superior to those in the control group, with a lower incidence of postoperative complications. The likely explanation is that patients undergoing surgery for gastric cancer often experience impaired gastric mucosal and barrier functions, leading to aggravated gastrointestinal symptoms such as nausea and vomiting, which heighten the body's stress response. Implementing a comprehensive intervention plan that combines systematic high-quality nursing with early enteral nutritional support, through nursing measures such as scientific postoperative exercise guidance and professional massage, can effectively promote the recovery of patients' gastrointestinal function. Clinical observations show that this intervention model can not only shorten the length of hospital stay but also significantly improve patients' appetite, ensure the full intake of nutrients, and thus accelerate the rehabilitation process. Relevant studies have confirmed that enteral nutritional support nursing can not only improve the safety of patients after gastric cancer surgery but also significantly optimize the postoperative recovery effect^[8].

Additionally, the study revealed that gastrointestinal hormone levels were more favorable in the observation group. A patient-centered enteral nutritional nursing model improves the quality of basic care and deepens professional nursing practice. By systematically implementing various nursing responsibility systems, this intervention model can comprehensively optimize the overall nursing service level. Clinical practice shows that standardized enteral nutritional support can effectively relieve patients' hunger and reduce the body's stress response, thus improving the nutritional and metabolic status. This nutritional intervention method can not only enhance patients' immune function but also regulate the secretion level of gastrointestinal hormones, which has multiple positive effects on promoting patients' recovery.

The study also demonstrated that all nutritional indicators were better in the observation group. Effective early postoperative nutritional interventions should incorporate psychological assessment and support to foster a positive treatment attitude. Since long-term bed rest may induce complications such as pulmonary infections and deep-vein thrombosis, patients and their families need to be guided to regularly adjust the patients' postures and conduct limb functional exercises. In terms of the management of nutrient solution infusion, strict aseptic operation procedures must be followed, and the preparation volume should be controlled according to seasonal characteristics. In summer, the single-preparation volume should be reduced. The use time of the nutrient solution should not exceed 8 hours in spring and summer, and not exceed 24 hours in autumn and winter to prevent the deterioration of the nutrient solution. When implementing enteral nutritional support, a gradual adjustment plan should be adopted, and the patients' intestinal tolerance should be closely monitored. If any discomfort symptoms occur, the infusion speed and dosage should be reduced immediately, and the improvement of the symptoms should be continuously observed. Before the complete transition to total enteral nutrition, parenteral nutritional support is recommended to ensure the continuity of nutrient supply. Meanwhile, the care of naso-intestinal tubes needs to be strengthened. The tubes should be flushed with normal saline 3–4 times a day to keep them unobstructed, so as to optimize the effect of nutritional support.

The study further indicated that humoral and cellular immune parameters were superior in the observation group. Enteral nutritional support nursing exerts a systematic influence on the host immune system through multi-pathway regulatory mechanisms. In terms of immune regulation, this intervention mainly acts on two major systems: humoral immunity and cellular immunity. Specifically, enteral nutrition can effectively maintain the physiological function of the intestinal mucosal barrier, significantly reduce the translocation of intestinal flora and their metabolites into the circulatory system, and thus inhibit the occurrence and development of excessive inflammatory responses. The molecular mechanism of this process involves the direct nutritional support of nutritional substrates to gut-associated lymphoid tissue, especially promoting the production and release of secretory immunoglobulin A, thereby strengthening the function of the mucosal immune barrier. Meanwhile, specific bioactive components in enteral nutrition can precisely regulate the dynamic balance of T-lymphocyte subsets. On the one hand, it stimulates the expression of Th1-type cytokines. On the other hand, it moderately inhibits Th2-type immune responses, forming a coordinated immune-regulatory network. In addition, enteral nutritional support can effectively activate the phagocytic function of neutrophils and macrophages and significantly enhance the killing activity of natural killer cells by providing sufficient proteins and essential micronutrients^[9]. More importantly, this nutritional support method has a wide-ranging impact on the neuroendocrine-immune system through the complex regulatory network of the gut-brain-immune axis. In this process, short-chain fatty acids produced by the metabolism of intestinal flora serve as key signaling molecules. They precisely regulate the development and function of regulatory T cells by specifically activating the G-protein-coupled receptor pathway, thereby maintaining the immune balance of the body. By adopting this multi-target and multi-level immune-regulatory mechanism, enteral nutrition establishes its

irreplaceable clinical value in optimizing the immune function of postoperative patients.

5. Conclusion

In conclusion, during the nursing process of elderly patients with gastric cancer, enteral nutritional support nursing can effectively improve the patients' immune capacity and nutritional status, promote their postoperative recovery, and prevent the occurrence of postoperative complications, with good results. However, the number of patients included in this study was relatively small, and the time for including study subjects was short. Therefore, in clinical practice, it is necessary to further increase the number of patients and extend the inclusion time. The impact of enteral nutritional support nursing on the nutritional status of elderly patients with gastric cancer needs to be verified again to further provide data support for formulating postoperative nutritional support plans for elderly patients with gastric cancer^[1].

Disclosure statement

The authors declare no conflict of interest.

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Impact of Problem-oriented Care on Self-efficacy and Compliance Behavior of Patients Undergoing Coronary Intervention Therapy

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Abstract: *Objective:* To explore the effects of problem-oriented nursing on self-efficacy and compliance behavior of patients undergoing coronary intervention. *Methods:* Seventy patients who underwent coronary intervention in a hospital from March 2024 to February 2025 were selected and divided into the control group ($n=35$) and the observation group ($n=35$) by using the randomized numeric table method. The control group implemented conventional clinical care, and the observation group was given problem-oriented nursing intervention on the basis of conventional care. The self-efficacy, negative psychological state, medical compliance behavior, and quality of life improvement of patients in the two groups were compared. *Results:* Before nursing intervention, the difference in the scores of patients' role function, symptom management, emotion management, nurse-patient communication and exchange and other dimensions between the control group and the observation group was not statistically significant ($P > 0.05$). After nursing intervention, the scores of all indexes of the two groups were significantly higher, and the difference between the two groups was statistically significant ($P < 0.05$). Before nursing intervention, the difference in the scores of patients' anxiety and depression status between the control group and the observation group was not statistical significance ($P > 0.05$). However, after nursing intervention, the negative psychological state of the two groups improved significantly, and the difference between the groups was statistically significant ($P < 0.05$). The total excellent rate of patients' compliance behavior in the observation group was 97.14%, which was significantly higher than that of the control group, which was 74.29%, with a statistically significant difference ($P < 0.05$). The patients of the observation group had a higher psychological state, social function, physical condition, emotional condition and other dimension scores of patients in the observation group were significantly higher than those of the control group, and the difference was statistically significant ($P < 0.05$). *Conclusion:* The implementation of problem-oriented nursing care for patients undergoing coronary intervention can not only significantly improve their self-efficacy and enhance their compliance behavior, but also positively improve their negative emotions of anxiety and depression, and improve their quality of life.

Keywords: Problem-oriented nursing; Coronary heart disease; Interventional therapy; Self-efficacy; Medical compliance behavior

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1. Introduction

Coronary heart disease is a common clinical cardiovascular disease, if not treated in time, it can lead to angina pectoris, chest tightness and chest pain, heart failure, shortness of breath, and other symptoms, and in serious cases, even endanger the patient's life ^[1]. Percutaneous Coronary Intervention (PCI) is an important means to improve the prognosis of patients, but the long-term recovery effect is not only dependent on the procedure itself, but also closely related to the patient's self-management ability and medical compliance behavior ^[2]. However, relevant medical studies have shown that post-PCI patients generally suffer from low self-efficacy, poor medical compliance behavior, anxiety, and depression, resulting in poor quality of life ^[3]. Therefore, how to enhance patients' self-efficacy and improve their compliance behavior through effective nursing interventions has become an important topic in clinical nursing research. Problem-Based Nursing (PBN) is a patient-centered, problem-solving nursing model, the core of which is to help patients actively participate in health management by systematically assessing their individualized needs and developing targeted = interventions ^[4]. In recent years, this model has demonstrated significant advantages in the field of chronic disease management, but the effectiveness of its application in post-PCI patients still needs to be further explored. This study aims to explore the effects of problem-oriented nursing on self-efficacy and compliance behavior of PCI patients through clinical trials, with a view to providing more scientific and efficient intervention strategies for clinical nursing practice, and ultimately improving patients' prognosis and quality of life.

2. Data and methods

2.1. General information

Seventy patients who underwent coronary intervention in a hospital from March 2024 to February 2025 are selected and divided into the control group ($n=35$) and the observation group ($n=35$) by using the random number table method. Comparison of the general information of patients in the two groups, the difference was not statistically significant, as shown in **Table 1**. All patients are aware of the content and purpose of the study in advance, and voluntarily signed the informed consent for the study, and the study has been approved by the ethics committee of the hospital for implementation.

Table 1. Comparison of the general information of the two groups

| Group | Number of cases (n) | Sex (n) | | Age ($\bar{x} \pm s$, years) | Disease duration ($\bar{x} \pm s$, years) | Co-morbidities(n) | | |
|-------------------|---------------------|---------|--------|-----------------------------------|--|-------------------|----------------|-------------------|
| | | Male | Female | | | Hypertension | Hyperlipidemia | Diabetes mellitus |
| Observation Group | 35 | 20 | 15 | 65.65 \pm 2.18 | 5.32 \pm 1.03 | 13 | 12 | 10 |
| Control group | 35 | 19 | 16 | 66.12 \pm 2.23 | 5.26 \pm 1.12 | 14 | 10 | 11 |
| χ^2/t value | | 0.058 | | 0.892 | 0.233 | | 0.267 | |
| P -value | | 1.809 | | 0.375 | 0.816 | | 0.875 | |

The inclusion criteria of the study are: (1) Those who were clearly diagnosed with coronary artery disease and successfully underwent percutaneous coronary intervention; (2) Those who possessed basic communication and comprehension skills and were able to cooperate with the study; (3) Those who were clearly conscious without serious cognitive disorders or psychiatric disorders; (4) Those who were in a stable condition after the procedure

and had serious complications such as cardiogenic shock and severe heart failure.

However, the exclusion criteria included: (1) Those with other serious diseases such as combined malignant tumors, end-stage liver and kidney failure; (2) Those with language or hearing impairment, unable to communicate effectively; (3) Those with previous history of psychiatric disease or cognitive dysfunction that affects the assessment of the effectiveness of the nursing intervention; and (4) Those with poor adherence, unable to complete the follow-up visit or withdraw from the study halfway.

2.2. Methods

2.2.3. Control group

Routine clinical nursing intervention is given. After the operation, closely monitor the patients' vital signs such as heart rate, blood pressure, oxygen saturation, etc., and keep an eye on the puncture site to see if there are any complications such as blood seepage and hematoma; if so, give symptomatic treatment. During the recovery period, the patients are asked to adjust their dietary structure, focusing on low-salt, low-fat, high-fiber foods, and are asked to quit smoking and alcohol, and actively carry out early exercise training. Before discharge from the hospital, they are given written instructions on coronary heart disease risk factors, postoperative precautions for PCI, and methods of drug administration, and are instructed to undergo regular outpatient review.

2.2.4. Observation group

Based on the control group, the observation group is given problem-oriented care, i.e., individualized and continuous rehabilitation management through problem identification, dynamic intervention, social support closed-loop management. First of all, a special nursing team composed of cardiologists, rehabilitators, and specialized nurses is set up, and after implementing special training on systematic PCI perioperative management guidelines and postoperative medication guidance, psychological adjustment, exercise rehabilitation, and dietary management, a group discussion is held to formulate a problem-oriented nursing program.

- (1) The Coronary Heart Disease Self-Management Behavior Scale is used to assess the individualized needs of the patients, identify the key problems of postoperative rehabilitation, and develop a targeted intervention plan.
- (2) Assess patients' cognitive level and self-efficacy changes through open-ended questioning, use positive incentives to strengthen their behavioral improvement, increase the frequency of education for low self-efficacy, and extend the intervention to the whole rehabilitation management, such as synchronous health education for family members to guide them to supervise the patients' behaviors. Screen the patients with good rehabilitation results as "peer supporters", and provide "peer supporters" through case sharing. For example, family members are provided with synchronized health education to guide them to monitor the patients' behavior. Patients with good rehabilitation results in the past are screened as "peer supporters", and experience is provided through case sharing to enhance patients' confidence. At the same time, a WeChat group was used to regularly disseminate PCI rehabilitation knowledge, provide medication reminders, conduct online self-efficacy assessments, and respond to patients' questions in real time, thereby enhancing self-efficacy and promoting long-term compliance behavior.

2.3. Observation indicators

- (1) Self-efficacy: The chronic disease self-efficacy scale is applied. The self-efficacy scale is used to assess patients' self-efficacy in terms of their role function, symptom management, emotion management, and

nurse-patient communication. The score ranges from 0 to 10 points, with 10 points being completely confident and 0 points being completely unconfident.

- (2) Negative psychological state: Hamilton Anxiety Scale (HAMA) and Hamilton Depression Scale (HAMD) are applied to assess the negative psychological state of the patients, with a total score of 30, and the higher the score, the more serious the negative psychological state of the patients.
- (3) Medical compliance behavior: A questionnaire is used to investigate the patients' compliance behaviors, such as taking medication dose, frequency, time, taking medication according to the course of treatment, adhering to a light diet, and exercising. A 4-level scoring method is used for evaluation, with 3 points for completely doing it, 2 points for basically accomplishing it, 1 point for occasionally accomplishing it, and 0 points for not being able to accomplish it.
- (4) Quality of life: The hospital's homemade quality of life scale is used to quantitatively score the patients' psychological state, social functioning, physical condition, and emotional condition, with a total score of 100 points, with higher scores indicating a higher level of quality of life.

2.4. Statistical methods

SPSS23.0 software is applied to carry out statistical analysis. Measurement data are expressed as mean \pm standard deviation ($\bar{x} \pm s$), and t-test is used for comparison. Count data are expressed as rate (%), and χ^2 test is used for comparison, and $P < 0.05$ is taken as the difference is statistically significant.

3. Results

3.1. Comparison of self-efficacy scores between the two groups

Before nursing intervention, the difference between the two groups of patients' scores in the dimensions of role function, symptom management, emotion management, nurse-patient communication and exchange was not significant, and there was no statistical significance ($P > 0.05$). After nursing intervention, the scores of all indicators in the two groups were significantly higher, and the observation group was better than the control group, and the difference was statistically significant ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of self-efficacy scores of patients in the two groups ($\bar{x} \pm s$, points)

| Group | Role function | | Symptom management | |
|--------------------------|--------------------|--------------------|-----------------------------|--------------------|
| | Pre- Intervention | Post- Intervention | Pre- Intervention | Post- Intervention |
| Control group (n=35) | 6.21 \pm 1.03 | 6.82 \pm 1.24* | 6.21 \pm 1.13 | 6.75 \pm 1.49* |
| Observation group (n=35) | 6.19 \pm 1.12 | 7.56 \pm 1.65* | 6.24 \pm 1.20 | 7.52 \pm 1.51* |
| <i>t</i> | 0.078 | 2.121 | 0.467 | 2.147 |
| <i>p</i> | 0.938 | 0.038 | 0.642 | 0.035 |
| Group | Emotion management | | Nurse-patient communication | |
| | Pre- Intervention | Post- Intervention | Pre- Intervention | Post- intervention |
| Control group (n=35) | 6.08 \pm 1.04 | 6.95 \pm 1.53* | 5.96 \pm 1.15 | 6.68 \pm 1.32* |
| Observation group (n=35) | 6.13 \pm 1.22 | 7.76 \pm 1.49* | 6.01 \pm 1.24 | 7.55 \pm 1.49* |
| <i>t</i> | 0.185 | 2.244 | 0.175 | 2.586 |
| <i>p</i> | 0.854 | 0.028 | 0.862 | 0.012 |

3.2. Comparison of negative psychological state scores between the two groups of patients

Before nursing intervention, the difference between the anxiety and depression state scores of the two groups of patients was not statistically significant ($P > 0.05$). After specialized nursing intervention, the negative psychological state of the two groups improved significantly, and the anxiety and depression scores of the observation group were lower than those of the control group, and the difference was statistically significant ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of negative psychological state scores of patients in two groups ($\bar{x} \pm s$, points)

| Group | HAMA | | | | HAMD | | | |
|-----------------------------------|------------------|-------------------|----------|----------|------------------|-------------------|----------|----------|
| | Pre-intervention | Post-intervention | <i>t</i> | <i>P</i> | Pre-intervention | Post-intervention | <i>t</i> | <i>P</i> |
| Control group (<i>n</i> =35) | 27.45 ± 1.38 | 19.52 ± 1.58 | 22.364 | < 0.001 | 26.02 ± 1.46 | 20.04 ± 1.19 | 18.783 | < 0.001 |
| Observation group (<i>n</i> =35) | 27.20 ± 1.12 | 12.78 ± 1.53 | 44.992 | < 0.001 | 25.75 ± 1.28 | 14.33 ± 1.26 | 37.616 | < 0.001 |
| <i>t</i> | 0.832 | 18.130 | | | 0.823 | 19.491 | | |
| <i>P</i> | 0.408 | < 0.001 | | | 0.414 | < 0.001 | | |

3.3. Comparison of the excellent rate of medical compliance behavior between the two groups

The total excellent rate of patients' medical compliance behavior in the observation group was 97.14%, significantly higher than the 74.29% in the control group, and the difference was statistically significant ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of the total excellent rate of medical compliance behavior of patients in the two groups [(cases), %]

| Group | Excellent | Excellent | Poor | Total good |
|-----------------------------------|------------|-----------|-----------|------------|
| Control group (<i>n</i> =35) | 16(45.72) | 10(28.57) | 9 (25.71) | 26 (74.29) |
| Observation group (<i>n</i> =35) | 25 (71.42) | 9 (25.71) | 1 (2.86) | 34 (97.14) |
| χ^2 | | | | 7.467 |
| <i>P</i> | | | | 0.006 |

3.4. Comparison of the quality of life scores of patients in the two groups

The scores of psychological state, social function, somatic condition, emotional condition and other dimensions of patients in the observation group were significantly higher than those of the control group, and the difference was statistically significant ($p < 0.05$), as shown in **Table 5**.

Table 5. Comparison of quality of life scores of patients in the two groups ($\bar{x} \pm s$, points)

| Group | Psychological status | Social function | Physical condition | Emotional status |
|-----------------------------------|----------------------|-----------------|--------------------|------------------|
| Control group (<i>n</i> =35) | 65.36 ± 3.28 | 63.56 ± 3.47 | 69.22 ± 2.98 | 68.74 ± 3.46 |
| Observation group (<i>n</i> =35) | 79.41 ± 3.65 | 80.06 ± 4.25 | 77.69 ± 3.85 | 81.13 ± 3.29 |
| <i>t</i> | 16.939 | 17.791 | 10.292 | 15.353 |
| <i>P</i> | < 0.001 | < 0.001 | < 0.001 | < 0.001 |

4. Discussion

Coronary artery disease is a narrowing or occlusion of the lumen of the coronary artery caused by atherosclerosis, which can lead to myocardial infarction, heart failure and other serious events. Although percutaneous coronary intervention (PCI) can rapidly restore patients' blood flow, the risk of post-procedural restenosis and in-stent thrombosis still exists, and patients are under long-term pressure for secondary prevention, so post-procedural care should focus on post-procedural complication monitoring, treatment adherence management, control of cardiovascular risk factors and lifestyle reconstruction^[5]. However, traditional nursing care focuses on the implementation of the main medical advice, lacks standardized and individualized education, ignores the differences in patients' cognitive level and cultural background, resulting in patients not being able to actively identify potential health problems, coupled with fragmented intervention models that tend to disassociate health education, psychological support, and behavioral supervision, there is an urgent need to build a new model of nursing care that focuses on the needs of the patient^[6].

Problem-Based Care (PBC) is based on the core of "accurate identification-collaborative solution-dynamic feedback", through the structured assessment tool to locate individualized health problems, and then combined with the patient's specific care needs to formulate a targeted intervention program, which is highly effective in the management of chronic disease care. It is highly effective in chronic disease care management^[7]. Shao *et al.* demonstrated that PBC-based health education combined with relaxation training significantly improved anxiety/depression scores and quality of life scores of elderly patients with PCI^[8]. Wang *et al.* found that a diversified PBC strategy increased patients' self-efficacy by 32.7%^[9]. Based on the above research results, this study was conducted to verify the optimization effect of PBC on self-efficacy and compliance behavior of PCI patients, aiming to provide an evidence-based basis for clinical practice.

The results of the study showed that the scores of the observation group in the dimensions of role functioning and symptom management were significantly higher than those of the control group ($P < 0.05$), indicating that PBC solved the problems of patients' medication omission coping and anginal attack management through contextualized nursing care and strengthened their confidence in recovery. The anxiety/depression scores of the observation group were reduced to $(12.78 \pm 1.53)/(14.33 \pm 1.26)$, which was close to the health threshold, confirming the effect of PBC on patients' self-efficacy and compliance behavior in clinical practice. The anxiety/depression score of the observation group dropped to $(12.78 \pm 1.53)/(14.33 \pm 1.26)$, which was close to the health threshold, confirming the synergistic mechanism of "psychological care-relaxation training" proposed by Du^[10]. The rate of good medical compliance in the observation group reached 97.14%, which was significantly higher than that of the control group that practiced routine clinical care (74.29%), due to the continuous tracking of the safety of medications and reminders of follow-up appointments by the PBC, ($P < 0.05$). In terms of social function and emotional status, the observation group had higher scores in all dimensions, which fully proved the important value of problem-oriented nursing in improving the physiological-psychological-social function of PCI patients.

Overall, the core advantages of the problem-oriented nursing model are obvious, as its timely response to patients' needs and through patients' participation in decision-making can significantly improve patients' behavioral autonomy.

5. Conclusion

In conclusion, problem-based care can significantly improve patients' self-efficacy and compliance by accurately

identifying the individualized health problems of PCI patients and constructing a collaborative intervention pathway, which can provide an efficient and scalable practice paradigm for the continuity of care in coronary intervention.

Disclosure statement

The authors declare no conflict of interest.

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Analysis of the Rationality and Management Strategies of Traditional Chinese Medicine Formula Granule Prescriptions

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Abstract: *Objective:* To analyze the application value of prescription management of traditional Chinese medicine formula granules in reducing unreasonable prescriptions. *Methods:* From January to June 2024, before improving prescription management strategies, 118 patients treated with traditional Chinese medicine formula granules were included in the control group. From July to December 2024, after improving prescription management strategies, 118 patients treated with traditional Chinese medicine formula granules were included in the observation group. The unqualified prescription rate, incidence of adverse reactions, complaint rate, and satisfaction were compared. *Results:* The unqualified prescription rate of traditional Chinese medicine formula granules in the observation group was lower than that in the control group ($P < 0.05$); the incidence of adverse reactions and patient complaint rate of traditional Chinese medicine formula granules in the observation group were lower than those in the control group ($P < 0.05$); the satisfaction of traditional Chinese medicine formula granules in the observation group was higher than that in the control group ($P < 0.05$). *Conclusion:* Improving the prescription management strategy of traditional Chinese medicine formula granules can reduce the unqualified prescription rate and the incidence of adverse drug reactions, reduce patient complaints, and is conducive to improving patient satisfaction.

Keywords: Traditional Chinese medicine formula granules; Prescription management strategies of traditional Chinese medicine; Rationality of traditional Chinese medicine prescriptions

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1. Introduction

Traditional Chinese medicine has a long history and wide application in China. TCM syndrome differentiation and treatment can flexibly adjust prescriptions based on patients' physical constitution and disease syndromes, achieving syndrome differentiation and medication, as well as addition and subtraction according to the prescription. However, with the acceleration of modern social rhythms, the disadvantages of traditional Chinese

medicinal decoction, such as time-consuming cooking and inconvenience in carrying, have gradually become apparent. With the continuous enrichment of traditional Chinese medicine formulations, the technology of traditional Chinese medicine formula granules has gradually matured, which can compensate for the defects of traditional Chinese medicinal decoction that is inconvenient to cook and difficult to store. It can also retain the medicinal properties of Chinese herbal medicines to the greatest extent, precisely control the dosage, and make it more convenient for patients to take. With the wide application of traditional Chinese medicine formula granules, the rationality of their prescriptions has also attracted much attention.

Therefore, hospitals should pay attention to the management of prescriptions for traditional Chinese medicine formula granules, improve prescription management strategies, and strengthen supervision to ensure the rational use of traditional Chinese medicine formula granules and reduce medical disputes ^[1]. During the implementation of prescription management strategies for traditional Chinese medicine formula granules, the prescription review system should be implemented to review and notify penalties for unqualified prescriptions. The prescription is not only a proof of medication for patients but also a basis for pharmacists to dispense medicines. It has legal effects and economic responsibilities. Standardized and reasonable prescriptions can not only ensure better efficacy but also reduce the incidence of adverse reactions. Based on this, this article explores the application value of improving traditional Chinese medicine prescription management strategies using patients treated with traditional Chinese medicine formula granules from January to December 2024 as samples.

2. Materials and methods

2.1. Materials

One hundred and eighteen patients treated with traditional Chinese medicine formula granules from January to June 2024 are randomly selected and included in the control group, and 118 patients treated with traditional Chinese medicine formula granules from July to December 2024 are also randomly selected and included in the observation group. The data of patients treated with traditional Chinese medicine formula granules in the observation group are compared with those in the control group ($P > 0.05$), as shown in **Table 1**.

Table 1. Analysis of basic information of patients treated with traditional Chinese medicine formula granules

| Group | n | Gender (%) | | Age (years) | | BMI (kg/m ²) | |
|-------------------|-----|------------|------------|-------------|--------------|--------------------------|--------------|
| | | Male | Female | Range | Mean±SD | Range | Mean±SD |
| Observation group | 118 | 71 (60.17) | 47 (39.83) | 36-41 | 38.41±1.11 | 18-32 | 24.61±1.48 |
| Control group | 118 | 70 (59.32) | 48 (40.68) | 36-42 | 38.39 ± 1.12 | 18-33 | 24.59 ± 1.51 |
| χ^2/t | - | 0.0176 | | 0.1378 | | 0.1028 | |
| <i>P</i> -value | - | 0.8944 | | 0.8905 | | 0.9182 | |

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

- (1) Consistent with the treatment standards for the clinical application of traditional Chinese medicine formula granules in the “International Expert Consensus on the Clinical Application of Traditional Chinese Medicine Formula Granules” ^[2]
- (2) Signed informed consent

- (3) Cooperated with the administration of traditional Chinese medicine formula granules

2.2.2. Exclusion criteria

- (1) Patients with kidney tumor diseases
- (2) Patients with hypertensive nephropathy
- (3) Critically ill patients

2.3. Methods

2.3.1. Observation group

- (1) Improving the system: Combining the guidelines for the use of traditional Chinese medicine, hospital prescription review norms, and clinical medication practices, improve the prescription management system that aligns with the daily work of the hospital.
- (2) Reviewing and reporting unreasonable prescriptions: During the improvement of traditional Chinese medicine formula granule prescription management strategies, pharmacists should implement prescription review work according to departmental rules and regulations, strictly inspect prescriptions for traditional Chinese medicine formula granules, and focus on analyzing whether there are compatibility contraindications and repeated medication issues. If unreasonable prescriptions are found, pharmacists should immediately communicate with the prescribing physician to avoid possible adverse effects; for physicians who refuse to communicate or cooperate, unreasonable prescriptions should be reported immediately.
- (3) Syndrome differentiation and treatment: During the management of traditional Chinese medicine formula granule prescriptions, pharmacists should understand patients' past medication history and allergy history, make dialectical adjustments to traditional Chinese medicine prescriptions based on the illness and constitution, and provide reasonable suggestions, including timing of administration, dosage, and medication methods. Additionally, as some patients treated with traditional Chinese medicine formula granules often take more than one medication, a comprehensive analysis of different drug indications and contraindications is necessary to avoid repeated administration or compatibility contraindications.
- (4) Strengthening training: Conduct training for clinicians and pharmacists, disseminate knowledge of traditional Chinese medicine compatibility and dialectical administration, and strengthen medical staff's understanding of traditional Chinese medicine theoretical knowledge; organize regular case seminars to discuss unqualified prescriptions and standardize the format of prescriptions written by doctors. Analyze typical cases of unreasonable prescriptions, and provide targeted training for pharmacists to improve their ability to review prescriptions.
- (5) Enhancing education: Patiently educate patients, disseminate information on drug contraindications, potential risks during administration, and precautions, and patiently answer patients' concerns about traditional Chinese medicine formula granules to ensure correct medication methods and dosages.
- (6) Introducing an information management system: Create an in-hospital traditional Chinese medicine compatibility database, add modules for syndrome differentiation and treatment, drug dosage reminders, and compatibility contraindications. After entering patient information into the database, the patient's prescription will automatically appear, enabling online review of prescription rationality. Only prescriptions that pass the review can enter the dispensing status. Electronic medical record systems are created for all patients receiving treatment with traditional Chinese medicine formula granules to monitor

and record adverse drug reactions in a timely manner, and to quickly review and address drug side effects. Additionally, during the improvement of traditional Chinese medicine formula granule management strategies, big data analysis techniques can be introduced to summarize and analyze the types and causes of common unreasonable prescriptions, continuously improving the hospital's management strategies for traditional Chinese medicine formula granule prescriptions.

- (7) Implementing reward and punishment measures: Regularly conduct random reviews of traditional Chinese medicine formula granule prescriptions, investigate unqualified prescriptions, deeply analyze influencing factors, discuss and propose improvement measures. If a physician frequently has unqualified prescriptions, they should be interviewed for rectification and subjected to performance penalties. A complaint hotline should be established for patients treated with traditional Chinese medicine formula granules to immediately investigate and address any prescription-related complaints.

2.3.2. Control group

Physicians directly administered medications based on prescriptions without implementing prescription management strategies.

2.4. Statistical analysis

Data are processed using SPSS 23.0. Count indicators are tested using the chi-square test and recorded as percentages (%), while measurement indicators are tested using the t-test and recorded as mean \pm standard deviation (\pm s). Statistical differences are considered significant at $P < 0.05$.

3. Results

3.1. Indices of unqualified prescriptions

The unqualified prescription rate of traditional Chinese medicine formula granules in the observation group was lower than that in the control group ($P < 0.05$), as shown **Table 2**.

Table 2. Comparison of unqualified prescription rates of traditional Chinese medicine formula granules (n,%)

| Group | Inadequate patient education | Westernized diagnostic approach | Inappropriate dosage | Improper administration | Incorrect case information |
|--------------------------|------------------------------|---------------------------------|----------------------|-------------------------|----------------------------|
| Observation group(n=118) | 1 (0.85%) | 0 (0.00%) | 1 (0.85%) | 0 (0.00%) | 0 (0.00%) |
| Control group (n=118) | 2 (1.69%) | 1 (0.85%) | 1 (0.85%) | 1 (0.85%) | 1 (0.85%) |
| χ^2 | - | - | - | - | - |
| P-value | - | - | - | - | - |

| Group | Non-standard prescription | Duplicate medication | Incompatible medication combinations | Incidence rate |
|---------------------------|---------------------------|----------------------|--------------------------------------|----------------|
| Observation group (n=118) | 0 (0.00%) | 0 (0.00%) | 0 (0.00%) | 2 (1.69%) |
| Control group (n=118) | 1 (0.85%) | 1 (0.85%) | 1 (0.85%) | 9 (7.63%) |
| χ^2 | - | - | - | 4.6723 |
| P-value | - | - | - | 0.0306 |

3.2. Adverse reaction and patient complaint indices

The incidence of adverse reactions and patient complaint rates of traditional Chinese medicine formula granules in the observation group were lower than those in the control group ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of the incidence of adverse reactions and patient complaint rates (n,%)

| Group | Facial edema | Nausea/ Vomiting | Palpitations | Pruritus | Adverse reaction rate | Patient complaint rate |
|--------------------------|--------------|---------------------|--------------|----------|--------------------------|---------------------------|
| Observation group(n=118) | 0 (0.00) | 1 (0.85) | 0 (0.00) | 0 (0.00) | 1 (0.85) | 0 (0.00) |
| Control group (n=118) | 2 (1.69) | 3 (2.54) | 1 (0.85) | 1 (0.85) | 7 (5.93) | 5 (4.24) |
| χ^2 | - | - | - | - | 4.6579 | 5.1082 |
| P-value | - | - | - | - | 0.0309 | 0.0238 |

3.3. Patient satisfaction index

The satisfaction with the management of traditional Chinese medicine formula granules in the observation group was higher than that in the control group ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of patient satisfaction with the treatment of traditional Chinese medicine formula granules (n,%)

| Group | Satisfied | Somewhat satisfied | Dissatisfied | Satisfaction rate |
|---------------------------|-------------|--------------------|--------------|-------------------|
| Observation group (n=118) | 82 (69.49%) | 34 (28.81%) | 2 (1.69%) | 116 (98.31%) |
| Control group (n=118) | 67 (56.78%) | 41 (34.75%) | 10 (8.47%) | 108 (91.53%) |
| χ^2 | - | - | - | 5.6190 |
| P-value | - | - | - | 0.0178 |

4. Discussion

The dispensing of traditional Chinese medicine refers to the process where pharmacists prepare Chinese herbal decoctions or preparations based on prescriptions issued by physicians for patient use. This process involves numerous steps to ensure that patients receive safe and effective medication. During routine treatment, the quality of prescription dispensing for traditional Chinese medicine formula granules directly affects the efficacy of the medication. Unreasonable prescriptions not only fail to achieve the desired therapeutic effect but may also lead to adverse events [3]. On the one hand, due to the rich diversity of traditional Chinese medicinal resources, confusion in medication use can easily occur due to similar names. For example, both “Sanqi” and “Tusanqi” can be used to reduce swelling and pain, as well as disperse blood stasis and stop bleeding. However, long-term use of “Tusanqi” as “Sanqi” may damage the patient’s liver because “Tusanqi” contains pyrrolizidine alkaloids. On the other hand, the use of multiple names for the same herb can also lead to confusion. For instance, “Yimucao” is also known as “Chongwei” and “Kuncao”. If the dispensing personnel are not familiar with these alternative names, it may increase the risk of medication dispensing errors.

Furthermore, different processing methods of traditional Chinese medicine can affect their medicinal properties. For example, the medicinal properties of *Rehmannia glutinosa* undergo significant changes depending on the processing method. Fresh *Rehmannia glutinosa* is mainly used for promoting the production of body fluid,

cooling blood, and clearing heat, while dried *Rehmannia glutinosa* is used for promoting the production of body fluid and nourishing Yin. Processed *Rehmannia glutinosa*, on the other hand, is used for nourishing and filling the marrow, benefiting the essence, nourishing Yin, and enriching the blood.

Therefore, hospitals should strengthen the supervision of the quality of prescriptions for traditional Chinese medicine formula granules and use the rational use of traditional Chinese medicine as a management basis to ensure the safety of traditional Chinese medicine formula granules as much as possible ^[4]. Although traditional Chinese medicine formula granules are extracted from single herbs, they are often used in combination during clinical application. Therefore, it is still necessary to follow the principles of “Eighteen Incompatibilities” and “Nineteen Mutual Inhibitions” to avoid situations where toxicity is superimposed or efficacy is canceled out in the prescriptions. For example, if both seaweed and licorice are present in a prescription of traditional Chinese medicine formula granules, it can cause severe side effects for patients. Additionally, strengthening the supervision of the quality of prescriptions for traditional Chinese medicine formula granules can also avoid errors in medication dosage ^[5]. For instance, using large amounts of aconite can induce arrhythmia, affecting the safety of medication for patients ^[6].

Based on the data analysis in this article, the rate of unqualified prescriptions for traditional Chinese medicine formula granules in the observation group was lower than that in the control group ($P < 0.05$). Analyzing the reasons, during the improvement of the management strategy for prescriptions of traditional Chinese medicine formula granules, combining relevant guidelines and clinical medication experience to improve the prescription review system played a significant role in reducing the unqualified prescription rate of traditional Chinese medicine formula granules ^[7]. Additionally, emphasizing the pharmacist’s review responsibilities, strictly reviewing and reporting unreasonable prescriptions, can avoid unqualified prescriptions of traditional Chinese medicine formula granules to some extent. Furthermore, after introducing the information management system, it became convenient for pharmacists to review prescriptions online, greatly improving work efficiency and further standardizing the rationality of prescriptions for traditional Chinese medicine formula granules. Finally, implementing rewards and punishments measures, such as imposing performance penalties on doctors who frequently issue unqualified prescriptions, can stimulate doctors’ sense of responsibility and fundamentally reduce adverse drug events.

Another set of data in this article shows that the incidence of adverse reactions to traditional Chinese medicine formula granules and the rate of patient complaints in the observation group were lower than those in the control group ($P < 0.05$). Analyzing the reasons, during the management of prescriptions for traditional Chinese medicine formula granules, pharmacists deeply understood patients’ past medication history and allergy history based on the theory of syndrome differentiation and treatment. Reviewing prescriptions based on illness and constitution, standardizing drug names, dosages, medication methods, and administration times can reduce the risk of contraindications or medication confusion in prescriptions, thereby reducing the incidence of adverse reactions. Strengthening the training of doctors and pharmacists can reduce unreasonable prescriptions from the source and ensure patient safety. Educating patients, popularizing medication knowledge, precautions, and potential medication risks, establishing good communication channels with patients, and answering patients’ questions can greatly reduce the incidence of adverse reactions and patient complaints while ensuring accurate medication methods and dosages ^[8,9].

The final set of data indicates that patient satisfaction with traditional Chinese medicine formula granules treatment in the observation group was higher than that in the control group ($P < 0.05$). The reason for this is closely related to the reduction of unqualified prescriptions issued by doctors and the decrease in adverse events

after improving the management strategy for traditional Chinese medicine formula granules. Simultaneously, strengthening education, emphasizing drug compatibility and dosage management, answering patients' questions, popularizing medication knowledge, valuing pharmacist training, and enhancing the competency of pharmacy staff have greatly improved patient satisfaction^[10]. Additionally, after introducing the information management system, pharmacists can review prescriptions online more efficiently, handle adverse events faster, and make doctors' prescriptions for traditional Chinese medicine formula granules more reasonable, thus shortening the course of the disease and improving patient satisfaction.

5. Conclusion

In summary, after improving the management strategy for prescriptions of traditional Chinese medicine formula granules, unreasonable prescription events have decreased, the incidence of adverse drug reactions and complaint rates have decreased, and patient satisfaction with traditional Chinese medicine formula granules treatment has increased. This approach has promotional value.

Disclosure statement

The authors declare no conflict of interest.

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Clinical Effect of Combined Therapy with Triple Nebulization and Montelukast Sodium Orally Dissolving Films in the Treatment of Pediatric Asthmatic Bronchopneumonia

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Abstract: *Objective:* To evaluate the efficacy of montelukast sodium orally dissolving films combined with triple nebulization in the treatment of pediatric asthmatic bronchopneumonia. *Methods:* A total of 60 pediatric patients with asthmatic bronchopneumonia who visited the hospital from December 2021 to December 2024 were selected as samples and randomly divided into two groups. Group A received combined therapy with montelukast sodium orally dissolving films, while Group B received triple nebulization therapy. The time to symptom relief, serum inflammatory factors, and adverse reactions were compared between the two groups. *Results:* The duration of asthma, cough, and wheezing, as well as the length of hospital stay, were shorter in Group A than in Group B ($P < 0.05$). The levels of C-reactive protein (CRP), white blood cell count (WBC), and serum amyloid A (SAA) were lower in Group A than in Group B ($P < 0.05$). The incidence of adverse reactions was lower in Group A than in Group B ($P < 0.05$). *Conclusion:* The combination therapy of montelukast sodium orally dissolving films and triple nebulization for pediatric asthmatic bronchopneumonia can effectively inhibit inflammation, shorten the duration of symptoms, and is safe and efficient.

Keywords: Montelukast sodium orally dissolving films; Triple nebulization therapy; Pediatric asthmatic bronchopneumonia; Efficacy

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1. Introduction

Pediatric asthmatic bronchopneumonia is a common respiratory disease in infants and young children. It is associated with infection by viruses, *Mycoplasma pneumoniae*, or allergic factors, which can cause airway spasms and induce wheezing. The main symptoms include wheezing, cough, and shortness of breath. Clinically, asthmatic bronchopneumonia is often treated with medication, commonly using corticosteroids, antibiotics, and

bronchodilators. Through a comprehensive drug administration plan, the symptoms of bronchopneumonia can be alleviated. However, irrational drug use can increase the risk of side effects and affect prognosis. The triple nebulization inhalation therapy is a commonly used treatment strategy for asthmatic bronchopneumonia, which can alleviate bronchopneumonia-related symptoms. Montelukast sodium orally dissolving film can antagonize leukotriene receptors, inhibit airway inflammatory responses, and relieve bronchial mucosal edema, which is beneficial for enhancing the management effect of pediatric asthmatic bronchopneumonia ^[1]. Based on this, this article explores the treatment effect of montelukast sodium orally dissolving film combined with triple nebulization inhalation therapy using 60 pediatric asthmatic bronchopneumonia cases as samples from December 2021 to December 2024.

2. Materials and methods

2.1. Materials

A sample of 60 cases of pediatric asthmatic bronchopneumonia treated from December 2021 to December 2024 is selected and randomly divided into two groups, Group A and Group B. The data of asthmatic bronchopneumonia in Group A are compared with those in Group B, with $P > 0.05$, as shown in **Table 1**.

Table 1. Data analysis of children with asthmatic bronchopneumonia

| Group | n | Gender (%) | | Age (years) | | Disease Duration (d) | |
|------------|----|------------|------------|-------------|-----------------|----------------------|-----------------|
| | | Male | Female | Range | Mean \pm SD | Range | Mean \pm SD |
| Group A | 30 | 19 (63.33) | 11 (36.67) | 1–7 | 4.09 \pm 0.84 | 1–4 | 3.11 \pm 0.49 |
| Group B | 30 | 20 (66.67) | 10 (33.33) | 1–8 | 4.11 \pm 0.89 | 1–5 | 3.09 \pm 0.51 |
| χ^2/t | - | 0.0733 | | 0.0895 | | 0.1549 | |
| P | - | 0.7866 | | 0.9290 | | 0.8774 | |

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

- (1) Compatible with asthmatic bronchopneumonia in Zhu Futang's Practical Pediatrics ^[2]
- (2) Parents signed the informed consent
- (3) Not taking bronchodilators or immunosuppressants

2.2.2. Exclusion criteria

- (1) Children with critical pneumonia requiring surgical intervention
- (2) Accompanied by organ lesions
- (3) Abnormal liver function

2.3. Treatment methods

Group A is treated with montelukast sodium orally dissolving membranes (Qilu Pharmaceutical Co., Ltd.). For children ≤ 5 years old, the single dose is 4mg; for children > 5 years old, the single dose is 5mg. Take an appropriate amount of medication and place it in the mouth. The active ingredients dissolve and are absorbed by the body. The medication is administered for 3 weeks.

Group B received triple nebulization therapy. The dosage is determined based on the child's weight. For children < 20kg, nebulized terbutaline sulfate solution (1ml) + budesonide suspension (2ml) + ipratropium bromide solution for inhalation (0.5ml) are administered. For children > 20kg, the dosages are adjusted to 2ml, 2ml, and 0.5ml, respectively. Nebulization is performed 3 times a day for 3 weeks.

2.4. Observation indicators

- (1) Symptom relief time: Record the time of wheezing, coughing, dry rales, and length of hospital stay.
- (2) Serum inflammatory factor indicators: CRP and SAA are detected by immunoturbidimetry, and WBC is detected by a blood analyzer.
- (3) Adverse reactions: Record dizziness, abdominal pain, and nausea.

2.5. Statistical analysis

The data are processed using SPSS 23.0 software. The chi-square test is used for counting data (% recorded), and the t-test is used for measurement data ($\pm s$ recorded). Statistical differences are considered significant at $P < 0.05$.

3. Results

3.1. Symptom relief time

The time of wheezing, coughing, dry rales, and hospital stay in Group A were shorter than those in Group B, with $P < 0.05$, as shown in **Table 2**.

Table 2. Comparison of symptom relief time in children with asthmatic bronchopneumonia ($\bar{x} \pm s$)

| Group | Wheezing disappearance time (days) | Cough disappearance time (days) | Dry rales disappearance time (days) | Hospitalization duration (days) |
|--------------------|------------------------------------|---------------------------------|-------------------------------------|---------------------------------|
| Group A ($n=30$) | 4.01 ± 0.61 | 3.28 ± 0.36 | 2.48 ± 0.26 | 3.81 ± 1.12 |
| Group B ($n=30$) | 5.94 ± 0.79 | 5.68 ± 0.81 | 4.32 ± 0.31 | 5.36 ± 1.36 |
| t | 10.5912 | 14.8301 | 24.9089 | 4.8187 |
| P | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |

3.2. Serum inflammatory factor indicators

After treatment, the levels of CRP, SAA, and WBC in Group A were lower than those in Group B, with $P < 0.05$. Details are shown in **Table 3**.

Table 3. Comparison of serum inflammatory factors in asthmatic bronchopneumonia ($\bar{x} \pm s$)

| Group | CRP (mg/L) | | SAA (mg/L) | | WBC ($\times 10^9/L$) | |
|--------------------|------------------|------------------|------------------|------------------|-------------------------|-----------------|
| | Pre- treatment | Post- treatment | Pre- treatment | Post- treatment | Pre- treatment | Post- treatment |
| Group A ($n=30$) | 81.29 ± 4.19 | 12.52 ± 1.26 | 22.14 ± 2.14 | 10.14 ± 1.81 | 14.22 ± 1.81 | 5.61 ± 1.06 |
| Group B ($n=30$) | 81.31 ± 4.21 | 37.51 ± 1.94 | 22.17 ± 2.16 | 16.36 ± 1.79 | 14.21 ± 1.79 | 8.72 ± 1.45 |
| t | 0.0184 | 59.1700 | 0.0540 | 13.3831 | 0.0215 | 9.4838 |
| P | 0.9853 | 0.0000 | 0.9571 | 0.0000 | 0.9829 | 0.0000 |

3.3. Adverse reaction indicators

The adverse reaction rate in Group A was lower than that in Group B, with $P < 0.05$, as shown in **Table 4**.

Table 4. Comparison of adverse reactions in asthmatic bronchopneumonia (n,%)

| Group | Dizziness | Abdominal pain | Nausea | Overall incidence |
|--------------------|------------|----------------|-----------|-------------------|
| Group A ($n=30$) | 1 (3.33%) | 0 (0.00%) | 0 (0.00%) | 1 (3.33%) |
| Group B ($n=30$) | 3 (10.00%) | 2 (6.67%) | 1 (3.33%) | 6 (20.00%) |
| χ^2 | - | - | - | 4.0431 |
| P | - | - | - | 0.0444 |

4. Discussion

Wheezing bronchopneumonia is prevalent in infants and young children, often with acute onset. It is associated with infectious pathogens or allergic factors, leading to edema and congestion of bronchial mucosa, as well as increased mucus secretion in the respiratory tract. Additionally, it is related to airway spasms and inflammatory reactions, resulting in narrowing of the airways and inducing wheezing symptoms^[3]. Common symptoms of wheezing bronchopneumonia include cough, wheezing, and dyspnea. A few children may experience fever $> 38^{\circ}\text{C}$ after 2–3 days of infection, accompanied by irritability, diarrhea, vomiting, and loss of appetite^[4]. Currently, clinical treatment for wheezing bronchopneumonia in children often involves medication, with the principles of relieving asthma, eliminating phlegm, stopping cough, and reducing fever.

A commonly used treatment is the triple nebulization inhalation regimen. Among them, terbutaline sulfate nebulization inhalation solution can activate β_2 adrenergic receptors, increase intracellular cyclic adenosine monophosphate content in children, relax bronchial smooth muscles, and relieve bronchial spasms. The medication takes effect within 5–10 minutes, reducing airway resistance and alleviating dyspnea. Budesonide is a glucocorticoid drug that binds to corticosteroid receptors, inhibiting airway inflammation and blocking excessive glandular secretion. When administered via nebulization inhalation, the medicinal components deposit heavily in the lungs, favoring prolonged duration of the medicinal effects. Ipratropium bromide for inhalation can block M cholinergic receptors in airway smooth muscles, inhibit receptor contraction, suppress glandular mucus secretion in children, and accelerate sputum excretion^[5, 6]. The triple nebulization inhalation regimen exerts medicinal effects through different targets, expanding the bronchi and reducing nocturnal wheezing symptoms^[7].

However, the improvement in lung function achieved by nebulization inhalation alone is limited, necessitating the exploration of efficient combination therapy regimens. Montelukast sodium orally dissolving films represent a modern therapeutic approach. They can antagonize leukotriene receptors, inhibit airway inflammation, alleviate bronchial mucosal edema, block mucus secretion from bronchial mucosa, and suppress smooth muscle spasms. They are suitable for the treatment of pediatric asthmatic diseases^[8]. However, it should be noted that children with wheezing bronchopneumonia are often young and have limited awareness of their own disease, sometimes even resisting medication^[9]. Therefore, in this paper, montelukast sodium orally dissolving films were selected as an adjuvant therapy. These films are directly absorbed through the oral mucosa, effectively avoiding the first-pass effect and degradation by gastric acid. They do not require water for administration, chewing, or swallowing, which can improve children's cooperation with medication intake.

Based on the data analysis in this article, Group A had shorter durations of wheezing, coughing, and dry

rales, as well as a shorter hospital stay compared to Group B, with $P < 0.05$. The reason for this is that the triple nebulization inhalation therapy targets multiple points, inhibiting inflammation progression in the children through the active ingredients of budesonide suspension, and dilating their airways through terbutaline sulfate nebulization inhalation solution and ipratropium bromide inhalation solution, which can rapidly relieve wheezing symptoms^[10]. On this basis, the combination of montelukast sodium orally dissolving films can inhibit airway hyperresponsiveness through antagonism of leukotrienes, prevent inflammatory factors from infiltrating the airways, and avoid difficulty in swallowing medication with water as the medication is placed in the child's mouth to dissolve, resulting in rapid relief of various symptoms^[11]. Another set of data shows that Group A had lower levels of CRP, SAA, and WBC compared to Group B, with $P < 0.05$. The reason for this is that combination therapy with montelukast sodium orally dissolving films stimulates eosinophil deactivation, blocks the release of mediators such as histamine and leukotrienes, inhibits airway hyperresponsiveness, and indirectly reduces the release of inflammatory mediators, resulting in lower serum indicators^[13].

Additionally, montelukast sodium orally dissolving films can block the release of mucus and reduce airway edema, which is beneficial for further reducing serum factors^[14]. Finally, another set of data indicates that Group A had a lower adverse reaction rate compared to Group B, with $P < 0.05$. Nebulization inhalation therapy, a commonly used treatment for pediatric diseases, can reduce the drug dosage and minimize the adverse effects of active ingredients on children's bodies. The nebulized medication directly exerts its effect at the site of the disease, relieving airway discomfort and reducing side effects associated with oral administration^[15]. Furthermore, the use of montelukast sodium orally dissolving films as adjunctive therapy improves medication compliance as they do not require water for administration, and the films are safer as they do not carry risks of osteoporosis or oral and pharyngeal candidiasis. However, the small sample size of children with asthmatic bronchopneumonia in this study may introduce deviations in the evaluation of the control effects of montelukast sodium orally dissolving films combined with triple nebulization inhalation therapy. Future studies should include a larger sample size of children with asthmatic bronchopneumonia to explore the control effects of this combination therapy through multicenter investigations.

5. Conclusion

In summary, the combination of montelukast sodium orally dissolving films and triple nebulization inhalation therapy for the treatment of pediatric asthmatic bronchopneumonia can shorten the duration of symptoms, reduce inflammatory responses, and decrease adverse reactions, making it a promising approach for widespread use.

Disclosure statement

The author declares no conflict of interest.

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Study on the Intervention of Renal Yang Deficiency Hypertension by Combined External Therapies of Traditional Chinese Medicine Through Regulating the RASS System

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Abstract: *Objective:* This study explores the mechanism and clinical efficacy of combined external therapies of traditional Chinese medicine (such as moxibustion, acupoint application, etc.) in intervening renal Yang deficiency hypertension through regulating the renin-angiotensin-aldosterone system (RASS). *Methods:* Sixty-one patients with renal Yang deficiency hypertension admitted to the hospital were selected as the study subjects. They were divided into a Western medicine combined with external therapies of traditional Chinese medicine group ($n=30$) and a conventional Western medicine treatment group ($n=31$) based on a random number table method. The enrollment information, blood pressure changes, and differences in aldosterone, angiotensin II, and renin activity during follow-up were compared between the two groups. *Results:* There were no statistically significant differences in gender, past history, pre-study medication, hypertension grading, aldosterone, angiotensin II, renin activity levels, and blood pressure between the two groups at baseline ($P > 0.05$). Aldosterone, angiotensin II, and renin activity levels were significantly reduced in both groups after treatment compared to pre-treatment levels. Moreover, the aldosterone, angiotensin II, and renin activity levels in the Western medicine combined with external therapies of traditional Chinese medicine group were significantly lower than those in the conventional Western medicine treatment group, with statistically significant differences ($P < 0.05$). *Conclusion:* Western medicine combined with external therapies of traditional Chinese medicine may regulate the RASS system through multiple targets, restoring renal Yang Qi transformation function and providing a new strategy for the integrated treatment of renal Yang deficiency hypertension with Chinese and Western medicine.

Keywords: Combined external therapies of traditional Chinese medicine; RASS system; Renal Yang deficiency hypertension

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1. Introduction

Hypertension is one of the most common chronic diseases worldwide, with a complex pathogenesis involving imbalances in neuroendocrine, vasoactive substances, and renal regulatory systems^[1]. The renin-angiotensin-aldosterone system (RASS), as a core pathway for blood pressure regulation, can lead to vasoconstriction, water-sodium retention, and oxidative stress responses when overactivated, further exacerbating the progression of hypertension^[2]. In recent years, traditional Chinese medicine theories have demonstrated unique advantages in the prevention and treatment of hypertension, particularly the potential association between “renal Yang deficiency” as a critical pathogenesis of hypertension and dysfunction of the RASS system. Renal Yang, the root of Yang Qi in the body, is responsible for warmth and Qi transformation. Deficiency of renal Yang leads to abnormal water metabolism, which can trigger internal cold accumulation, blood vessel constriction, and ultimately elevated blood pressure^[3]. Currently, Western medicine interventions targeting the RASS system rely mainly on drugs such as angiotensin-converting enzyme inhibitors (ACEI) and angiotensin receptor blockers (ARB), but long-term use may cause adverse reactions such as dry cough and hyperkalemia^[4]. Traditional Chinese medicine therapies emphasize holistic regulation and may regulate the RASS system through multiple targets, improving clinical symptoms and long-term outcomes for patients with renal Yang deficiency hypertension. Additionally, external therapies (such as moxibustion, acupoint application, auricular acupressure, etc.) can stimulate specific meridians and acupoints, regulating Qi and blood circulation and synergistically enhancing the efficacy of internally administered Chinese medicine^[5, 6]. However, research on the mechanism of combined external therapies of traditional Chinese medicine in regulating the RASS system to intervene in renal Yang deficiency hypertension remains scarce and urgently needs further exploration. This study intends to combine traditional Chinese medicine syndrome differentiation and treatment with modern biological techniques to investigate the regulatory effect of Western medicine combined with external therapies of traditional Chinese medicine on key RASS factors in patients with renal yang deficiency hypertension, providing a new theoretical basis and clinical strategy for the integrated prevention and treatment of hypertension with Chinese and Western medicine.

2. Research objects and methods

2.1. Research objects

Sixty-one patients with hypertension due to kidney Yang deficiency treated in the hospital are selected as the research subjects, including 31 male patients and 30 female patients.

The inclusion criteria of the study are:

- (1) Meet the diagnostic criteria for hypertension, classified as grade II hypertension
- (2) Meet the dialectical standards of traditional Chinese medicine syndromes, with the syndrome type being kidney Yang deficiency, referring to the “Guiding Principles for Clinical Research of New Chinese Medicines”
- (3) Aged 18–65 years old; comply with ethical principles and sign an informed consent form
- (4) All research subjects and their families have signed informed consent forms

The exclusion criteria included:

- (1) Patients with hypertensive emergencies or secondary hypertension
- (2) Those with severe cardiac insufficiency (cardiac function grade III or above), abnormal liver function (ALT > 40 U/L, AST > 40 U/L, TBIL > 21 μmol/L), abnormal renal function (Cr > 133 μmol/L, BUN > 7.1 mmol/L), tumors, and other severe diseases

- (3) Women during pregnancy or lactation
- (4) Disabled or mentally abnormal individuals according to legal provisions
- (5) Those participating in other clinical trials
- (6) Those with swallowing dysfunction
- (7) Those with allergic constitution or multiple drug allergies
- (8) Those with ruptured skin, induration at treatment acupoints, or skin allergies to the test drugs
- (9) Those in critical condition

2.2. Methods

2.2.1. Experimental grouping

Sixty-one subjects are divided into a Western medicine combined with external treatment of traditional Chinese medicine group and a conventional Western medicine treatment group according to the random number table method, with 30 cases in the Western medicine combined with external treatment of traditional Chinese medicine group and 31 cases in the conventional Western medicine treatment group.

The conventional Western medicine treatment group received standard Western medicine treatment for a period of 1 month, specifically using standard antihypertensive drugs (CCB antihypertensive drugs + diuretics).

The traditional Chinese medicine combined with external treatment group received auricular acupuncture, auricular point pressing with beans, and acupoint application as external treatments combined with antihypertensive drugs for a treatment period of 1 month. Auricular acupuncture involved the application of moxibustion to the ears, Baihui, and Fengchi acupoints, with one moxibustion stick used per acupoint for 20 minutes. Auricular point pressing with beans used “Wang Bu Liu Xing” seeds as the pressing material, selecting acupoints such as Jiangya groove, Shenmen, Jiaogan, cortical subregion, heart, brain, spleen, and stomach, which are pressed on one side of the ear. Patients are instructed to press four times a day, 20 presses each time, alternating between the two ears, changing every two days, and continuing for four weeks. Acupoint application involved the use of powdered Wu Zhu Yu and Rou Gui mixed with vinegar and applied to the Yongquan acupoint. The treatment course is four weeks.

2.2.2. Statistical analysis of patient information

Patient information, including gender, past medical history, medication use before the study, and hypertension grading, is collected and analyzed for both groups. Additionally, 5 mL of fasting elbow venous blood is collected, centrifuged at 3500 r/min for 10 minutes to separate the serum, and radioimmunoassay is used to detect aldosterone (ALD), angiotensin II (AngII), and plasma renin activity (PRA).

2.2.3. Blood pressure measurement and analysis

Blood pressure levels are measured using a blood pressure monitor after patients rested for more than 5 minutes before treatment, and at 1, 2, 3, and 4 weeks after treatment initiation.

2.2.4. Traditional Chinese medicine syndrome scoring

Based on the relevant content of vertigo in the “Guiding Principles for Clinical Research of New Chinese Medicines (Trial Implementation)”, the traditional Chinese medicine syndrome grading scoring method is used to evaluate five main syndromes: headache and dizziness, cold sensation in limbs or back, frequent or involuntary urination at night, fatigue and laziness to speak, and shortness of breath and weakness. These syndromes are scored

on a scale of 0 to 3 (none, mild, moderate, and severe), with higher scores indicating more severe conditions. The total score ranged from 0 to 15.

2.2.5. Statistical analysis of follow-up information for two groups of patients

Blood samples of 5 mL are collected from the patients in both groups after fasting, taken from the elbow vein. The samples are centrifuged at 3500 r/min for 10 minutes to separate the serum. Radioimmunoassay is used to detect aldosterone (Aldosterone, ALD), angiotensin II (Angiotensin II, AngII), and plasma renin activity (PRA).

2.3. Statistical analysis

All data in this study are processed using SPSS 20.0 statistical analysis software (IBM Corporation, USA). Measurement data are expressed as “mean \pm standard deviation” ($\pm s$), and independent sample t-tests are used for comparisons between groups. Count data are expressed as percentages (%), and chi-square (χ^2) analysis is used for comparisons between groups. A *P*-value less than 0.05 indicated a statistically significant difference.

3. Results

3.1. Statistical analysis of enrollment information for two groups of patients

There were no statistically significant differences in gender, past medical history, pre-study medication use, hypertension grading, aldosterone, angiotensin II, and plasma renin activity levels between the two groups (*P* > 0.05), as shown in **Table 1**.

Table 1. Statistical analysis of enrollment information for two groups of patients ($\bar{x} \pm s$)

| Grouping | TCM + external therapy (<i>n</i> =30) | Conventional Western medicine (<i>n</i> =31) | <i>t</i> / χ^2 value | <i>P</i> value |
|--|--|---|---------------------------|----------------|
| Gender (Male/Female) | 13/17 | 18/13 | 0.111 | 0.930 |
| Past medical history | | | 1.200 | 0.356 |
| Hypertension | 28(93.34) | 29(93.54) | | |
| Hypertension, Hyperlipidemia, Diabetes | 1(3.33) | 1(3.23) | | |
| Hypertension, Hyperlipidemia | 1(3.33) | 1(3.23) | | |
| Pre-study medication | | | 0.382 | 0.298 |
| CCB | 23(76.67) | 20(64.52) | | |
| ARB | 0(0.00) | 3(9.68) | | |
| CCB + ARB | 7(23.33) | 6(19.35) | | |
| None | 0(0.00) | 2(6.45) | | |
| Hypertension grade | | | 0.535 | 0.687 |
| Grade I | 16(53.33) | 16(51.61) | | |
| Grade II | 14(46.67) | 15(48.39) | | |
| Aldosterone (pg/mg) | 137.84 \pm 10.59 | 115.94 \pm 7.95 | 0.790 | 0.436 |
| Angiotensin II (pg/mg) | 48.99 \pm 2.08 | 52.00 \pm 8.41 | 0.669 | 0.509 |
| Renin (μ IU/mL) | 58.93 \pm 1.67 | 21.65 \pm 2.48 | 1.248 | 0.222 |

3.2. Blood pressure measurement analysis for two groups of patients

There were no statistically significant differences in blood pressure measurements between the two groups ($P > 0.05$), as shown in **Table 2**.

Table 2. Blood pressure measurement analysis for two groups of patients ($\bar{x} \pm s$)

| Time point | TCM + external therapy (n=30) (mmHg, Systolic/Diastolic) | Conventional Western medicine (n=31) (mmHg, Systolic/Diastolic) | t/χ^2 value | P value |
|------------|---|--|------------------|-----------|
| First | 136.10/83.60 | 143.03/88.13 | 4.775 | 0.131 |
| Second | 139.70/86.90 | 136.84/84.87 | 5.892 | 0.107 |
| Third | 141.10/88.20 | 134.20/82.50 | 10.500 | 0.060 |
| Fourth | 136.50/85.50 | 134.40/82.40 | 5.200 | 0.121 |

3.3. Comparison of TCM syndrome scores between two groups of patients

The external treatment group of traditional Chinese medicine scored significantly better than the control group in terms of TCM syndromes such as headache and dizziness, cold extremities or back chill, frequent or involuntary urination at night, fatigue and laziness, shortness of breath, and lack of strength ($P < 0.05$). The difference was statistically significant, as shown in **Table 3**.

Table 3. Comparison of TCM syndrome scores between two groups of patients [$\bar{x} \pm s$, points]

| Group | Headache/ Dizziness (score) | Cold limbs/ Back Sensation (score) | Frequent nocturia/ Incontinence (score) | Lassitude with reluctance to speak (score) | Shortness of breath/ Fatigue (score) |
|--------------------------------|--------------------------------|---------------------------------------|--|---|---|
| TCM external therapy (n=30) | 1.35 \pm 0.66 | 1.20 \pm 0.90 | 1.88 \pm 0.53 | 1.99 \pm 0.75 | 1.13 \pm 0.92 |
| Western medicine (n=31) | 2.12 \pm 0.71 | 2.55 \pm 0.75 | 2.64 \pm 0.69 | 2.46 \pm 0.80 | 2.03 \pm 1.01 |
| t | 4.326 | 3.127 | 5.220 | 2.542 | 3.875 |
| P | 0.000 | 0.002 | 0.000 | 0.013 | 0.000 |

3.4. Statistical analysis of follow-up information for two groups of patients

The levels of aldosterone, angiotensin II, and plasma renin activity in both groups were significantly lower than before treatment. Moreover, the levels of aldosterone, angiotensin II, and plasma renin activity in the integrated traditional Chinese and external treatment group were significantly lower than those in the conventional Western medicine treatment group. The differences were statistically significant ($P < 0.05$), as shown in **Table 4**.

Table 4. Statistical analysis of follow-up information for two groups of patients ($\bar{x} \pm s$)

| Group | TCM + External therapy (n=30) | Conventional Western medicine (n=31) | t/χ^2 -value | P -value |
|------------------------|-------------------------------|--------------------------------------|-------------------|------------|
| Aldosterone (pg/mg) | 100.28 \pm 4.35 | 116.92 \pm 5.25 | 12.530 | 0.003 |
| Angiotensin II (pg/mg) | 40.15 \pm 1.76 | 47.28 \pm 2.91 | 10.972 | 0.001 |
| Renin (μ IU/mL) | 27.36 \pm 2.99 | 32.66 \pm 4.52 | 13.716 | 0.003 |

4. Discussion

This study observed the intervention effect of combined traditional Chinese medicine (TCM) and external therapies (including auricular point pressing with beans, moxibustion, and acupoint application) on patients with kidney-Yang deficiency hypertension. The results showed that after treatment, patients' levels of aldosterone (ALD), angiotensin II (AngII), and plasma renin activity (PRA) were significantly reduced, while blood pressure (both systolic and diastolic) was effectively controlled. These findings suggest that the combined TCM and external therapies may improve the pathological state of kidney-Yang deficiency hypertension and exert antihypertensive effects by regulating the overactivation of the renin-angiotensin-aldosterone system (RASS).

In the theory of TCM, kidney-Yang deficiency hypertension belongs to the categories of “dizziness” and “headache”. Its pathogenesis is mainly attributed to kidney yang deficiency, which leads to impaired Qi transformation, internal retention of water and dampness, and subsequently, poor circulation of Qi and blood and imbalance of Yin and Yang. Modern medical research has shown that the overactivation of the RASS system is closely related to the occurrence and development of hypertension^[7]. Specifically, the elevation of AngII and ALD can cause vasoconstriction, water and sodium retention, and oxidative stress reactions, further exacerbating the progression of hypertension. According to TCM theory, kidney Yang has the functions of warming, promoting, and controlling. Kidney Yang deficiency results in the loss of Qi transformation and disordered water metabolism, which highly corresponds to the water and sodium metabolism mechanism regulated by the RASS system. The results of this study indicate that the combined TCM and external therapies can reduce the levels of AngII, ALD, and PRA, suggesting that they may inhibit the abnormal activation of the RASS system by warming and nourishing kidney yang and regulating water metabolism, thereby improving hypertension.

This study found that patients' PRA, AngII, and ALD levels significantly decreased after treatment, indicating that the combined TCM and external therapies may intervene in the RASS system through the following pathways: The warming yang method in TCM (such as moxibustion on auricular points like the kidney and subcortex) may improve renal blood flow and reduce renin secretion caused by renal ischemia. External therapies in TCM (such as auricular point pressing with beans, moxibustion, and acupoint application) can stimulate specific meridians (such as the Foot Shaoyin Kidney Meridian and Du Meridian), improve microcirculation, and enhance vasodilation function. Additionally, warming and nourishing kidney Yang herbs (such as aconite and cinnamon bark) may regulate endothelial function, promote the release of nitric oxide (NO), and antagonize vasoconstriction induced by AngII, thereby synergistically lowering blood pressure^[8].

Recent studies have shown that TCM has the advantage of multi-target regulation in the treatment of hypertension^[9, 10]. For example, certain kidney-Yang-tonifying prescriptions (such as JinKui ShenQi Pill) have been proven to reduce AngII levels and improve endothelial function. This study further confirms that the combined TCM and external therapies can not only regulate the RASS system but also holistically improve the symptoms of kidney Yang deficiency, such as aversion to cold, soreness and weakness of waist and knees, and frequent nocturia. This reflects the advantages of “syndrome differentiation and treatment” and “holistic regulation” in TCM. Compared with pure Western medications (such as ACEI/ARB drugs), the combined TCM and external therapies focus not only on lowering blood pressure but also on restoring the body's Yin-Yang balance and reducing the side effects (such as dry cough and hyperkalemia) caused by long-term medication use. Furthermore, the non-drug characteristics of external therapies (such as moxibustion and acupoint application) make them safer for long-term interventions.

5. Conclusion

In summary, the combined TCM and external therapies may lower AngII and ALD levels and improve blood pressure and clinical symptoms in patients with kidney-Yang deficiency hypertension by inhibiting the overactivation of the RASS system. This therapeutic approach embodies the characteristic of “treating both the manifestation and root cause” in TCM and provides a new theoretical basis and practical direction for the integrated treatment of hypertension with both Western and TCM methods. Future research should focus on conducting large-sample, multi-center studies to optimize treatment regimens and promote clinical application.

Disclosure statement

The authors declare no conflict of interest.

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Clinical Study on the Combination Therapy of Diosmin Tablets and Mayinglong Musk Hemorrhoids Ointment for Patients with Acute Hemorrhoids

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Abstract: *Objective:* To evaluate the clinical effect of combined therapy with Diosmin Tablets and Mayinglong Musk Hemorrhoids Ointment for patients with acute hemorrhoids. *Methods:* A total of 50 patients with acute hemorrhoids who visited the hospital from January 2023 to January 2025 were selected as samples and randomly divided into two groups. Group A was treated with Diosmin Tablets combined with Mayinglong Musk Hemorrhoids Ointment, while Group B was treated with Mayinglong Musk Hemorrhoids Ointment only. The efficacy, wound recovery time, perianal pain score, hemorrhoid symptom score, and stress indicators were compared between the two groups. *Results:* The efficacy of Group A was higher than that of Group B ($P < 0.05$). The postoperative perianal edema time and wound healing time in Group A were shorter than those in Group B, and the Visual Analog Scale (VAS) score was lower than that in Group B ($P < 0.05$). The hemorrhoid symptom score in Group A was lower than that in Group B ($P < 0.05$). The stress level in Group A was lower than that in Group B ($P < 0.05$). *Conclusion:* The combination therapy of Diosmin Tablets and Mayinglong Musk Hemorrhoids Ointment for postoperative treatment of acute hemorrhoids can effectively relieve perianal pain, shorten the duration of hemorrhoids, and is highly feasible.

Keywords: Acute hemorrhoids; Mayinglong musk hemorrhoids ointment; Diosmin tablets; Efficacy

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1. Introduction

Acute hemorrhoids can cause symptoms such as anal pain, edema, and hematochezia, as well as prolapse of hemorrhoidal nuclei, which have a significant impact on patients' daily lives and require early treatment. Surgical treatment can remove hemorrhoidal nuclei, but it is an invasive procedure that can cause changes in anal anatomy, even exacerbate physiological stress responses in the perianal area, increase the production of inflammatory factors in the body, and enhance vascular permeability. Additionally, a few patients may experience complications such as edema after surgery, which may affect prognosis. In modern medical concepts, the primary goal of clinical treatment for hemorrhoids is to eliminate symptoms, rather than remove hemorrhoidal nuclei. Therefore, it is

crucial to explore effective medications to relieve postoperative symptoms. Diosmin Tablets, used in the treatment of acute hemorrhoids, can block the release of inflammatory mediators in the body, improve microcirculation, accelerate blood flow, shorten the time for edema resolution and absorption, and achieve anti-inflammatory and anti-swelling effects. However, its analgesic effect is limited. Mayinglong Musk Hemorrhoids Ointment is a traditional Chinese medicine preparation composed of multiple herbal medicines that can provide analgesic and anti-swelling effects^[1]. Based on this, this article explores the clinical efficacy of combined therapy with Diosmin Tablets and Mayinglong Musk Hemorrhoids Ointment using a sample of 50 patients with acute hemorrhoids who visited the hospital from January 2023 to January 2025.

2. Materials and methods

2.1. Materials

A total of 50 patients with acute hemorrhoids who visited our hospital from January 2023 to January 2025 are selected as samples and randomly divided into two groups using a lottery method. There was no significant difference in baseline data between Group A and Group B ($P > 0.05$), as shown **Table 1**.

Table 1. Analysis of acute hemorrhoid data

| Group | <i>n</i> | Gender (%) | | Age (years) | |
|------------|----------|-------------|-------------|-------------|--------------|
| | | Male | Female | Range | Mean ± SD |
| Group A | 25 | 16 (64.00%) | 9 (36.00%) | 22–71 | 41.35 ± 2.62 |
| Group B | 25 | 15 (60.00%) | 10 (40.00%) | 26–68 | 39.39 ± 2.41 |
| χ^2/t | - | 0.0849 | | 2.7529 | |
| <i>P</i> | - | 0.7708 | | 0.0083 | |

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

- (1) Meet the criteria for hemorrhoids in the “Guidelines for Diagnosis and Treatment of Hemorrhoids in China”^[2]
- (2) Sign the consent form
- (3) Present with symptoms such as prolapse of hemorrhoidal nodes and hematochezia

2.2.2. Exclusion criteria

- (1) Hemorrhagic shock
- (2) Coagulation disorders
- (3) Concomitant with other anorectal diseases

2.3. Treatment methods

- (1) Group A: Oral administration of Diosmin tablets (Nanjing Chia Tai Tianqing Pharmaceutical Co., Ltd.; National Medical Approval Number H20058471; 0.45g), with a single dose of 1.35g, twice per day, taken at noon and evening. After 4 days of administration, the dose was changed to a single dose of 0.9g, twice per day. Additionally, Mayinglong Musk Hemorrhoids Ointment (Mayinglong Pharmaceutical Group Co.,

Ltd.; National Medical Approval Number Z42021920; 10g) was applied into the anus, 2.5g each time, twice per day (morning and evening). The medication was administered for 7 days.

- (2) Group B: Mayinglong Musk Hemorrhoids Ointment was applied into the anus, 2.5g each time, twice per day (morning and evening). The medication was administered for 7 days.

2.4. Observation indicators

- (1) Efficacy: After 7 days of medication, fresh granulation tissue growth is visible on the wound surface, without symptoms such as edema, hematochezia, and pain, which was recorded as markedly effective. No significant redness or swelling and oozing of fluid on the wound surface, controllable pain, and relief of perianal symptoms, which is recorded as effective. Edema on the wound surface, visible excessive oozing of fluid, and significant perianal pain, which is recorded as ineffective.
- (2) Postoperative wound recovery time and perianal pain score: Record the time of perianal edema, wound healing time, and VAS score (0–10 points, with the score being directly proportional to perianal pain) after 7 days of medication.
- (3) Symptom score of hemorrhoids: Evaluate the degree of hematochezia, anal itching, anal bulging, and pain according to the criteria of none, mild, moderate, and severe, with scores ranging from 0 to 3.
- (4) Stress indicators: Peripheral venous blood was drawn before medication and after 7 days of medication. Serum is collected, and cortisol and norepinephrine levels are monitored using an immunochromatographic assay.

2.5. Statistical analysis

Data are processed using SPSS 23.0 software. Count data are tested using the chi-square test and described using percentages. Measurement data are tested using the t-test and recorded using mean \pm standard deviation. Statistical significance is set at $P < 0.05$.

3. Results

3.1. Efficacy

The efficacy rate of Group A was 96.00%, which was higher than that of Group B (76.00%). The difference was statistically significant ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of efficacy in acute hemorrhoids (n,%)

| Group | Markedly effective | Effective | Ineffective | Effectiveness rate |
|--------------------|--------------------|-------------|-------------|--------------------|
| Group A ($n=25$) | 13 (52.00%) | 11 (44.00%) | 1 (4.00%) | 24 (96.00%) |
| Group B ($n=25$) | 7 (28.00%) | 12 (48.00%) | 6 (24.00%) | 19 (76.00%) |
| χ^2 | - | - | - | 4.1528 |
| P | - | - | - | <0.05 |

3.2. Wound recovery time and anal pain scores

The duration of perianal edema and wound healing time in Group A were shorter than those in Group B, and the VAS scores were lower in Group A compared to Group B, with $P < 0.05$, as shown **Table 3**.

Table 3. Comparison of wound recovery time and anal pain scores in acute hemorrhoid disease ($\bar{x} \pm s$)

| Group | Perianal edema time (days) | Wound healing time (days) | VAS score (points) |
|-------------------------|----------------------------|---------------------------|--------------------|
| Group A (<i>n</i> =25) | 12.01 ± 1.25 | 26.01 ± 2.25 | 1.21 ± 0.42 |
| Group B (<i>n</i> =25) | 15.43 ± 1.43 | 29.43 ± 3.43 | 3.33 ± 0.69 |
| <i>t</i> | 9.0032 | 4.1686 | 13.1225 |
| <i>P</i> | < 0.01 | < 0.01 | < 0.01 |

3.3. Hemorrhoid symptom scores

After medication, the hemorrhoid symptom scores in Group A were lower than those in Group B, with $P < 0.05$, as shown in **Table 4**.

Table 4. Comparison of hemorrhoid symptom scores in acute hemorrhoid disease ($\bar{x} \pm s$)

| Group | Hematochezia(points) | | Anal itching(points) | |
|-------------------------|----------------------|------------------|----------------------|------------------|
| | Before medication | After medication | Before medication | After medication |
| Group A (<i>n</i> =25) | 2.49 ± 0.32 | 0.81 ± 0.18 | 2.53 ± 0.36 | 0.74 ± 0.21 |
| Group B (<i>n</i> =25) | 2.47 ± 0.35 | 1.36 ± 0.26 | 2.51 ± 0.38 | 1.39 ± 0.28 |
| <i>t</i> | 0.2109 | 8.6963 | 0.1910 | 9.2857 |
| <i>P</i> | 0.8339 | < 0.01 | 0.8493 | < 0.01 |

| Group | Anal distension(points) | | Pain(points) | |
|-------------------------|-------------------------|------------------|-------------------|------------------|
| | Before medication | After medication | Before medication | After medication |
| Group A (<i>n</i> =25) | 2.44 ± 0.33 | 0.75 ± 0.21 | 2.36 ± 0.33 | 0.71 ± 0.24 |
| Group B (<i>n</i> =25) | 2.42 ± 0.34 | 1.42 ± 0.26 | 2.39 ± 0.34 | 1.43 ± 0.28 |
| <i>t</i> | 0.2111 | 10.0235 | 0.3166 | 9.7619 |
| <i>P</i> | 0.8337 | < 0.01 | 0.7529 | < 0.01 |

3.4. Stress indicators

After medication, the stress indicators in Group A were lower than those in Group B, with $P < 0.05$, as shown **Table 5**.

Table 5. Comparison of stress indicators in acute hemorrhoid disease ($\bar{x} \pm s$)

| Group | Cortisol (μg/L) | | Norepinephrine (μg/L) | |
|-------------------------|-------------------|------------------|-----------------------|------------------|
| | Before medication | After medication | Before medication | After medication |
| Group A (<i>n</i> =25) | 127.42 ± 2.81 | 53.66 ± 1.69 | 164.28 ± 8.43 | 78.33 ± 3.69 |
| Group B (<i>n</i> =25) | 127.39 ± 2.79 | 84.44 ± 1.98 | 164.33 ± 8.41 | 88.26 ± 4.29 |
| <i>t</i> | 0.0379 | 59.1202 | 0.0210 | 8.7742 |
| <i>P</i> | 0.9699 | < 0.01 | 0.9833 | < 0.01 |

4. Discussion

Hemorrhoids are caused by multiple adverse factors that lead to local congestion, combined with abnormalities in the hemorrhoidal venous plexus and spasms of the perianal sphincter, resulting in acute attacks of hemorrhoids. After an acute attack of hemorrhoids, patients experience pain and discomfort around the anus, especially after defecation, when the pain intensifies. In a few cases, the pain may spread to the back of the thighs or buttocks. As the disease progresses, the rectal mucosa becomes damaged, leading to acute bleeding manifested as visible blood on the surface of the stool, or symptoms such as anal bleeding or jet-like bleeding. The observed blood is mostly bright red. During acute episodes, anal masses protrude, and some patients can manually reduce them. However, if the edema is obvious and the compression is severe, they cannot be reset. As the disease progresses, patients often develop local inflammatory reactions, and a large number of inflammatory factors are secreted around the anus, continuously stimulating the skin and mucosa around the anus, which can cause itching, bloating, and other symptoms.

Severe itching can affect nighttime sleep and reduce sleep quality. Currently, there are various theories about the pathogenesis of acute hemorrhoids in clinical practice, which may be closely related to the downward movement of the anal cushion and varicose veins. Analyzing the physiological and anatomical structure of the anus, there is a vascular cushion on the inner side of the anal canal, which is ring-shaped and called the “anal cushion.” It has functions such as precise control of defecation and adjustment of the closure state of the anal canal. The internal vascular network is rich, and its adjacent areas have connective tissue and smooth muscle. When the body is in a healthy state during defecation, the anal cushion is pushed out with the feces, and after completing defecation, the anal cushion retracts by itself.

However, under the influence of adverse factors, the elasticity of the anal cushion is damaged, which can lead to problems such as hyperplasia, hypertrophy, congestion, and downward movement of the anal cushion. Over time, “hemorrhoids” are formed ^[3]. In addition, the venous plexus in the anal canal area of the human body is rich, and its anatomical location is at the lowest point of blood transportation in the abdominal and pelvic cavities. Moreover, there are no venous valves in the veins of the anal canal area, making it more susceptible to pathological changes such as congestion and blood stasis, especially for those who are constipated or sit for long periods. Blood stasis in the venous plexus of the anal canal area can lead to the formation of “hemorrhoids” in severe cases, which can also cause acute attacks of hemorrhoids ^[4]. Currently, there are many clinical treatment options for acute hemorrhoids, such as surgery, physical therapy, oral medications, suppositories, ointments, etc. Different treatment options have different effects on controlling hemorrhoids.

Acute hemorrhoids surgery leaves wounds that expose nerve endings, damage capillaries, and are affected by necrotic tissue that can impair wound drainage. This can exacerbate inflammatory responses in the wound, leading to edema and even delayed healing. Therefore, it is crucial to explore effective medications that can accelerate post-surgical recovery. Mayinglong Musk Hemorrhoids Ointment is a traditional Chinese medicine preparation composed of various herbal ingredients. Among them, cow bezoar can clear the heart, detoxify, cool the liver, calm the wind, induce resuscitation, and eliminate phlegm; musk can relieve pain, promote blood circulation, disperse nodules, and eliminate necrosis while promoting tissue regeneration; borax can detoxify and clear heat; pearls can heal wounds, promote tissue regeneration, reduce heat, and detoxify; borneol can relieve pain, reduce swelling, and enhance musk’s ability to eliminate necrosis and promote tissue regeneration; and calamine can reduce swelling, stop bleeding, promote convergence, and prevent decay ^[5].

The combination of these ingredients in Mayinglong Musk Hemorrhoids Ointment can effectively eliminate

necrosis, promote tissue regeneration, clear heat and detoxify, reduce swelling, and relieve pain ^[6]. However, the onset of action of Mayinglong Musk Hemorrhoids Ointment alone is slow, and its overall regulatory effect is limited. Diosmin tablets can activate perianal cells, stimulate cell migration in affected areas, dilute blood, restore perianal blood circulation, and release complement through oral administration to inhibit perianal inflammation and achieve anti-inflammatory effects. Additionally, diosmin tablets can stimulate venous dilation, protect perianal blood vessels, accelerate perianal blood circulation, stimulate lymphatic vessel contraction, inhibit venous blood stasis, accelerate tissue fluid reflux, and facilitate the resolution of perianal edema ^[7].

The combination of Mayinglong Hemorrhoids Ointment and Diosmin tablets can synergistically enhance their effects, accelerate the absorption of edema, promote wound blood circulation, reduce perianal pain, facilitate wound healing, and improve patient outcomes. During medication treatment, patients should also be instructed to take sitz baths, clean the anal area promptly, maintain local cleanliness and dryness, and apply the medication evenly as prescribed to ensure its full effectiveness. Furthermore, patients with hemorrhoids should be advised to plan their meals appropriately, avoid stimulating and greasy foods, increase their intake of fresh fruits and vegetables to maintain smooth bowel movements, change their underwear more frequently, and seek prompt re-examination and adjustment of treatment plans if they notice a significant increase in bleeding during medication.

Based on the data analysis in this article, the efficacy, perianal edema time, wound healing time, and VAS scores of group A are better than those of group B, with $P < 0.05$. The reason for this is that Mayinglong Musk Hemorrhoids Ointment is a synergistic effect of multiple herbal ingredients, and the medicinal ingredients directly contact the wound, resulting in a high perianal blood concentration. This can inhibit perianal inflammation, relieve perianal pain, and also exert effects such as promoting blood circulation, healing wounds, and promoting tissue generation, which is beneficial for the repair of perianal wounds. Based on modern pharmacological analysis, borneol in Mayinglong Musk Hemorrhoids Ointment can resist *Staphylococcus aureus* and *Escherichia coli*, reducing the number of perianal bacteria. When combined with diosmin tablets, it can enhance the anti-inflammatory effect ^[8].

Diosmin tablets are a type of flavonoid medication, and its medicinal ingredients can act on the venous wall, prolonging the contraction time of the venous wall and facilitating venous return, thereby improving perianal blood circulation. The medicinal ingredients can also stimulate lymphatic peristalsis and accelerate tissue fluid reflux, resulting in rapid absorption of perianal edema ^[9]. In addition, Diosmin tablets can inhibit the expression of inflammatory factors, accelerate the reconstruction of perianal microcirculation, and facilitate the prognosis of hemorrhoids. Another set of data shows that the hemorrhoid symptom scores and stress indicators of group A are better than those of group B, with $P < 0.05$. The reason for this is that after an acute hemorrhoid attack, the production of inflammatory factors around the anus increases, which can aggravate the stress response. The combination of Mayinglong Musk Hemorrhoids Ointment and Diosmin tablets can inhibit inflammation in the perianal wound, relieve perianal pain, and improve patient comfort. The synergistic effect of the two medications can improve perianal blood circulation, inhibit excessive activation of the sympathetic nervous system in the body, and reduce stress indicators such as norepinephrine and cortisol ^[10].

5. Conclusion

In summary, the combination of Mayinglong Musk Hemorrhoids Ointment and Diosmin tablets for the treatment of patients with acute hemorrhoids after surgery results in reduced stress indicators in the body, relief of

hemorrhoid-related symptoms, reduced perianal pain, and shortened duration of symptoms. This treatment can be promoted.

Disclosure statement

The author declares no conflict of interest.

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Application of Report Analysis in Standardized Training for Resident Physicians in Biochemistry Sub-specialty of Laboratory Medicine

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Abstract: In recent years, with the continuous deepening of educational reform in the medical field, standardized training, as an important stage of providing excellent laboratory physicians to the clinic, not only needs to strengthen various professional skills of laboratory physicians, but also needs to integrate medical ethics education into the education. Report analysis uses clinical case test reports as teaching content. Under the guidance of attending physicians, resident physicians are the main body of standardized training. Teaching activities for report analysis are carried out by combining theoretical knowledge and case information. Through detailed planning of report analysis teaching activities and adequate preparation, standardized training activities are smoothly carried out. This targeted and comprehensive teaching model can effectively improve the clinical thinking and clinical laboratory professional ability of resident physicians, strengthen medical ethics, and make biochemistry sub-specialty resident physicians in laboratory medicine more adaptable to clinical work, thus achieving teaching goals.

Keywords: Report analysis; Laboratory medicine; Biochemistry sub-specialty; Standardized training

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1. Introduction

Standardized training for resident physicians is an important component of medical education, aimed at improving the professional skills, clinical thinking, and overall quality of resident physicians through systematic training and practice. This training process not only helps resident physicians consolidate and deepen their theoretical medical knowledge, but also enables them to gradually master clinical diagnosis and treatment skills through practical training, laying a solid foundation for becoming a qualified clinical laboratory physician^[1, 2]. At the same time, standardized training also emphasizes the cultivation of medical ethics, guiding resident physicians to establish correct values and professional views, and providing patients with better medical services. The report is a medical document provided by the laboratory department to the clinic, which plays a crucial role in the medical process. It is an important basis for doctors to understand the patient's condition and formulate treatment plans. Through

the analysis of inspection and examination reports, doctors can obtain the patient's physiological and biochemical indicators, thereby judging the patient's health status and disease types. Secondly, report analysis helps doctors detect abnormalities in patients in a timely manner and take corresponding treatment measures to prevent the disease from worsening ^[3, 4]. In addition, report analysis can also provide doctors with dynamic information about disease development, which helps to evaluate treatment effects and adjust treatment plans. Therefore, proficiency in report analysis skills is important for improving doctors' clinical decision-making abilities and patient treatment outcomes. This article explores the process and effectiveness of report analysis based on its application in the standardized training of resident physicians in biochemistry sub-specialty of laboratory medicine in the hospital.

2. Clarifying teaching objectives

Clarifying teaching objectives, specifically through the analysis of biochemical test reports, serves as the cornerstone of the entire teaching process. The aim of this teaching approach is to enable resident physicians to master the analytical methods of biochemical test reports, deeply understand the clinical significance of various biochemical indicators, and thereby improve diagnostic accuracy and clinical decision-making abilities. This objective not only requires resident physicians to grasp theoretical knowledge but also demands flexible application in practice, transforming knowledge into the ability to solve practical problems. Understanding the clinical significance of biochemical indicators is essential to enhancing diagnostic accuracy and clinical decision-making. The teaching objectives primarily include the following points:

- (1) Mastering detection methods, influencing factors, and reference ranges of biochemical testing items.
- (2) Accurately interpreting various data in biochemical test reports and understanding the physiological and pathological mechanisms behind them.
- (3) Combining patient history, clinical manifestations, and laboratory test results to conduct comprehensive analysis and make correct diagnoses.
- (4) Providing further examination suggestions, formulating or adjusting treatment plans based on biochemical test results in clinical practice, and promoting the improvement of treatment effects.
- (5) Explaining complex biochemical test results in an easy-to-understand manner to patients or their families through effective communication, enhancing patient trust.

3. Consolidating basic knowledge

3.1. Theoretical knowledge explanation

Through systematic classroom teaching combined with carefully crafted PPT presentations, resident physicians are introduced to the basic principles of biochemical tests, including the mechanisms of various biochemical reactions and the principles of testing methods. Simultaneously, common biochemical indicators, their reference ranges, the clinical significance of abnormal values, and the relationship between these indicators and diseases are explained.

3.2. Report case analysis

Typical biochemical test reports are selected for detailed analysis. By analyzing specific reports, theoretical knowledge is integrated with practical applications, assisting resident physicians in understanding the practical use of various indicators in clinical work. The selected reports should cover different types of diseases, such

as liver disease, kidney disease, diabetes, etc., enabling resident physicians in the laboratory department to comprehensively understand the application of biochemical tests in the diagnosis of various diseases.

4. Teaching skills for report analysis

4.1. Identifying key information

Resident physicians are instructed on how to quickly identify key information from reports, such as basic patient information (e.g., name, gender, age, medical history), testing items, result values, and units. By recognizing key information, resident physicians can rapidly grasp the basic situation of the test report, laying an informational foundation for subsequent analysis and judgment.

4.2. Explaining detection methods, influencing factors, and reference ranges of biochemical testing items

This allows resident physicians to gain a preliminary understanding of the basic information of each item.

4.3. Analyzing abnormal values

Abnormal values are a particularly important aspect of biochemical test reports, often reflecting abnormal conditions in certain aspects of the patient's health. Residents first need to determine whether the abnormal results are caused by the disease itself or by unqualified samples, taking into account factors such as sample conditions and influencing factors. Secondly, combining information such as the patient's medical history and clinical manifestations, they should identify possible causes of the abnormal values. This requires residents to have solid medical knowledge and keen clinical thinking skills, enabling them to accurately link abnormal values to diseases and provide evidence for diagnosis. During teaching activities, mentors guide residents in mastering methods for analyzing abnormal values.

4.4. Comprehensive interpretation of reports

The various indicators in biochemical test reports are interrelated, collectively reflecting the patient's physiological and pathological state. Therefore, residents need to have comprehensive medical knowledge and proficient analytical skills to integrate and comprehensively analyze these biochemical indicators, and then draw accurate diagnostic conclusions. This requires residents to accurately grasp the intrinsic relationships between the various indicators, enabling them to make correct diagnoses and conclusions.

5. Clinical communication and exchange

Through simulated communication scenarios with patients or clinical healthcare workers, residents are trained to explain the results of biochemical test reports to clinical staff, patients, and their families. These simulations should cover different situations and audiences, such as explaining to clinicians, clinical nurses, patients, and their families. Through simulated communication, residents can master effective communication skills and methods, improve their communication abilities, and enhance patient trust.

6. Group discussion

Organize residents from different grades to discuss specific biochemical test reports, allowing them to share their experiences and insights on analyzing the reports. Comprehensive analysis is conducted based on various aspects such as sample condition, patient medical history, clinical manifestations, and laboratory results, ultimately leading to diagnostic opinions and treatment suggestions. Through group discussions, residents can learn from each other, leverage each other's strengths, and collectively improve their ability to analyze reports. This practice deepens their understanding and application of biochemical test indicators. Simultaneously, group discussions can stimulate residents' thinking vitality and promote the emergence and development of innovative thinking.

7. Evaluation and feedback on teaching effectiveness

7.1. Regular assessment

Regular assessments are conducted to evaluate the mastery level of resident physicians in biochemical subspecialty of laboratory medicine regarding report analysis. The assessment covers various aspects such as theoretical knowledge and practical analysis, comprehensively examining the professional ability of resident physicians. The assessment results should be promptly fed back to the resident physicians and instructors, facilitating timely identification of issues and provision of targeted guidance.

7.2. Feedback mechanism

During the teaching process, resident physicians may encounter various questions and confusions, thus they are encouraged to actively raise questions and seek help from their mentors. Resident physicians can also provide suggestions and opinions on teaching methods and content, continuously optimizing the teaching plan and improving teaching quality. The feedback mechanism can be implemented through Q&A sessions during teaching activities, daily mentorship discussions, and other means.

8. Continuous learning and improvement

8.1. Follow-up learning

Resident physicians are encouraged to continue learning new knowledge, techniques, and methods in the field of biochemical testing after the training. During the teaching period, they can participate in academic conferences, seminars, and other activities to stay updated on the latest research progress and clinical application. Mentors can encourage resident physicians to acquire new knowledge through online courses, professional books, and other resources, constantly updating their knowledge systems.

8.2. Learning exchange

Organize participation in academic conferences, seminars, and other activities to broaden horizons and learn about the latest biochemical testing research achievements and clinical application progress. These events serve as important platforms for exchange in the medical field, allowing resident physicians to access the latest research findings and clinical experience. Discussing and exploring with peers at these events can enhance their academic level and clinical abilities. These activities also provide important opportunities for resident physicians to expand their network resources and establish academic connections, laying a foundation for future work and learning development.

9. Precautions

During the teaching process, attention should be paid to the following aspects:

- (1) Biochemical test report analysis requires strong practicality, so practical teaching should be emphasized
- (2) The cultivation of comprehensive analytical ability should be stressed during the teaching process
- (3) Individual differences should be considered, and teaching should be tailored to individual needs. For example, resident physicians with a weaker foundation should receive additional teaching and guidance on basic knowledge, while those with stronger learning abilities can be provided with more challenges and expansion opportunities
- (4) Communication skills should be developed, and resident physicians are encouraged to take initiative in learning in the field of biochemical testing to enhance their abilities and proficiency.

10. Conclusion

The analysis of laboratory reports can significantly improve resident physicians' theoretical knowledge and practical skills. Through deep interpretation and analysis of the reports, resident physicians can not only consolidate and deepen their understanding of biochemical test indicators but also practice how to make accurate diagnoses based on the results of the reports. This combination of theory and practice allows resident physicians to master theoretical knowledge while continuously improving their practical skills and clinical thinking^[5, 6].

Report analysis helps improve the peer evaluation scores among resident physicians in the biochemical sub-specialty of laboratory medicine. In the process of jointly analyzing and discussing the reports, resident physicians can learn from each other, draw on each other's strengths, and thus more comprehensively understand and apply biochemical testing knowledge^[7, 8]. Moreover, when guiding resident physicians in analyzing reports, teachers can demonstrate their profound professional knowledge and rich clinical experience. This professional guidance not only benefits resident physicians greatly but also enhances their trust and respect for the teachers, leading to higher recognition in evaluations. Through report analysis, resident physicians can deeply appreciate the benefits of the teaching mode that combines theory with practice. This teaching mode not only enhances their learning interest and enthusiasm but also allows them to constantly challenge and surpass themselves in practice, resulting in higher evaluations of the teaching mode^[9, 10].

In the standardized training of resident physicians in the biochemical sub-specialty of laboratory medicine, report analysis can help resident physicians master the analysis methods of biochemical test reports, understand the clinical significance of various biochemical indicators, and improve diagnostic accuracy and clinical decision-making abilities. This is achieved through deepening theoretical knowledge, enhancing practical operations, promoting mutual learning, strengthening respect and trust for teachers, enhancing recognition of teaching modes, and improving patient satisfaction. In summary, adopting report analysis can cultivate resident physicians' practical ability to analyze reports, communication skills with patients and their families, and independent learning abilities, laying a solid foundation for their future career development.

Disclosure statement

The author declares no conflict of interest.

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Clinical Evaluation of the Efficacy of Calcitriol Combined with Low-Calcium Dialysate in the Treatment of Secondary Hyperparathyroidism

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Abstract: *Objective:* To investigate the clinical effect of combined application of calcitriol and low-calcium dialysate in the treatment of secondary hyperparathyroidism (SHPT). *Methods:* Eighty-nine patients with SHPT who visited the hospital from February 2023 to February 2025 were included in the study. They were divided into an observation group ($n=45$) and a control group ($n=44$) using a random number table method. The observation group received calcitriol combined with low-calcium dialysate treatment, while the control group received calcitriol combined with conventional dialysate treatment. The differences in intact parathyroid hormone (iPTH), calcium and phosphorus metabolism indicators, renal function indicators, and adverse reaction rates were compared and evaluated before and after treatment between the two groups. *Results:* Compared with before treatment, the levels of iPTH, serum phosphorus, and calcium-phosphorus product were significantly reduced in both groups after treatment, and the observation group had lower levels than the control group ($P < 0.05$). Additionally, the blood calcium levels in both groups increased compared to before treatment, and the observation group had higher levels than the control group ($P < 0.05$). After intervention, there was no statistically significant difference in renal function indicators between the two groups ($P > 0.05$). The incidence of adverse reactions in the observation group was lower than that in the control group ($P < 0.05$). *Conclusion:* The combination of calcitriol and low-calcium dialysate for the treatment of SHPT can effectively reduce the levels of iPTH, serum phosphorus, and calcium-phosphorus product, increase blood calcium levels, and has a low incidence of adverse reactions. It has no significant effect on renal function and is a safe and effective treatment method.

Keywords: Calcitriol; Hemodialysis; Low-calcium dialysate; Secondary hyperparathyroidism; Clinical efficacy

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1. Introduction

Secondary hyperparathyroidism (SHPT) is a common complication among patients with chronic kidney disease, particularly prevalent in those with end-stage renal disease^[1]. According to surveys, SHPT caused by chronic

kidney disease is most widespread in China among global patients, accounting for 85.14% [2]. The occurrence of SHPT is primarily related to calcium and phosphorus metabolism disorders caused by decreased renal function, deficiency of active vitamin D metabolites, and abnormal secretion of parathyroid hormone. Long-term uncontrolled SHPT can lead to a series of severe complications such as skeletal lesions, cardiovascular diseases, and soft tissue calcification, significantly affecting patients' quality of life. Currently, treatment options for SHPT include drugs, surgery, and interventional therapies. Among these, drug therapy is the fundamental and preferred approach, and active vitamin D and its analogs play a critical role in drug therapy.

As a typical representative of active vitamins, calcitriol is widely used in clinical practice. This drug can directly act on the vitamin D receptor of parathyroid cells, inhibiting the synthesis and secretion of PTH while promoting intestinal calcium absorption and regulating calcium and phosphorus metabolism [3]. However, when calcitriol is used alone for SHPT treatment, some patients may experience adverse reactions such as hypercalcemia and hyperphosphatemia, which can restrict its clinical efficacy. In recent years, the application of low-calcium dialysate has gradually gained attention. Reducing the calcium concentration in the dialysate and decreasing calcium load can lower the risk of hypercalcemia. The low blood calcium state can stimulate the calcium-sensing receptor on the surface of parathyroid cells, inhibiting PTH secretion and achieving the goal of treating SHPT [4]. This study aims to explore the clinical efficacy of calcitriol combined with low-calcium dialysate in the treatment of SHPT. The relevant results are described below.

2. Materials and methods

2.1. General information

Eighty-nine patients with SHPT who visited the hospital from February 2023 to February 2025 are included in the study. They are divided into an observation group ($n=45$) and a control group ($n=44$) using a random number table method. General information for both groups is shown in **Table 1**.

Table 1. Comparison of general information [$(\bar{x} \pm s)$, n(%)]

| Item | | Observation group ($n=45$) | Control group ($n=44$) | t/χ^2 | P -value |
|----------------------------|------------------------------------|------------------------------|--------------------------|------------|------------|
| Age (years) | | 57.27 ± 6.44 | 57.56 ± 6.19 | 0.217 | 0.829 |
| Gender | Male | 24 | 26 | 0.300 | 0.584 |
| | Female | 21 | 18 | | |
| Dialysis duration (months) | | 30.15 ± 5.87 | 30.54 ± 5.43 | 0.325 | 0.746 |
| Disease type | Primary chronic glomerulonephritis | 10 | 11 | 0.518 | 0.915 |
| | Hypertensive nephropathy | 9 | 10 | | |
| | Diabetic nephropathy | 14 | 14 | | |
| | Polycystic kidney disease | 12 | 9 | | |

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

- (1) Diagnosis of SHPT
- (2) Receiving maintenance hemodialysis treatment for at least 3 months

- (3) Aged between 18 and 75 years old
- (4) Signed informed consent

2.2.2. Exclusion criteria

- (1) Used drugs affecting calcium and phosphorus metabolism or parathyroid hormone secretion in the past month.
- (2) Long-term use of glucocorticoids, immunosuppressants, etc.
- (3) Presence of primary hyperparathyroidism
- (4) History of parathyroid surgery or planned parathyroid surgery in the past 3 months

2.3. Methods

The control group received calcitriol combined with conventional dialysate treatment. Patients in the control group took calcitriol orally once a day (National Medicine Approval Number: H20030491, Specification: $0.25\mu\text{g} \times 10$ capsules), with a dose of $0.25\mu\text{g}$ each time. During the entire treatment process, blood calcium levels need to be regularly monitored. If the calcium ion level remains below 2.75mmol/L , the dose is adjusted by $0.5\mu\text{g}$ each time. Based on medication, patients underwent conventional dialysis using a dialysate with a calcium ion concentration of 1.75mmol/L for 4 hours, 2–3 times a week. The course of treatment for the control group was 6 months.

The observation group received calcitriol combined with low-calcium dialysate treatment. The medication for calcitriol in the observation group is the same as that in the control group. Based on this medication, the observation group required dialysis using a dialysate with a calcium ion concentration of 1.25mmol/L for 2–3 times a week, each lasting 4 hours. The entire course of treatment lasted for 6 months.

2.4. Observation indicators

Peripheral venous blood is collected from patients in both groups before and after treatment. After centrifugation at 3500r/min , the supernatant is extracted, and the level of intact parathyroid hormone (iPTH) is detected using radioimmunoassay. Calcium and phosphorus metabolism indicators (blood calcium, blood phosphorus) and renal function indicators [blood creatinine (Scr), blood urea nitrogen (BUN)] are measured using an automatic biochemical analyzer, and the calcium-phosphorus product is calculated. The adverse reactions that occurred during the treatment of the two groups are recorded.

2.5. Statistical analysis

Data analysis is performed using SPSS 24.0 software. Measurement data are expressed as $(\bar{x} \pm s)$, and count data are expressed as $n(\%)$. The t-test and χ^2 test are used for comparison between groups, and the significance level was set at $P < 0.05$.

3. Results

3.1. iPTH and Calcium and Phosphorus metabolism indicators

The results before and after treatment are compared, the levels of iPTH, blood phosphorus, and calcium-phosphorus product were significantly reduced in both groups after treatment, and the observation group was lower than the control group ($P < 0.05$). In addition, the blood calcium levels in both groups increased compared to before treatment, and the observation group was higher than the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of iPTH and Calcium and Phosphorus metabolism indicators before and after treatment ($\bar{x} \pm s$)

| Group | n | iPTH(ng/L) | | Calcium (mg/dL) | |
|-------------------|----|--------------------|---------------------|-------------------|--------------------|
| | | Pre- intervention | Post- intervention | Pre- intervention | Post- intervention |
| Observation group | 45 | 447.56 \pm 43.49 | 231.56 \pm 46.57* | 8.75 \pm 1.18* | 8.86 \pm 0.64* |
| Control group | 44 | 451.39 \pm 40.87 | 259.88 \pm 47.12* | 8.94 \pm 1.21* | 8.44 \pm 0.89* |
| <i>t</i> | | 0.428 | 2.852 | 0.750 | 2.551 |
| <i>P</i> | | 0.670 | 0.005 | 0.455 | 0.013 |

| Group | n | Phosphorus (mg/dL) | | Ca \times P Product (mg ² /dL ²) | |
|-------------------|----|--------------------|--------------------|---|--------------------|
| | | Pre- intervention | Post- intervention | Pre- intervention | Post- intervention |
| Observation group | 45 | 7.62 \pm 1.55 | 6.25 \pm 1.47* | 66.68 \pm 1.26 | 55.38 \pm 1.39* |
| Control group | 44 | 7.51 \pm 1.49 | 6.94 \pm 1.52* | 67.14 \pm 1.33 | 58.57 \pm 1.46* |
| <i>t</i> | | 0.341 | 2.177 | 1.675 | 10.559 |
| <i>P</i> | | 0.734 | 0.032 | 0.098 | < 0.001 |

Note: Compared with before intervention, * $P < 0.05$

3.2. Renal function indicators

After intervention, there was no statistically significant difference in renal function indicators between the two groups ($P > 0.05$), as shown in **Table 3**.

Table 3. Comparison of renal function indicators ($\bar{x} \pm s$)

| Group | n | BUN(mmol/L) | | Scr(μ mol/L) | |
|-------------------|----|------------------|-------------------|---------------------|---------------------|
| | | Pre-intervention | 1 Month | 2 Months | 6 Months |
| Observation group | 45 | 26.71 \pm 2.81 | 27.13 \pm 2.28* | 839.54 \pm 13.54* | 829.25 \pm 12.45* |
| Control group | 44 | 26.89 \pm 2.94 | 27.01 \pm 2.31* | 838.78 \pm 14.85* | 830.54 \pm 14.21* |
| <i>t</i> | | 0.295 | 0.267 | 0.252 | 0.456 |
| <i>P</i> | | 0.769 | 0.806 | 0.801 | 0.650 |

3.3. Incidence of adverse reactions

The incidence of adverse reactions in the observation group was lower than that in the control group ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of the incidence of adverse reactions [n(%)]

| Group | n | Vomiting | Headache | Muscle pain | Total adverse events |
|-------------------|----|----------|----------|-------------|----------------------|
| Observation group | 45 | 1 (2.22) | 1 (2.22) | 1 (2.22) | 3 (6.67) |
| Control group | 44 | 3 (6.82) | 3 (6.82) | 4 (9.09) | 10 (22.73) |
| χ^2 | | | | | 4.601 |
| <i>P</i> -value | | | | | 0.032 |

4. Discussion

Hemodialysis, as a critical life-sustaining treatment for patients with chronic kidney disease, can prolong survival. However, as dialysis time accumulates, various complications gradually emerge, among which secondary hyperparathyroidism is particularly prevalent. Patients often experience symptoms such as skin itching and joint pain, which not only severely affect the efficacy of dialysis treatment but may also pose life-threatening risks, necessitating effective clinical intervention measures^[6]. Calcitriol, as the active metabolite of vitamin D metabolized by the liver and kidneys, can effectively inhibit parathyroid hormone secretion and correct disturbances in calcium-phosphorus metabolism and parathyroid hormone secretion^[7]. Currently, calcitriol pulse therapy is widely used, but high-dose administration can easily induce hypercalcemia and increase the risk of cardiovascular system calcification. Multiple studies have confirmed that the combination of low-calcium dialysis and active vitamin D for the treatment of secondary hyperparathyroidism can achieve good efficacy while reducing adverse reactions, making it a clinically recommended treatment option^[8,9].

The results of this study showed that compared to before treatment, both the conventional group and the observation group had significant reductions in iPTH levels, blood phosphorus levels, and calcium-phosphorus product after treatment, with the observation group showing a more pronounced decrease ($P < 0.05$). Blood calcium levels in both groups increased compared to before treatment, and the observation group had higher levels than the conventional group ($P < 0.05$). These findings suggest that the combination of calcitriol and low-calcium dialysate has significant advantages in reducing iPTH levels, regulating blood calcium and phosphorus metabolism, and controlling the calcium-phosphorus product in patients with SHPT.

These results are consistent with the findings of Xu *et al.*^[10]. Analyzing its mechanism of action: Active vitamin D can promote intestinal calcium absorption, inhibit iPTH secretion, and increase blood calcium concentration by increasing the number of parathyroid receptors. However, long-term use can easily lead to hypercalcemia and bone lesions. In the combined therapy used in this study, low-calcium dialysate lowers blood calcium concentration. However, when calcitriol is used alone in the treatment of SHPT, some patients may experience side effects such as hypercalcemia and hyperphosphatemia, which can limit its clinical effectiveness. Low-calcium dialysate, as another treatment modality for SHPT, primarily works by reducing the concentration of calcium ions in the dialysate, creating a calcium ion concentration gradient between the blood and the dialysate. This promotes the transfer of calcium ions from the blood to the dialysate, achieving a negative calcium balance in the body and effectively avoiding the risk of excessively high blood calcium caused by monotherapy.

After the intervention, there was no statistically significant difference in renal function indicators between the two groups ($P > 0.05$). This indicates that the combination of calcitriol and low-calcium dialysate therapy has no significant adverse effects on patients' renal function in the short term. Patients undergoing maintenance hemodialysis already have severely impaired renal function, and the primary goal of treatment is to control complications and improve quality of life, rather than restore renal function. The results of this study show that this combined treatment regimen effectively treats SHPT without causing further damage to residual renal function, demonstrating a certain level of safety.

Furthermore, this study revealed that the incidence of adverse reactions in the observation group was lower than that in the conventional group ($P < 0.05$). This finding suggests that the combination of low-calcium dialysate and calcitriol can effectively reduce adverse reactions in hemodialysis patients with SHPT. The reason for this is that this treatment strategy not only significantly optimizes the balance of calcium and phosphorus metabolism in patients but also avoids a series of discomfort symptoms caused by hypercalcemia, such as decreased appetite and

headache, by controlling blood calcium concentration.

5. Conclusion

In summary, the combination of calcitriol and low-calcium dialysate for the treatment of SHPT can effectively reduce iPTH, blood phosphorus, and calcium-phosphorus product levels, increase blood calcium levels, and has a lower incidence of adverse reactions without significantly affecting renal function. It is a safe and effective treatment method.

Disclosure statement

The authors declare no conflict of interest.

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Application Value Analysis of a New Empowerment Teaching Method Based on Kirkpatrick's Evaluation Model in Teaching Chinese Medicine Nursing in Otorhinolaryngology

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Abstract: *Objective:* To explore the application value of a new empowerment teaching method based on Kirkpatrick's evaluation model in teaching Chinese medicine nursing in otorhinolaryngology. *Methods:* 60 nurses who practiced in the otolaryngology department of our hospital from June 2022 to October 2024 were included in the study and equally divided into two groups using a convenient sampling method. 30 nurses who chose traditional Chinese medicine skill teaching management were included in the control group, and 30 nurses who chose the new empowerment teaching method based on Kirkpatrick's evaluation model were included in the observation group. Relevant indicators such as clinical teaching environment perception, theoretical knowledge scores of Chinese medicine nursing, and excellent rate of practical operation assessment were compared. *Results:* The nurses in the observation group had higher scores for clinical teaching environment perception than the control group ($P < 0.05$). However, the midterm and final exam scores for theoretical knowledge of Chinese medicine nursing were higher in the observation group than in the control group ($P < 0.05$). Compared with the control group, the observation group had a higher excellent rate of practical operation assessment ($93.33\% > 73.33\%$) and a higher Chinese medicine nursing ability score [(215.69 ± 19.73) points $> (184.87 \pm 15.66)$ points] ($P < 0.05$). *Conclusion:* Applying the new empowerment teaching method based on Kirkpatrick's evaluation model to Chinese medicine nursing teaching in otolaryngology can help nurses understand the theoretical knowledge of Chinese medicine nursing and optimize the clinical teaching environment, thereby promoting their practical skills and Chinese medicine nursing abilities.

Keywords: Kirkpatrick evaluation model; New empowerment teaching method; Otolaryngology; Chinese medicine nursing

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1. Introduction

Otolaryngology is an important department in hospitals, mainly treating various diseases related to ears, nose, throat, and head and neck^[1]. Chinese medicine nursing is a nursing service guided by Chinese medicine theory, which fully reflects the concept of “three parts treatment, seven parts nursing” advocated by Chinese medicine. In the past, most of the Chinese medicine nursing teaching in the otolaryngology department adopted conventional skill teaching management, with the purpose of teacher instruction and completing teaching tasks. During the teaching process, teachers strictly implement the requirements of the syllabus to summarize and explain key knowledge, and students only need to follow the teacher’s thinking to accept the instillation of knowledge. Due to the lack of communication between teachers and students, it is difficult for students to better integrate theoretical knowledge with practice, which not only affects the teaching effect and learning quality but also affects students’ practical operation and Chinese medicine nursing ability. The Kirkpatrick evaluation model was first proposed by American scholars in the 1950s, initially focusing on evaluating training effectiveness, and then gradually promoted in the field of education, receiving widespread praise^[2]. The new empowerment teaching method is a teaching method aimed at enhancing learners’ self-efficacy. By guiding learners to actively and independently learn, it promotes their rapid growth and long-term development. Relevant research shows that the new empowerment teaching method has achieved remarkable results in Chinese medicine nursing teaching in neurosurgery and nephrology^[3]. This article mainly analyzes the application value of the new empowerment teaching method based on the Kirkpatrick evaluation model in Chinese medicine nursing teaching in otolaryngology, as reported below.

2. Methods and materials

2.1. General information

A total of 60 nurses interning in the Otorhinolaryngology Department of our hospital from June 2022 to October 2024 are selected as the study subjects. Using convenience sampling, the 60 nurses are evenly divided into a control group (30 nurses) and an observation group (30 nurses). All participants in both groups are female. The average age of nurses in the control group ranged from 19 to 26 years, with a mean age of (23.27 ± 0.78) years. Their educational backgrounds included 19 with bachelor’s degrees and 11 with associate degrees. The average age of nurses in the observation group ranged from 19 to 25 years, with a mean age of (23.48 ± 0.82) years. Their educational backgrounds are 18 with bachelor’s degrees and 12 with associate degrees.

The inclusion criteria of the study are: (1) Intern nurses from nursing colleges with college degree or above; (2) Completed theoretical training in otolaryngology Traditional Chinese Medicine; (3) Internship period of 4 weeks or more; (4) Understanding and voluntary participation in the entire process of this study.

Meanwhile, the exclusion criteria are: (1) Participation in course training but not in assessment; (2) Absence from class or leave for 3 or more class hours; (3) Credit retake.

2.2. Methods

2.2.1. Control group

Conventional traditional Chinese medicine (TCM) teaching methods are used. Learning tasks are completed with the assistance of mentors, requiring interns to apply theoretical knowledge to practical operations. Typical cases are selected to guide students in strengthening their knowledge of TCM nursing, impart practical experience, and

urge students to participate in practical training. Groups of 2–3 students are assigned to one mentor who guided them in learning TCM-related knowledge, mastering TCM skills, and actively carrying out practical training.

2.2.2. Observation group

A new empowering teaching method based on the Kirkpatrick evaluation model is adopted.

- (1) New empowering teaching method: Papers and works related to new empowering teaching methods in otolaryngology TCM clinical practice are reviewed using websites such as Wanfang and CNKI. These resources are combined with real typical cases to design teaching plans. Before the training, the ultimate goal of the mentorship is clarified, and then the content of each stage is refined. Training supervisors are responsible for coordinating and controlling the mentorship process, conducting teaching quality control and supervision, and promptly rectifying any issues found. Mentors need to send relevant materials and teaching processes to students for preview. During the learning process, mentors not only explained the training process, learning content, and goals of each stage but also clarified the learning tasks for each stage, requiring students to achieve learning objectives. All students are invited to join a WeChat group, where learning materials, including text, images, and videos, are regularly distributed. Students are encouraged to use their free time to study independently, attempt to solve difficult problems, broaden their thinking, and enhance their innovative abilities. Students are guided to analyze typical cases and combine them with daily rounds of practical operations, laying a foundation for acquiring more TCM nursing skills.
- (2) Integration of TCM theory into clinical practice training allowed students to understand the profoundness of TCM culture, comprehend TCM nursing concepts, and enhance their professional TCM literacy during practical operations.
- (3) During the mentorship, mentors could adopt various methods based on actual situations to ensure that students maximized their understanding of TCM nursing knowledge, mastered more operational skills, promoted the cultural connotation of TCM, and improved their humanistic care abilities and professional levels.
- (4) The Kirkpatrick model's four-level evaluation included:
 - (a) Reaction level: This level mainly investigated students' impressions of teaching practices, including overall evaluations of mentors, teaching content, teaching methods, and teaching effects. Questionnaires are distributed to students one week before learning, with a scoring range of 1–5. One represented complete dissatisfaction, and five represented complete satisfaction.
 - (b) Learning level: This level primarily evaluated students' mastery of knowledge and skills. The full score is 100 points.
 - (c) Behavioral level: This level is used to evaluate teaching effectiveness, referring to whether learning outcomes had improved after a period of study. Questionnaires are distributed to students one week before and after learning, with a scoring range of 1–5. One represented complete disagreement, and five represented complete agreement.
 - (d) Results level: Questionnaires are distributed six months after learning to investigate whether significant achievements are made during this study, with a scoring range of 1–5. One represented strong disagreement, and five represented strong agreement.

2.3. Observation indicators

- (1) Perception of clinical teaching environment: Evaluate nurses' perceptions by referencing the Clinical Teaching Environment Measurement Questionnaire. The clinical teaching environment perception module consists of 5 dimensions and 26 items, specifically: perception of learning (8 items); perception of clinical instructors (5 items); perception of academic self (3 items); perception of the environment (6 items); and perception of social self (4 items). The scoring range for each individual item is 1–5. 1 point indicates strong disagreement, and 5 points indicate strong agreement.
- (2) Scoring of theoretical knowledge in Traditional Chinese Medicine (TCM) nursing: Select otolaryngology-related TCM nursing content from the TCM nursing question bank, and assess nurses at different stages. The maximum score for each assessment is 100 points. A higher score indicates a more solid grasp of theoretical knowledge in TCM nursing.
- (3) Excellent rate of practical operation assessment: The teaching team will conduct on-site assessments of the practical operation skills of nurses in both groups. Effective integration of theoretical knowledge into practical operations without improper procedures is considered excellent; reasonable integration of theoretical knowledge and practical operations without improper procedures is considered good; failure to combine theory with practice or improper nursing operations is considered poor. The excellent rate is calculated as (excellent + good) / total number of cases $\times 100\%$.
- (4) Scoring of TCM nursing ability: Evaluate nurses' TCM nursing ability by referencing the TCM Nursing Ability Self-Assessment Scale. The scale consists of 7 dimensions and 48 items. The scoring range for each individual item is 1–5, with a maximum score of 245 points. The score increases with improved nursing ability.

2.4. Statistical analysis

All data are analyzed and compared using the statistical analysis software SPSS 25.0. Data satisfying normal distribution are represented as ($\bar{x} \pm s$), probability values are represented as [n(%)], and tests are performed using t-values and χ^2 -values respectively. A comparison result of ($P < 0.05$) indicates statistical significance.

3. Results

3.1. Comparison of clinical teaching environment perceptions between the two groups

The nurses in the observation group scored higher on all aspects of clinical teaching environment perception compared to the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of clinical teaching environment perceptions between the two groups ($\bar{x} \pm s$, points)

| Group | <i>n</i> | Perception of learning | Perception of clinical instructors | Academic self-perception | Perception of environment | Social self-perception |
|-------------------|----------|------------------------|------------------------------------|--------------------------|---------------------------|------------------------|
| Control group | 30 | 28.71 \pm 6.12 | 26.43 \pm 5.25 | 18.94 \pm 4.52 | 28.65 \pm 4.89 | 14.89 \pm 4.13 |
| Observation group | 30 | 36.48 \pm 5.96 | 31.48 \pm 5.76 | 22.04 \pm 4.19 | 32.42 \pm 5.95 | 17.95 \pm 3.95 |
| <i>t</i> -value | | 4.982 | 3.549 | 2.755 | 2.681 | 2.933 |
| <i>P</i> -value | | <0.001 | <0.001 | 0.008 | 0.010 | 0.005 |

3.2. Comparison of theoretical knowledge scores in traditional Chinese medicine nursing between the two groups

The examination scores of theoretical knowledge in traditional Chinese medicine nursing for both the midterm and final exams were higher in the observation group compared to the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of theoretical knowledge scores in traditional Chinese medicine nursing between the two groups ($\bar{x} \pm s$, scores)

| Group | <i>n</i> | Pre-instruction | Midterm exam | Final exam |
|-------------------|----------|------------------|------------------|------------------|
| Control group | 30 | 68.51 \pm 3.35 | 81.95 \pm 2.27 | 84.49 \pm 3.49 |
| Observation group | 30 | 68.44 \pm 3.33 | 94.52 \pm 2.59 | 95.19 \pm 1.48 |
| <i>t</i> -value | | 0.081 | 19.991 | 15.460 |
| <i>P</i> -value | | 0.936 | < 0.001 | < 0.001 |

3.3. Comparison of excellent and good rates in practical operation assessment between the two groups

The excellent and good rate of practical operation assessment was higher in the observation group compared to the control group ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of excellent and good rates in practical operation assessment between the two groups [*n*(%)]

| Group | <i>n</i> | Excellent | Good | Poor | Good-to-excellent rate |
|-------------------|----------|-------------|-------------|------------|------------------------|
| Control group | 30 | 12 (40.00%) | 10 (33.33%) | 8 (26.67%) | 22 (73.33%) |
| Observation group | 30 | 18 (60.00%) | 10 (33.33%) | 2 (6.67%) | 28 (93.33%) |
| χ^2 | | | | | 4.320 |
| <i>P</i> -value | | | | | 0.038 |

3.4. Comparison of traditional Chinese medicine nursing ability scores between the two groups

The traditional Chinese medicine nursing ability scores were higher in the observation group compared to the control group ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of traditional Chinese medicine nursing ability scores between the two groups ($\bar{x} \pm s$, scores)

| Group | <i>n</i> | TCM nursing competency score |
|-------------------|----------|------------------------------|
| Control group | 30 | 184.87 \pm 15.66 |
| Observation group | 30 | 215.69 \pm 19.73 |
| <i>t</i> -value | | 6.702 |
| <i>P</i> -value | | < 0.001 |

4. Discussion

Otorhinolaryngology-head and neck surgical diseases are common clinical conditions that cause significant distress to people's daily lives and work ^[4, 5]. In recent years, with the continuous development of traditional Chinese medicine, traditional Chinese medicine nursing techniques have been promoted in multiple departments, including otolaryngology. Providing corresponding traditional Chinese medicine nursing in the treatment of such diseases not only helps improve symptoms and control the condition but also fundamentally improves patients' psychological emotions, enhancing treatment compliance and clinical efficacy ^[6-8]. Traditional teaching methods for traditional Chinese medicine nursing mainly rely on classroom lectures, demonstration operations, and other approaches, which have significant deficiencies in guiding students' active learning and analyzing typical cases. This results in students only relying on rote memorization of fragmented knowledge points to prepare for exams, unable to effectively integrate theory with practice ^[9]. The new empowerment teaching method based on the Kirkpatrick evaluation model is a teaching mode that fully reflects the student-centered approach, utilizing various methods to promote students' subjective initiative, thereby enhancing their self-efficacy and practical abilities.

According to this study, the nurses in the observation group reported higher scores for their perception of the clinical teaching environment compared to the control group ($P < 0.05$). Before the teaching period, there was no significant difference in the scores of the theoretical knowledge test of traditional Chinese medicine nursing between the two groups ($P > 0.05$). However, the observation group achieved higher scores in both the midterm and final exams for traditional Chinese medicine nursing theoretical knowledge compared to the control group ($P < 0.05$). The new empowerment teaching method based on the Kirkpatrick evaluation model can provide strong support for nurses in otolaryngology to learn traditional Chinese medicine nursing through a multi-dimensional evaluation mechanism. During the teaching process, the new empowerment teaching method fully mobilizes nurses' enthusiasm for learning through methods such as data review and case analysis, so that they are no longer passively receiving knowledge ^[10].

The Kirkpatrick evaluation model can timely discover problems in teaching through multi-level evaluation and analysis, and improve and optimize them to meet nurses' learning needs for traditional Chinese medicine nursing theory and practice ^[11]. The results of this study showed that compared with the control group, the observation group had a higher excellent and good rate in practical operation assessment ($93.33\% > 73.33\%$) and a higher score for traditional Chinese medicine nursing ability [(215.69 ± 19.73) points $> (184.87 \pm 15.66)$ points] ($P < 0.05$). In application, the new empowerment teaching method based on the Kirkpatrick evaluation model can stimulate nursing students' enthusiasm for learning by combining teaching with a multi-level evaluation mechanism, enabling them to break away from the inherent mode of traditional teaching, actively understand and learn new knowledge, and explore the positive role of traditional Chinese medicine theory in recovery through real typical cases. This allows them to deeply understand the essence of traditional Chinese medicine nursing, better transform theoretical knowledge into practical skills, and enhance their traditional Chinese medicine nursing abilities.

5. Conclusion

In summary, the new empowerment teaching method based on the Kirkpatrick evaluation model has high application value in otolaryngology traditional Chinese medicine nursing teaching and is worthy of recommendation and application.

Disclosure statement

The authors declare no conflict of interest.

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Study on the Construction and Initial Application of Home Skin Care Guidance Program for Neonates

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Abstract: *Objective:* To explore the construction and application value of a home skin care guidance program for neonates. *Methods:* From February 2024 to February 2025, 60 neonates were selected as samples and randomly grouped by drawing. Group A received the constructed home skin care program for neonates, while Group B received routine care. The mastery of skin care knowledge by parents, emotional scores of mothers, and adverse reaction rates of neonates were compared. *Results:* The mastery of skin care knowledge by parents in Group A was higher than that in Group B, $P < 0.05$. The anxiety (SAS) and depression (SDS) scores of mothers in Group A were lower than those in Group B, $P < 0.05$. The adverse reaction rate of neonates in Group A was lower than that in Group B, $P < 0.05$. *Conclusion:* The construction of a home skin care program for neonates can reduce adverse reactions of mothers, improve parents' mastery of neonatal skin care knowledge, and is beneficial for reducing adverse events such as neonatal eczema, diaper dermatitis, and infection.

Keywords: Neonatal care; Home skin care; Adverse reactions

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1. Introduction

Skin is an important tissue that reduces interference from external factors to the human body. However, as it directly contacts the external environment, the skin is susceptible to viruses and bacteria, especially for neonates who have immature organ functions and incomplete immune functions. Once there are abnormalities in skin barrier function, it can increase the risk of skin infections and skin damage. In addition, due to the abuse of antibiotics, the number of drug-resistant bacteria has increased, further increasing the risk of neonatal skin damage. Therefore, attention should be paid to neonatal skin management^[1]. Routine neonatal skin care mainly focuses on basic interventions such as diaper changing, bathing, and touching, which lack evidence-based support. Moreover, routine care is often provided through oral education, resulting in poor mastery of neonatal care knowledge by parents and even affecting the quality of home care. In modern neonatal nursing services, using the WeChat platform as a carrier to construct a systematic and comprehensive skin care strategy can prevent and control skin problems and ensure the quality of home care^[2]. Based on this, this article explores the value of home skin care for neonates using 60 neonates born from February 2024 to February 2025 as samples.

2. Materials and methods

2.1. Materials

Sixty neonates born from February 2024 to February 2025 are selected as samples and randomly grouped by drawing. There was no statistically significant difference in baseline data between Group A and Group B, $P > 0.05$, as shown in **Table 1**.

Table 1. Baseline data of neonates

| Group | <i>n</i> | Gender (%) | | Age (years) | | Gestational age (weeks) | | Feeding method (%) | | |
|----------|----------|------------|-------------|-------------|-----------------|-------------------------|------------------|--------------------|------------|-----------|
| | | Male | Female | Range | Mean \pm SD | Range | Mean \pm SD | Exclusive breast | Formula | Mixed |
| Group A | 30 | 18 (60.00) | 12 (40.00) | 2.8–4.1 | 3.39 \pm 0.21 | 36–40 | 38.44 \pm 1.29 | 18 (60.00) | 10 (33.33) | 2 (6.67) |
| Group B | 30 | 17 (56.67) | 13 (43.33)* | 2.7–4.2 | 3.41 \pm 0.23 | 36–41 | 38.41 \pm 1.31 | 16 (53.33) | 11 (36.67) | 3 (10.00) |
| X^2/t | - | 0.0686 | | 0.3517 | | 0.0894 | | 0.0911 | | |
| <i>p</i> | - | 0.7934 | | 0.7263 | | 0.9291 | | 0.8942 | | |

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

- (1) Normal immune function
- (2) Signed informed consent
- (3) Parents cooperate with the physician

2.2.2. Exclusion criteria

- (1) Cardiovascular disease
- (2) Hepatic and renal dysfunction
- (3) Delivery time > 1 week

2.3. Methods

2.3.1. Group A

- (1) Establish a nursing team: The head nurse develops a neonatal nursing process, assigns neonatal nursing responsibilities to individuals, and regularly assesses and evaluates the team's mastery of neonatal skin care knowledge. Improve reward and punishment strategies to stimulate nurses' work enthusiasm. Regularly hold seminars to adjust nursing strategies based on the actual needs of patients, and encourage team members to search for relevant nursing literature on platforms such as CNKI and VIP, using keywords such as "neonatal skin care" and "home care" to summarize relevant nursing skills as a basis for constructing a neonatal home skin care plan.
- (2) Discharge education: Before discharge, parents are required to follow the WeChat public account, join the WeChat group, and receive face-to-face discharge education. Regularly promote skin care knowledge in the WeChat group, and instruct the responsible nurse to remind parents to read it in a timely manner. Guide parents to ask questions about neonatal skin care in the group, and the responsible nurse will answer after reviewing professional materials.
- (3) Implement home skin care strategies:

- (a) Basic care: Create a quiet and comfortable environment for neonatal recuperation, adjust temperature and humidity based on neonatal needs. Regularly change bed sheets and bedding, assist in trimming neonatal nails to avoid skin infections caused by scratching.
- (b) Reasonable selection of neonatal supplies: Avoid using nursing supplies containing ethanol, fragrances, essential oils, etc. Unless otherwise specified, use warm water to clean the skin to reduce adverse skin irritation. The PH value of neonatal cleansers and shower gels should be controlled at 5.5–6.0 to stabilize skin permeability, enhance hydration, and optimize skin barrier function. When cleaning the skin, choose baby-specific wet wipes. Reasonably select diapers based on neonatal weight to ensure proper tightness. Additionally, evaluate whether neonatal skin care products meet testing standards.
- (c) Bathing care: Adjust the room temperature to 26–28°C and water temperature to 37–40°C before bathing, avoid air convection, and prepare towels, clothing, and shower gel. After bathing, disinfect toys and bathtubs with alcohol wet wipes, reduce porous toys to lower dirt accumulation. Additionally, dry the neonatal skin thoroughly after bathing, including folded positions such as behind the ears, neck, and armpits. For those with undetached umbilical cords, actively perform umbilical cord care.
- (d) Prevention of diaper dermatitis: Adhere to breastfeeding, which contains various nutrients that can strengthen neonatal immune function and reduce the incidence of diaper dermatitis. Change diapers every 2 hours, increase diaper changing frequency for sensitive skin, and immediately replace diapers after defecation. Regularly clean the neonatal buttocks skin, preferably with baby wet wipes or warm water, and dry the skin surface moisture after completing buttocks care operations to avoid skin friction. Observe dry feces on the buttocks and gently wipe the area with a cotton ball dipped in vegetable oil to avoid forceful wiping and reduce skin damage. Maintain dryness and cleanliness of the buttocks skin, expose the buttocks skin 3 times a day for about 30 minutes each time, and pay attention to local warmth. Additionally, for some infants who have developed diaper dermatitis, apply barrier cream or diaper rash cream to prevent feces and urine from irritating the skin. Observe local skin exudate, clean the buttocks with a cotton ball and normal saline, and protect the buttocks with absorbable skin care powder.
- (e) Prevention of eczema: Breastfeeding can also prevent eczema. Adjust the temperature of the neonatal room to 22–28°C. If the temperature is too high, it may cause skin dampness and increase the risk of eczema. Continuous irritation of feces, urine, and saliva to local skin can easily induce eczema, so skin cleansing should be done well.
- (f) Cleaning neonatal clothing: It is recommended to choose soft cotton clothing and rinse multiple times during cleaning to reduce residual detergent. Additionally, neonatal clothing should be washed separately to avoid mixing with adult clothing.

2.3.2. Group B

Provide focused education before discharge, guiding parents on scientific prevention and treatment of neonatal skin problems, and informing them about breastfeeding methods, jaundice treatment, and vaccination-related precautions. After discharge, regularly follow up and answer parents' concerns.

2.4. Observation indicators

- (1) Health knowledge: A self-made scale is used to evaluate the mastery of skin care knowledge among

newborn parents, including dimensions such as mastery (80–100 points), basic mastery (40–79 points), and no mastery (0–39 points).

- (2) Maternal emotions: The Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) are used to evaluate maternal emotional fluctuations. The critical values are 50 and 53 points, respectively, and the scores are positively correlated with the degree of anxiety and depression in the mothers.
- (3) Adverse reactions: Records of diaper dermatitis, eczema, and infections occurring in newborns are kept.

2.5. Statistical analysis

SPSS 23.0 is used to process the data of newborns. Percentage records and chi-square tests are used for counting indicators of newborns, while $\bar{x} \pm s$ records and t-tests are used for measurement indicators of newborns. Statistical significance is set at $P < 0.05$.

3. Results

3.1. Health knowledge

The mastery of skin care knowledge among parents in group A was higher than that in group B, with $P < 0.05$, as shown in **Table 2**.

Table 2. Comparison of mastery of skin care knowledge (%)

| Group | Masteredn (%) | Basically masteredn (%) | Not Masteredn (%) | Mastery raten (%) |
|--------------------|---------------|-------------------------|-------------------|-------------------|
| Group A ($n=30$) | 19 (63.33) | 10 (33.33) | 1 (3.33) | 29 (96.67) |
| Group B ($n=30$) | 12 (40.00) | 11 (36.67) | 7 (23.33) | 23 (76.67) |
| χ^2 | - | - | - | 5.1923 |
| p | - | - | - | 0.0227 |

3.2. Emotional scores

After nursing, the SAS and SDS scores of mothers in group A were lower than those in group B, with $P < 0.05$. **Table 3** contains details for a comparison of maternal emotional scores.

Table 3. Comparison of emotional scores of pregnant women ($\bar{x} \pm s$)

| Group | SAS (scores) | | SDS (scores) | |
|--------------------|------------------|------------------|------------------|------------------|
| | Before care | After care | Before care | After care |
| Group A ($n=30$) | 55.69 \pm 1.52 | 32.19 \pm 1.02 | 56.19 \pm 1.42 | 31.44 \pm 1.11 |
| Group B ($n=30$) | 55.71 \pm 1.49 | 45.21 \pm 1.33 | 56.21 \pm 1.39 | 46.25 \pm 1.36 |
| t | 0.0515 | 42.5474 | 0.0551 | 46.2084 |
| p | 0.9591 | 0.0000 | 0.9562 | 0.0000 |

3.3. Adverse reactions

The rate of adverse reactions among newborns in group A was lower than that in group B, with $P < 0.05$, as shown in **Table 4**.

Table 4. Comparison of adverse reactions (n,%)

| Group | Diaper dermatitis n (%) | Eczema n (%) | Infection n (%) | Incidence rate n (%) |
|----------------|-------------------------|--------------|-----------------|----------------------|
| Group A (n=30) | 1 (3.33) | 0 (0.00) | 0 (0.00) | 1 (3.33) |
| Group B (n=30) | 3 (10.00) | 2 (6.67) | 1 (3.33) | 6 (20.00) |
| χ^2 | - | - | - | 4.0431 |
| p | - | - | - | 0.0444 |

4. Discussion

The organ functions of newborns are not fully developed, and their immune system function is relatively weak. Additionally, their skin structure is special, with issues such as less subcutaneous fat, more distributed blood vessels, and poor resistance^[3]. Therefore, skin damage problems are prone to occur during home care. To ensure the safety of home care for newborns and reduce skin damage events, it is necessary to carry out efficient nursing care based on the characteristics of newborn skin^[4]. Conventional nursing only provides routine education and oral guidance to parents on correct home care, which is difficult to meet the actual needs of newborns and prevent skin damage. Therefore, exploring new home care operations is extremely important^[5]. After constructing a home skin care plan for newborns, emphasis is placed on cleaning and drying the newborn's skin, enabling parents to provide professional nursing services at home. This can reduce the frequency of frequent hospital visits and save time for hospital revisits, which is beneficial for preventing and controlling cross-infection events^[6]. Furthermore, during correct home skin care, frequent contact between parents and newborns can enhance the emotional connection between mother and child.

Based on the data analysis presented in this article, Group A parents had a higher mastery of skin care knowledge compared to Group B, with $P < 0.05$. The reason for this difference is analyzed, and a home-based neonatal care guidance program is constructed to guide parents in selecting appropriate products for newborns, adjusting the temperature and humidity of the newborn's living space, and instructing parents on the correct prevention and control of diaper dermatitis and eczema in newborns. This program can enhance parents' awareness of newborn skin issues, enabling them to acquire more knowledge and skills in skin care. Therefore, parents in Group A demonstrated a higher mastery of skin care knowledge^[7]. Another set of data indicates that the SAS and SDS scores of mothers in Group A were lower than those in Group B, with $P < 0.05$. The delicate skin of newborns can be damaged by allergens, feces, and urine, as well as repeated cleaning and friction, increasing the risk of diaper dermatitis and causing excessive anxiety for mothers. By constructing a home-based skin care program for newborns, guiding parents to scientifically select newborn products, avoiding physical and chemical factors that irritate the newborn's buttocks, and instructing parents on the correct exposure and cleaning of the buttocks skin, the risk of skin damage can be reduced, thereby easing mothers' anxiety^[8].

Additionally, nurses use the WeChat platform to push skin care knowledge, allowing parents to easily access information and answer questions about home skin care. This corrects mothers' incorrect nursing methods, enables them to observe changes in their newborns' skin, such as the fading of rashes on the buttocks, and eliminates their anxiety about unknown risks. During home care, guiding family members to participate in newborn skin care can distribute the mother's caregiving pressure, enhance family cohesion, and further comfort the mother^[9].

The final set of data shows that the adverse reaction rate of newborns in Group A was lower than that in Group B, with $P < 0.05$. The reason for this is that during home skin care, nursing strategies are improved based

on the actual skin condition and care needs of the newborn. For example, parents are guided to prevent and control skin problems such as eczema and diaper dermatitis, and to scientifically select nursing strategies and products to meet the individualized care needs of different newborns. By regularly sending home skin care knowledge via WeChat groups, parents are guided to systematically learn nursing knowledge and master various nursing skills and methods, which can improve parents' nursing ability and reduce newborn skin problems. Timely identification and discovery of newborn skin problems during home care, and the improvement of targeted prevention and control strategies, can inhibit the deterioration of skin diseases, improve newborn comfort, and reduce local skin discomfort^[10]. In addition, compared to medical institution nursing services, home-based skin care for newborns is more economical. It only requires guiding parents to prepare necessary nursing supplies to provide professional and comprehensive services, which can reduce newborn skin problems.

5. Conclusion

In summary, constructing a home-based skin care guidance program for newborns can improve parents' mastery of skin care knowledge, comfort mothers of newborns, and reduce adverse reactions in newborns. This program has promotional value.

Disclosure statement

The author declares no conflict of interest.

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Observation on the Intervention Effect of Time-sensitive Incentive Model Combined with Specialized Rehabilitation Nursing in Patients with Severe Pneumonia and Respiratory Failure

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Abstract: *Objective:* To explore the effect of implementing a time-sensitive incentive model combined with specialized rehabilitation nursing in patients with severe pneumonia and respiratory failure. *Methods:* Seventy-eight patients with severe pneumonia and respiratory failure admitted from January 2024 to February 2025 were selected and randomly divided into two groups using a computer-based random drawing method. The control group (39 patients) received routine nursing, while the observation group (39 patients) received a time-sensitive incentive model combined with specialized rehabilitation nursing. Lung function and adverse emotional states were compared between the two groups. *Results:* After 2 weeks of nursing, the lung function of the observation group was higher than that of the control group ($P < 0.05$), and the adverse emotional states of the observation group were lower than those of the control group ($P < 0.05$). *Conclusion:* Implementing a time-sensitive incentive model combined with specialized rehabilitation nursing in patients with severe pneumonia and respiratory failure can improve lung function and emotional state.

Keywords: Severe pneumonia with respiratory failure; Time-sensitive incentive model; Specialized rehabilitation nursing

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1. Introduction

Severe pneumonia is a critical illness that progresses rapidly ^[1]. Some patients are prone to severe complications such as respiratory failure. Respiratory failure can lead to impaired lung ventilation and gas exchange, resulting in dysfunction of other organs and tissues ^[2]. Patients with severe pneumonia and respiratory failure often have a severe physical and mental burden due to the need for long-term bed rest, leading to poor physical and mental states ^[3]. To improve rehabilitation outcomes and prognostic conditions, proper nursing care is essential. The time-sensitive incentive model emphasizes patient-centered care, requiring appropriate encouragement at suitable

times to stimulate rehabilitation potential and actively engage patients in various nursing activities. Specialized rehabilitation nursing involves developing rehabilitation plans based on disease type and severity, focusing on promoting patient recovery. In this study, 78 patients with severe pneumonia and respiratory failure were investigated to analyze the implementation effect of the time-sensitive incentive model combined with specialized rehabilitation nursing.

2. Materials and methods

2.1. General information

From January 2024 to February 2025, 78 patients with severe pneumonia and respiratory failure participated in the study. They are randomly divided into two groups using a computer-based random drawing method, with 39 patients in each group. Control group: 22 males and 17 females, aged 35–75 years (mean age: 55.43 ± 4.39 years), with a disease duration of 1–7 days (mean duration: 4.38 ± 1.07 days). Observation group: 21 males and 18 females, aged 37–74 years (mean age: 55.96 ± 4.65 years), with a disease duration of 1–8 days (mean duration: 4.85 ± 1.20 days). There are no significant differences in baseline characteristics between the two groups ($P > 0.05$).

2.2. Inclusion criteria

- (1) Diagnosis of severe pneumonia with respiratory failure according to the “Clinical Practice Guidelines for Emergency Adult Community-Acquired Pneumonia (2024 Edition)”^[4]
- (2) Body temperature $> 39^{\circ}\text{C}$, with obvious symptoms such as shortness of breath, cough with expectoration, dyspnea, and changes in sputum color and properties. Chest imaging shows multi-lobar involvement, lung infiltration, and detection of respiratory failure
- (3) Mechanical ventilation treatment
- (4) Informed consent for the study

2.3. Exclusion criteria

- (1) Other severe respiratory tract diseases
- (2) Abnormalities of the blood system
- (3) Communication, reading, or cognitive impairments
- (4) Psychiatric or psychological disorders.

2.4. Methods

The control group received routine nursing care, including preparing and administering medications as prescribed, monitoring medication responses and effects, providing mechanical ventilation therapy with ventilators, closely monitoring ventilation status, implementing ventilator care, regularly helping patients change positions, scientifically adjusting the angle of the bed head to promote sputum excretion and drainage, closely monitoring heart rate, blood pressure, and other indicators, promptly detecting malignant changes in the patient's condition, reporting to the physician in a timely manner, and following medical advice. Disease knowledge and treatment plans are introduced through manuals and videos, and patients are urged to follow medical advice.

The observation group implemented a time-sensitive incentive model combined with specialized rehabilitation nursing, including:

- (1) Emotional incentives: One-on-one communication with patients within 1–2 days of admission to evaluate their psychological state and rehabilitation cognition, and analyze the causes of adverse psychological and non-compliance with rehabilitation training. Based on full respect and understanding for the patient, the responsible nurse introduced the impact of adverse psychology on rehabilitation training in simple and understandable language, flexibly used positive guidance, psychological suggestion, meditation decompression, mindfulness training, etc., to implement psychological counseling, helped patients establish confidence in rehabilitation, communicated with patients' families, urged them to participate in emotional support and psychological care, so that patients could obtain adequate emotional support and family warmth to improve their psychological state.
- (2) Goal incentives: Design rehabilitation training programs based on patients' lung function, exercise endurance, and blood gas analysis, set rehabilitation training goals for each stage, scientifically arrange daily rehabilitation training content. Nurses introduced the reasons, content, processes, precautions, and advantages of rehabilitation training to patients, supervised patients to complete daily training, evaluated training conditions, evaluated the compliance and effectiveness of rehabilitation training based on weekly rehabilitation training assessment results, and created a graph of training results to affirm patients' excellent performance at various times, continuously motivate patients, and promote them to successfully complete each stage of rehabilitation training results, improving rehabilitation compliance.
- (3) Role model incentives: Based on monitoring and evaluation results, a group of patients who strictly complete rehabilitation training, have good compliance, and show significant improvement in lung function and other indicators are selected weekly. Their superior performance is recognized, and they are actively arranged to share their rehabilitation training experiences and feelings at patient support group meetings, allowing other patients to obtain reference and learn from their experiences, adjust their compliance with rehabilitation training, improve their accurate cognition of rehabilitation training, and enhance their subjective initiative and active participation in training.
- (4) Benefit incentives: Detailed statistics of patients' rehabilitation effects at various time points are collected, and longitudinal comparisons (evaluation of patients' condition indicators at different time points) and horizontal comparisons (comparison of rehabilitation effects at the same stage with patients admitted at the same time with similar conditions) are implemented. The positive impact of rehabilitation training on patients' diseases is comprehensively analyzed to demonstrate the value of training and improve cooperation.
- (5) Rehabilitation nursing:
 - (a) Sputum drainage training: Patients are guided to perform sputum drainage training by adjusting their respiratory frequency. They are instructed to take a deep breath, hold their breath for 3–5 seconds, and then cough out the sputum from their bronchi. If patients are unable to cough effectively, a sputum suction machine is used to clear their sputum regularly, with suctioning performed every 2 hours. If patients have phlegm sounds, cough symptoms, or if medical equipment alarms, sputum suction is performed immediately. The daily water intake is appropriately increased to fully dilute the sputum and prevent the impact of viscous sputum on sputum drainage.
 - (b) Ventilation nursing: Patients are positioned in a sitting or semi-reclining position, with the head, neck, and shoulders aligned and the head tilted back slightly to ensure the airway remains open. An appropriate face mask is selected, and the ventilator pressure is adjusted, gradually increasing based on

blood gas indicators and changes in the patient's condition. Respiratory rate, heart rate, blood pressure, and other indicators are closely monitored. Patients are assisted in sputum drainage, with turning and back percussion performed every 2 hours to prevent large accumulations of sputum. The patient's ventilation status is closely monitored, and if symptoms such as aspiration, gastrointestinal discomfort, or dryness of the mouth and nose occur, the doctor is immediately informed for prompt symptomatic treatment. During ventilation, all indicators are closely monitored, and the alarm system is regularly reviewed to prevent system malfunctions.

- (c) Rehabilitation training: Pulmonary rehabilitation training is initiated after successful weaning from the ventilator to reduce dependence on the device. The training focuses on respiratory exercises and physical training. Respiratory exercises include breathing exercises, blowing balloons, pursed-lip breathing, and abdominal breathing. Physical training is tailored to the patient's exercise tolerance, function, and current status. Initially, it focuses on passive bed exercises and limb massage. As the patient recovers some motor function, they are encouraged to engage in active movements and attempt to get out of bed, including standing with support, walking independently, climbing stairs, practicing Tai Chi, Wu Qin Xi, walking, and brisk walking. The patient's motor function and lung function are evaluated twice a week, and the rehabilitation training content is adjusted based on the latest assessment results to ensure its scientific effectiveness.
- (d) Active communication: Patients are actively informed about their disease and nursing mode, emphasizing the positive role of rehabilitation training in their early recovery. They are encouraged to participate in training to improve their lung function.

Both groups received continuous nursing care for 2 weeks.

2.5. Observation indicators

2.5.1. Lung function

Lung function tester is used to measure forced vital capacity (FVC), forced expiratory volume in the first second (FEV1), and peak expiratory flow (PEF).

2.5.2. Negative emotions

Self-rating Anxiety Scale and Self-rating Depression Scale are adopted for evaluation. Both scales consist of 20 items with a total score of 80. The critical values are set at 50 and 53, respectively ^[5, 6]. The lower the score, the better.

2.6. Statistical method

SPSS 26.0 software is used to process data. Enumeration data is expressed as a percentage (%) and tested by χ^2 test. Measurement data conforming to normal distribution is represented by mean \pm standard deviation, and tested by t-test (or F-test). $P < 0.05$ indicates that the difference in data is statistically significant.

3. Results

3.1. Comparison of lung function between the two groups

After 2 weeks of nursing, the lung function indicators of the observation group were higher than those of the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Lung function in two groups ($n=39$ cases, $\bar{x} \pm s$)

| Group | FVC (L) | | FEV1 (L) | | PEF (L/s) | |
|-------------------|-----------------|------------------------------|-----------------|------------------------------|-----------------|------------------------------|
| | Pre-care | After 2-week care | Pre-care | After 2-week care | Pre-care | After 2-week care |
| Observation group | 1.51 \pm 0.13 | 2.27 \pm 0.27 ^a | 0.65 \pm 0.11 | 1.78 \pm 0.29 ^a | 2.71 \pm 0.30 | 4.79 \pm 0.49 ^a |
| Control group | 1.56 \pm 0.15 | 2.00 \pm 0.23 ^a | 0.69 \pm 0.13 | 1.40 \pm 0.23 ^a | 2.77 \pm 0.34 | 4.31 \pm 0.42 ^a |
| <i>t</i> -value | 1.573 | 4.754 | 1.467 | 6.411 | 0.826 | 4.645 |
| <i>p</i> -value | 0.120 | < 0.001 | 0.147 | < 0.001 | 0.411 | < 0.001 |

Note: Compared with before nursing in the same group, ^a $P < 0.05$.

3.2. Comparison of negative emotions between the two groups

After 2 weeks of nursing, the negative emotions of the observation group were lower than those of the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Negative emotions in two groups ($n=39$ cases, scores)

| Group | <i>n</i> | Anxiety (Pre-care) | Anxiety (After 2-week care) | Depression (Pre-care) | Depression (After 2-week care) |
|-----------------|----------|--------------------|-----------------------------|-----------------------|--------------------------------|
| Observation | 41 | 55.98 \pm 3.76 | 35.21 \pm 3.16 | 57.98 \pm 3.96 | 38.67 \pm 3.22 |
| Control | 41 | 55.32 \pm 3.58 | 43.25 \pm 3.31 | 57.42 \pm 3.80 | 45.79 \pm 3.46 |
| <i>t</i> -value | | 0.794 | 10.972 | 0.637 | 9.407 |
| <i>p</i> -value | | 0.430 | < 0.001 | 0.526 | < 0.001 |

Note: Compared with before nursing in the same group, ^a $P < 0.05$.

4. Discussion

Severe pneumonia complicated with respiratory failure is a clinical syndrome induced by uncontrolled pneumonia, dysfunction of pulmonary ventilation, inability to perform normal and effective gas exchange, resulting in hypoxia and/or carbon dioxide retention^[7]. The disease is severe and progresses rapidly, especially for elderly patients with poor physiological and immune functions. Untimely treatment can induce multiple organ damage, affecting prognosis and threatening life safety^[8]. Routine nursing care is often implemented in the treatment of this disease, focusing on enhancing cognition, monitoring the disease, timely mechanical ventilation, adjusting body position, and other interventions to improve patients' quality of life and disease control effects^[9]. However, routine nursing care has not formed a unified standard, and some nursing operations are not standardized, resulting in general nursing effects. Both time-limited incentive model and specialized rehabilitation nursing are modern nursing methods that emphasize patient-centered care. They were often used singly in the past, but now they are tried to be implemented together.

After 2 weeks of nursing, the lung function of the observation group was higher than that of the control group ($P < 0.05$), and the negative emotions of the observation group were lower than those of the control group ($P < 0.05$). Time-limited incentives can be based on human needs and instincts, using reasonable exogenous stimulation to promote individual endogenous positive health behaviors. It can strictly grasp the best opportunity, apply the best incentive method at different time points based on actual needs, implement personalized services, stimulate subjective initiative, adjust patients' psychology and attitude, and encourage patients to actively participate in treatment^[10]. Specialized rehabilitation nursing can analyze patients' requirements for rehabilitation from a specialized perspective

based on their current physical function and disease rehabilitation needs, timely develop and implement effective nursing plans, urge patients to carry out rehabilitation training step by step, and effectively improve lung function.

5. Conclusion

In summary, the implementation of a time-limited incentive model and specialized rehabilitation nursing for patients with severe pneumonia complicated with respiratory failure can exert a synergistic effect, improve nursing effects, and enhance patients' lung function while reducing negative emotions.

Disclosure statement

The authors declare no conflict of interest.

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Evaluation of the Effectiveness and Improvement of Quality of Life of Tianma Gouteng Decoction Combined with Betahistine Mesylate in Treating Posterior Circulation Ischemic Vertigo

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Abstract: *Objective:* To evaluate the therapeutic effect of Tianma Gouteng Decoction combined with Betahistine Mesylate in patients with posterior circulation ischemic vertigo (PCI). *Methods:* Eighty-two patients with PCI who visited the hospital from February 2024 to February 2025 were selected as samples and randomly divided into two groups. Group A received Tianma Gouteng Decoction combined with Betahistine Mesylate, while Group B received only Betahistine Mesylate. The efficacy, syndrome scores, hemodynamics, and quality of life indicators were compared between the two groups. *Results:* The efficacy of PCI treatment in Group A was higher than that in Group B ($P < 0.05$). The syndrome scores in Group A were lower than those in Group B ($P < 0.05$). The peak systolic velocity (PSV) of the basilar artery and left and right vertebral arteries in Group A were higher than those in Group B ($P < 0.05$). The quality of life (SF-36) score in Group A was higher than that in Group B ($P < 0.05$). *Conclusion:* Tianma Gouteng Decoction combined with Betahistine Mesylate is effective and feasible in the treatment of PCI, with improved hemodynamic indicators and reduced disease scores.

Keywords: Posterior circulation ischemic vertigo; Betahistine mesylate; Tianma Gouteng Decoction; Efficacy

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1. Introduction

PCI accounts for a relatively high proportion of neurological diseases and is related to blood circulation disorders in the vertebrobasilar artery system that block blood supply to the brainstem and thalamus. Symptomatic treatment of PCI in Western medicine corrects craniocerebral blood transport disorders, restores craniocerebral blood oxygen supply, and reduces PCI patient symptoms. Betahistine Mesylate, an oral medication for PCI, can dilate blood vessels, resolve vertebrobasilar circulatory disorders, accelerate craniocerebral blood flow, and reduce vertigo symptoms. However, its effect on improving the quality of life of PCI patients is limited when used as a

monotherapy. According to dialectical analysis of PCI pathological changes in traditional Chinese medicine, this disease is closely related to the interaction of deficiency, stagnation, phlegm, fire, and wind. The main pathogenesis is wind-Yang disturbance, which should be treated with a formula that calms the liver and suppresses Yang ^[1]. Tianma Gouteng Decoction, composed of various Chinese herbal medicines, can eliminate stasis, promote blood circulation, nourish the liver, enrich Yin, suppress Yang, and calm the liver. Based on this, this article explores the efficacy of Tianma Gouteng Decoction combined with Betahistine Mesylate using 82 PCI patients who visited the hospital from February 2024 to February 2025 as samples.

2. Materials and methods

2.1. Materials

Eighty-two PCI patients who visited the hospital from February 2024 to February 2025 are selected as samples and randomly divided into groups. There was no significant difference in baseline PCI data between Group A and Group B ($P > 0.05$), as shown in **Table 1**.

Table 1. PCI baseline data analysis

| Group | <i>n</i> | Gender (%) | | Age (years) | | Disease Duration (months) | |
|------------|----------|------------|------------|-------------|--------------|---------------------------|-------------|
| | | Male | Female | Range | Mean±SD | Range | Mean±SD |
| Group A | 41 | 21 (51.22) | 20 (48.78) | 37–68 | 53.11 ± 1.88 | 3–14 | 6.68 ± 1.08 |
| Group B | 41 | 22 (53.66) | 19 (46.34) | 37–69 | 53.16 ± 1.91 | 3–16 | 6.62 ± 1.09 |
| χ^2/t | - | 0.0489 | | 0.1195 | | 0.2504 | |
| P | - | 0.8250 | | 0.9052 | | 0.8029 | |

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

- (1) Meet the PCI standards in the “Chinese Expert Consensus on Posterior Circulation Ischemia” ^[2]
- (2) PCI is indicated by cranial ultrasound and MRI
- (3) Signed informed consent
- (4) Diagnosed as wind-yang disturbance syndrome according to traditional Chinese medicine

2.2.2. Exclusion criteria

- (1) Cognitive impairment
- (2) Abnormal liver and kidney function
- (3) Allergy to diagnosis and treatment drugs
- (4) Dizziness caused by non-PCI factors

2.3. Treatment methods

Group A is treated with Tianma Gouteng Decoction, with the following formula: 30g of Shijueming (*Haliotis* shell); 18g of another type of Shijueming; 15g each of Gouteng, Duzhong, Yejiaoteng, Fushen, Sangjisheng, Yimucao, Huainiuxi; 10g each of Shanzhizi, Huangqin, Tianma. Dialectical prescriptions are as follows: For severe headache, add mulberry leaves, chrysanthemums, and angelica; for severe insomnia and dreaminess, add

keel, oyster, and *Albizia* flowers; for cough and expectoration, add *Pinellia ternata*, windproof, and polygala. The medicinal herbs are decocted in water, and 300ml of juice is taken, which is taken warm in the morning and evening. The medication is administered for 2 weeks.

Group B is orally administered betahistine mesylate [Eisai (China) Pharmaceutical Co., Ltd.; National Medical Approval Number H20040130; 6mg], 6–12mg after meals, 3 times/day. The medication is administered for 2 weeks.

2.4. Observation indicators

- (1) Efficacy: If tinnitus and dizziness disappear, the disease does not recur, and arterial blood circulation is restored, it is considered as markedly effective; if tinnitus and dizziness are reduced, and arterial blood circulation speed is accelerated, it is considered as effective; if there is no change in tinnitus, dizziness, and blood circulation speed, it is considered as ineffective.
- (2) Syndrome score: Evaluate the patient's condition based on the principles of none, mild, moderate, and severe, including irritability, headache, tinnitus and dizziness, insomnia and dreaminess, etc., with a score of 0–3.
- (3) Hemodynamics: Use Doppler ultrasonography to detect PSV indicators, focusing on obtaining blood flow data from the basilar artery and left and right vertebral arteries.
- (4) Quality of life: The SF-36 score is directly proportional to the quality of life of PCI patients, divided into four dimensions.

2.5. Statistical research

SPSS 23.0 is used to process data, with % recording and χ^2 testing for counting data, $\pm s$ recording, and t-testing for measurement data. It has comparative significance, $P < 0.05$.

3. Results

3.1. PCI efficacy

The PCI efficacy of Group A is higher than that of Group B, $P < 0.05$, as shown in **Table 2**.

Table 2. Comparison of efficacy among PCI patients (n,%)

| Group | Markedly effective | Effective | Ineffective | Effective rate |
|----------------|--------------------|-------------|-------------|----------------|
| Group A (n=41) | 30 (73.17%) | 10 (24.39%) | 1 (2.44%) | 40 (97.56%) |
| Group B (n=41) | 22 (53.66%) | 12 (29.27%) | 7 (17.07%) | 34 (82.93%) |
| χ^2 | - | - | - | 4.9865 |
| P | - | - | - | 0.0255 |

3.2. PCI syndrome scoring

After medication, the PCI syndrome score in Group A was lower than that in Group B, with $P < 0.05$, as shown in **Table 3**.

Table 3. Comparison of PCI patient syndrome scores ($\bar{x} \pm s$)

| Group | Irritability/Restlessness (score) | | Head Distension/Headache (score) | |
|---------------|-----------------------------------|------------------|----------------------------------|------------------|
| | Before medication | After medication | Before medication | After medication |
| Group A(n=41) | 2.49 \pm 0.32 | 0.68 \pm 0.18 | 2.44 \pm 0.31 | 0.72 \pm 0.19 |
| Group B(n=41) | 2.51 \pm 0.33 | 1.33 \pm 0.25 | 2.42 \pm 0.32 | 1.36 \pm 0.23 |
| <i>t</i> | 0.2786 | 13.5105 | 0.2874 | 13.7365 |
| <i>P</i> | 0.7813 | 0.0000 | 0.7745 | 0.0000 |

| Group | Tinnitus/Dizziness (score) | | Insomnia/Vivid dreams (score) | |
|---------------|----------------------------|------------------|-------------------------------|------------------|
| | Before medication | After medication | Before medication | After medication |
| Group A(n=41) | 2.36 \pm 0.35 | 0.69 \pm 0.15 | 2.41 \pm 0.36 | 0.72 \pm 0.12 |
| Group B(n=41) | 2.38 \pm 0.37 | 1.36 \pm 0.23 | 2.43 \pm 0.38 | 1.38 \pm 0.21 |
| <i>t</i> | 0.2514 | 15.6236 | 0.2447 | 17.4726 |
| <i>P</i> | 0.8021 | 0.0000 | 0.8074 | 0.0000 |

3.3. PCI Hemodynamics

After medication, the PSV of the basilar artery and left and right vertebral arteries in Group A were higher than those in Group B, with $P < 0.05$, as shown in **Table 4**.

Table 4. Comparison of hemodynamic indices in PCI patients ($\bar{x} \pm s$)

| Group | Basilar artery PSV(cm/s) | | Left vertebral artery PSV(cm/s) | | Right vertebral artery PSV(cm/s) | |
|---------------|--------------------------|------------------|---------------------------------|------------------|----------------------------------|------------------|
| | Before medication | After medication | Before medication | After medication | Before medication | After medication |
| Group A(n=41) | 37.21 \pm 2.42 | 48.11 \pm 3.59 | 32.71 \pm 2.33 | 42.49 \pm 3.11 | 32.28 \pm 2.11 | 42.87 \pm 3.25 |
| Group B(n=41) | 37.23 \pm 2.41 | 42.06 \pm 2.73 | 32.62 \pm 2.36 | 38.82 \pm 2.96 | 32.31 \pm 2.13 | 39.33 \pm 3.06 |
| <i>t</i> | 0.0375 | 8.5894 | 0.1738 | 5.4733 | 0.0641 | 5.0779 |
| <i>P</i> | 0.9702 | 0.0000 | 0.8625 | 0.0000 | 0.9491 | 0.0000 |

3.4. PCI quality of life

After medication, the SF-36 score in Group A was higher than that in Group B, with $P < 0.05$, as shown in **Table 5**.

Table 5. Comparison of quality of life in PCI patients ($\bar{x} \pm s$)

| Group | Physical health (score) | | Mental health (score) | |
|---------------|-------------------------|------------------|-----------------------|------------------|
| | Before medication | After medication | Before medication | After medication |
| Group A(n=41) | 61.29 \pm 2.28 | 85.51 \pm 3.26 | 62.38 \pm 2.36 | 86.11 \pm 3.38 |
| Group B(n=41) | 61.33 \pm 2.26 | 78.44 \pm 3.14 | 62.39 \pm 2.37 | 75.36 \pm 3.09 |
| <i>t</i> | 0.0798 | 10.0016 | 0.0191 | 15.0306 |
| <i>P</i> | 0.9366 | 0.0000 | 0.9848 | 0.0000 |

Table 5 (Continued)

| Group | Physical role functioning (score) | | Social role functioning (score) | |
|------------------------|-----------------------------------|------------------|---------------------------------|------------------|
| | Before medication | After medication | Before medication | After medication |
| Group A(<i>n</i> =41) | 62.44 ± 2.21 | 86.58 ± 3.45 | 62.33 ± 2.19 | 87.16 ± 3.62 |
| Group B(<i>n</i> =41) | 62.41 ± 2.19 | 76.11 ± 3.14 | 62.38 ± 2.23 | 75.43 ± 3.21 |
| <i>t</i> | 0.0617 | 14.3710 | 0.1024 | 15.5240 |
| <i>P</i> | 0.9509 | 0.0000 | 0.9187 | 0.0000 |

4. Discussion

The posterior circulation refers to the vertebrobasilar artery system. If basilar artery sclerosis causes transient cerebral ischemia, it can induce a series of symptoms. After PCI occurs, typical symptoms include sudden balance disorder, where patients suddenly experience a spinning sensation, feeling as if they or their surroundings are rotating. Severe vertigo can be accompanied by nausea and vomiting, and patients may even be unable to walk upright. Visual function may also be impaired, manifesting as blurred vision, visual field defects, double vision, or even temporary blindness. As PCI progresses, patients may develop ataxia, exhibiting clumsy movements, tremor, difficulty performing fine motor tasks, and a few patients may experience swallowing difficulties, hearing loss, limb numbness, headaches, and other symptoms. Clinical diagnosis of PCI is challenging, as it is difficult to accurately classify the type of disease, limiting the effectiveness of management and control measures. Therefore, exploring effective diagnostic and therapeutic drugs is crucial. Western medicine treats PCI with symptomatic drug therapy, commonly using histamine receptor antagonists such as betahistine mesylate. Oral administration can quickly correct intracranial ischemia and hypoxia, alleviating PCI symptoms ^[3].

However, PCI carries a high risk of recurrence and has a long disease course. Long-term use of betahistine mesylate can lead to drug resistance, affecting its efficacy. Thus, combination therapy with other drugs is necessary. Based on PCI symptoms, traditional Chinese medicine scholars categorize this disease under the “vertigo” umbrella. The disease originates in the brain but is related to kidney, spleen, and liver functions. The liver and kidney transport essence and blood, while the spleen transports and transforms food essence to nourish the brain. If the liver and kidney are deficient, spleen deficiency can lead to phlegm production, liver Yang hyperactivity can cause phlegm-turbidity stagnation, and disturbance of the clear orifices, inducing vertigo. Treatment requires a formula to calm the liver and suppress yang.

Tianma Gouteng Decoction is a classic traditional Chinese medicine formula derived from “New Meanings in the Treatment of Miscellaneous Diseases.” In this formula, Gouteng is combined with Tianma as the monarch drugs, exerting effects of calming wind, suppressing liver, nourishing liver, and tonifying kidneys. Shijueming is combined with Huainiuxi as the minister drugs. Shijueming can suppress liver Yang, brighten eyes, clear heat, and enhance the monarch drugs’ ability to calm wind and suppress liver. Huainiuxi promotes urination, invigorates blood, and guides blood downward ^[4]. Duzhong is combined with Huainiuxi and Sangjisheng to calm the liver, brighten eyes, and clear heat. Yimucao invigorates blood and calms wind, while Huangqin and Shanzhizi clear and reduce liver fire. Yejiaoteng and Fushen can tranquilize and calm the mind, serving as adjuvant drugs ^[5]. Based on this foundation, traditional Chinese medicine scholars adjust the formula according to PCI patients’ symptoms, adding drugs to clear the head and eyes for headaches, relieving liver depression and suppressing liver yang for

insomnia and dreams, and adding expectorant and wind-resistant drugs for cough and phlegm^[6]. The combination of drugs in Tianma Gouteng Decoction exerts effects of calming wind, stopping convulsions, and suppressing liver yang, which can alleviate symptoms such as vertigo and headaches^[7].

Based on the data analysis in this article, the combination of Western medicine and Tianma Gouteng Decoction demonstrates better efficacy in the treatment of PCI (posterior circulation ischemia). The reason for this is that PCI patients take betahistine mesylate orally, which allows the medicinal components to directly reach the vertebrobasilar artery, stimulating arterial dilation and increasing blood supply. This restores arterial blood circulation, corrects intracranial ischemic injury, and subsequently restores blood and oxygen supply to the vestibular system of the inner ear, effectively relieving vertigo symptoms. When combined with Tianma Gouteng Decoction, which exerts effects of calming the nerves, clearing heat, suppressing wind, and stabilizing the liver, it can optimize the efficacy of PCI treatment^[8]. Another set of data indicates that the combination of Western medicine and Tianma Gouteng Decoction can reduce PCI symptoms and lower syndrome scores. The reason for this is that oral administration of betahistine mesylate inhibits vestibular lateral protruding neurons and blocks neuronal impulse signal transmission, preventing the onset of vertigo. Based on this, the combination therapy with Tianma Gouteng Decoction exerts antiplatelet aggregation, improves blood viscosity, and lowers blood lipid levels, thereby reducing vertebrobasilar artery damage and restoring arterial blood circulation, resulting in a decrease in various symptom scores^[9].

Another set of data suggests that the combination of Western medicine and Tianma Gouteng Decoction can improve patients' basilar artery and left and right vertebral artery PSV indicators, as well as increase SF-36 scores. The reasons for this include the presence of various medicinal components in the combined therapy. For example, abalone shell can regulate blood pressure, relieve eye discomfort, and reduce the severity of vertigo; *Gastrodia elata*, rich in gasterodin, acts on the nervous system to accelerate vertebrobasilar artery blood circulation, optimize intracranial microcirculation, and enhance PCI auxiliary control effects; motherwort components can prevent thrombosis and platelet aggregation, protecting coronary artery and heart function, and facilitating the removal of arterial blood flow obstacles; baicalin can reduce craniocerebral reperfusion injury, optimize craniocerebral function, protect intracranial microvascular structure, and repair damaged craniocerebral tissue, facilitating the restoration of craniocerebral microcirculation; mulberry mistletoe can accelerate craniocerebral microcirculation and stabilize blood pressure; *Poria cocos* can reduce anxiety and stabilize the mind, correcting symptoms such as excessive dreaming and palpitations; various active components in tuber fleeceflower root can regulate the central nervous system, extending deep sleep time and shortening sleep latency, thereby avoiding vertigo recurrence due to insufficient sleep time; *Eucommia* bark and cape jasmine fruit can stabilize blood pressure and promote body microcirculation, helping to relieve vertigo symptoms; and *Uncaria rhynchophylla* can inhibit craniocerebral vascular sclerosis and maintain stable blood pressure, thereby reducing vertigo symptoms^[10,11].

However, during the treatment of PCI patients with Tianma Gouteng Decoction and other medications, it is recommended to increase intake of high-fiber foods such as grains, fruits, and vegetables, avoid smoking and alcohol consumption to reduce vascular damage caused by improper food intake. Patients should also be guided to regulate their emotions, autonomously adjust feelings of anger, tension, and anxiety, and adopt stress-relieving methods such as chatting, traveling, and listening to soft music to stabilize their emotions. Additionally, increasing nighttime sleep duration to 7–8 hours can help improve vertigo symptoms. In summary, the combination of betahistine mesylate and Tianma Gouteng Decoction in the treatment of PCI patients can improve vertebrobasilar microcirculation, reduce PCI symptoms, and optimize the quality of life for PCI patients, demonstrating

promotional value.

5. Conclusion

The combination of Tianma Gouteng Decoction and Betahistine Mesylate demonstrates notable efficacy and feasibility in treating PCI (Posterior Circulation Ischemia). This therapeutic approach not only improves hemodynamic indicators but also significantly reduces disease severity scores, suggesting its potential as a promising treatment strategy for PCI management. Further clinical studies are warranted to validate these findings and explore long-term outcomes.

Disclosure statement

The authors declare no conflict of interest.

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Research Progress on Epidemiology and Comprehensive Prevention and Control Strategies of HIV Infection

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Abstract: Acquired Immunodeficiency Syndrome (AIDS) caused by Human Immunodeficiency Virus (HIV) infection poses a serious threat to global public health. This article comprehensively reviews the epidemiological characteristics of HIV infection, including the global and domestic epidemic situation, transmission routes, and characteristics of high-risk groups. It also introduces comprehensive prevention and control strategies in detail. Through analysis, it aims to provide a reference for further optimizing HIV prevention and control work.

Keywords: HIV infection; Epidemiology; Prevention and control strategies

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1. Introduction

AIDS is an infectious disease caused by the Human Immunodeficiency Virus (HIV), which has a significant impact on society. It not only severely damages the health of patients, leading to the collapse of the immune system and triggering various opportunistic infections and tumors, but also greatly reduces the quality of life of patients and shortens life expectancy. In addition, it brings a heavy socioeconomic burden, including medical expenses, labor loss, and impact on family and social stability. As time goes by, the epidemiological characteristics of HIV infection are constantly changing, such as the change in the proportion of transmission routes and the expansion of high-risk groups, which puts forward continuous and higher requirements for prevention and control work. In-depth study of the epidemiology and comprehensive prevention and control strategies of HIV infection is extremely important to effectively contain the spread of the epidemic, improve patient prognosis, and reduce the socioeconomic burden.

2. Epidemiological characteristics of HIV infection

2.1. Global epidemic situation

2.1.1. Number of infections and geographical distribution

In 2023, according to a report by UNAIDS, approximately 40 million people worldwide are currently infected with HIV. The geographical distribution is extremely uneven, with Sub-Saharan Africa remaining the hardest hit region, accounting for nearly 70% of global infections. For example, in South Africa, according to local health department data, as of 2024, approximately 7.8 million people are infected with HIV, with an infection rate of 12.6%. This is mainly attributed to factors such as relatively open sexual attitudes in the region, high prevalence of sexually transmitted diseases, lack of medical and health resources, and weak awareness of HIV prevention and control among some people ^[1]. The number of infections in Asia cannot be ignored. India has about 2.3 million HIV-infected people. Due to its large population base, poor sanitary conditions in some areas, and the lack of protection for sex workers, the number of infections remains at a relatively high level.

2.1.2. Changes in epidemic trends

In recent years, the number of new HIV infections globally has shown a downward trend overall, but the situation is not optimistic in some regions. Due to the large scale of injecting drug users and the widespread phenomenon of sharing needles, coupled with the imperfect health service system during the socio-economic transition, the epidemic is on the rise in Eastern Europe and Central Asia. According to data from the European Centre for Disease Prevention and Control, the number of new infections in some countries in the region increased by 15% to 20% compared with the same period last year in 2024. However, the number of AIDS-related deaths globally has declined, thanks to the promotion and popularization of Highly Active Antiretroviral Therapy (HAART), which has enabled patients' immune systems to be rebuilt, reducing the risk of death from opportunistic infections and tumors.

2.2. Current epidemiological situation in China

2.2.1. Overall infection situation

The number of HIV infections in China is continuously increasing, but the growth rate has slowed down. As of the end of 2023, there were approximately 1.29 million reported HIV infections in China, with about 110,000 new AIDS patients in 2023. The epidemic situation varies significantly in different regions, with relatively higher prevalence in southwestern regions such as Yunnan, Guangxi, and Sichuan. Taking Yunnan as an example, its location along drug smuggling routes and large population of injecting drug users, coupled with frequent personnel mobility in border areas and increased risk of sexual transmission, have made the province one of the leading regions in China for HIV infections ^[2].

2.2.2. Population distribution characteristics

From the perspective of age distribution, sexually active individuals aged 15–49 are the main infected group, but in recent years, the number of infections among elderly and adolescent populations has gradually increased. Among the elderly, some lack knowledge about sexual health and have a weak awareness of condom use, making them susceptible to HIV infection during sexual activities such as “twilight romances.” ^[3] Adolescents, on the other hand, have open sexual attitudes but inadequate self-protection abilities, especially in complex social environments around schools and online, leading to an increased risk of infection. Regarding gender, there are more male

infections than female, and the infection rate among men who have sex with men (MSM) has risen significantly. In some cities in 2024, the HIV infection rate among MSM reached 10%–15%. Occupations are widely distributed, including workers, farmers, students, and business service personnel. High-risk groups such as MSM, people who inject drugs (PWID), and sex workers remain the focus of prevention and control.

2.3. Analysis of transmission routes

2.3.1. Sexual transmission

Sexual transmission has become the primary route of HIV infection globally and in China. Worldwide, sexual transmission accounts for over 70% of new infections. In China, this proportion continues to rise, currently reaching about 90%. Heterosexual transmission used to dominate in China, mainly due to multiple sexual partners, extramarital sex, and low condom usage rates ^[4]. As social attitudes change, sexual transmission among MSM is rapidly increasing. This group engages in special sexual behaviors, frequently changes sexual partners, and generally has a lower condom usage rate than the heterosexual population. Some surveys indicate that condom usage among MSM is only 30%–50% ^[5]. Additionally, sexually transmitted infections (STI) such as syphilis and gonorrhea commonly coexist with HIV. STI-induced genital mucosal damage can increase the risk of HIV infection by 2–5 times ^[6].

2.3.2. Blood transmission

Treponema pallidum and *Neisseria gonorrhoeae* can survive in the blood, so unsterilized needles and blood products (such as blood collection or transfusion) can cause infection. *Treponema pallidum* is easily transmitted through tiny breaks in the skin or mucous membranes, typically through unprotected sex or sharing needles for drug injection. *Neisseria gonorrhoeae* can be transmitted through contaminated syringes, needles, and other medical equipment, as well as through blood, but due to its low infection rate and most people's immunity to it, it is not currently considered a route of HIV transmission ^[7].

2.3.3. Mother-to-child transmission

Mother-to-child transmission includes intrauterine infection, transmission during childbirth, and breastfeeding. Without intervention, the probability of mother-to-child transmission can reach 15%–45%. Through the implementation of the Prevention of Mother-to-Child Transmission (PMTCT) program, such as HIV testing for pregnant women, providing antiviral drugs to infected pregnant women for blocking treatment, choosing safe delivery methods (such as cesarean section to reduce the risk of transmission during childbirth), and guiding artificial feeding to replace breastfeeding, the mother-to-child transmission rate in China has dropped to below 2% ^[8]. However, in some remote areas, due to scarce medical resources, untimely prenatal care for pregnant women, and low awareness and participation in the PMTCT program, the risk of mother-to-child transmission still exists.

2.4. Characteristics of high-risk groups

2.4.1. Men who have sex with men (MSM)

The HIV infection rate among MSM is much higher than that of the general population, with infection rates reaching 10%–15% in some cities. They are sexually active, and according to surveys, some MSM have an average of 5–10 or more sexual partners. Additionally, there are high-risk behaviors such as multiple sexual

partners and group sex, which occasionally occur in some MSM social venues ^[9, 10]. Although awareness of HIV infection has increased among this group, some still have insufficient understanding of the risks of infection. Coupled with social discrimination and pressure, they are afraid to actively seek testing and treatment services after engaging in high-risk behaviors, increasing the risk of HIV transmission within the group and to other populations ^[11].

2.4.2. People who inject drugs (PWID)

PWID are highly susceptible to HIV transmission due to sharing syringes, needles, and other equipment. Drug addiction makes it difficult for them to abandon high-risk behaviors, and the high mobility of this group, often gathering in hidden places to use drugs, coupled with poor living and sanitary conditions, increases the difficulty of prevention and control. Some drug users also engage in promiscuous sexual behaviors to obtain drugs or money, further increasing the risk of HIV transmission. In some areas with severe drug problems, the HIV infection rate among PWID can reach up to 50%–80%, making them a significant source of HIV transmission in the local area ^[12].

2.4.3. Sex workers and their clients

Due to the occupational characteristics of sex workers, they frequently engage in sexual behavior with different sexual partners. If effective protective measures are not taken, the risk of HIV infection is extremely high. According to surveys in some areas, the condom usage rate among sex workers ranges from 60% to 80%, but there are still some who do not use condoms correctly due to client demands or their own lack of health awareness ^[13]. Their client group comes from a wide range of ages and occupations, and because of sexual contact with sex workers, they become a potential group for HIV infection. Moreover, this group often has a weak sense of health, lacks regular physical examinations and access to reproductive health services, which makes the risk of HIV transmission among this group and related populations persistent.

3. Comprehensive prevention and control strategies for HIV infection

3.1. Strengthen education and behavioral intervention

Through various channels such as television, radio, the internet, and social media, conduct HIV prevention and treatment publicity for the general public to enable them to have a correct understanding of their own physical condition ^[14]. For example, on platforms such as Weibo and Douyin, the click-through rate for HIV prevention themes has reached billions. Short videos and science articles are used to widely promote the transmission routes of HIV, the importance of prevention and testing. In primary and secondary schools, knowledge about HIV prevention should be integrated into health education courses. Starting from junior high school, various methods such as classroom teaching, thematic class meetings, and knowledge competitions should be used to strengthen adolescents' understanding. In communities, personalized publicity should be provided for residents of all ages through the distribution of promotional materials and lectures, reaching deep into community squares and residential areas ^[15]. For the MSM population, the role of peers in the group should be utilized to promote condom use, carry out offline communication activities, share experiences in AIDS prevention and treatment, and provide services such as AIDS screening and counseling ^[16]. Provide methadone maintenance therapy for PWID to reduce their dependence on drugs and reduce high-risk behaviors caused by drug abuse.

3.2. Universal HIV testing and diagnostic services

HIV detection technology has evolved from the initial Enzyme-Linked Immunosorbent Assay (ELISA) and Western Blot (WB) to rapid detection reagents and nucleic acid testing ^[17]. Rapid detection reagent methods are simple and easy to use, with results available in 15–20 minutes, making them suitable for testing in community screenings and primary medical institutions ^[18]. Nucleic acid testing can shorten the window period to 1–2 weeks, thereby improving the early diagnosis rate of the disease and laying the foundation for timely treatment of patients ^[19]. Testing sites are set up in large hospitals, disease control and prevention centers, community health service centers, and Voluntary Counseling and Testing (VCT) facilities, providing testing at low or no cost. At the same time, active testing in medical institutions is carried out, routinely screening hospitalized patients, surgical patients, and patients in STD clinics for HIV. Community mobilization testing encourages individuals with high-risk behaviors to actively seek testing through community organizations and volunteer promotions. In recent years, self-testing has been promoted, with testing reagents sold through internet platforms and pharmacies, allowing users to test themselves at home. After testing, online counseling services are provided to guide result interpretation and follow-up treatment, greatly improving testing convenience and promoting early detection and diagnosis.

3.3. Initiation of treatment and care support

HIV treatment primarily involves symptomatic management and antiretroviral therapy, typically commencing within the first three months after HIV infection. Since most patients cannot adhere to the complete drug regimen, and adverse drug reactions often affect patients' quality of life, researchers have continuously updated various antiretroviral drug combination regimens, such as the combined use of nucleoside and non-nucleoside drugs, long-acting and short-acting formulations, to improve efficacy, reduce toxic side effects, and enhance adherence. Currently, there are multiple validated effective treatment options available ^[20].

In recent years, with the emergence of new antiretroviral drugs, monotherapy or dual therapy has become an important choice for HIV treatment. Currently, various single-drug and two-drug combination regimens have been approved for the treatment of HIV/AIDS. For patients who cannot tolerate the adverse reactions of traditional regimens, novel multidrug combination therapy may be the best option ^[21]. However, this approach carries a higher risk of drug resistance, requiring individualized treatment strategies based on each patient's condition. Simultaneously, increasing evidence suggests that implementing immune reconstitution therapy early in treatment can prevent AIDS-related complications. Therefore, besides antiretroviral therapy, it is also necessary to consider how to restore human immunity through comprehensive means, including regulating bodily functions, enhancing antiviral capabilities, and stimulating the human immune system.

4. Conclusion

The epidemiological characteristics of HIV infection are complex and constantly changing. Although global and domestic prevention and control efforts have achieved certain results, there are still many challenges, such as virus variation and drug resistance, difficulties in preventing and controlling high-risk populations, and social discrimination. In the future, it is necessary to continuously strengthen multi-sectoral collaboration and social participation to jointly address HIV infection as a global public health issue, striving to reduce HIV infection rates, alleviate the burden of disease, and promote harmonious social development.

Disclosure statement

The author declares no conflict of interest.

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Analysis of Cognitive Differences and Influencing Factors of Traditional Chinese Medicine Culture in Rural Areas

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Abstract: This article compares the cognitive differences and influencing factors of traditional Chinese medicine culture among rural residents in Guigang, Guangxi, and Jinhua, Zhejiang, providing a reference for balanced development. A stratified sampling method was used to conduct a questionnaire survey in three townships in each region, and data were analyzed using SPSS 25.0 and chi-square test. The survey shows that residents in Guigang rely more on personal experience for their understanding, resulting in fragmented cognition, with their needs concentrated on disease treatment. On the other hand, residents in Jinhua rely on rational trust and digital communication, leading to deeper cognition, and their needs tend to focus on preventive healthcare. Occupational factors significantly affect the cognitive level in Jinhua, while in Guigang, it is closely related to trust and cultural atmosphere. The interaction of regional economy, occupational background, and cultural tradition affects cognitive differences. It is suggested that Guigang should build a community traditional Chinese medicine cultural experience matrix, develop digital content for ethnic medical resources, and strengthen the “experience-identification-dissemination” closed loop. Jinhua should deepen the construction of digital IP and promote the integration of industry and education. The two regions should jointly build a cross-regional cultural corridor, cultivate inheritors, and use new media to expand the coverage of dissemination.

Keywords: Traditional Chinese medicine culture; Influencing factors; Cognitive differences

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1. Introduction

The cognition of traditional Chinese medicine culture is an important dimension to measure residents' health literacy, involving the understanding and application of traditional Chinese medicine healthy lifestyle and cultural knowledge ^[1]. In recent years, the “Healthy China 2030” Planning Outline and the “14th Five-Year Plan” for the Development of Traditional Chinese Medicine have emphasized the improvement of traditional Chinese medicine service capabilities and citizens' health and cultural literacy ^[2, 3]. As a crucial position for the inheritance

of traditional Chinese medicine culture, rural areas' residents' cognitive level directly affects the accessibility and effectiveness of services. However, differences in regional economies and cultural backgrounds may lead to cognitive differentiation, and targeted research is urgently needed to promote balanced development. This study selects rural residents from Guigang, Guangxi, and Jinhua, Zhejiang as subjects, compares the differences in cognition, attitudes, and needs of traditional Chinese medicine culture between the two regions, and deeply analyzes the influencing factors. The research aims to reveal the influence mechanism of regional differences on the dissemination of traditional Chinese medicine culture, provide a theoretical basis for formulating differentiated policies and promoting the balanced development of traditional Chinese medicine culture, and actively respond to the call of the national rural revitalization strategy to enhance primary health service capabilities ^[4].

2. Research methods

The study adopted and revised the questionnaire used in the research “Problems and Countermeasures of the Current Situation of Traditional Chinese Medicine Cultural Cognition and Demand of Rural Residents in Lingnan” conducted by Zhang *et al*, based on specific circumstances ^[5]. The questionnaire included basic information, attitudes towards traditional Chinese medicine, cognitive level, and demand evaluation. A stratified multi-stage random sampling method was used to select 3 townships in Guigang and Jinhua each. Through a random number table method, 4 administrative villages were selected from each township, and 30–35 households were randomly selected from each village for the questionnaire survey. The collected data were verified using Excel, and 11 questionnaires with a missing rate of key variables greater than 20% or contradictory answers were excluded. The SPSS 25.0 complex sampling module was used for analysis, and differences between the two locations were compared using the chi-square test.

3. Research results

3.1. Basic information of survey respondents

This study conducted research in the villages of Guigang, Guangxi, and Jinhua, Zhejiang, distributing 690 questionnaires and collecting 679 valid questionnaires, with an effective recovery rate of 98.41%. The basic information of the survey respondents is shown in **Table 1**. In terms of gender, the distribution in Guigang was balanced, while there were slightly more women in Jinhua. Regarding age, Guigang respondents were mainly aged 46 and above, while Jinhua respondents were predominantly between 18 and 35 years old. In terms of education level, Guigang had a high proportion of respondents with primary and junior high school education, while Jinhua had a significantly higher proportion of respondents with college education and above compared to Guigang. Occupation-wise, farmers and workers accounted for 52.89% in Guigang, while students and teachers were more prominent in Jinhua. The proportion of other occupations was relatively balanced in both locations. In terms of annual income, Guigang had a high proportion of respondents earning below 30,000 and between 30,000 to 50,000, while Jinhua had a similar proportion of respondents earning between 50,000 to 100,000 as Guigang.

Table 1. Basic demographic characteristics of survey respondents on tcm culture awareness

| Survey item | Category | Guigang (n) | Jinhua (n) | Guigang (%) | Jinhua (%) |
|-----------------|------------------------------|-------------|------------|-------------|------------|
| Gender | Male | 167 | 159 | 50.76 | 45.43 |
| | Female | 162 | 191 | 49.24 | 54.57 |
| Age | < 18 years | 107 | 34 | 32.52 | 9.71 |
| | 18–35 years | 56 | 174 | 17.02 | 49.71 |
| | 36–45 years | 51 | 100 | 15.50 | 28.57 |
| | ≥ 46 years | 115 | 42 | 34.95 | 12.00 |
| Education level | Primary school or below | 69 | 25 | 20.97 | 7.14 |
| | Junior high school | 100 | 70 | 30.40 | 20.00 |
| | High school/technical school | 98 | 109 | 29.79 | 31.14 |
| | College or above | 62 | 146 | 18.84 | 41.71 |
| Occupation | Farmers/Workers | 174 | 105 | 52.89 | 30.00 |
| | Teachers | 14 | 49 | 4.26 | 14.00 |
| | Healthcare workers | 53 | 41 | 16.11 | 11.71 |
| | Students | 36 | 100 | 10.94 | 28.57 |
| | Others | 52 | 55 | 15.81 | 15.71 |
| Annual income | < ¥30,000 | 126 | 116 | 38.30 | 33.14 |
| | ¥30,000–50,000 | 102 | 56 | 31.00 | 16.00 |
| | ¥50,000–100,000 | 57 | 116 | 17.33 | 33.14 |
| | ≥ ¥100,000 | 44 | 62 | 13.37 | 17.71 |

3.2. Cognition, attitude, and demand for traditional Chinese medicine

The level of cognition of traditional Chinese medicine directly affects residents' attitudes towards it, which in turn determines their demand and behavior choices ^[6]. The trust in traditional Chinese medicine was similar in both locations, but in terms of willingness to try traditional Chinese medicine treatment, 41.03% of Guigang respondents were willing, significantly higher than the 19.71% in Jinhua. Among the main reasons for choosing traditional Chinese medicine treatment, 71.12% of Guigang respondents chose “affordable price,” higher than the 41.43% in Jinhua. Among the reasons for not choosing traditional Chinese medicine, Guigang residents believed that decocting medicine was inconvenient, while Jinhua residents tended to think that it was difficult to find a good traditional Chinese medicine practitioner. The proportion of people familiar with traditional Chinese medicine culture was 34.95% in Guigang and only 10.57% in Jinhua. Jinhua residents believed that the cognition of traditional Chinese medicine culture was “average,” accounting for 44.00%, higher than the 14.29% in Guigang.

The evaluation of medical treatment status and cultural atmosphere perception of traditional Chinese medicine was similar in both locations. Residents in both places generally believed that limited funding and a shortage of grassroots practitioners were the main issues for the development of traditional Chinese medicine. However, 55.32% of Guigang residents believed that there was a lack of policy support, much higher than the 32.86% in Jinhua. Regarding channels for obtaining information about traditional Chinese medicine, Jinhua residents preferred “recommendations from friends and family” and “obtaining information from newspapers and the internet,” while

Guigang residents relied more on personal experience. There were significant differences in the demand for traditional Chinese medicine services between the two locations. Guigang residents had a higher demand for medical services targeting disease treatment, while Jinhua residents had a stronger demand for related preventive health services.

Table 2. Survey on attitudes, knowledge level, and demand for traditional Chinese medicine (TCM) culture

| Survey content | Category | Guigang (n) | Jinhua (n) | Guigang (%) | Jinhua (%) |
|---|---|-------------|------------|-------------|------------|
| Attitude toward TCM | Trust | 143 | 165 | 43.47 | 47.14 |
| | Neutral | 33 | 93 | 10.03 | 26.57 |
| | Skeptical | 115 | 70 | 34.95 | 20.00 |
| | Distrust | 38 | 22 | 11.55 | 6.29 |
| Willingness to try TCM treatment | Very willing | 117 | 159 | 35.56 | 45.43 |
| | Willing | 135 | 69 | 41.03 | 19.71 |
| | May consider | 42 | 76 | 12.77 | 21.71 |
| | Unwilling | 35 | 46 | 10.64 | 13.14 |
| Reasons for choosing TCM | Affordable cost | 234 | 145 | 71.12 | 41.43 |
| | Stable efficacy, fewer side effects | 234 | 225 | 71.12 | 64.29 |
| | Promotes health | 225 | 151 | 68.39 | 43.14 |
| | Needed for post-illness recovery | 128 | 109 | 38.91 | 31.14 |
| | Physical discomfort without clear diagnosis | 146 | 144 | 44.38 | 41.14 |
| Reasons for not choosing TCM | Inconvenient preparation | 224 | 192 | 68.09 | 54.86 |
| | Slow effect | 177 | 123 | 53.80 | 35.14 |
| | Unpleasant taste | 107 | 34 | 32.52 | 9.71 |
| | Difficulty finding skilled TCM doctors | 196 | 239 | 59.57 | 68.29 |
| | Lack of understanding of TCM | 126 | 96 | 38.30 | 27.43 |
| | Perceived ineffectiveness | 112 | 172 | 34.04 | 49.14 |
| Perceived most effective TCM applications | Health preservation | 211 | 168 | 64.13 | 48.00 |
| | Cancer treatment | 162 | 153 | 49.24 | 43.71 |
| | Treatment of difficult diseases | 152 | 133 | 46.20 | 38.00 |
| | Rehabilitation therapy | 149 | 134 | 45.29 | 38.29 |
| | Chronic disease management | 213 | 181 | 64.74 | 51.71 |
| | Emergency care | 116 | 158 | 35.26 | 45.14 |
| Awareness of TCM culture | Familiar | 115 | 37 | 34.95 | 10.57 |
| | Somewhat familiar | 129 | 140 | 39.21 | 40.00 |
| | Neutral | 47 | 154 | 14.29 | 44.00 |
| | Unfamiliar | 38 | 19 | 11.55 | 5.43 |
| Accessibility of TCM services | Convenient | 123 | 125 | 37.39 | 35.71 |
| | Moderate | 128 | 114 | 38.91 | 32.57 |
| | Somewhat inconvenient | 42 | 72 | 12.77 | 20.57 |
| | Inconvenient | 36 | 20 | 10.94 | 5.71 |
| | (Skipped) | 0 | 19 | 0.00 | 5.43 |

Table 2 (Continued)

| Survey content | Category | Guigang (n) | Jinhua (n) | Guigang (%) | Jinhua (%) |
|-------------------------------------|--|-------------|------------|-------------|------------|
| Local TCM cultural atmosphere | Very strong | 69 | 87 | 20.97 | 24.86 |
| | Relatively strong | 93 | 116 | 28.27 | 33.14 |
| | Neutral | 112 | 55 | 34.04 | 15.71 |
| | Relatively weak | 34 | 43 | 10.33 | 12.29 |
| | Very weak | 21 | 49 | 6.38 | 14.00 |
| Challenges in local TCM development | Limited funding | 204 | 209 | 62.01 | 59.71 |
| | Insufficient policy support | 182 | 115 | 55.32 | 32.86 |
| | Lagging IT infrastructure | 121 | 123 | 36.78 | 35.14 |
| | Inadequate promotion | 149 | 160 | 45.29 | 45.71 |
| | Shortage of grassroots TCM practitioners | 178 | 186 | 54.10 | 53.14 |
| | Weak application of TCM techniques | 146 | 164 | 44.38 | 46.86 |
| | No issues | 60 | 4 | 18.24 | 1.14 |
| Frequency of following TCM culture | Actively follow | 112 | 74 | 34.04 | 21.14 |
| | Occasionally follow | 132 | 191 | 40.12 | 54.57 |
| | Rarely follow | 58 | 55 | 17.63 | 15.71 |
| | Never follow | 27 | 30 | 8.21 | 8.57 |
| Channels for learning about TCM | Personal experience | 208 | 145 | 63.22 | 41.43 |
| | Recommendations from friends/family | 173 | 242 | 52.58 | 69.14 |
| | Recommendations from Western doctors | 131 | 133 | 39.82 | 38.00 |
| | Health lectures | 135 | 116 | 41.03 | 33.14 |
| | TV, radio, internet, newspapers | 166 | 177 | 50.46 | 50.57 |
| | Other | 123 | 10 | 37.39 | 2.86 |
| Most desired local TCM services | Disease treatment services | 214 | 159 | 65.05 | 45.43 |
| | Post-illness rehabilitation | 195 | 201 | 59.27 | 57.43 |
| | Family healthcare | 131 | 171 | 39.82 | 48.86 |
| | Preventive healthcare | 184 | 223 | 55.93 | 63.71 |
| Overall knowledge level | High | 53 | 52 | 16.11 | 14.86 |

3.3. Key factors influencing cognitive level

Surveys in both regions indicate that the stronger the local cultural atmosphere of traditional Chinese medicine (TCM), and the higher the residents' attention to TCM, the higher their cognitive level of TCM will be. Occupation is an important factor influencing the cognitive level of TCM culture among residents in Jinhua ($X^2=9.649$, $P=0.047$). The cognitive level of students, teachers, and health service professionals is significantly higher than that of farmers and workers. In Guigang, residents' trust in TCM is positively correlated with their cognitive level ($X^2=31.912$, $P < 0.001$), and residents who trust TCM are more likely to actively understand and learn about TCM culture. The cognitive level of residents in Guigang is also affected by their familiarity with TCM culture ($X^2=27.400$, $P < 0.001$) and the convenience of local TCM medical services ($X^2=8.048$, $P=0.090$).

Table 3. Influence of various factors on residents' awareness level in Guangxi and Zhejiang

| Survey content | Category | Guigang awareness level | | Guigang X^2 (%) | Guigang P (%) | Jinhua awareness level | | Jinhua X^2 (%) | Jinhua P (%) |
|--|-------------------------------|-------------------------|------|-------------------|-----------------|------------------------|-----|------------------|----------------|
| | | Low | High | | | High | Low | | |
| Age | 18–30 | 49 | 7 | 1.020 | 0.796 | 28 | 146 | 2.044 | 0.563 |
| | 31–45 | 41 | 10 | | | 3 | 31 | | |
| | < 18 | 90 | 17 | | | 13 | 87 | | |
| | ≥ 46 | 96 | 19 | | | 8 | 34 | | |
| Education | High school/ technical school | 88 | 10 | 7.261 | 0.064 | 27 | 119 | 4.701 | 0.195 |
| | College or above | 48 | 14 | | | 11 | 98 | | |
| | Primary school or below | 61 | 8 | | | 12 | 58 | | |
| | Middle school | 79 | 21 | | | 2 | 23 | | |
| Occupation | Farmers/ workers | 149 | 25 | 7.996 | 0.092 | 17 | 83 | 9.649 | 0.047 |
| | Healthcare- related | 48 | 5 | | | 16 | 89 | | |
| | Students | 30 | 6 | | | 12 | 43 | | |
| | Others | 40 | 12 | | | 7 | 42 | | |
| | Teachers | 9 | 5 | | | 0 | 41 | | |
| Annual income (CNY) | 30,000–50,000 | 89 | 13 | 2.632 | 0.452 | 18 | 98 | 2.319 | 0.509 |
| | 50,000–100,000 | 49 | 8 | | | 9 | 47 | | |
| | < 30,000 | 104 | 22 | | | 12 | 50 | | |
| | $\geq 100,000$ | 34 | 10 | | | 13 | 103 | | |
| Attitude toward TCM | Neutral | 105 | 10 | 28.067 | 0.000 | 23 | 142 | 1.134 | 0.769 |
| | Trusting | 103 | 40 | | | 11 | 59 | | |
| | Skeptical | 30 | 3 | | | 16 | 77 | | |
| | Distrustful | 38 | 0 | | | 2 | 20 | | |
| Awareness of TCM culture | Familiar | 81 | 34 | 31.912 | 0.000 | 10 | 27 | 6.744 | 0.081 |
| | Basic understanding | 110 | 19 | | | 15 | 125 | | |
| | Average | 47 | 0 | | | 25 | 129 | | |
| | Unfamiliar | 38 | 0 | | | 2 | 17 | | |
| Local TCM healthcare accessibility | Convenient | 88 | 35 | 27.400 | 0.000 | 15 | 110 | 8.048 | 0.090 |
| | Moderate | 111 | 17 | | | 24 | 90 | | |
| | Less convenient | 41 | 1 | | | 11 | 61 | | |
| | Inconvenient | 36 | 0 | | | 0 | 20 | | |
| | Skipped | 0 | 0 | | | 2 | 17 | | |
| Local TCM cultural atmosphere | Moderate | 101 | 11 | 18.770 | 0.001 | 17 | 38 | 14.040 | 0.007 |
| | Relatively strong | 70 | 23 | | | 15 | 101 | | |
| | Relatively weak | 32 | 2 | | | 8 | 79 | | |
| | Very weak | 21 | 0 | | | 6 | 37 | | |
| | Very strong | 52 | 17 | | | 6 | 43 | | |
| Proactive attention to TCM information | Occasionally | 115 | 17 | 22.099 | 0.000 | 36 | 155 | 8.602 | 0.035 |
| | Rarely | 55 | 3 | | | 8 | 47 | | |
| | Frequently | 80 | 32 | | | 8 | 66 | | |
| | Never | 26 | 1 | | | 0 | 30 | | |

Note: p represents the significance level; $p \leq 0.05$ indicates a statistically significant influence.

4. Discussion

4.1. Occupation as a sculpting tool for cognitive differences

Occupation plays a significant role in an individual's social role system and has a notable impact on cognitive differences in TCM culture ^[6]. Different occupational groups, influenced by factors such as knowledge structure, work environment, and lifestyle, have varying degrees of exposure to and understanding of TCM culture. Research shows that occupation is a crucial factor affecting the cognitive level of TCM culture among residents in Jinhua, which is consistent with the research of Juxi and others ^[7, 8]. The influence of occupational factors on cognition is not a simple linear relationship but is modulated by both regional cultural background and economic development. Due to Jinhua's developed economy and abundant educational resources, occupational differences have a significant impact on cognitive levels. However, in Guigang, where the economy is relatively lagging, the influence of occupational differences is overshadowed by economic and educational factors ^[9-11]. It is recommended that Guigang enhance its educational level and strengthen publicity to narrow the cognitive gap among occupational groups.

Occupational factors exhibit significant stratification characteristics for age differences in the cognition of TCM culture. Among younger groups, the influence of occupation on cognitive level is relatively weakened, and cognitive differences mainly stem from exposure to digital communication. For middle-aged and older groups, the key variable is occupational background. There is a significant difference in cognitive scores between agricultural workers and teachers, which is closely related to their knowledge acquisition channels. The former relies more on traditional experience accumulation, while the latter gains access to standardized training through professional characteristics. This intergenerational difference arises because young people have strong cognitive plasticity and can actively break through professional field limitations.

However, middle-aged and older groups are affected by knowledge solidification effects, making it difficult to reconstruct the cognitive framework shaped by the professional environment. It is suggested to build an age-stratified intervention system: develop immersive learning scenarios such as metaverse interactive courses and digital twin communities of TCM culture for young people, and implement occupational scene-embedded education for middle-aged and older groups, creating community TCM health workshops for retired employees. Simultaneously, a cross-generational communication mechanism should be established to promote intergenerational cognitive transmission through family digital feedback.

4.2. Attitude towards traditional Chinese medicine (TCM) serves as a dynamic compass for measuring cognitive levels

The influence of attitudes towards TCM on cognitive levels is both dynamic and multidimensional, with "rational trust" and "experience-dependent trust" emerging as typical patterns. Rational trust is formed through logical analysis and information screening based on the recognition of the scientific and systematic nature of TCM. Conversely, experience-dependent trust relies on personal experience or traditional inertia and lacks systematic cognition ^[9]. Residents of Jinhua exhibit a high level of recognition for the efficacy of TCM, particularly in terms of "TCM health maintenance" and "chronic disease treatment". They tend to acquire knowledge through systematic channels such as health lectures, demonstrating characteristics of "rational trust", and are able to actively screen information to form deep cognition.

On the other hand, residents of Guigang mostly hold an "experience-dependent trust" attitude towards TCM, relying on personal experience and traditional inertia, resulting in fragmented cognition. This aligns with the theory of "information acquisition mode determining cognitive structure" and reveals the moderating effect of

attitude motivation on information screening^[12]. In-depth interviews reveal that while the experience-led cognitive pathway has a high emotional identification, some highly trusting groups actually have a vague understanding of concepts such as “appropriate TCM techniques”, and blind trust inhibits the development of critical cognition. Rational trust improves cognitive quality through a process of “trust-doubt-recognition”, whereas experience-dependent trust remains at a superficial level due to the lack of systematic support^[13]. It is suggested that Guigang learn from Jinhua’s experience and integrate evidence-based medicine concepts into TCM promotion to facilitate a shift from “experience-dependent” to “rational trust” among residents. Leveraging its advantage in rational trust, Jinhua can establish a digital science popularization platform to strengthen residents’ deep cognition of TCM and promote the transformation of TCM culture.

4.3. Cultural atmosphere and attention serve as fertile soil for enhancing cognition

Traditional viewpoints suggest that cultural atmosphere enhances attention and strengthens cognition through exposure to various scenarios. However, in the digital era, research indicates a dynamic interaction between cultural atmosphere and attention, which jointly affects cognitive levels through a two-way mechanism of “cultural identity-information reach”, presenting differentiated pathways in different regions^[14, 15]. Jinhua, with a strong cultural atmosphere stemming from historical accumulation, actively utilizes new media platforms to reconstruct TCM cultural symbols. For instance, by creating IPs such as “TCM health bloggers” and transforming traditional medicinal diet preparation into interesting short videos, it achieves integrated online and offline communication, breaking geographical limitations. Conversely, residents of Guigang rely heavily on personal experience, lacking digital recording and dissemination, which confines the cultural atmosphere to individual perception, making it difficult to form group identity and leading to a dilemma of “high experience, low diffusion”^[12].

The level of attention is not only determined by the amount of information provided, but is also closely related to the degree of cultural identity among residents. The stronger the atmosphere of traditional Chinese medicine culture, the higher the residents’ attention and cognitive level. Residents of Jinhua have a high cultural identity, are sensitive to relevant information, and actively pay attention to it. Residents of Guigang often act out of practical needs, lack cultural identity, and their attention is characterized by passiveness and fragmentation. When individuals view traditional Chinese medicine culture as part of their cultural identity, they spontaneously strengthen their attention behavior^[16]. The key to increasing attention lies in fostering cultural identity, not simply increasing the frequency of promotion. Jinhua should leverage its digital advantages and could collaborate with universities and medical institutions to develop AR traditional Chinese medicine diagnosis and treatment simulation programs, promoting the transformation of traditional Chinese medicine culture from a “traditional resource” to a “cultural capital”. Guigang needs to focus on the closed-loop construction of the “experience-identity-dissemination” chain, encouraging residents to record and share their own cases of traditional Chinese medicine application, forming localized cultural symbols, and gradually building group identity.

4.4. Public demands are the guiding beacon for the development of traditional Chinese medicine

The dynamic evolution of the supply and demand relationship of traditional Chinese medicine services reveals a two-way driving mechanism of “demand stratification - supply iteration”. On one hand, the stratification of public demand guides supply optimization; on the other hand, supply optimization in turn shapes demand upgrading, that is, “supply and demand coordination”, revealing the dynamic interaction mechanism between the two. There are

significant differences in the demand for traditional Chinese medicine services between residents of Guigang and Jinhua, reflecting the regional characteristics of demand stratification. Due to the low level of economic development and scarcity of medical resources in Guigang, residents are more concerned with disease treatment, and their demand remains at the level of “treating diseases”. Residents in Jinhua tend to prefer preventive health care services, and their demand has shifted from “treating diseases” to “preventing diseases”, which is in line with the concept of “health-centered”. It is recommended to establish a demand response index system to dynamically monitor the supply and demand matching degree of traditional Chinese medicine services in different economic development areas, and achieve a benign resonance between supply innovation and demand upgrading through precise policies.

Demand stratification is influenced by multiple factors such as regional economy, culture, and policies, and transitions with changes in external conditions. Supply optimization is the key to meeting public demands and guiding demand upgrading. Jinhua promotes services such as TCM constitution identification, cultivates residents’ health management awareness, and drives demand transformation. Guigang’s limited supply capacity and long-term stagnation of demand indicate that the core of supply optimization lies in “precise matching” and “forward-looking guidance”. Guigang should strengthen primary-level traditional Chinese medicine service capabilities, carry out traditional Chinese medicine cultural experience activities, enhance residents’ cognitive level and cultural identity, cultivate talents, and then carry out preventive health care pilots to cultivate health awareness. Jinhua needs to deepen the supply of preventive health care services, deepen the “traditional Chinese medicine + health management” model, and promote cultural dissemination.

5. Conclusion

This study compared the differences in cultural cognition of traditional Chinese medicine (TCM) among rural residents in Guigang, Guangxi, and Jinhua, Zhejiang. The findings revealed significant interactions between regional economic levels, occupational backgrounds, and cultural traditions. Residents in Guigang relied heavily on personal experience, demonstrating “experience-dependent trust” with fragmented cognition, and their demands were concentrated on disease treatment. Conversely, residents in Jinhua relied on rational trust and digital communication, exhibiting more systematic and deeper cognition, with a preference for preventive healthcare. Occupational factors significantly influenced cognition in Jinhua, while enhancing trust in TCM and optimizing the convenience of primary TCM healthcare services were identified as breakthrough points for improving cognition in Guigang. It is suggested that Guigang should strengthen the clinical application of TCM at the primary level, utilize digitalization to promote cultural dissemination, and enhance residents’ cognitive level of TCM culture. Jinhua, on the other hand, should leverage its cultural heritage, deepen the “TCM + Health Management” model, and lead the transition of demand from “disease treatment” to “disease prevention.” Both regions also need to improve talent cultivation and funding mechanisms. The balanced development of cultural cognition of TCM is significant for enhancing residents’ health literacy, promoting rural revitalization, and advancing the Healthy China strategy. Future research can expand the dimensions of regional comparison, explore innovative digitalization pathways, promote the vitality of TCM in inheritance, and contribute the wisdom of TCM to building a global community of health for all.

Disclosure statement

The authors declare no conflict of interest.

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Study on the Correlation between the Expression Level of Interleukin-17D in the Serum of Patients with Severe Pneumonia and Disease Severity

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Abstract: *Objective:* To investigate the expression level of interleukin-17D (IL-17D) in the serum of patients with severe pneumonia and its correlation with disease severity. *Methods:* This study included 50 patients with severe pneumonia who were diagnosed and treated in the hospital from May 2024 to May 2025. The expression level of IL-17D in the serum of all patients was recorded. Patients were divided into severe and mild groups based on their disease severity. Gender, age, disease duration, presence of fever, atelectasis, pneumothorax, interleukin-2 (IL-2), interleukin-4 (IL-4), interleukin-6 (IL-6), and interleukin-17D were selected as independent variables. Statistical software SPSS 22.00 was used for univariate analysis, and variables with statistical significance in the univariate analysis were included in a multivariate logistic regression analysis to determine the correlation between IL-17D and the severity of severe pneumonia. *Results:* The results of this study showed that the level of IL-17D in patients with severe pneumonia was significantly higher than the normal threshold. Univariate analysis indicated that atelectasis, IL-2, IL-6, and IL-17D were statistically significant ($P < 0.05$) and could be considered as influencing factors for the severity of severe pneumonia. Multivariate logistic regression analysis revealed that atelectasis (OR=2.141, 95% CI: 1.684–2.391), IL-2 (OR=2.884, 95% CI: 2.240–3.614), IL-6 (OR=2.571, 95% CI: 2.190–2.943), and IL-17D (OR=2.416, 95% CI: 2.093–2.735) were positively correlated with the severity of severe pneumonia. *Conclusion:* The expression level of IL-17D in the serum of patients with severe pneumonia is higher than the normal threshold and is positively correlated with disease severity.

Keywords: Interleukin-17D; Severe pneumonia; Expression level; Disease severity; Correlation

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1. Introduction

Severe pneumonia, as a serious respiratory disease, is characterized by high morbidity and mortality, posing a significant threat to patients' lives and health^[1]. Its pathogenesis is complex and involves multiple aspects such as

pathogen infection, abnormal host immune response, and multiple organ dysfunction. In the pathophysiological process of severe pneumonia, excessive activation of inflammatory response and imbalance of immune regulation are key factors leading to disease progression ^[2]. Therefore, exploring the pathogenesis of severe pneumonia and searching for effective biomarkers to evaluate disease severity and predict prognosis are crucial for improving patients' treatment efficacy and survival rate ^[3]. Cytokines, as important signaling molecules in the immune system, play a key role in inflammatory response and immune regulation. The interleukin-17 (IL-17) family is an important group of proinflammatory cytokines, including multiple members such as IL-17A to IL-17F ^[4]. Among them, IL-17D, as a member of the IL-17 family, has gradually attracted researchers' attention in recent years. Although the specific mechanism of IL-17D in severe pneumonia is not fully understood, studies have shown that IL-17D is upregulated in various inflammatory and infectious diseases and may be involved in regulating the activation of immune cells and the release of inflammatory factors ^[5]. In patients with severe pneumonia, changes in serum cytokine levels are often closely related to disease severity and prognosis ^[6]. For example, cytokines such as IL-6 and IL-17A have been proven to be potential biomarkers for severe pneumonia, and changes in their levels can reflect the degree of inflammatory response and immune status of patients. However, research on the expression level of IL-17D in the serum of patients with severe pneumonia and its correlation with disease severity is still insufficient. Based on this, this study included patients with severe pneumonia diagnosed and treated in the hospital from May 2024 to May 2025 as research subjects to explore the correlation between the expression level of interleukin-17D in the serum of patients with severe pneumonia and disease severity.

2. Materials and methods

2.1. General information

In this study, fifty patients with pneumonia admitted to Shapingba District People's Hospital in Chongqing from May 2024 to May 2025 are selected as the research subjects. They are divided into severe and mild groups based on the severity of their illness.

2.2. Inclusion criteria and exclusion criteria

2.2.1. Inclusion criteria

- (1) Meet the diagnostic criteria for severe pneumonia and exhibit clinical symptoms of severe pneumonia.
- (2) Age > 18 years old.
- (3) Complete clinical data.
- (4) Patients and their families signed informed consent and expressed voluntary participation in this study.

2.2.2. Exclusion criteria

- (1) Combined cardiovascular disease.
- (2) Combined liver and kidney dysfunction.
- (3) Combined coagulation dysfunction.
- (4) Pregnant or breastfeeding patients.
- (5) Loss of clinical data.

2.3. Methods

In this study, 50 patients are divided into severe and mild groups based on disease severity, which is considered the dependent variable. The independent variables selected are gender, age, duration of illness, presence of fever, atelectasis, pneumothorax, interleukin-2, interleukin-4, interleukin-6, and interleukin-17D. Relevant indicators are compared between different groups.

2.4. Statistical methods

SPSS 25.0 statistical software is used for data processing. Count data are expressed as rates or proportions (%), and chi-square (χ^2) tests are used for comparisons between groups. For measurement data, the t-test is used for data that follows a normal distribution, expressed as mean \pm standard deviation. For data that did not follow a normal distribution, M(IQR) is used, and non-parametric rank sum tests are used for comparisons between groups. Correlation analysis is performed on variables with statistical significance in univariate analysis, and $P < 0.05$ is considered statistically significant.

3. Results

3.1. Expression level of serum Interleukin-17D

The study results showed that among the 50 patients, the expression level of serum interleukin-17D was 4.93 ± 0.85 ng/L. The expression level in the mild group was 3.75 ± 0.74 ng/L, while the expression level in the severe group was 5.83 ± 1.03 ng/L. The comparison of results was statistically significant, as shown in **Table 1**.

Table 1. Comparison of serum Interleukin-17D expression levels

| Group | <i>n</i> | IL-17D level (ng/L) |
|--------------|----------|---------------------|
| Severe group | 22 | 5.83 ± 1.03 |
| Mild group | 28 | 3.75 ± 0.74 |
| <i>t</i> | - | 8.308 |
| <i>P</i> | - | < 0.001 |

3.2. Analysis of single-factor results

The research results indicate that 28 cases were included in the mild group and 22 cases in the severe group. Single-factor analysis revealed that atelectasis, interleukin-2, interleukin-6, and interleukin-17D were statistically significant in the single-factor analysis ($P < 0.05$), while other variables were not statistically significant ($P > 0.05$). Specific data are shown in **Table 2**.

3.3. Multi-factor logistics regression analysis results

Variables with statistical significance from the above single-factor analysis were included in the multi-factor logistics regression analysis. The research results showed that atelectasis (OR=2.141, 95% CI: 1.684–2.391), IL-2 (OR=2.884, 95% CI: 2.240–3.614), IL-6 (OR=2.571, 95% CI: 2.190–2.943), and IL-17D (OR=2.416, 95% CI: 2.093–2.735) were positively correlated with the severity of severe pneumonia. Specific data are presented in **Table 3**.

Table 2. Single-factor results analysis

| Variable | Category | Mild group (n=28) | Severe group (n=22) | Statistic | P |
|-------------------------|----------------|-------------------|---------------------|-----------|---------|
| Gender, n (%) | Male (n=26) | 15 (53.57%) | 11 (50.00%) | 0.063 | 0.802 |
| | Female (n=24) | 13 (46.43%) | 11 (50.00%) | | |
| Age (years) | Mean ± SD | 41.84 ± 6.91 | 40.99 ± 7.30 | 0.421 | 0.673 |
| Disease course (months) | Mean ± SD | 6.82 ± 1.04 | 7.29 ± 1.20 | 1.482 | 0.145 |
| Fever, n (%) | Present (n=21) | 12 (42.86%) | 9 (40.91%) | 0.019 | 0.890 |
| | Absent (n=29) | 16 (57.14%) | 13 (59.09%) | | |
| Pneumothorax, n (%) | Present (n=18) | 11 (39.29%) | 7 (31.82%) | 0.298 | 0.585 |
| | Absent (n=32) | 17 (60.71%) | 15 (68.18%) | | |
| Atelectasis, n (%) | Present (n=20) | 7 (25.00%) | 13 (59.09%) | 5.966 | 0.015 |
| | Absent (n=30) | 21 (75.00%) | 9 (40.91%) | | |
| IL-2 (ng/L) | Mean ± SD | 6.08 ± 1.09 | 8.63 ± 1.31 | 7.513 | < 0.001 |
| IL-4 (pg/L) | Mean ± SD | 6.80 ± 1.15 | 6.98 ± 1.16 | 0.547 | 0.587 |
| IL-6 (ng/L) | Mean ± SD | 1.59 ± 0.21 | 2.31 ± 0.29 | 10.182 | <0.001 |
| IL-17D (ng/L) | Mean ± SD | 3.75 ± 0.74 | 5.83 ± 1.03 | 8.308 | < 0.001 |

Table 3. Multi-factor logistics regression analysis results

| Variable | β | S.E | P | OR | 95% CI |
|-------------|------|------|--------|-------|-------------|
| Atelectasis | 0.88 | 0.91 | < 0.05 | 2.141 | 1.684–2.391 |
| IL-2 | 0.74 | 0.86 | < 0.05 | 2.884 | 2.240–3.614 |
| IL-6 | 0.85 | 1.02 | < 0.05 | 2.571 | 2.190–2.943 |
| IL-17D | 0.93 | 0.98 | < 0.05 | 2.416 | 2.093–2.735 |

4. Discussion

As a member of the IL-17 family, IL-17D shows a significant upward trend in the serum of patients with severe pneumonia. This upregulation may originate from the immune response activated by pathogen infection ^[7]. Immune cells, such as monocytes and macrophages, regulate downstream inflammatory responses by secreting IL-17D after recognizing pathogens. Its expression level is positively correlated with disease severity, suggesting that IL-17D may be involved in the pathological process of severe pneumonia ^[8]. Relevant studies have directly pointed out that IL-17D is closely related to the APACHE II score ^[9]. As the level of IL-17D increases, the demand for mechanical ventilation also increases, and the mortality rate rises significantly. This may become a potential marker of disease progression. Other studies have conducted dynamic monitoring of IL-17D levels to reflect the treatment response of patients with severe pneumonia ^[10]. If the treatment is effective, the IL-17D level should gradually decrease. Conversely, persistently high levels may indicate a poor prognosis. This dynamic change provides a reference for clinical adjustment of treatment plans.

Based on this, the present study explored the correlation between interleukin-17D and the severity of severe pneumonia. A total of 50 patients were included as research samples. Through monitoring of expression levels,

it was found that the expression level of interleukin-17D in patients with severe pneumonia was significantly higher than the normal threshold. Single-factor analysis revealed that atelectasis, interleukin-2, interleukin-6, and interleukin-17D are influencing factors that affect the severity of severe pneumonia. After incorporating these factors into multi-factor logistics regression analysis, it was found that atelectasis, interleukin-2, interleukin-6, and interleukin-17D are all positively correlated with the severity of severe pneumonia, which may become important markers for the treatment of severe pneumonia.

5. Conclusion

In summary, interleukin-17D is positively correlated with the severity of severe pneumonia. However, the current study has a limited sample size, and there is heterogeneity in patient etiology and underlying diseases, which may affect the universality of the results. Future multi-center, large-sample studies are needed to validate the conclusions.

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Research Progress on the Feasibility and Effectiveness of Home-Based Exercise Rehabilitation in the Management of Chronic Obstructive Pulmonary Disease (COPD)

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Abstract: Chronic obstructive pulmonary disease (COPD) is a common chronic respiratory disease that severely affects patients' quality of life. Current clinical treatments primarily rely on medication, with limited rehabilitation options and uncertain efficacy. Home-based exercise rehabilitation, as a non-pharmacological therapy, can promote the improvement of respiratory muscle function and cardiopulmonary endurance, exerting a positive preventive effect on COPD. However, due to factors such as the home environment and lack of health knowledge, COPD patients face numerous difficulties in accepting home-based exercise rehabilitation. This article reviews domestic and international research on the feasibility and effectiveness of home-based exercise rehabilitation for COPD, aiming to provide references for medical workers to better implement home-based exercise rehabilitation for COPD, assist patients in performing rehabilitation exercises at home, improve their quality of life, reduce hospitalization rates, and lower medical costs.

Keywords: Home-based exercise rehabilitation; Chronic obstructive pulmonary disease; Feasibility; Effectiveness

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1. Introduction

Home-based exercise rehabilitation is a treatment method that encourages patients to enhance their physical function and improve their health status within the home environment ^[1]. Specifically, it refers to completing exercises at home that help improve physical activity and quality of life, including activities of daily living (ADL), housework, gardening, and more. In 1976, the World Health Organization introduced the concept of home-based exercise rehabilitation, emphasizing its important role in improving patients' quality of life. Currently, home-based exercise rehabilitation has been widely used in the management of various chronic diseases, particularly cardiovascular diseases, cancers, chronic pain, endocrine and metabolic diseases, and Alzheimer's disease ^[2]. In the United States, home-based exercise rehabilitation has become a standard clinical practice model ^[3]. However,

in China, due to the uneven distribution of medical resources and high demand for community medical services, home-based exercise rehabilitation has not received adequate attention. In recent years, with the increasing awareness of health among the population, the concept of home-based rehabilitation has gradually gained popularity. Since the 1990s, researchers have begun to focus on combining exercise rehabilitation with home-based rehabilitation, providing new ideas for addressing issues such as the lack of professional guidance for the elderly and their reluctance to seek medical attention.

2. Concept and feasibility of home-based exercise rehabilitation

2.1. Feasibility analysis

The greatest advantage of home-based exercise rehabilitation lies in its convenience for patients, which can meet their demand for a high-quality life ^[4]. Simultaneously, it also helps alleviate the pressure on healthcare professionals and social institutions in terms of medical resource allocation ^[5]. As chronic disease patients often require long-term treatment, they need continuous health management support in their daily work, study, and life. However, there is currently a lack of relevant services for home-based exercise rehabilitation targeted at chronic disease patients in China, which is one of the reasons driving the development of home-based rehabilitation.

Although studies have shown that pure home-based training cannot achieve ideal results, compared with traditional hospital rehabilitation, home-based exercise rehabilitation has many advantages ^[6]. Firstly, patients can develop personalized exercise programs based on their physical conditions, thereby improving exercise efficiency ^[7]. Secondly, patients can flexibly arrange exercises at home, reducing the time cost of traveling to hospitals or participating in group activities ^[8]. In addition, home-based exercise rehabilitation can also reduce patients' transportation costs and time spent commuting to and from hospitals.

According to reports, compared with conventional outpatient treatment, home-based exercise rehabilitation can save patients 50% to 80% of costs per year ^[9]. At the same time, home-based exercise rehabilitation can help patients maintain good health, avoid unnecessary outings, and reduce the risk of infection ^[10].

In summary, home-based exercise rehabilitation not only meets the needs of patients but also plays a positive role in reducing the pressure on medical resources and improving patients' quality of life. Therefore, incorporating home-based exercise rehabilitation into chronic disease management is a feasible and worthwhile direction to explore.

2.2. Differences between home-based exercise rehabilitation and traditional rehabilitation methods

Traditional rehabilitation methods are typically conducted under the guidance of professionals, requiring patients to visit hospitals for treatment or rehabilitation training. This approach not only increases patients' medical costs but also often fails to achieve ideal rehabilitation effects due to a lack of targeted and personalized design. In contrast, home-based exercise rehabilitation emphasizes that patients complete exercise programs at home, enabling them to adjust the intensity and content of exercises according to their needs and preferences and participate with family members. Furthermore, the implementation of home-based exercise rehabilitation is more convenient and not restricted by time and location, allowing patients to exercise at any time. On the other hand, traditional rehabilitation is limited to hospitals, rehabilitation centers, and other facilities, requiring patients to make appointments, arrange travel, and potentially encounter traffic congestion. Therefore, the main differences

between home-based exercise rehabilitation and traditional methods lie in: higher autonomy for patients, flexible adjustment of exercise plans based on individual needs and physical conditions; no additional costs, while reducing the pressure on the healthcare system; easier monitoring of patients' health status, timely detection of abnormalities, and corresponding measures; and the provision of more health education and support to help patients understand disease-related knowledge and improve self-management abilities.

3. The therapeutic effects of home-based exercise rehabilitation on COPD

Research both domestically and internationally has confirmed that home-based exercise rehabilitation can improve patients' respiratory muscle function, respiratory function, and pulmonary ventilation, enhance the body's immunity and resistance, effectively reduce the acute exacerbation rate of COPD, and prevent COPD complications^[11, 12]. Some scholars have proposed that exercise can improve the symptoms of COPD through the following mechanisms^[13]:

- (1) Increasing oxygen intake and diffusion in the lungs.
- (2) Promoting gas exchange and increasing carbon dioxide excretion
- (3) Strengthening the glycoprotein receptor expression on bronchial smooth muscle cell membranes and inhibiting inflammatory responses;
- (4) Activating glycoprotein receptors, increasing interleukin-10 (IL-10) and transforming growth factor- β 1 (TGF- β 1) levels, and reducing the production of proinflammatory mediators,
- (5) Stimulating ciliary movement in the airways, promoting mucus clearance, and diluting sputum, thereby reducing sputum blockage.

Additionally, some scholars believe that exercise can enhance the activity of the thoracic cage and diaphragm, increase lung capacity, improve lung volume, increase pulmonary vascular tension, improve blood circulation, increase tissue oxygenation, reduce pulmonary congestion, alleviate hypoxic states, and improve ventilation and gas exchange functions^[14].

3.1. Improving respiratory muscle function

Respiratory muscle function is an important factor affecting the quality of daily life for COPD patients, and its decline can lead to symptoms such as respiratory muscle fatigue and dyspnea. Research has found that systematic and standardized rehabilitation training can significantly improve patients' exercise capacity and physical fitness, enhance cardiopulmonary function during aerobic endurance exercise, and reduce oxygen consumption^[15].

Zeng *et al.* conducted a randomized controlled trial to evaluate the efficacy of home-based exercise rehabilitation intervention on 40 COPD patients. The results showed that compared to the control group, the exercise rehabilitation group had significant improvements in maximal oxygen uptake (VO₂max) and subjective physical activity capacity scores, with no significant adverse reactions. This indicates that home-based exercise rehabilitation can effectively improve respiratory muscle function and increase exercise endurance^[16]. Therefore, home-based rehabilitation exercise can improve the exercise capacity and respiratory function of COPD patients, thereby enhancing their quality of life.

3.2. Promoting lung function recovery

Home-based exercise rehabilitation not only improves patients' respiratory muscle function but also promotes

the recovery of lung function. A study on healthy individuals found that exercise had no effect on lung capacity but could improve indicators such as forced expiratory volume in one second (FEV1), FEV1 as a percentage of predicted value (FEV1/PEF), forced expiratory volume during the first second of expiration (VFEV1), forced vital capacity (FVC), and FEV1/FVC ratio at rest and after activity^[17]. Similar effects can be achieved through exercise intervention in COPD patients^[18].

Tang randomly divided 90 COPD patients into an exercise training group and a control group. The exercise group performed walking rehabilitation exercises twice a day, while the control group only received routine care for 8 weeks. The results showed that compared to the control group, the lung capacity of the exercise training group was significantly higher, and the difference was statistically significant^[19]. There is considerable evidence supporting such research, such as another randomized controlled trial involving 112 patients, which demonstrated that aerobic exercise therapy could significantly improve participants' FEV1/FVC ratio and FEV1%pred, alleviating dyspnea symptoms^[20]. Additionally, home-based exercise rehabilitation for COPD can complement treatments such as inhaled bronchodilators and inhaled corticosteroids, thereby reducing the frequency and severity of acute exacerbations^[21, 22].

Based on the above, domestic and foreign studies have shown that home-based exercise rehabilitation can improve exercise endurance, lung capacity, and quality of life for patients with COPD. However, there is currently limited research on home-based exercise rehabilitation for COPD in China, and there is a lack of unified and standardized criteria. Some studies divide COPD rehabilitation into three stages^[23]: initial assessment, education and training, and intervention implementation. However, existing home-based rehabilitation programs lack a comprehensive assessment process for patients and do not clarify the training content, time, and frequency for different stages^[24]. Additionally, some studies have found that elderly COPD patients still experience symptoms such as limited mobility and cough after undergoing home-based exercise rehabilitation^[25, 26]. Therefore, it is necessary to strengthen health education for patients undergoing home-based rehabilitation, provide detailed home care guidance including a balanced diet, smoking cessation, and moderate exercise, and design individualized exercise rehabilitation programs based on patient characteristics to improve patient compliance and self-management skills, thereby promoting better participation in rehabilitation exercises.

4. Conclusion

In summary, although home-based exercise rehabilitation has a certain preventive and therapeutic effect on COPD patients, its clinical application is still limited due to factors such as small research sample size, incomplete methodological approaches, and single intervention measures. Therefore, relevant research should be continued to enrich the intervention methods of home-based exercise rehabilitation, optimize the specific implementation plan of home-based exercise rehabilitation, make it more suitable for China's national conditions, and provide scientific, safe, and effective home-based exercise rehabilitation services for patients, thereby improving their quality of life, enhancing living standards, reducing hospitalization risks, and lowering medical costs.

Disclosure statement

The author declares no conflict of interest.

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The Rehabilitation Effect of Pulmonary Function Rehabilitation Training on Elderly Patients with Chronic Obstructive Pulmonary Disease During Hospitalization

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Abstract: *Objective:* To explore the rehabilitation effect of pulmonary rehabilitation training in elderly patients with chronic obstructive pulmonary disease (COPD). *Methods:* Elderly COPD patients hospitalized from June 2024 to December 2024 were selected as subjects for a quasi-experimental study. The study randomly assigned patients into two equal groups of 50 each. One group served as the control and received standard treatment and nursing care, while the other group, the intervention group, was given additional pulmonary rehabilitation exercises alongside the conventional care. The lung function indexes [forced expiratory volume in the first second (FEV1), forced vital capacity (FVC), FEV1/FVC], 6-minute walk distance (6MWD), Borg's Category Scale for perceived exertion (BCSS), COPD Assessment Test (CAT), Barthel Index for activities of daily living, blood oxygen saturation, and Modified Medical Research Council (MMRC) dyspnea scale were compared between the two groups before and after intervention. *Results:* Following the intervention, the intervention group demonstrated improved lung function compared to the control group ($P < 0.05$). However, no significant difference was observed in the 6-minute walk distance (6MWD) ($P > 0.05$). The intervention group had lower Bronchitis Severity Scale (BCSS) scores ($P < 0.05$) and better quality of life scores ($P < 0.05$) than the control group. No notable differences were found in activities of daily living scores or blood oxygen saturation ($P > 0.05$). Additionally, the intervention group exhibited a lower proportion of residual severe dyspnea ($P < 0.05$). *Conclusion:* Pulmonary rehabilitation can enhance respiratory function in individuals with COPD, leading to beneficial therapeutic outcomes and ultimately improving their overall quality of life.

Keywords: Elderly chronic obstructive pulmonary disease; Pulmonary rehabilitation training during hospitalization; Rehabilitation effect

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1. Introduction

Chronic obstructive pulmonary disease (COPD) is a common chronic respiratory disorder characterized primarily

by persistent airflow obstruction ^[1]. In the treatment and rehabilitation of COPD patients, most international respiratory associations advocate the use of non-drug treatments and educational guidance for stable COPD patients. Pulmonary rehabilitation (PR) is a key non-drug treatment. Pulmonary rehabilitation was proposed by the American Thoracic Society and the European Respiratory Society in 2006, and its definition was later revised by the American Thoracic Society, which was accepted by more researchers ^[2, 3]. For elderly COPD patients, it is necessary not only to actively treat them based on the reason for admission, but also to find effective ways to improve lung function. In this study, 100 elderly COPD patients were selected to analyze the role of pulmonary rehabilitation training.

2. Materials and methods

2.1. General Information

From June to December 2024, patients are enrolled in a hospital-based quasi-experimental study. Using a random number table, they are assigned equally into two groups, with 50 participants in each. Demographic and clinical data, such as gender, age, BMI, and smoking history, are gathered via a general information questionnaire.

2.2. Inclusion criteria and exclusion criteria

2.2.1. Inclusion criteria

- (1) Meet the diagnostic criteria for COPD in the “Guidelines for the Diagnosis and Treatment of Chronic Obstructive Pulmonary Disease (2021 Revision)” ^[4].
- (2) Age ≥ 60 years old
- (3) Stable condition and in remission phase.
- (4) Willingly took part in the study and completed an informed consent agreement.

2.2.2. Exclusion criteria

- (1) Combined with severe cardiac, liver, kidney, and other organ dysfunction.
- (2) Suffering from mental illness or cognitive impairment.
- (3) Had acute exacerbations or received lung surgery recently
- (4) Unable to cooperate to complete pulmonary rehabilitation exercise training.

2.3. Methods

The control group is given standard medical care, which involved prescribed anti-infection therapy, supplemental oxygen, as well as mucus-clearing and cough-suppressing treatments as directed by physicians. Based on the type of disease, patients also received health education, psychological nursing, medication guidance, dietary nursing, and exercise guidance.

The intervention group received pulmonary function rehabilitation training in addition to the conventional treatment. This training included:

- (1) Respiratory training, consisting of pursed-lip breathing and abdominal breathing. The training process, skills, and precautions are taught through graphics, videos, and live demonstrations to ensure that patients fully grasped the training knowledge and skills and could complete the training normally and smoothly. Pursed-lip breathing involved closing the mouth, inhaling through the nose, exhaling slowly through

pursed lips (like blowing a whistle), with exhalation time being 2–3 times longer than inhalation time. This is performed 2–3 times per day, for 10–15 minutes each time. Abdominal breathing is performed in a supine or semi-reclining position, as chosen by the patient for comfort and relaxation. During inhalation, the abdomen is gently raised while the chest remained stationary, and during exhalation, the abdomen is lowered while the chest remained stationary. This is also performed 2–3 times per day, for 10–15 minutes each time.

- (2) Exercise training is based on the latest comprehensive assessment results, patient interests, and exercise habits. Patients are guided to train in the rehabilitation area of the hospital, using equipment such as dumbbells, sandbags, elastic bands, respiratory trainers, and sputum discharge devices. The target heart rate is determined by subtracting the patient's age from 220 to establish the maximum heart rate, with exercise intensity set at 60% to 80% of this value. The regimen consisted of one daily session lasting 10 to 15 minutes. To optimize outcomes and ensure safety, rehabilitation guidance included proper warm-up routines and exercise precautions.

2.4. Research tools

- (1) Pulmonary function is evaluated with a spirometer, measuring forced vital capacity (FVC), forced expiratory volume in one second (FEV1), and the FEV1/FVC ratio.
- (2) Exercise capacity is evaluated through a 6-minute walk test, in which patients are asked to cover the maximum distance possible within six minutes.
- (3) Exercise intensity is assessed using the Borg Category Scale for perceived exertion (BCSS), with scores ranging from 0 to 10, where lower scores indicate better exercise intensity ^[5].
- (4) The Chronic Obstructive Pulmonary Disease Assessment Test (CAT) questionnaire is used to measure quality of life, which evaluates nine items with scores ranging from 0 to 5 for each item, where lower scores indicate better quality of life ^[6].
- (5) The Barthel Index is used to evaluate daily living skills, with scores on a scale from 0 to 100. A higher score reflects greater independence in daily activities.
- (6) Blood oxygen saturation is measured using a blood oxygen saturation detector.
- (7) Dyspnea severity is evaluated using the Modified Medical Research Council (MMRC) scale, which categorizes breathlessness into five levels (0 to 4).

2.5. Statistical methods

The data are analyzed using SPSS 25.0 software. Categorical variables are presented as percentages (%) and analyzed with the chi-square test. Normally distributed continuous data are reported as mean \pm standard deviation and compared using the t-test (or F-test). Statistical significance is set at $P < 0.05$.

3. Results

3.1. Comparison of general information between the two groups

No significant variations in demographic data were observed between the groups ($P > 0.05$). Results are shown in **Table 1**.

Table 1. General information of the two groups [$n=50$, $n/(\bar{x} \pm s)$]

| Variables | Control group (n = 50) | Experimental group (n = 50) | Statistic | P-value |
|---|------------------------|-----------------------------|------------------|---------|
| Age (years), Mean \pm SD | 71.58 \pm 7.11 | 69.08 \pm 6.53 | $t = 1.831$ | 0.070 |
| BMI (kg/m ²), Mean \pm SD | 22.11 \pm 4.42 | 21.72 \pm 3.65 | $t = 0.481$ | 0.632 |
| Gender, n(%) | | | $\chi^2 = 1.214$ | 0.271 |
| Male | 33 (66.00) | 38 (76.00) | | |
| Female | 17 (34.00) | 12 (24.00) | | |
| Smoking history, n(%) | | | $\chi^2 = 0.048$ | 0.830 |
| No | 14 (28.00) | 15 (30.00) | | |
| Yes | 36 (72.00) | 35 (70.00) | | |

3.2. Comparison of lung function before and after intervention in two groups of COPD patients

The lung function in the intervention group was significantly improved relative to the control group following the intervention ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of lung function before and after intervention in two groups of COPD patients ($n=50$ cases)

| Group | FEV1 (L) | | FVC (L) | |
|-----------------|-------------------|------------------------------|-------------------|------------------------------|
| | Pre- intervention | Post- intervention | Pre- intervention | Post- intervention |
| Intervention | 2.98 \pm 1.14 | 4.56 \pm 0.89 ^a | 3.08 \pm 1.45 | 4.89 \pm 0.94 ^a |
| Control | 2.95 \pm 1.21 | 4.02 \pm 0.97 ^a | 3.01 \pm 1.57 | 4.27 \pm 0.79 ^a |
| <i>t</i> -value | 0.128 | 2.901 | 0.232 | 3.570 |
| <i>P</i> -value | 0.899 | 0.005 | 0.817 | 0.001 |

| Group | FEV1/FVC (%) | |
|-----------------|-------------------|------------------------------|
| | Pre- intervention | Post- intervention |
| Intervention | 0.71 \pm 0.14 | 0.85 \pm 0.10 ^a |
| Control | 0.69 \pm 0.21 | 0.79 \pm 0.12 ^a |
| <i>t</i> -value | 0.560 | 2.716 |
| <i>P</i> -value | 0.577 | 0.008 |

Note: Compared with before intervention in the same group, $aP < 0.05$.

3.3. Comparison of exercise function and intensity before and after intervention in two groups of COPD patients

After intervention, the intervention group showed a lower BCSS score compared to the control group, ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of exercise function and intensity before and after intervention in two groups of COPD patients ($n=50$ cases)

| Group | Exercise function (m) | | BCSS score (points) | |
|--------------------|-----------------------|---------------------|---------------------|--------------------|
| | Pre- intervention | Post- intervention | Pre- intervention | Post- intervention |
| Intervention group | 207.47 \pm 89.63 | 265.79 \pm 63.52a | 6.46 \pm 1.16 | 4.22 \pm 1.59a |
| Control group | 205.21 \pm 95.05 | 250.65 \pm 92.59a | 6.55 \pm 2.38 | 3.54 \pm 1.62a |
| <i>t</i> -value | 0.122 | 0.953 | 0.240 | 2.118 |
| <i>P</i> -value | 0.903 | 0.343 | 0.811 | 0.037 |

Note: Compared with before intervention in the same group, ^a $P < 0.05$.

3.4. Comparison of quality of life, daily living ability, and blood oxygen saturation before and after intervention in two groups of COPD patients

After the intervention, the quality of life score in the intervention group was significantly lower compared to the control group ($P < 0.05$). However, no significant differences were observed between the two groups in terms of daily living ability scores and blood oxygen saturation levels ($P > 0.05$), as shown in **Table 4**.

Table 4. Comparison of quality of life, daily living ability, and blood oxygen saturation before and after intervention in two groups of COPD patients ($n=50$ cases)

| Group | CAT (score) | | Barthel Index (score) | | Blood oxygen saturation (mmHg) | |
|--------------------|-------------------|--------------------|-----------------------|--------------------|--------------------------------|--------------------|
| | Pre- intervention | Post- intervention | Pre- intervention | Post- intervention | Pre- intervention | Post- intervention |
| Intervention Group | 25.84 \pm 6.55 | 15.66 \pm 3.91a | 89.30 \pm 11.07 | 95.50 \pm 6.00a | 92.12 \pm 6.83 | 94.96 \pm 4.87a |
| Control Group | 26.34 \pm 5.61 | 22.66 \pm 4.56a | 90.20 \pm 10.30 | 95.40 \pm 9.19a | 92.52 \pm 3.11 | 95.54 \pm 0.65a |
| <i>t</i> -value | 0.410 | 8.240 | 0.420 | -0.060 | 0.371 | 0.835 |
| <i>P</i> -value | 0.683 | < 0.001 | 0.675 | 0.949 | 0.707 | 0.406 |

Note: Compared with before intervention in the same group, ^a $P < 0.05$.

3.5. Comparison of dyspnea grading before and after intervention in two groups of COPD patients

After the intervention, the rate of remaining severe dyspnea was significantly reduced in the treatment group relative to the control group ($P < 0.05$), as shown in **Table 5**.

Table 5. Comparison of dyspnea grading before and after intervention in two groups of COPD patients

| MMRC grade | Control group ($n=50$) | | Z- value | P- value | Experimental group ($n=50$) | | Z- value | P- value |
|------------|--------------------------|------------|----------|----------|-------------------------------|------------|----------|----------|
| | Pre- test | Post- test | | | Pre- test | Post- test | | |
| Grade 0 | 5 | 5 | | | 6 | 8 | | |
| Grade 1 | 9 | 15 | | | 10 | 23 | | |
| Grade 2 | 15 | 14 | 3.023 | 0.003 | 16 | 10 | 4.124 | < 0.001 |
| Grade 3 | 12 | 10 | | | 10 | 6 | | |
| Grade 4 | 9 | 6 | | | 8 | 3 | | |

Note: Before the experiment, the control group and the experimental group had $Z=0.574$, $P=0.427$. After the experiment, the control group and the experimental group had $Z=5.181$, $P < 0.001$.

4. Discussion

COPD is a common and highly prevalent disease, especially among the elderly. The disease progresses slowly and is prone to recurrent attacks ^[7]. Symptoms such as cough, shortness of breath, and dyspnea appear after lung function damage, affecting normal social interaction, work, and life, and increasing the burden on health and mental well-being. Drug therapy for this disease is limited and difficult to continuously improve lung function, with generally modest effects ^[8]. Therefore, it is necessary to combine other ideal solutions on the basis of routine COPD treatment and care to improve rehabilitation outcomes. Pulmonary function rehabilitation training is a non-drug intervention model that emphasizes patient-centeredness. It focuses on rehabilitation training that meets the needs of COPD patients. Active rehabilitation training can continuously improve lung function, enhance the effectiveness of COPD control, and prevent recurrent attacks of COPD ^[9].

4.1. Pulmonary rehabilitation can improve respiratory function in patients with chronic obstructive pulmonary disease (COPD)

Pulmonary function is the most intuitive indicator to evaluate the condition of elderly COPD patients, and it has a high correlation with patients' quality of life and symptoms of dyspnea ^[10, 11]. At present, there are many methods for respiratory function training in COPD, such as abdominal breathing, pursed-lip breathing, and respiratory training exercises based on the Five-Animal Plays ^[12, 13]. In this study, the intervention group had higher FEV1/FVC(%) and FEV1%pred measurements than the control group at various stages of the study, which is consistent with the meta-analysis results of Liu. This suggests that nursing workers should add richer and more targeted respiratory training exercises to basic respiratory training to improve respiratory function in COPD patients.

4.2. Pulmonary rehabilitation can improve patients' motor function

Relevant studies have shown that the six-minute walk test distance is negatively correlated with the severity of COPD ^[14, 15]. The study findings indicated that the intervention group achieved a greater distance in the 6MWT compared to the control group. This result fully demonstrates that pulmonary rehabilitation training can effectively improve patients' lower limb exercise endurance.

4.3. Pulmonary rehabilitation can improve the quality of life of COPD patients

This study assessed the quality of life in COPD patients using the CAT scale, a widely recognized tool in clinical research. Following the intervention, a notable improvement in patients' quality of life was observed. The intervention group demonstrated significantly lower CAT scores compared to the control group, suggesting that the pulmonary rehabilitation program implemented in this study effectively enhanced the well-being of COPD patients. This improvement may be attributed to the program's ability to enhance respiratory function, alleviating symptoms such as chest tightness and coughing. As these subjective symptoms diminished, patients experienced a corresponding improvement in their overall quality of life.

5. Conclusion

In summary, implementing pulmonary rehabilitation training for elderly COPD patients is beneficial for rapid improvement of pulmonary function and motor function, can reduce pain symptoms, improve patients' physical and mental health levels, and is conducive to disease control and prognosis improvement. It is suitable for

promotion and popularization.

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Disclosure statement

The authors declare no conflict of interest.

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Clinical Study on the Effect of Elderly Hypertension in Yunnan on Glomerular Filtration Rate

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Abstract: *Objective:* As the prevalence of chronic diseases among the elderly increases year by year, chronic renal insufficiency caused by hypertension has become a hot issue of concern to society and even the world. *Methods:* This article conducted a retrospective analysis of 1856 elderly people over 65 years old, with a follow-up time of 6 years. The aim is to compare the decline in estimated glomerular filtration rate (EGFR) between hypertensive and non-hypertensive populations under non-intervention conditions, and to explore the impact of blood pressure on EGFR in the elderly. *Results:* The incidence of hypertension among the elderly in this region is significantly higher than the national level. The EGFR value of hypertensive patients is significantly lower than that of non-hypertensive people. There is a difference in the percentage decline in EGFR between hypertensive and non-hypertensive populations under non-intervention conditions, with hypertensive patients experiencing a higher rate of EGFR decline. When blood pressure is lower than 120/80 mmHg, the EGFR decline ratio is lower compared to when blood pressure is higher than 120/80 mmHg. *Conclusion:* Lowering blood pressure can effectively slow down the decline of EGFR, and the prevalence of hypertension should be reduced.

Keywords: Elderly; Hypertension; EGFR decline ratio; Non-intervention

Online publication: July 8, 2025

1. Introduction

Population aging is a common problem faced by countries around the world. As aging intensifies, the number of elderly people with hypertension increases accordingly. Currently, there are 245 million hypertensive patients, and this number is increasing year by year. The overall blood pressure control in elderly hypertensive patients is not ideal, and there are many complications^[1]. It is common for elderly hypertensive patients to experience a decline in renal function. For hypertensive patients, the assessment of target organ damage is more significant than the mere value of hypertension, especially for the elderly. Therefore, it is particularly important to correctly

identify the risk factors of major target organs ^[2]. The estimated glomerular filtration rate (EGFR) can reflect the degree of renal function damage more sensitively and early than creatinine and urinary microalbumin ^[3]. However, there is currently relatively little research on the progression of kidney disease in elderly hypertensive patients, especially in comparison to changes in renal function in non-hypertensive elderly patients ^[4]. This study aims to track data from 1856 elderly people over 65 years old in Guandu District, Kunming City, who underwent physical examinations in 2017 and 2023. The goal is to compare whether there is a significant difference in the rate of EGFR decline over six years between hypertensive patients and non-hypertensive individuals under non-intervention conditions. Additionally, the study explores whether controlling blood pressure can affect the rate of EGFR decline and effectively protect renal function. Through this research, it is hoped to provide a deeper understanding and guidance for hypertension management and renal function protection in the elderly population.

2. Subjects and methods

2.1. Subjects

This study employs a cross-sectional analysis method and is retrospective. It focuses on 1,856 elderly individuals who participated in free health screenings for those over 65 years old in Guandu District, Kunming, both in 2017 and 2023.

Inclusion criteria are:

- (1) Voluntary participation in the health screening by elderly individuals aged 65–80 in 2017.
- (2) Participation in the screening program in both 2017 and 2023.

Exclusion criteria are:

- (1) Patients who were on dialysis during the 2017 screening.
- (2) Individuals over 80 years old during the 2017 screening. This study does not involve ethical issues; thus, no informed consent form was signed.

2.2. Methods

2.2.1. Data source

This study retrospectively analyzed 1,856 elderly individuals aged 65–86, including 678 males (36.53%) and 1,178 females (63.47%). The average age is 71.88 years (median 72.5) in 2017 and 77.88 years (median 78.5) in 2023. These 1,856 elderly individuals underwent health screenings in 2017 and 2023, including liver and kidney function tests, blood glucose, blood lipids, and ultrasound examinations. The research team compared and analyzed changes in EGFR, hypertension incidence, and blood pressure control compliance rates over six years without any intervention.

Data collection for the 2017 screening is done manually. Team members accessed the medical system and manually extracted and organized participant data. For the 2023 screening, some data are collected manually, while other parts are matched by medical staff. Through phone number matching, 2,000 elderly individuals who participated in both screenings are identified. After excluding those over 80 in 2017, those on dialysis for End-Stage Renal Disease (ESRD), and those with incomplete data, 1,856 elderly individuals were matched for analysis. These 1,856 participants came from nine community centers in the Guandu District. The participation rate and gender composition of each community center are shown in **Table 1**. The table indicates that the

female population is larger than the male population, possibly due to women valuing the free screening more. It also suggests that women have a longer average lifespan than men. Since the same group of people participated in both screenings, there are no comparative differences.

Table 1. Proportion of health screening participants from each community and gender

| Area | Total examined | Proportion | Male | Proportion | Female | Proportion |
|-------------|----------------|------------|------|------------|--------|------------|
| Jinma | 338 | 18.20% | 114 | 33.80% | 224 | 66.20% |
| Xiaobanqiao | 170 | 9.00% | 66 | 38.82% | 104 | 61.18% |
| Guandu | 249 | 13.30% | 76 | 30.52% | 173 | 69.48% |
| Liujia | 144 | 7.70% | 60 | 42.67% | 84 | 57.33% |
| Yiliu | 64 | 3.50% | 20 | 31.25% | 44 | 68.75% |
| Dabanqiao | 238 | 12.50% | 89 | 37.39% | 149 | 62.61% |
| Taihe | 159 | 8.50% | 53 | 33.33% | 106 | 66.67% |
| Wujing | 151 | 8.10% | 62 | 41.06% | 89 | 58.94% |
| Guanshang | 343 | 18.40% | 138 | 40.23% | 205 | 59.77% |
| Total | 1856 | 100% | 678 | 36.53% | 1178 | 63.47% |

2.2.2. Methods

All elderly participants are informed the day before to attend a health check-up the next day. On the day of the check-up, they arrived at the community center on an empty stomach for blood draws. The biochemical testing equipment used at all nine community centers was the Dirui CS-600B biochemical analyzer. The reference range for creatinine in the test results (for both 2017 and 2023) is 31.8–93.7 $\mu\text{mol/L}$. Blood pressure is measured twice in the right upper limb using a mercury blood pressure monitor in a resting state, and the average value is taken. Past medical histories are collected and gathered by community doctors during the check-up. EGFR is calculated using the formula: $\text{EGFR} = 186 * \text{Scr}^{(-1.154)} * \text{Age}^{(-0.203)} * 1$ (for females: 0.742). Blood creatinine value, age, and gender are input into the glomerular filtration rate formula to obtain the EGFR ^[5]. All statistical data are double-checked.

2.2.3. Statistical analysis

SPSS 21.0 software is used for the analysis of the health check-up data. Comparisons between the two groups were made using t-test and chi-square test (χ^2). Count data are expressed as the number of cases and percentages. A *P*-value of less than 0.05 is considered statistically significant.

3. Results

3.1. Comparison of blood pressure control rates and EGFR decline between blood pressure-controlled and uncontrolled groups in two health check-ups

Based on past medical histories, there were 858 hypertensive patients in 2017 (334 males and 524 females) and 915 hypertensive patients in 2023 (354 males and 561 females). Over six years, there was an increase of 57 hypertensive patients among the 1856 elderly individuals. The incidence rate of hypertension among those aged

65 and above was 46.23% in 2017 and 49.30% in 2023. According to the China Hypertension Prevention and Treatment Guidelines (2024 Revised Edition) released by the Beijing Hypertension Prevention and Treatment Association, the weighted prevalence rate of hypertension among adults aged 18 and above in China was 27.5% in 2018 ^[6]. The comparison shows that the incidence rate of hypertension among the elderly in this region is significantly higher than the national average, and it increases with age. Additionally, a significant differences in EGFR values between hypertensive and non-hypertensive patients, both in 2017 and 2023, was observed. Over six years, excluding the influence of time, the EGFR decline in the two groups was 9.59 ml/min and 7.2 ml/min, respectively. The percentage decline was 13.28% and 8.32% ($P < 0.05$), indicating a statistically significant difference (**Figure 1** and **Figure 2**).

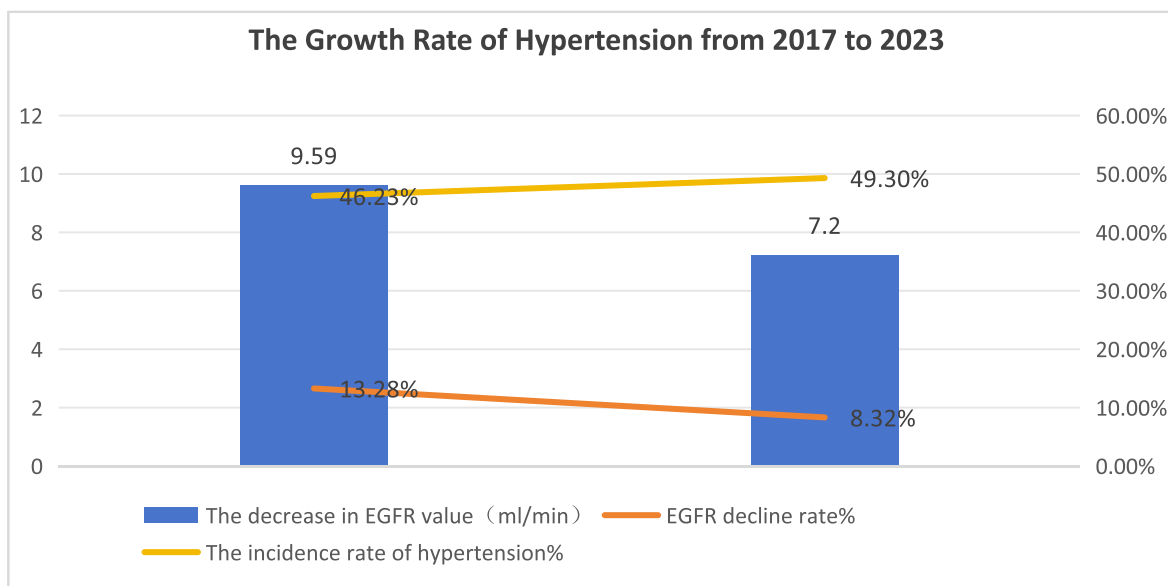


Figure 1. Comparison of EGFR decline rates and hypertension incidence between hypertensive and non-hypertensive populations in two health check-ups.

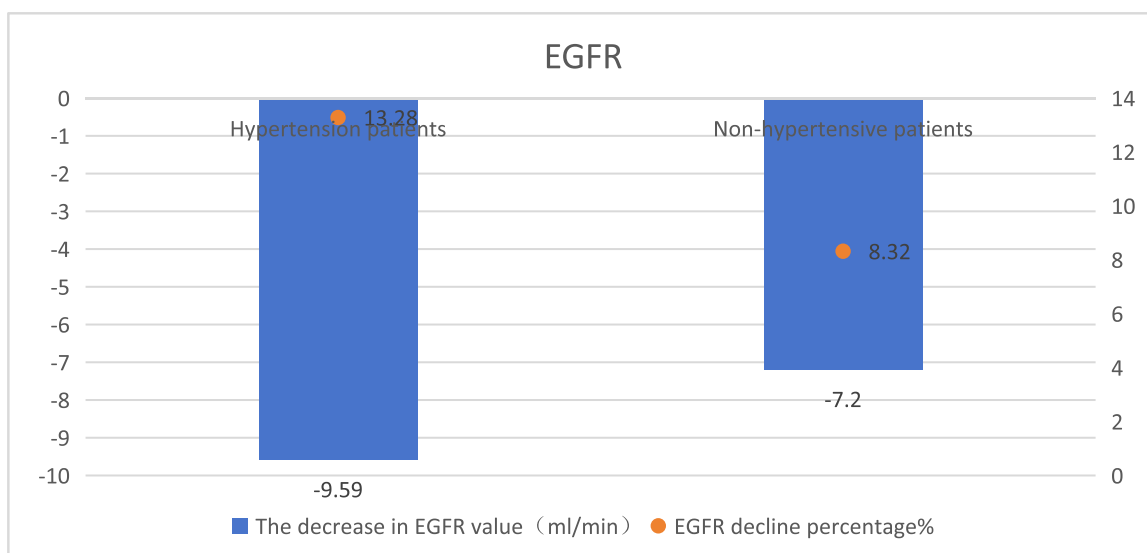


Figure 2. Comparison of EGFR decline between hypertensive and non-hypertensive populations in two physical examinations

3.2. Analysis of two physical examination results across different age groups

Excluding 57 hypertensive patients added in 2023, the 1799 cases were divided into 858 hypertensive patients and 941 non-hypertensive patients. A comparative analysis was conducted by grouping them according to their age during the 2017 physical examination, with 5-year intervals. It was observed that the percentage decrease in EGFR among hypertensive patients was greater than that of non-hypertensive patients in all age groups. Notably, in the 70–74 age group, the EGFR decline among hypertensive patients was significantly steeper than that of non-hypertensive patients. Upon analysis, it was found that the blood pressure control rate among hypertensive patients in this age group was relatively low. Therefore, it can be inferred that there are significant differences in the impact on EGFR values across different age stages (see **Table 2**).

Table 2. Comparison of EGFR decline percentage between hypertensive and non-hypertensive patients in different age groups

| Age group | 2017 EGFR value | | 2023 EGFR value | |
|-------------|-------------------|--------------|-------------------|--------------|
| | Non- hypertensive | Hypertensive | Non- hypertensive | Hypertensive |
| 65–69 years | 89.84 | 84.40 | 83.67 | 75.68 |
| 70–74 years | 86.38 | 80.68 | 81.43 | 73.05 |
| 75–79 years | 81.78 | 77.28 | 76.25 | 70.51 |

| Age group | EGFR decline rate | | P- value |
|-------------|-------------------|--------------|----------|
| | Non- hypertensive | Hypertensive | |
| 65–69 years | 6.87% | 10.33% | 0.008 |
| 70–74 years | 5.73% | 9.46% | 0.004 |
| 75–79 years | 6.76% | 8.76% | 0.010 |

3.3. Impact of blood pressure on EGFR

The EGFR values of 858 hypertensive patients among 1856 individuals who underwent physical examinations in 2023 were analyzed. The patients are categorized based on their SBP (greater than 140mmHg, 120–140 mmHg, less than 120 mmHg) and DBP (greater than 90mmHg, 80–90 mmHg, less than 80 mmHg). It was observed that higher blood pressure corresponded to lower EGFR values. Notably, when blood pressure was below 120/80 mmHg, the EGFR value was 82.39. Patients with either SBP below 120 mmHg or DBP below 80 mmHg had the best EGFR values ($P < 0.05$). Therefore, actions should be taken to lower patients' blood pressure below 120/80 mmHg whenever possible. Controlling blood pressure can delay the progression of chronic kidney disease or the occurrence of complications ^[6].

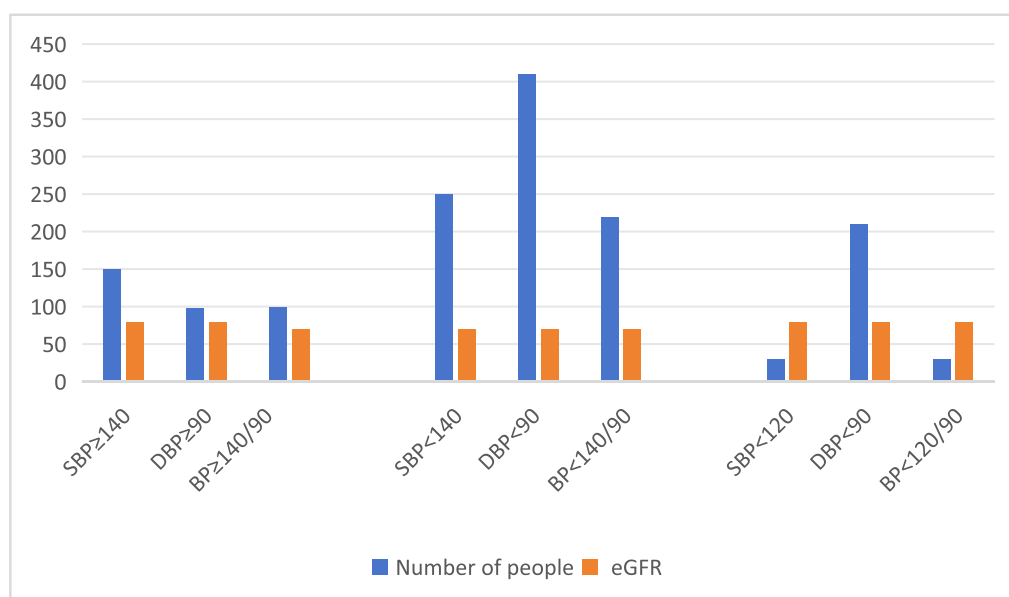


Figure 3. Impact of blood pressure on EGFR

4. Discussion

Essential hypertension (EH) is a polygenic genetic disease influenced by both genetic background and environmental factors. It is a risk factor for the onset and death of cardiovascular and cerebrovascular diseases. The kidney is not only an important organ that causes hypertension but also a target organ damaged by hypertension. Epidemiological data shows that the number of patients progressing to chronic kidney disease (CKD) due to hypertension is increasing year by year. The close relationship between independent factors of hypertensive nephropathy and patient mortality has received increasing attention. Some experimental research conclusions in recent years suggest that EGFR, urinary microalbumin, and insulin resistance are independently associated with renal function impairment in patients with EH and are also independent risk factors for cardiovascular event fatality in hypertensive patients^[7]. The “Chinese Guidelines for the Prevention and Treatment of Hypertension” points out that for every 5 mmHg reduction in diastolic blood pressure, the risk of developing end-stage renal disease can be reduced by 1/4^[8]. Good control of hypertension to reduce cardiovascular disease mortality and prevent or delay the occurrence and development of hypertensive nephropathy is an important issue faced by clinicians and patients^[9].

Chronic kidney damage caused by long-term hypertension can affect multiple sites such as glomeruli, renal tubules, renal interstitium, and renal blood vessels, which can progress to ESRD. The pathogenesis of CKD is complex and not fully understood, but the following related mechanisms have been proven to be closely related to the onset of CKD: changes in glomerular hemodynamics, overactivity of the renin-angiotensin-aldosterone system, excessive generation of reactive oxygen species and inflammatory factors, genetic and epigenetic disorders, and other factors may be related to CKD^[10, 11]. Additionally, elevated systolic blood pressure may damage the glomeruli through endothelial cells and glomerular epithelial cells, leading to glomerulosclerosis, inducing renal lesions, forming renal function decline, and resulting in decreased EGFR^[12]. Elevated systolic blood pressure can also cause the deposition of substances such as lipids in the body, forming macrophage infiltration and phagocytosis, which can cause inflammatory damage to the renal parenchyma^[13, 14]. Therefore,

early prevention, early diagnosis, and early treatment of CKD are particularly important for delaying the progression of CKD and improving patients' quality of life ^[15]. EGFR is a specific indicator of hypertensive nephropathy and has important reference significance for judging renal function decline and clinical treatment effects ^[16].

5. Conclusion

In summary, the incidence of hypertension among elderly people in this region is significantly higher than the national level. The EGFR values of hypertensive patients are significantly lower than those of non-hypertensive people. There are differences in the percentage of EGFR decline between hypertensive and non-hypertensive populations, with a higher rate of EGFR decline in hypertensive patients. Lowering blood pressure in a non-intervention state can alleviate the decline in EGFR and protect renal function. Blood pressure, which should be below 120/80 mmHg without contraindications, needs to be controlled to effectively slow down the declining trend of EGFR. Simultaneously, the management of hypertensive risk factors should be strengthened, to reduce the prevalence of hypertension, and reduce hypertensive kidney damage.

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Disclosure statement

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The Impact of Comprehensive Nursing Based on Protection Motivation Theory on Treatment Compliance and Quality of Life in Elderly Patients with Hypertension

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Abstract: *Objective:* To explore the effect of comprehensive nursing based on protection motivation theory in elderly patients with hypertension. *Methods:* The study period was from August 2023 to May 2025. During this period, 40 elderly patients with hypertension who visited the hospital were selected and divided into an observation group (comprehensive nursing based on protection motivation theory, n=20) and a control group (routine nursing, n=20) based on a random number table method. Nursing indicators were compared between the two groups. *Results:* After nursing, the diastolic blood pressure (80.12 ± 2.31 mmHg) and systolic blood pressure (136.05 ± 3.47 mmHg) in the observation group were significantly different from those in the control group ($P < 0.05$). The scores of health behaviors (nutrition, exercise, health responsibility, and psychological comfort) in the observation group were higher than those in the control group ($P < 0.05$). After nursing, the scores of compliance and negative emotional indicators in the observation group were better than those in the control group ($P < 0.05$). The scores of psychological function (66.31 ± 5.84), physical function (66.57 ± 6.28), material function (61.85 ± 6.21), and social function (69.51 ± 7.25) in the observation group were higher than those in the control group ($P < 0.05$). *Conclusion:* During the treatment of elderly patients with hypertension, the application of a comprehensive nursing program based on protection motivation theory is beneficial for regulating blood pressure levels, significantly improving health behaviors and quality of life, alleviating negative emotions, and improving treatment compliance to some extent. This approach is feasible for promotion.

Keywords: Protection motivation theory; Comprehensive nursing; Hypertension; Compliance; Quality of life

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1. Introduction

Hypertension can affect cardiovascular health and even induce a series of complications such as renal failure,

stroke, and heart disease ^[1]. Elderly patients, who often have multiple chronic diseases, need to rely on various methods to control their blood pressure and optimize their quality of life. However, reasonable blood pressure management cannot rely solely on medication but also requires corresponding nursing interventions in daily life to adjust patients' lifestyles ^[2]. The Protection Motivation Theory, a psychological theory, suggests that individuals' motivation to protect their health depends on their perception of the severity of threats to their health, susceptibility, self-efficacy, and the effectiveness of coping strategies ^[3]. Implementing comprehensive nursing based on this theory in the treatment of elderly patients with hypertension can enable them to form a more comprehensive understanding of the disease, improve their self-management ability and cooperation with treatment, and ultimately achieve the goal of improving quality of life ^[4]. Therefore, it is essential to conduct in-depth research and analyze the clinical value of comprehensive nursing based on Protection Motivation Theory in the clinical treatment of elderly patients with hypertension.

2. Materials and methods

2.1. Clinical data

The study selected 40 hypertensive patients who are treated in the hospital from August 2023 to May 2025. These patients are divided into two groups using a random number table method. In the control group, there are 12 male patients and 8 female patients, with ages ranging from 62 to 78 years old. The median age is (67.79 ± 2.43) years old. In the observation group, there are 11 male patients and 9 female patients, with the maximum age of 77 and the minimum age of 61. The average age is (67.75 ± 2.47) years old. There was no statistically significant difference in the basic characteristics between the two groups ($P > 0.05$).

2.2. Inclusion and exclusion criteria

2.2.1. Inclusion criteria

- (1) Patients diagnosed with hypertension; patients aged 60 years or older.
- (2) Patients with complete clinical data.

2.2.2. Exclusion criteria

- (1) Patients with allergies to the study medications.
- (2) Patients with severe chronic diseases.
- (3) Patients with renal failure.

2.3. Methods

In the control group, patients received routine nursing care, which involved regular monitoring of blood pressure levels to ensure they remained within a safe range. Patients are reminded and supervised to take medication as prescribed, particularly regarding medication dosage and timing. Knowledge about the disease, including potential risks and key points of daily blood pressure management, is imparted to the patients. Through scientific guidance, patients were encouraged to develop healthy habits such as smoking cessation, limited alcohol consumption, and regular exercise, as well as maintaining a healthy diet. Patient health status and medication compliance are monitored through phone calls or clinic visits, and any treatment issues are promptly addressed.

The observation group received comprehensive nursing care based on the Protection Motivation Theory. The nursing interventions included:

- (1) Personalized education: Tailored health education programs are designed based on individual patient differences. These programs covered topics such as disease triggers, treatment options, and complication risks. The educational content is updated every half month, and each session lasted for about half an hour.
- (2) Psychological support and motivation enhancement: Psychological counseling is provided to understand patients' concerns and feelings about their disease. Using the threat assessment and coping efficacy components of the Protection Motivation Theory, patients are encouraged to actively participate in their treatment, enhancing their self-efficacy. These sessions are conducted every half month.
- (3) Behavioral goal setting: Patients are involved in setting healthy behavioral goals, such as gradually increasing physical activity and improving dietary habits. These activities are organized monthly to promote healthy lifestyle habits.
- (4) Medication compliance monitoring: Electronic monitoring tools or phone follow-ups are used to oversee patients' medication adherence, ensuring they took the correct dosages on time. Monthly systematic evaluations of medication status are conducted for timely feedback.
- (5) Self-management of blood pressure: Patients are educated on the proper use of household blood pressure monitors and record-keeping after measuring. Nurses reviewed these records every half month via phone or clinic visits to inform subsequent treatments.
- (6) Creating a social support network: Monthly support group meetings are held where patients could share treatment experiences, discuss problems, and encourage each other. Nurses provided resources to help patients build a stronger family and community support system.
- (7) Emotional management training: Patients are organized every half month to learn about emotional management and coping with stress, enabling them to accurately identify and manage negative emotions.
- (8) Assessment and feedback: Monthly health assessments focused on blood pressure control effectiveness, improvement in healthy behaviors, medication adherence, and quality of life. Based on these assessments, subsequent clinical nursing interventions are adjusted.

2.4. Evaluation indicators

Evaluate changes in patients' blood pressure levels, healthy behaviors, treatment adherence, negative emotions, and quality of life.

2.5. Statistical analysis

Data processing: SPSS 23.0 statistical software; Data description: Measurement data is (\bar{x} false \pm s); Difference test: Measurement data is t; $P < 0.05$ is used as the basis for statistical difference expression.

3. Results

3.1. Study on blood pressure levels before and after nursing in observation group and control group

Before nursing, there were no significant differences between groups, $P > 0.05$. After nursing, there were significant differences in diastolic blood pressure and systolic blood pressure between the two groups, $P < 0.05$. (Table 1)

Table 1. Comparison of changes in blood pressure levels between the two groups ($\bar{x} \pm s$ false)

| Group | <i>n</i> | Diastolic BP (mmHg) | | Systolic BP (mmHg) | |
|-------------------|----------|---------------------|------------------|--------------------|-------------------|
| | | Before nursing | After nursing | Before nursing | After nursing |
| Observation group | 20 | 150.62 \pm 5.84 | 80.12 \pm 2.31 | 150.46 \pm 6.24 | 136.05 \pm 3.47 |
| Control group | 20 | 150.66 \pm 5.86 | 87.49 \pm 3.02 | 150.44 \pm 6.22 | 149.52 \pm 4.35 |
| <i>T</i> -value | | 0.0216 | 8.6686 | 0.0102 | 10.8258 |
| <i>P</i> -value | | 0.9829 | 0.0000 | 0.9920 | 0.0000 |

3.2. Analysis of changes in health behavior scores of two groups of patients

After nursing, the observation group's scores for various health behavior indicators were significantly better than the control group, $P < 0.05$. (Table 2)

Table 2. Comparison of health behavior scores before and after nursing in observation group and control group ($\bar{x} \pm s$ false)

| Group | <i>n</i> | Nutrition score (points) | | Exercise score (points) | |
|-------------------|----------|--------------------------|------------------|-------------------------|------------------|
| | | Before nursing | After nursing | Before nursing | After nursing |
| Observation Group | 20 | 16.89 \pm 2.33 | 23.14 \pm 3.21 | 16.17 \pm 2.35 | 19.98 \pm 2.74 |
| Control Group | 20 | 16.85 \pm 2.35 | 19.42 \pm 2.83 | 16.14 \pm 2.32 | 17.89 \pm 2.63 |
| <i>T</i> -value | | 0.0541 | 3.8876 | 0.0406 | 2.4610 |
| <i>P</i> -value | | 0.9572 | 0.0004 | 0.9678 | 0.0185 |

| Group | <i>n</i> | Health responsibility score (points) | | Psychological well-being score (points) | |
|-------------------|----------|--------------------------------------|------------------|---|------------------|
| | | Before nursing | After nursing | Before nursing | After nursing |
| Observation group | 20 | 18.14 \pm 2.51 | 22.51 \pm 2.84 | 16.17 \pm 2.17 | 23.04 \pm 3.18 |
| Control group | 20 | 18.12 \pm 2.55 | 20.21 \pm 3.11 | 16.15 \pm 2.14 | 19.42 \pm 2.82 |
| <i>T</i> -value | | 0.0250 | 2.4423 | 0.0293 | 3.8090 |
| <i>P</i> -value | | 0.9802 | 0.0194 | 0.9767 | 0.0005 |

3.3. Comparison of treatment adherence and negative emotion scores before and after nursing in observation group and control group

Before nursing, there were no significant differences in relevant indicators between the two groups, $P > 0.05$. After nursing, the MMAS-8 score and HADS score of the observation group were better than those of the control group, $P < 0.05$. (Table 3)

Table 3: Study on Changes in Treatment Adherence and Negative Emotion Scores of Two Groups of Patients
($\bar{x} \pm s$ false)

| Group | n | MMAS-8 Score (points) | | HADS Anxiety Score (points) | | HADS Depression Score (points) | |
|-------------------|----|-----------------------|-----------------|-----------------------------|-----------------|--------------------------------|------------------|
| | | Before Nursing | After Nursing | Before Nursing | After Nursing | Before Nursing | After Nursing |
| Observation group | 20 | 5.27 \pm 1.05 | 7.54 \pm 0.24 | 12.38 \pm 2.11 | 7.11 \pm 1.24 | 12.16 \pm 2.12 | 7.44 \pm 1.35 |
| Control group | 20 | 5.24 \pm 1.02 | 6.38 \pm 0.51 | 12.35 \pm 2.15 | 9.92 \pm 1.33 | 12.14 \pm 2.15 | 10.15 \pm 1.81 |
| T-value | | 0.0917 | 9.2037 | 0.0445 | 6.9109 | 0.0296 | 5.3673 |
| P-value | | 0.9275 | < 0.0001 | 0.9647 | < 0.0001 | 0.9765 | < 0.0001 |

3.4. Comparison of changes in quality of life between two groups of patients

After nursing, various quality of life indicators in the observation group were significantly better compared to the control group, $P < 0.05$. (Table 4)

Table 4. Analysis of quality of life before and after nursing in observation group and control group ($\bar{x} \pm s$ false)

| Group | n | Psychological function (points) | | Physical function (points) | |
|-------------------|----|---------------------------------|------------------|----------------------------|------------------|
| | | Before nursing | After nursing | Before nursing | After nursing |
| Observation group | 20 | 51.49 \pm 5.34 | 66.31 \pm 5.84 | 53.28 \pm 5.21 | 66.57 \pm 6.28 |
| Control group | 20 | 51.52 \pm 5.31 | 57.26 \pm 5.44 | 53.24 \pm 5.26 | 57.74 \pm 6.11 |
| T-value | | 0.0178 | 5.0710 | 0.0242 | 4.5069 |
| P-value | | 0.9859 | 0.0000 | 0.9808 | 0.0001 |

| Group | n | Material function (points) | | Social function (points) | |
|-------------------|----|----------------------------|------------------|--------------------------|------------------|
| | | Before nursing | After nursing | Before nursing | After nursing |
| Observation group | 20 | 51.32 \pm 5.22 | 61.85 \pm 6.21 | 55.32 \pm 5.36 | 69.51 \pm 7.25 |
| Control group | 20 | 51.34 \pm 5.24 | 55.17 \pm 5.81 | 55.35 \pm 5.31 | 59.42 \pm 5.64 |
| T-value | | 0.0121 | 3.5129 | 0.0178 | 4.9125 |
| P-value | | 0.9904 | 0.0012 | 0.9859 | 0.0000 |

4. Discussion

Hypertension has a significant impact on the daily lives of elderly patients and can even lead to various negative psychological emotions^[5]. Incorporating Protection Motivation Theory into comprehensive nursing not only focuses on the physical health of patients but also considers behavioral changes and improvements in mental health^[6]. Active adoption of health education, behavioral intervention, and psychological support in nursing measures can lead to more impressive control of blood pressure^[7]. Comprehensive nursing based on Protection Motivation Theory emphasizes evaluating the extent of patients' perceived health threats and provides necessary support and encouragement to enable them to make changes independently, which is more conducive to strengthening patients' self-management abilities^[8].

In the study, the blood pressure levels of the observation group were lower than those of the control

group, with $P < 0.05$. This confirms that integrated care incorporating protection motivation theory has a more pronounced effect on blood pressure management. The main reason is that the intervention methods adopted are more conducive to strengthening patients' cognition of the disease and enhancing their self-efficacy^[9]. Based on continuous health monitoring and regular feedback to patients, follow-up treatment plans can be adjusted accordingly, enhancing the precision of care and ensuring the effectiveness of blood pressure control^[10]. The health behavior indicators of the observation group were also better than those of the control group, with $P < 0.05$. The reason is that educational support can formulate measures in multiple aspects, such as psychology, diet, and physical activity, motivating patients to form healthy habits^[11–13]. The treatment adherence and negative emotional indicators of the observation group were better than those of the control group, with $P < 0.05$. This indicates that this nursing model enables patients to form correct cognitions about the role of treatment plans through health education and psychological intervention, resulting in improved emotions. The scores of various quality of life indicators in the observation group were higher than those in the control group, with $P < 0.05$. This demonstrates the value of this nursing model in improving patients' quality of life^[14].

5. Conclusion

Overall, integrating protection motivation theory into integrated care and applying it to the clinical treatment of elderly hypertensive patients can more effectively control blood pressure, improve patients' negative emotions and quality of life, gradually form healthy behaviors, and enhance their cooperation in treatment.

Disclosure statement

The authors declare no conflict of interest.

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The Impact of Quality Nursing on Instrument Quality Management and Department Satisfaction in the Management of Reusable Instruments in the Central Sterile Supply Department

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Abstract: *Objective:* To evaluate the effectiveness of quality nursing in the management of reusable instruments in the Central Sterile Supply Department (CSSD). *Methods:* Eleven nurses from the CSSD department were selected from January to October 2024, and quality nursing activities were implemented in the management of reusable instruments. The completion of quality indicators was analyzed. The instrument quality management scores, department satisfaction, and nurses' professional ability scores before and after nursing management were compared. *Results:* After nursing intervention, the qualified rates of initial cleaning and final cleaning of sterilization instruments were 99.66% and 100%, respectively. The qualified rate of packaging was 99.97%, the wet package rate was 0.1%, the loading qualified rate was 99.88%, and the qualified rate of distribution was 99.99%. After nursing intervention, the nurses' instrument quality management scores, department satisfaction, and nurses' professional ability scores were all higher than those before nursing intervention ($P < 0.05$). *Conclusion:* Quality nursing activities can improve the cleaning, packaging, and sterilization qualified rates of reusable instruments in the CSSD, enhance the effect of instrument quality management, obtain higher department satisfaction from nurses, cultivate their professional abilities, and possess significant nursing management advantages.

Keywords: Quality nursing; Central Sterile Supply Department; Reusable instrument management; Instrument quality management; Department satisfaction

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1. Introduction

The Central Sterile Supply Department (CSSD) is responsible for providing treatment instruments or sterile items to different departments. It also handles the recovery, unified cleaning, packaging, and sterilization of reusable instruments to ensure their sterility^[1]. Due to the wide range of reusable instruments and the complexity of operational procedures, any issues in a certain link can reduce the quality of instrument management and increase the incidence of nosocomial infections. Therefore, it is necessary to strengthen the

comprehensive and standardized management of reusable instruments. Quality nursing activities optimize conventional instrument management measures, with comprehensive nursing management content that can deeply analyze the management issues of reusable instruments and maximize the effectiveness of instrument management ^[2]. Based on this, this study selected 11 nurses to evaluate the implementation effect of quality nursing activities on the management of reusable instruments in the CSSD department.

2. Materials and methods

2.1. General information

From January to October 2024, a total of eleven nurses were selected from the CSSD department, all of whom were female. Their ages ranged from 24 to 42 years, with a mean age of 35.02 ± 3.12 years. The group included 1 associate chief nurse, 6 nurse practitioners, and 4 staff nurses. In terms of educational background, 7 held bachelor's degrees and 4 held college degrees.

2.2. Methods

Routine nursing management measures for CSSD reusable instruments include:

- (1) Equipment management: Enhance equipment management systems and emergency response plans to ensure operational readiness. Conduct comprehensive skill assessments for nurses, ensuring they are fully qualified before assuming their duties. Perform thorough equipment inspections before and after each shift, supported by weekly cleaning, maintenance, and routine checks to promptly detect and address any malfunctions. Verify safety valves annually, inspect sterilizer equipment gauges biannually, and test both sterilizer effectiveness and sealer performance once per year. Monitor equipment cleaning procedures twice annually and conduct monthly drills focused on responding to equipment failures to strengthen staff preparedness and minimize risk.
- (2) Quality management system: Reasonably optimize the management organizational structure, implement flat management, clearly delineate the job responsibilities of each nurse, and refine corresponding assessment criteria. Based on the current situation of nursing management, optimize the specialized management system, quality control evaluation criteria, and quality monitoring indicators. Arrange nursing management matters reasonably by week and month, organize monthly meetings, screen for nursing defects, provide immediate feedback on nursing issues, and make immediate corrections.
- (3) Key link management: Conduct monthly screenings of typical cases to support safety warning education. Organize one to two safety hazard inspections each month to promptly identify and address potential issues. Perform weekly inspections of fire protection systems as well as water and electrical facilities. Ensure that hazardous chemicals and explosives are securely managed in designated storage cabinets. Nurse scheduling should be flexibly adjusted to accommodate special circumstances, such as temporary leave or increased surgical volume during holidays. In such cases, allocate nursing staff reasonably and enhance supervision of intern and rotating nurses to ensure safe and compliant operations.
- (4) Continuing education: Organize monthly theoretical study and practical skills training activities, provide four continuing education sessions per month, participate in training courses on new management developments, continuous improvement training courses, etc., to provide a learning platform for nurses.

Based on the above nursing management, from January to October 2024, we will combine high-quality

nursing activities:

- (1) Equipment pretreatment: Equip the operating room with a special enzymatic hydrolysis moisturizing solution, indicate the expiration date and proportion of the moisturizing solution, and place it at the equipment collection point. Draw a pretreatment flowchart in graphic and text form, showing the spraying time and amount of moisturizing solution to prevent blood stains from drying and affecting the disinfection and sterilization effect.
- (2) Endoscopic equipment system training: The sterilization and supply specialist nurses are responsible for endoscopic equipment training activities, such as lumen brushing operation, endoscopic equipment disassembly operation, and visual inspection methods for key points. Establish an endoscopic equipment management group, invite operating room nurses to join the WeChat group, and encourage them to communicate equipment issues at any time.
- (3) Surgical observation: Organize nurses to enter the operating room for observation once a week to learn about the operation process of surgical instruments, common usage issues, and precautions. Nurses are required to record the frequency of use and severity of contamination of each surgical instrument during the operation, clarify the priority of contaminated instrument processing, and improve the professional skills of nurses.
- (4) Respiratory circuit management training: Invite neonatal nurses to demonstrate the connection method of the respiratory circuit on site, and clarify the highly contaminated areas, such as Y-shaped bifurcations. Select cleaning tools such as slender brushes based on the size of the lumen to ensure the rationality and pertinence of the cleaning plan.
- (5) Color marking management: Categorize equipment based on its purpose and belonging department. Emergency equipment can use red labels, high-risk equipment can use orange labels, and ordinary departments can choose green labels. Divide low-temperature or high-temperature sterilized products by different colors.
- (6) Making equipment package lists: Create visual equipment package lists that include information such as equipment name, quantity, and specifications, and place them in the equipment package. Using an electronic scanning system, scanning the equipment package barcode can provide detailed information about its contents.
- (7) Increase the number of daytime equipment collections: Reasonably adjust the frequency of equipment collections based on peak surgical periods, such as multiple collections at 11 am or 4 pm daily during peak hours.
- (8) Optimizing the collection and delivery process: Establish a dedicated team to draw up a route map based on the specific needs of the department to ensure that the daily collection and delivery process is meticulous and standardized. Utilize an information system or phone to open an urgent channel, respond within 10 minutes, and deliver immediately when needed.

2.3. Observation indicators

- (1) Completion of quality indicators: Statistical indicators include the qualification rates of equipment cleaning, packaging, sterilization, wet package rate, monitoring qualification rate, equipment loading qualification rate, and distribution qualification rate.
- (2) Equipment quality management score: A self-made equipment quality management evaluation scale includes quality supervision and management, disinfection and sterilization processes, quality

inspection, implementation of sterile principles, etc. Each item is worth 25 points, totaling 100 points, scored in a positive direction.

- (3) Department satisfaction: A self-made department satisfaction scale includes equipment recovery process, delivery and collection process, operational convenience, etc. The total score is 100 points, with high satisfaction > 85 points, satisfaction between 50–85 points, basic satisfaction between 25–49 points, and dissatisfaction < 25 points.
- (4) Nurse professional ability score: A self-made questionnaire on nurses' professional abilities includes basic knowledge, sterilization and storage, cleaning and packaging, delivery and collection, self-protection, etc. Each item is worth 100 points, scored in a positive direction.

2.4. Statistical analysis

Data processing software is SPSS 28.0. Measurement data is expressed as $[\bar{x} \pm s]$, using t-value comparison and test. Count data is expressed as $[n/\%]$, using χ^2 value comparison and test. The criterion for statistical significance is $P < 0.05$.

3. Results

3.1. Analysis of the completion of quality indicators

A total of 882,240 reusable equipment items were processed. After high-quality nursing, the initial cleaning qualification rate of disinfection equipment was 99.66% (879,240/882,240); the final cleaning qualification rate was 100%. There were 50,346 disinfection packages and 140,947 sterilization packages, with a packaging qualification rate of 99.97% (191,235/191,293). Among all the equipment, there were 8 wet packages, with a wet package rate of 0.1%. High-temperature sterilization was performed 1,581 times, with a sterilization qualification rate of 99.99% (882,151/882,240). B-D experimental monitoring was performed 589 times, biological monitoring 88 times, and batch monitoring 1,581 times, with a monitoring qualification rate of 100%. Low-temperature sterilization was performed 1,228 times, with a sterilization qualification rate of 100% for items. Biological monitoring was performed 269 times, and batch monitoring 1,228 times, with a monitoring qualification rate of 100%. The equipment loading qualification rate was 99.88% (881,181/882,240); the distribution qualification rate was 99.99% (882,152/882,240).

3.2. Comparison of equipment quality management scores before and after nursing

After nursing, the nurses' equipment quality management scores were higher than before the implementation of high-quality nursing ($P < 0.05$). The results are shown in **Table 1**.

Table 1. Comparison of equipment quality management scores before and after the implementation of high-quality nursing $[\bar{x} \pm s, \text{scores}]$

| Time | Number | Quality supervision | Sterilization process | Quality inspection | Aseptic principle implementation |
|-----------|--------|---------------------|-----------------------|--------------------|----------------------------------|
| Pre-care | 11 | 16.98 \pm 2.41 | 18.21 \pm 2.45 | 16.35 \pm 2.74 | 17.52 \pm 2.33 |
| Post-care | 11 | 23.71 \pm 3.98 | 23.06 \pm 2.37 | 23.36 \pm 2.81 | 23.14 \pm 1.86 |
| <i>t</i> | - | 4.797 | 4.719 | 5.924 | 6.252 |
| <i>P</i> | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 |

3.3. Comparison of department satisfaction before and after nursing

After nursing, the department satisfaction of nurses was higher than before the implementation of high-quality nursing ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of department satisfaction before and after the implementation of high-quality nursing [n/%]

| Time | Number | Highly satisfied | Satisfied | Basically satisfied | Dissatisfied | Satisfaction rate |
|-----------|--------|------------------|-----------|---------------------|--------------|-------------------|
| Pre-care | 11 | 2(18.18) | 2(18.18) | 1(9.09) | 6(54.55) | 45.45(5/11) |
| Post-care | 11 | 4(36.36) | 3(27.27) | 3(27.27) | 1(9.09) | 90.91(10/11) |
| χ^2 | - | - | - | - | - | 5.238 |
| P | - | - | - | - | - | 0.022 |

3.4. Comparison of nurses' professional ability scores before and after the implementation of high-quality nursing

After nursing, the nurses' professional ability scores were higher than before the implementation of high-quality nursing ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of nurses' professional ability scores before and after the implementation of high-quality nursing [$\bar{x} \pm s$, scores]

| Time | Number | Basic knowledge | Sterilization & storage | Cleaning & packaging | Distribution & collection | Self-protection |
|-----------|--------|------------------|-------------------------|----------------------|---------------------------|------------------|
| Pre-care | 11 | 80.65 \pm 4.53 | 85.11 \pm 4.24 | 87.16 \pm 4.50 | 88.52 \pm 3.56 | 85.45 \pm 4.13 |
| Post-care | 11 | 93.56 \pm 3.74 | 95.02 \pm 3.15 | 96.57 \pm 4.63 | 95.14 \pm 3.60 | 90.97 \pm 4.27 |
| t | - | 7.289 | 6.223 | 4.834 | 4.337 | 3.082 |
| P | - | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.006 |

4. Discussion

The work content of CSSD includes cleaning, disinfection, packaging, and sterilization of various instruments. The focus is on preventing nosocomial infections and improving the quality of instrument management through standardized and scientific nursing management methods [3]. In routine nursing management measures, attention is paid to the disinfection and sterilization processes of instrument management, which can reduce the occurrence of unqualified instruments and improve the safety of instrument use. However, for reusable instruments, their high frequency of use makes them more prone to complications such as infections, thus requiring optimization of nursing management content [4].

The high-quality nursing activities can implement responsibility-based nursing management, improve and deepen the nursing content of the CSSD department, and continuously cultivate the professional level of nurses, thereby improving the effectiveness of instrument management [5]. The diversified nursing management content meets the work requirements of the CSSD department, enabling predictive evaluation of common problems in instrument management and targeted development of nursing management plans.

The results showed that after the implementation of high-quality nursing, the quality indicators were

excellently achieved. The nurses' instrument quality management scores, department satisfaction, and nurses' professional ability scores were all higher than before the implementation of high-quality nursing ($P < 0.05$). The reason for this improvement is that instrument pretreatment can reduce the large-scale generation of biofilms on the instrument surface, making it easier to clean the instruments and prolonging their service life ^[6]. Systematic training on endoscopic instruments can reduce nurses' operational errors and prevent instrument damage, thereby improving the qualified rate of instrument cleaning. Surgical observation and learning can enhance nurses' understanding of the usage procedures and performance of operating room instruments, preventing missed cleaning of areas such as joint gaps during the cleaning process ^[7]. Respiratory tubing management training can improve the rate of qualified cleaning, prevent nosocomial infections, and ensure the safety of instrument use ^[8]. Color-coded management can reduce instrument distribution errors and accurately identify emergency instruments, thereby improving instrument usage efficiency. Creating an instrument pack list can prevent missing instruments and shorten preoperative preparation time. Increasing the frequency of daytime instrument collection can improve instrument turnover efficiency, prevent long-term accumulation of contaminated instruments, and meet the demand for instruments in emergency surgeries. Optimizing the collection and delivery process can reduce labor consumption and maximize closed-loop management ^[9, 10].

5. Conclusion

In summary, adopting high-quality nursing activities in the instrument management of the CSSD department can improve the quality of instrument management, department satisfaction, and optimize nurses' professional abilities. The nursing management approach demonstrates strong scientific validity.

Disclosure statement

The author declares no conflict of interest.

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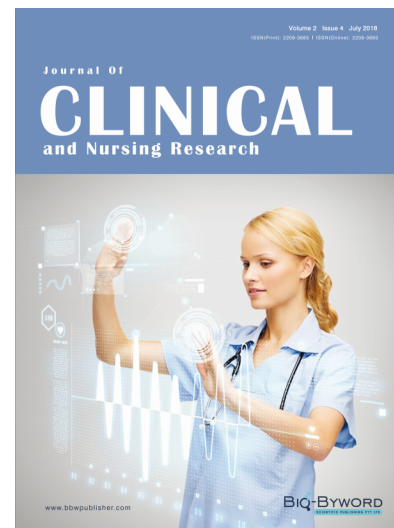
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- Architectural technology, including new technologies and energy saving technologies
- Architectural practice
- Urban planning
- Impacts of architecture on environment

Journal of Clinical and Nursing Research (JCNr) is an international, peer reviewed and open access journal that seeks to promote the development and exchange of knowledge which is directly relevant to all clinical and nursing research and practice. Articles which explore the meaning, prevention, treatment, outcome and impact of a high standard clinical and nursing practice and discipline are encouraged to be submitted as original article, review, case report, short communication and letters.

Topics covered by not limited to:

- Development of clinical and nursing research, evaluation, evidence-based practice and scientific enquiry
- Patients and family experiences of health care
- Clinical and nursing research to enhance patient safety and reduce harm to patients
- Ethics
- Clinical and Nursing history
- Medicine



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Topics covered but not limited to:

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- Electronics and Communications Engineering
- Power Systems and Power Electronics
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