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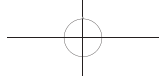
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Journal of Clinical and Nursing Research (JCNR) is an international, peer reviewed and open access journal that seeks to promote the development and exchange of knowledge which is directly relevant to all clinical and nursing research and practice. 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.

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Prediction of Quality Markers (Q-Markers) for the Mongolian Medicine Naru-3 Based on Chemical Composition, Pharmacological Effects, and Network Pharmacology

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Abstract: Naru Sanwei Pill, also known as Naru-3, a Mongolian medicine originating from *Zhigao Pharmacopoeia*, is a classic prescription used in the treatment of rheumatism. It is composed of *Terminalia chebula*, processed *Aconitum kusnezoffii* Reichb., and *Piper longum*, and is known for its effects in eliminating “mucus,” relieving pain, and reducing swelling, with significant efficacy in treating joint effusion and lumbar pain. In recent years, researchers have summarized its chemical components and pharmacological effects, and employed network pharmacology methods based on the core theory of Traditional Chinese Medicine quality markers (Q-Markers) to analyze and predict its markers. The results identified potential Q-Markers for Naru-3, providing a scientific basis for quality control and further research.

Keywords: Mongolian medicine Naru-3; Network pharmacology; Quality markers; Chemical components; Pharmacological effects

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1. Introduction

Naru Sanwei Pill, also known as Naru-3, was first recorded in *Zhigao Pharmacopoeia* and is one of the classic formulas in Mongolian medicine. It consists of *Terminalia chebula*, *Piper longum*, and processed *Aconitum kusnezoffii* Reichb., and is a unique and effective remedy in Mongolian medicine for treating rheumatism. The prescription originates from *Zhigao Pharmacopoeia* ^[1] and is included in the *Mongolian Medicine Standards of the Ministry of Health of the People's Republic of China* ^[2]. The formulation functions to eliminate “mucus,” reduce swelling, dry “Xieri Wusu” (also known as “yellow water disease”), dispel wind, relieve pain, and eliminate cold.

It is used to treat rheumatism, joint pain, lumbar and leg cold pain, toothache, diphtheria, and other conditions. Warm in nature, this formula is particularly effective for cold-induced yellow water diseases.

In this formulation, *Aconitum kusnezoffii* Reichb. serves as the primary component for eliminating mucus, relieving pain, and drying yellow water. *Terminalia chebula* acts as an auxiliary to regulate bodily humidity, while *Piper longum* supplements gastric fire and expels “Badagan” (the sticky materials inside humans characterized by coldness) and “Heyi” (the moving energy of the body, directing language, thinking, and outer and inner physical activity) diseases. Together, these three ingredients effectively treat cold-induced “yellow water diseases,” parasitic skin diseases, diphtheria, anthrax, and other mucus-related conditions ^[1,2].

Mongolian medicine has gained increasing recognition nationwide for its unique efficacy, but quality concerns remain a major challenge. Due to its multi-component, multi-target characteristics, establishing a unique quality and bioactivity evaluation system remains an arduous task. The pharmacopeia’s quality monographs, which are based on chemical markers, deviate from the theoretical framework of Mongolian medicine. The concept of quality markers (Q-Markers), proposed by academician Changxiao Liu, integrates multiple principles and multidisciplinary technologies, offering an approach to building a scientific quality control system ^[3,4].

Network pharmacology aligns well with the mechanisms of Mongolian medicine. This study comprehensively analyzes the chemical composition and pharmacological effects of Naru-3. Based on the Q-Marker theory, network pharmacology was employed to predict its quality markers, providing a basis for its quality control.

2. Chemical composition

2.1. Chemical composition of single ingredients

Naru-3 is a Mongolian medicine prescription composed of three single ingredients with functions such as expelling wind-dampness and relieving pain. It is the preferred medication for treating cold-damp arthralgia ^[5]. The chemical compositions of each single ingredient differ, and their synergistic effects contribute to the overall therapeutic efficacy. Therefore, a thorough understanding of the chemical composition of each ingredient is a prerequisite for studying the quality control and efficacy evaluation of traditional medicine.

2.1.1. *Aconitum kusnezoffii* Reichb.

Li *et al.* ^[6] used chromatographic methods, including silica gel, Sephadex LH-20, and high-performance liquid chromatography (HPLC), to isolate and identify compounds such as neoline, norditerpenoid alkaloids, dehydrosonchifoline, songorine, neoline, talatisamine, isotalatisine, hokbusine A (isolated for the first time), neoline base, 8-acetyl-14-benzoylaconine, and 8-methoxy-14-benzoyl-beiwutinine (both isolated for the first time). Peng ^[7] employed thin layer chromatography (TLC), nuclear magnetic resonance (NMR), mass spectrometry (MS), and infrared (IR) techniques to identify compounds such as Dzungar alkaloid (isolated for the first time), Dzungar amine (isolated for the first time), talatisamine, multiroot alkaloid (isolated for the first time), and 3-deoxyaconitine. Zhi *et al.* ^[8] used ultra-high performance liquid chromatography (UPLC) with high-resolution mass spectrometry (Orbitrap-MS) to identify compounds such as hypaconitine, benzoylneoline, benzoylaconine, benzoylhypaconine, and aconitine.

2.1.2. *Piper longum*

Liu *et al.* ^[9] used UPLC-Q-Exactive-MS to identify compounds such as piperine, pipartine, piperlonguminine,

and methylpiperate. Zhang *et al.* ^[10] used silica gel, MCI, TLC, and preparative HPLC for isolation and purification, identifying compounds based on their physicochemical properties and spectral data, such as 1 β ,6 α -dihydroxy-4(15)-eudesmene, (+)-aphanamol I, 1,2-dihydroxy-3,10-bisaboladien-4-one, 3',4'-dihydroxy-1,10-bisaboladien-4-one, 1 α -hydroxy-4-eudesmaldehyde (isolated for the first time), commiphorane I (isolated for the first time), black pepper lactam R (isolated for the first time), dihydropiperlonguminamide A (isolated for the first time), hydroxydihydro-bovistolide (isolated for the first time), 3R-chloro-4S-hydroxy-2-pyrrolidone (isolated for the first time), 3S-chloro-4R-hydroxy-2-pyrrolidone (isolated for the first time), guinea piperine, pseudo-piperlonguminamide D, wallamine, pseudo-piperlonguminamide C, pseudo-piperlonguminamide A, dihydropiperlongumine, zanthoxylamide, trans-zanthoxylamide, and (2E-N-2-isobutyl)-3-phenylpropenamide.

2.1.3. *Terminalia chebula*

Zhou *et al.* ^[11] used UPLC-Q-Exactive Orbitrap-MS to identify compounds such as gallic acid, methyl gallate, ellagic acid, corilagin, rugosin A, geraniin, rutin, arjunglucoside, and arjunolic acid. Wang *et al.* ^[12] used HPLC to determine the content of chebulagic acid and chebulinic acid. Yang and Tang ^[13] employed ¹H-NMR, ¹³C-NMR, and IR to identify quercetin in *Terminalia chebula*.

2.2. Compound chemical composition

Compared to single ingredients, the compound components in Mongolian medicine formulations are richer and more complex, forming the basis for their multi-component, multi-target, and holistic regulation effects. Research on compounds such as aconitine in Naru-3 is extensive, and advanced techniques like HPLC have introduced new approaches to quality control. For instance, a study employing HPLC-triple quadrupole mass spectrometry combined with chemical pattern recognition revealed six differential markers ^[14]. Cao *et al.* ^[15] established a fingerprint profile for Naru-3 using UPLC combined with diode array detection (DAD), providing a basis for controlling the quality of compound medicinal materials.

3. Pharmacological effects

3.1. Analgesic effects

Yue *et al.* ^[16] observed that in patients receiving pregabalin combined with nerve block therapy for neuropathic pain (NP), the addition of Naru-3 significantly reduced interleukin-6 (IL-6), interleukin-1 β (IL-1 β), and tumor necrosis factor- α (TNF- α) levels compared to conventional treatment, demonstrating its efficacy in NP treatment. Naru-3 may alleviate pain by modulating neuroinflammation and inhibiting the release of inflammatory factors. Zong *et al.* ^[17] pointed out that peripheral nerve injury induces central sensitization to pain. Naru-3 intervention blocked MMP2/IL-1 β signaling, inhibited related expression and chemokine release, and potentially acted through the negative regulation of the dorsal root ganglion (DRG)-spinal cord pathway to manage sustained NP.

3.2. Anti-inflammatory effects

Multiple studies have demonstrated the anti-inflammatory effects of Naru-3. Bai *et al.* ^[18] found that it reduced IL-1 and TNF- α levels in the joint tissues of rats with adjuvant arthritis. Zhao *et al.* ^[19] constructed a collagen-induced arthritis (CIA) rat model and observed that different doses of Naru-3 reduced serum VEGF and TNF- α levels. High doses also reduced IL-1 levels and improved synovial membrane structure. E'nirile ^[20] reported that

Naru-3 alleviated synovitis and joint damage by inhibiting synovial angiogenesis and inflammatory cytokines and regulating MMP2 expression.

4. Network pharmacology-based Q-Marker prediction analysis of Naru-3

4.1. Screening of candidate compounds based on measurability and modifiability

Li *et al.* ^[21] analyzed 16 batches of Naru-3 using HPLC-MS/MS and identified nine components with good linearity and precision (RSD < 3.0%), recovery rates between 95.91% and 102.92%, and stable content. These nine components from *Aconitum carmichaelli*, *Terminalia chebula*, and *Piper longum* exhibit pharmacological activity and measurability, making them viable candidates for Naru-3 compounds after a comprehensive evaluation.

4.2. Target prediction of Q-Marker candidate components

Target information for gallic acid, corilagin, benzoylaconine, benzoylmesaconine, benzoylhypaconine, aconitine, mesaconitine, hypaconitine, and piperine was predicted using the Traditional Chinese Medicine Systems Pharmacology Database and Analysis Platform (TCMSP, <https://old.tcmsp-e.com/tcmsp.php>) and SwissTargetPrediction (<http://www.swisstargetprediction.ch>). Protein and gene names were converted using the UniProt database (<http://www.uniprot.org/>). A total of 157 targets were identified after removing duplicates.

4.3. Construction of protein-protein interaction (PPI) networks

The 157 identified targets were imported into the STRING database (<http://string-db.org>) to construct a PPI network, with the species set as “Homo sapiens,” a minimum required interaction score of > 0.4, and unconnected nodes hidden. The remaining parameters were kept as default. The PPI network of 157 target proteins was generated (see **Figure 1**). The analysis results were then imported into Cytoscape 3.7.2, and the “Centiscape2.2” plugin was used for topological analysis. Key targets were identified by selecting those with the degree, betweenness centrality, and closeness centrality values greater than the median, and a degree value of ≥ 10 . A total of 38 key targets were obtained through this filtering process (see **Table 1**).

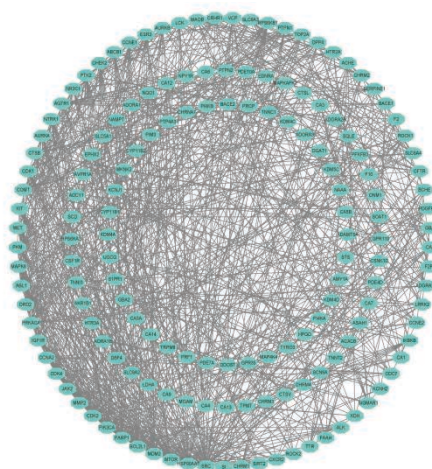


Figure 1. PPI network

Table 1. Topological properties of the PPI network

Target name	Betweenness centrality	Closeness centrality	Degree
SRC	4,118.2901	0.0036	57
HSP90AA1	1,757.5726	0.0035	47
MTOR	1,183.9132	0.0032	39
MDM2	564.0807	0.0031	37
BCL2L1	819.8547	0.0032	36
PARP1	412.9712	0.0030	32
PIK3CA	468.1337	0.0029	30
MMP2	618.6497	0.0030	29
CDK2	574.6500	0.0030	29
JAK2	483.7640	0.0031	28
CDK4	373.6547	0.0029	26
DRD2	666.4660	0.0028	24
PRKACA	1,139.4346	0.0030	24
KIT	600.3463	0.0029	23
MET	621.4489	0.0030	23
PKM	1,317.7946	0.0029	23
COMT	797.7177	0.0028	22
CDK1	366.7417	0.0027	21
CTSB	1,145.5314	0.0029	21
NR3C1	668.5234	0.0030	20
NTRK1	511.6742	0.0029	20
AGTR1	781.0390	0.0028	20
ABCB1	330.1906	0.0029	19
ESR2	1,221.2748	0.0029	19
LCK	336.3792	0.0029	18
MAOB	322.9984	0.0027	18
PTPN1	529.7860	0.0029	17
SLC6A3	335.3646	0.0027	17
CRHR1	413.0155	0.0028	17
VCP	544.2264	0.0028	17
DPP4	970.8921	0.0028	16
ACHE	596.3169	0.0026	15
SERPINE1	613.7177	0.0029	14
CFTR	703.8496	0.0029	13
BACE1	500.3856	0.0028	13
GBA	1,324.3972	0.0027	13
BCHE	354.9683	0.0027	13
CA2	939.2063	0.0027	12

4.4. GO and KEGG pathway enrichment analysis

The DAVID 2021 database (<https://david.ncifcrf.gov/>) was used to conduct Gene Ontology (GO) functional enrichment and KEGG pathway analyses on the 157 identified targets. GO analysis identified 25 terms, including 8 related to biological processes (BP), 6 related to cellular components (CC), and 11 related to molecular functions (MF). A selection of 15 significant terms was visualized (see **Figure 2**).

The Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway enrichment analysis identified 14 significant pathways, with a focus on statistically significant entries ($P \leq 0.01$ and Benjamini ≤ 0.01). The results are visualized in **Figure 3**.

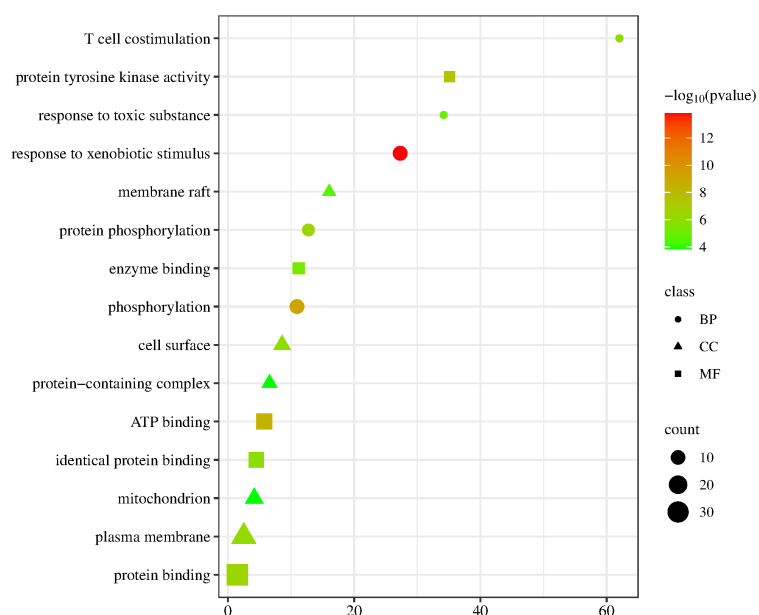


Figure 2. GO functional enrichment analysis of core targets

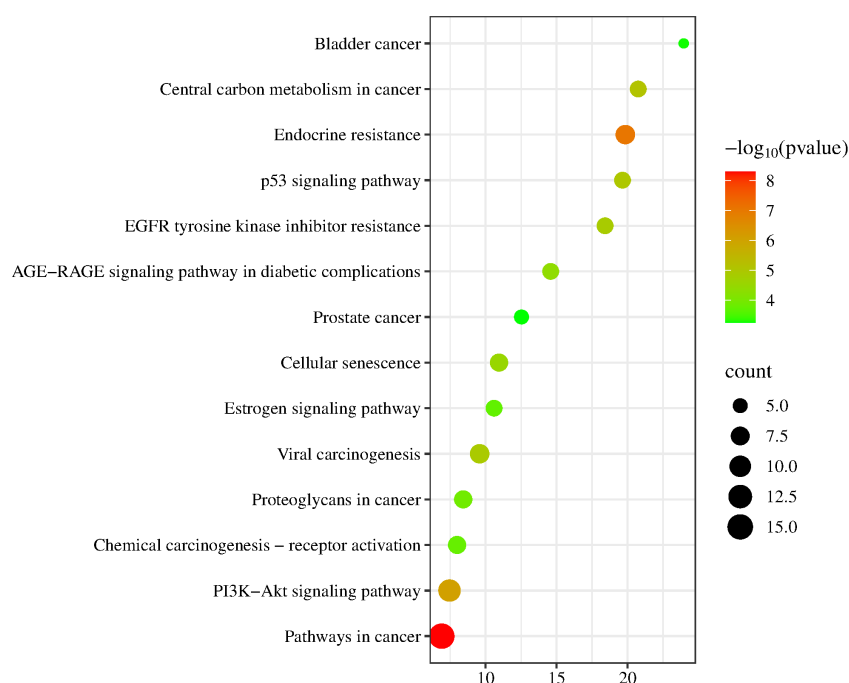


Figure 3. KEGG pathway enrichment analysis of core targets

4.5. Construction of the component-target-pathway network

The nine identified components of Naru-3, 38 key targets, and top-ranked pathways were integrated into a “Component-Target-Pathway” network using Cytoscape 3.7.2. The network was analyzed using the CentiScape2.2 plugin, and the topological analysis results are summarized in **Table 2**. The network visualization is provided in **Figure 4**.

Table 2. Topological properties of the component-target-pathway network

Name	Betweenness centrality	Degree
Piperine	954.3284	25
Gallic acid	339.4962	16
Aconitine	145.3234	14
Mesaconitine	163.7608	14
Benzoylaconitine	197.2629	14
Hypaconitine	140.1783	13
Corilagin	361.1974	13
Benzoylmesaconitine	164.5092	11
Benzoylhypaconitine	54.6823	8

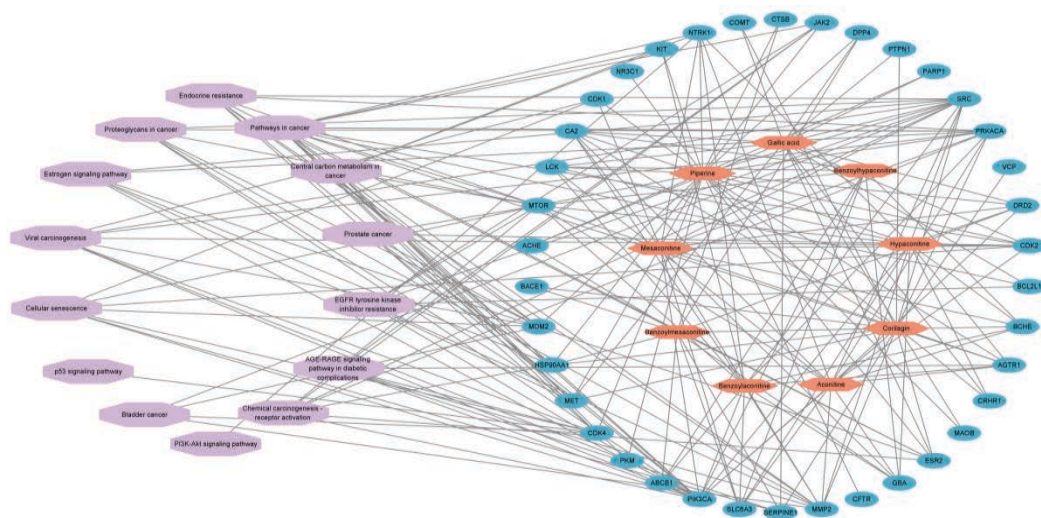


Figure 4. Component-target-pathway network of Naru-3

4.6. Analysis of Q-Marker

Naru-3 is primarily used clinically for treating joint pain, rheumatic diseases, rheumatoid arthritis (RA), and neuropathic pain, demonstrating significant anti-inflammatory and analgesic effects along with a favorable safety profile.

The network pharmacology analysis revealed that corilagin, benzoylaconitine, and aconitine might act on MMP2, a matrix metalloproteinase capable of degrading extracellular matrix (ECM) components such as collagen and laminin. This degradation disrupts the normal structure and barrier function of joint tissues, facilitating the migration and invasion of inflammatory cells and thus promoting the development of inflammation^[22].

Gallic acid has been found to suppress inflammation induced by LPS in THP-1 macrophages, potentially by modulating the MAPK and NF- κ B signaling pathways ^[23]. Piperine significantly inhibits the release of the inflammatory cytokine IL-1 β , highlighting its anti-inflammatory mechanism through multi-target and multi-pathway effects ^[24].

HSP90AA1, a member of the heat shock protein 90 family, plays a role in inhibiting inflammation by downregulating inflammatory signaling pathways, thereby reducing inflammatory responses ^[25]. PIK3CA, a catalytic subunit of PI3K, activates the PI3K/Akt signaling pathway, which is implicated in the pathogenesis of RA. Abnormal activation of this pathway leads to excessive production of inflammatory mediators, reduced autophagy, enhanced osteoclast differentiation and activity, and increased angiogenesis and vascular permeability. These effects collectively contribute to the progression and severity of RA. Targeting the PI3K/Akt pathway is thus a promising strategy for controlling inflammation, alleviating joint damage, and improving patient quality of life ^[26,27].

GO functional enrichment analysis indicated that Naru-3 can regulate processes such as gene expression and enzyme binding. KEGG pathway enrichment analysis revealed that Naru-3 is involved in pathways such as cancer signaling, the P53 signaling pathway, and the PI3K/Akt signaling pathway. The P53 signaling pathway plays a critical role in regulating cell survival and inflammation. Its protective effect against inflammation is primarily achieved by suppressing the activity of the transcription factor NF- κ B and enhancing the polarization of M2 macrophages. Numerous studies have demonstrated a reciprocal regulatory relationship between NF- κ B and P53, which is key to controlling inflammation ^[28,29].

These findings are consistent with previously reported data, suggesting that the network pharmacology approach used in this study is both reliable and valid.

5. Conclusion

Mongolian medicinal preparations are natural remedies formulated through the combination of different Mongolian medicinal materials under the guidance of traditional Mongolian medical theories. The aim of developing quality control methods for these preparations is to ensure the safety and consistent efficacy of their use.

Naru-3 is a commonly used Mongolian medicinal preparation in clinical practice, employed for the treatment of conditions such as rheumatoid arthritis, ankylosing spondylitis, osteoarthritis, and related disorders ^[5]. Long-term clinical experience in Mongolian medicine has demonstrated that this preparation has the effects of dispelling excess mucus, relieving pain, reducing swelling, and drying “Xieri Wusu” (a traditional Mongolian medical term).

Network pharmacology is an emerging interdisciplinary field that integrates systems biology, network science, and computational technologies into pharmacological research. Given the multi-component and multi-target characteristics of Mongolian medicinal compounds, network pharmacology provides a means to simulate and analyze the pharmacological mechanisms of various components. This approach helps elucidate the material basis of their efficacy and facilitates the prediction of quality markers (Q-Markers), laying a theoretical foundation for establishing quality control methods for Mongolian medicine.

Based on a literature review of Naru-3, this study selected nine compounds associated with anti-rheumatoid arthritis effects: gallic acid, corilagin, benzoylmesaconine, benzoylaconine, benzoylhypaconine, mesaconine, hypaconine, aconitine, and piperine. A network pharmacology study was conducted on these

compounds, constructing a “component-target-pathway” network to provide a theoretical basis for elucidating the pharmacological mechanisms of Naru-3.

The network pharmacology analysis indicated that these nine compounds are active components and may serve as potential Q-Markers of Naru-3. To ensure the reliability of these predicted Q-Markers, experimental validation is currently underway. The results of this study provide a theoretical basis for establishing quality control methods for the Mongolian medicinal preparation Naru-3.

Disclosure statement

The authors declare no conflict of interest.

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Cesarean Section in a Patient with Severe Preeclampsia with Pulmonary Edema: A Case Report

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Abstract: Acute pulmonary edema is a leading cause of death in patients with preeclampsia. The authors reported a case of a pregnant woman at 25 weeks of gestation with severe preeclampsia complicated by pulmonary edema, who required an emergency cesarean section, posing a significant challenge to the anesthesiologist. The patient had developed Type 1 respiratory failure and needed supplemental oxygen with high-flow nasal oxygen. Due to contraindications for neuraxial anesthesia, the cesarean section was performed under general anesthesia. After induction of anesthesia, the patient's hypoxemia worsened. Eventually, after treatment with fluid restriction, diuretics, and albumin, oxygenation improved gradually, and the procedure was performed successfully. Both the patient and the newborn had a good prognosis.

Keywords: Preeclampsia; Pulmonary edema; Cesarean section; Anesthesia

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1. Case information

A 41-year-old female, primigravida at 24 weeks and 6 days of gestation, presented with a 3-day history of epigastric pain and a 1-day history of right upper quadrant pain accompanied by elevated blood pressure. The epigastric pain was unrelated to food intake and progressively worsened. On examination, her blood pressure was 176/111 mmHg, heart rate 77 bpm, respiratory rate 18 breaths per minute, and oxygen saturation (SpO₂) 100% on room air.

The patient had a history of hypertension diagnosed two years prior, which was managed irregularly. She also had hypothyroidism treated with levothyroxine, obesity (BMI 38.6 kg/m²), gastroesophageal reflux disease, migraines treated with amitriptyline, depression-controlled pre-pregnancy but untreated during pregnancy, polycystic ovary syndrome, and a history of laparoscopic ovarian cystectomy. She reported frequent air travel over the previous three weeks.

Laboratory findings revealed significant proteinuria (+++++) and the presence of ketone bodies (+). Liver

function tests showed elevated ALT (53 U/L) and AST (38 U/L), with total protein at 60 g/L and albumin at 35 g/L. Other blood tests, including renal function, electrolytes, and coagulation profiles, were unremarkable. Ultrasound findings included fatty liver, and a fetal ultrasound estimated the gestational age to be approximately 23 weeks and 5 days.

The patient was diagnosed with preeclampsia with mild liver dysfunction. She was treated with labetalol (100 mg orally every 8 hours) for blood pressure control and aluminum magnesium carbonate tablets for symptomatic relief. After her abdominal pain improved and her blood pressure was controlled below 140/90 mmHg, she was discharged. A follow-up 24-hour urine protein quantification revealed proteinuria of 3.66 g.

Four days later, the patient was readmitted with epigastric and chest pain radiating to the right shoulder and back, along with shortness of breath. On arrival, her blood pressure was 177/102 mmHg, heart rate 71 bpm, respiratory rate 17 breaths per minute, and SpO₂ 98% on room air. On examination, her BP was 195/87 mmHg, SpO₂ 96% on 3 L/min nasal oxygen, and fetal heart rate was 148 bpm. She had facial and limb edema and bilateral lung crackles.

She was diagnosed with severe preeclampsia and treated with magnesium sulfate for seizure prophylaxis. Blood pressure was managed with oral nifedipine and intravenous phentolamine. Her symptoms worsened, with new-onset dyspnea, headache, and visual disturbances. Despite oxygen therapy, her SpO₂ remained low, requiring high-flow nasal oxygen at 50 L/min with an FiO₂ of 70%.

Laboratory investigations showed significant proteinuria (+++), hypoalbuminemia (31 g/L), elevated D-dimer (6552 ng/mL), and NT-proBNP (1275 pg/mL). Arterial blood gas analysis revealed Type I respiratory failure. Chest computed tomography angiography ruled out pulmonary embolism but showed bilateral pulmonary infiltrates, pleural effusion, and lower lobe atelectasis. Echocardiography revealed mild mitral regurgitation with normal pulmonary artery pressure and a left ventricular ejection fraction of 65%.

The patient was diagnosed with pulmonary edema. She was treated with diuretics and fluid restriction. Despite blood pressure control within the range of 120–145/70–90 mmHg, her hypoxemia persisted. Multidisciplinary discussions concluded that the patient had chronic hypertension with early-onset severe preeclampsia complicated by pulmonary edema, respiratory failure, and fetal growth restriction. Given the poor maternal and fetal prognosis, urgent preparation for cesarean delivery was recommended to terminate the pregnancy.

2. Anesthesia management

2.1. Preoperative assessment

The patient presented with anxiety, semi-recumbent posture, and an inability to lie flat. She was receiving high-flow nasal oxygen (HFNO) at 50 L/min with a FiO₂ of 70%. Her blood pressure was 140/85 mmHg, heart rate 96 bpm, respiratory rate 16/min, and SpO₂ 95%. Physical examination revealed facial and limb edema with bilateral lung crackles. Airway evaluation indicated obesity, a short neck, and a Mallampati grade III classification, suggesting a potentially difficult airway (**Figure 1**). She was classified as ASA III-IV/E by the American Society of Anesthesiologists. The patient had a functional classification of New York Heart Association (NYHA) class III with an activity tolerance of < 4 METs. Her preoperative fluid intake was 1,840 mL, with a urine output of 1,750 mL. Due to the recent administration of low-molecular-weight heparin within 24 hours, neuraxial anesthesia was contraindicated, and a cesarean section under general anesthesia was planned.

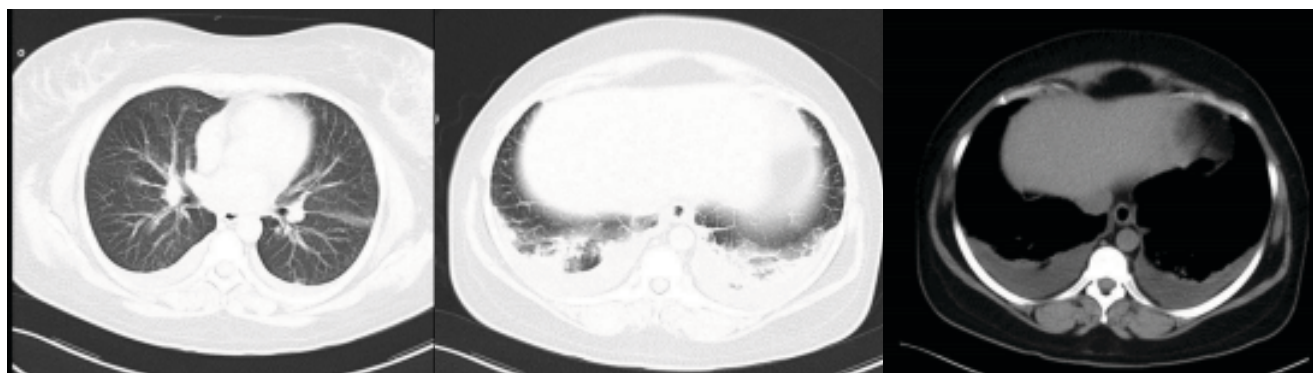


Figure 1. Preoperative pulmonary CTA

2.2. Anesthesia course

Thirty minutes before induction, the patient received intravenous famotidine (20 mg) and metoclopramide (10 mg) to suppress gastric acid and enhance gastric emptying. During transport, she was semi-recumbent, with oxygen provided at 15 L/min by face mask, though she reported dyspnea and restlessness. Upon entering the operating room, oxygen support was continued at the same rate. Initial readings showed BP 191/98 mmHg, HR 96 bpm, RR 20/min, and SpO₂ 90–92%, possibly due to HFNO discontinuation, worsening dyspnea, and agitation.

Local anesthesia was administered for a right radial arterial line. Parameters such as arterial blood pressure (ABP), cardiac output (CO), stroke volume variation (SVV), and bispectral index (BIS) were monitored. Concurrently, surgical preparation began.

After 15 minutes, rapid sequence induction was performed using etomidate (16 mg), remifentanyl (100 µg), succinylcholine (100 mg), and propofol (50 mg). Tracheal intubation was successfully completed with a video laryngoscope, and norepinephrine (8 µg) was administered intravenously to manage a transient drop in BP. ABP stabilized at 140–160/75–93 mmHg, HR at 90–100 bpm, and post-intubation SpO₂ was 85%.

Anesthesia was maintained using sevoflurane (0.5–1%) and propofol (100–300 mg/h) infusion. Local infiltration anesthesia was used at the incision site, and remifentanyl infusion (50–200 µg/h) began post-delivery. Hydromorphone (1.8 mg), midazolam (5 mg), and rocuronium (100 mg) were also administered. Ventilation settings included a tidal volume of 6–8 mL/kg, RR of 12/min, PEEP of 5 cmH₂O, and FiO₂ of 100%.

Surgery commenced 1 minute post-induction, and the neonate was delivered 4 minutes later. Oxytocin (10 IU) and carbetocin (100 µg) were administered to promote uterine contraction. Despite adjustments to PEEP (up to 15 cmH₂O), SpO₂ remained 80–83% with peak airway pressures of 30–35 cmH₂O. Pulmonary edema was suspected, and treatment included 20 g of albumin and 25 mg of furosemide.

2.3. Surgical and anesthetic outcomes

The procedure lasted 45 minutes, with 122 minutes of general anesthesia. Intraoperative fluid input was 700 mL (600 mL crystalloids, 100 mL albumin), blood loss was 400 mL, and urine output was 400 mL. Intraoperative ABP ranged from 120–160/70–80 mmHg, CO was 6.6–9.1 L/min, and SVV was 4–8%. The results of the patient's intraoperative arterial blood gas analysis are detailed in **Table 1**.

Table 1. Patient's intraoperative blood gas analysis

Parameter	30 minutes post-induction	60 minutes post-induction	100 minutes post-induction
pH	7.368	7.381	7.425
PO ₂ (mmHg)	52	57	68
PCO ₂ (mmHg)	33.1	33.1	30.8
BE (mmol/L)	-6	-3	-4
K ⁺ (mmol/L)	4.0	4.1	3.8
Na ⁺ (mmol/L)	131	129	130
Hct	0.37	0.3	0.33
Lac (mmol/L)	1.42	1.64	1.29

2.4. Postoperative course

After intensive care unit (ICU) admission, the patient remained on mechanical ventilation. Chest X-rays showed bilateral pulmonary congestion on the day of surgery, which improved by postoperative day 1. The endotracheal tube was removed 24 hours postoperatively, transitioning to HFNO (50 L/min, FiO₂ 50%). By postoperative day 4, chest X-rays were normal, and the patient was discharged on day 6. She received magnesium sulfate and diuretics for one day in the ICU, with stable blood pressure maintained through antihypertensive therapy after discharge. The results of arterial blood gas analysis during the patient's ICU stay are detailed in **Table 2**. Postoperative chest X-ray images can be found in **Figure 2**.

Table 2. Patient's blood gas analysis during ICU stay

Parameter	1.5 hours post-ICU admission	6 hours post-ICU admission	12 hours post-ICU admission	23 hours post-ICU admission	3 hours post-extubation
pH	7.364	7.424	7.448	7.474	7.485
PO ₂ (mmHg)	74	74	84	77	107
PCO ₂ (mmHg)	37.3	34.5	35.6	33.3	32.2
BE (mmol/L)	-4	-2	1	1	1
K ⁺ (mmol/L)	3.6	3.7	4.2	3.9	3.6
Na ⁺ (mmol/L)	133	133	132	132	134
Hct	0.3	0.3	0.29	0.35	0.3
FiO ₂ (%)	50	60	40	35	50



Figure 2. (Left) Chest X-ray taken on the day of surgery shows increased bilateral lung markings and enlarged hila. **(Middle)** Chest X-ray taken on the first day after surgery indicated improved bilateral pulmonary edema. **(Right)** Chest X-ray taken on the fourth day after surgery reveals normal chest X-ray findings.

2.5. Neonatal outcomes

The time from anesthesia induction to delivery was 5 minutes. The neonate required immediate intubation and had Apgar scores of 3, 7, and 8 at 1, 5, and 10 minutes, respectively. The umbilical artery pH was 7.215, and birth weight was 590 g. The neonate underwent mechanical ventilation for 32 days, transitioned to BiPAP on day 42, and achieved autonomous breathing by day 75. The neonate was discharged on day 108, weighing 2,455 g.

3. Discussion

Preeclampsia is a multisystem disorder characterized by hypertension and/or proteinuria after 20 weeks of gestation, with an incidence of approximately 3–5% in all pregnancies ^[1]. Its primary pathophysiological mechanism involves endothelial dysfunction, which results in widespread endothelial leakage and may lead to eclampsia, placental abruption, disseminated intravascular coagulation, severe renal failure, pulmonary edema, and hepatocellular necrosis, posing a significant risk to maternal and fetal life in severe cases ^[2].

Acute pulmonary edema is a leading cause of death in patients with preeclampsia and a common reason for admission to intensive care units. Its occurrence often indicates severe disease. Studies have shown that the incidence of pulmonary edema in preeclampsia is significantly higher than in normal pregnancies and correlates closely with the severity of the disease ^[3]. The incidence of pulmonary edema during pregnancy is approximately 0.08% ^[4], whereas in preeclampsia patients, it rises to 2.1%. Primiparas with preeclampsia, along with multiple pregnancies, anemia, and elevated mean arterial pressure, are more prone to developing pulmonary edema ^[5]. This is likely associated with systemic endothelial dysfunction, fluid retention, and increased cardiac preload and afterload caused by preeclampsia ^[6].

If a patient with preeclampsia experiences dyspnea and orthopnea along with signs of impaired respiratory function (e.g., tachypnea, crackles and rales on auscultation, and hypoxemia), and no alternative explanation for acute respiratory failure exists, a diagnosis of preeclampsia-related pulmonary edema should be considered. Chest X-rays and bedside ultrasound can assist in confirming the diagnosis.

For patients with severe preeclampsia, timely delivery may be the only option to ensure maternal and fetal safety ^[7]. When acute pulmonary edema is present, treatment depends on the severity of hypoxemia and the underlying disease. Interventions include oxygen therapy and maintaining hemodynamic stability to reduce left ventricular preload and afterload. Ventilatory support can range from nasal cannula, Venturi masks, and high-flow non-rebreather masks to HFNO, noninvasive mechanical ventilation, or endotracheal intubation with mechanical ventilation, depending on the severity of hypoxemia and the patient's respiratory effort ^[8]. Hemodynamic stability can be achieved with vasodilators, diuretics, and fluid restriction.

The use of albumin in patients with pulmonary edema remains controversial. Research suggests that hypoalbuminemia increases pulmonary capillary permeability, promoting the development of pulmonary edema ^[9]. Some studies indicate that albumin use can improve plasma colloid osmotic pressure, thereby reducing pulmonary edema and improving oxygenation ^[10]. A domestic expert consensus also recommends human serum albumin solution for patients with acute respiratory distress syndrome (ARDS) and hypoalbuminemia to improve oxygenation ^[11]. However, albumin use may carry risks such as allergic reactions, increased infection risk, and fluid overload; some studies even suggest that high doses of albumin may increase the risk of pulmonary edema ^[12]. Therefore, individualized evaluation is necessary to determine whether albumin should

be used. In patients with severe preeclampsia and pulmonary edema, if hypoalbuminemia is present and routine diuretic treatment alongside fluid restriction and mechanical ventilation proves ineffective, a moderate infusion of albumin can be considered to increase colloid osmotic pressure and reduce fluid leakage, while closely monitoring hemodynamic status, electrolytes, and renal function.

Preanesthetic evaluation is crucial for patients with preeclampsia and pulmonary edema. Attention should be given to the severity of hypertension and pulmonary edema, airway assessment, hemodynamic status, coagulation function, and fetal condition. Careful consideration should be given to the type and volume of preoperative fluids, and changes in the aforementioned conditions should be monitored closely. Multidisciplinary consultations involving anesthesiologists, obstetricians, and intensivists may be necessary to formulate an individualized anesthesia plan.

All types of anesthesia carry certain risks for severe preeclampsia patients undergoing cesarean section. General anesthesia is faster to administer but carries risks of failed intubation and further complications. Spinal anesthesia allows the patient to remain conscious during delivery and reduces the impact of anesthetics on the neonate. It can mitigate neuroendocrine responses, helping to lower blood pressure. The use of intrathecal opioids also reduces postoperative pain, minimizing the risks of intubation and ventilation failure, aspiration, and blood pressure spikes or increased intracranial pressure during laryngoscopy. Thus, many studies support spinal anesthesia as the preferred method for cesarean sections in preeclampsia patients^[13,14]. Spinal anesthesia is suitable for patients who are conscious and have normal coagulation function and platelet levels based on laboratory results. General anesthesia is typically used when spinal anesthesia is contraindicated, fails, or in emergencies. In such cases, individualized anesthesia management should be implemented, with preparations for difficult intubation. During anesthesia, invasive monitoring may be required in addition to standard vital signs monitoring, such as invasive arterial pressure and central venous pressure measurements.

Case reports on the anesthesia management of cesarean sections in patients with preeclampsia and pulmonary edema are limited. Alves *et al.* reported a case of preeclampsia with pulmonary edema and type 1 respiratory failure requiring oxygen therapy with a Venturi mask. The cesarean section was successfully performed under epidural anesthesia^[15]. Ethy Ahammedunni *et al.* reported a case of preeclampsia with pulmonary edema and morbid obesity, in which spinal anesthesia was successfully administered in a sitting position to complete the cesarean section^[16].

In the present case, the patient was diagnosed with severe preeclampsia complicated by acute pulmonary edema. Due to high suspicion of pulmonary embolism at admission, therapeutic doses of low-molecular-weight heparin were administered. As the interval between heparin administration and cesarean section was less than 24 hours, general anesthesia was chosen. Anesthesia induction was performed using titrated doses of fast-acting sedatives, analgesics, and muscle relaxants. When hypotension occurred, a single intravenous dose of low-dose norepinephrine was administered to stabilize blood pressure while achieving sufficient anesthetic depth, allowing for successful tracheal intubation. Following intubation and mechanical ventilation, the patient developed severe hypoxemia, likely due to the physiological effects of positive pressure ventilation, reduced functional residual capacity in the supine position, and exacerbation of pulmonary edema caused by postpartum uterotonic agents, increased venous return, blood loss, reduced plasma colloid osmotic pressure, and increased capillary permeability. Symptomatic treatment during anesthesia, including strict fluid restriction, diuretics, and albumin infusion, helped reduce venous return, increase colloid osmotic pressure, and enhance diuresis, ultimately improving pulmonary edema and oxygenation.

4. Conclusion

Acute pulmonary edema is a leading cause of mortality in patients with preeclampsia. For patients with severe preeclampsia complicated by pulmonary edema requiring cesarean section, both pulmonary edema and hypertension should be managed before surgery begins. When no contraindications exist, spinal anesthesia is the preferred anesthetic method for cesarean section in patients with preeclampsia. However, if general anesthesia is necessary due to contraindications for spinal anesthesia, attention should be given to the impact of general anesthesia on the patient's already compromised respiratory function, ensuring hemodynamic stability and adequate oxygenation.

Disclosure statement

The authors declare no conflict of interest.

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Efficacy of Sodium Oligomannate Capsules Combined with Memantine Hydrochloride and Donepezil Hydrochloride in Treating Moderate Alzheimer's Disease

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Abstract: *Objective:* To explore the clinical efficacy of sodium oligomannate capsules combined with memantine hydrochloride and donepezil hydrochloride in the treatment of moderate Alzheimer's disease (AD) and analyze its impact on cognitive function. *Methods:* Eighty patients with moderate AD admitted to the neurology outpatient clinic of our hospital from June 2021 to December 2022 were selected as the study subjects and randomly divided into a study group and a control group, each with 40 patients. The control group was treated with oral memantine hydrochloride and donepezil hydrochloride, while the study group was additionally treated with oral sodium oligomannate capsules for 24 weeks. The scores of neuropsychological scales [Montreal Cognitive Assessment (MoCA) and Mini-Mental State Examination (MMSE)], and Activities of Daily Living (ADL) scale were compared before and after treatment. Additionally, the levels of homocysteine (Hcy), central nervous system-specific protein (S100-β), interleukin (IL)-6, and tumor necrosis factor (TNF)-α were measured in both groups, and the treatment effects and adverse reactions were compared. *Results:* After 24 weeks of treatment, the MMSE, MoCA, and ADL scores of both groups were significantly higher than those before treatment ($P < 0.05$). Compared with the control group after 24 weeks of treatment, the study group had significantly higher MMSE, MoCA, and ADL scores ($P < 0.05$), and significantly lower levels of Hcy, IL-6, and TNF-α ($P < 0.05$). Both the study group and the control group showed reduced levels of Hcy, IL-6, and TNF-α after 24 weeks of treatment compared to before ($P < 0.05$), but there was no significant change in S100-β levels ($P > 0.05$). *Conclusion:* The combination of sodium oligomannate capsules, memantine hydrochloride, and donepezil hydrochloride is effective in the treatment of moderate AD. It can improve the cognitive function and daily living abilities of patients with dementia, enhancing their quality of life.

Keywords: Sodium oligomannate capsules; Alzheimer's disease; Memantine hydrochloride; Donepezil hydrochloride

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1. Introduction

Alzheimer's disease (AD), the most common neurodegenerative disease in clinical practice, is primarily characterized by progressive cognitive dysfunction, behavioral changes, and emotional disturbances. These higher nervous function impairments manifest as memory decline, compromised calculation abilities, aphasia, agnosia, apraxia, and visuospatial disorders. In severe cases, patients may exhibit psychiatric and behavioral abnormalities and lose their ability to perform daily activities. Previous studies have linked the pathogenesis of AD to the deposition of β -amyloid protein ($A\beta$) and tau protein in the brain ^[1-3]. Recent research has highlighted the critical role of persistent and excessive inflammatory responses in the pathogenesis of degenerative diseases such as AD ^[4]. Memantine hydrochloride, an N-methyl-D-aspartate receptor antagonist (NMDAR-A), regulates excitatory neurotransmitters by reducing the "noise" generated by excessive NMDA activation. It inhibits the formation of $A\beta$, delays neurodegeneration, and improves cognitive function ^[5]. Donepezil hydrochloride, a second-generation cholinesterase inhibitor, treats mild to moderate AD by inhibiting the hydrolysis of acetylcholine and increasing its synaptic levels. However, monotherapy with donepezil often fails to achieve ideal therapeutic effects ^[6]. There is a relationship between AD and gut microbiota. Dysbiosis can affect intestinal permeability and inflammation levels, which in turn can impact the central nervous system, leading to cognitive dysfunction. Studies have indicated that sodium oligomannate capsules (GV-971), a novel drug developed in China, significantly improve cognitive function in AD patients by reshaping gut microbiota balance and targeting the brain-gut axis ^[7]. This article compares the clinical efficacy and safety of GV-971 combined with memantine hydrochloride and donepezil hydrochloride versus dual therapy of memantine hydrochloride and donepezil hydrochloride in the treatment of AD patients.

2. General information and methods

2.1. General information

Eighty patients with moderate AD who visited the neurology outpatient clinic of the Affiliated Hospital of Jiangsu University from June 2021 to December 2022 were selected as study subjects. They were randomly divided into a study group and a control group, with 40 patients in each group. This study was approved by the ethics committee of our hospital. The control group received oral treatment with memantine hydrochloride and donepezil hydrochloride. The study group, on this basis, received additional oral treatment with sodium oligomannate capsules. The treatment was continuous for 24 weeks. Neuropsychological scale scores, including the Montreal Cognitive Assessment (MoCA) and the Mini-Mental State Examination (MMSE), were compared before and after treatment in both groups. Simultaneously, levels of homocysteine (Hcy), central nervous system-specific protein (S100- β), interleukin (IL)-6, and tumor necrosis factor (TNF)- α were measured in both groups. The treatment efficacy and adverse reactions were also compared between the two groups. The general information of the two groups was comparable ($P > 0.05$).

2.2. Inclusion and exclusion criteria

The diagnosis of AD follows the criteria established by the American Psychiatric Association in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)* in 1999. The diagnosis is primarily based on clinical symptoms, medical history, neurological examination, and neuropsychological assessment using the MMSE scale. Among the patients with dementia, 80 were identified as having moderate symptoms. Inclusion

criteria are as follows: (1) Meet the DSM-5 criteria for dementia diagnosis; (2) Age greater than 65 years; (3) MMSE scores are graded according to severity using the guidelines from the first edition of the “Operational Guidelines for Neuropsychological Cognitive Scales” in 2015: scores of 21–26 are defined as mild dementia and scores of 10–20 are defined as moderate dementia. Cognitive impairment is also defined based on education level, with scores less than 17 for illiteracy, less than 20 for primary school education, and less than 24 for middle school education and above; (4) Normal laboratory test results for blood routine, liver and kidney function, urine routine, thyroid function, and vitamin levels; (5) Presence of bilateral temporal lobe and hippocampal atrophy on magnetic resonance imaging (MRI) of the brain; (6) Negative for syphilis and HIV infection. Exclusion criteria are as follows: (1) Cognitive decline due to other causes such as mental retardation, bipolar disorder, hypothyroidism, schizophrenia, etc.; (2) Comorbidities including malignant tumors, active tuberculosis, severe respiratory, circulatory, or digestive system diseases, or other internal medical conditions or severe organ failure; (3) History of drug abuse, alcohol abuse, or allergies; (4) Use of medications that may improve cognition within the past month; (5) Simultaneous participation in other drug clinical trials; (6) Absence of multiple or widespread cerebral infarction lesions, or severe white matter lesions on MRI of the brain.

2.3. Drugs

Donepezil hydrochloride tablets: Produced by Jiangsu Hansoh Pharmaceutical Group Co., Ltd., specifications: 150 mg, 14 tablets/plate, batch number: National Medical Approval Number H20030472, expiration date: from September 30, 2020 to September 29, 2023; Memantine hydrochloride tablets: Produced by CSPC Ouyi Pharmaceutical Co., Ltd., specifications: 10 mg, 60 tablets/bottle, batch number: National Medical Approval Number H20203319, expiration date: from May 16, 2020 to May 15, 2024; Sodium oligomannate capsules: Produced by Shanghai Green Valley Pharmaceutical Co., Ltd., specifications: 150 mg, 14 capsules/plate, batch number: National Medical Approval Number H20190031, expiration date: from April 01, 2021 to March 31, 2023.

2.4. Grouping and drug administration

Using the random number table method, 80 patients with moderate dementia were divided into a control group and a study group, with 40 patients in each group. Patients in the control group were orally administered 5 mg of donepezil hydrochloride once daily, which was increased to 10 mg after one month. Additionally, they received memantine hydrochloride once daily, starting with 5 mg in the first week, increasing to 10 mg in the second week, 15 mg in the third week, and 20 mg in the fourth week, maintained at 20 mg thereafter. Patients in the treatment group received the same treatment as the control group, but with the addition of 450 mg of sodium oligomannate capsules, taken twice daily (morning and evening). Both groups were treated continuously for 24 weeks.

2.5. Observation indicators and efficacy evaluation

The cognitive function and activities of daily living (ADL) of patients in both groups were evaluated before treatment and after 24 weeks of treatment using the MMSE score, MoCA score, and ADL score. The levels of Hcy, S100- β , IL-6, and TNF- α were measured in both groups before treatment and after 24 weeks of treatment using enzyme-linked immunosorbent assay (ELISA).

2.6. Adverse reactions

Patients in both groups were observed for adverse reactions, including dizziness, fatigue, lethargy, gastrointestinal

reactions (vomiting, diarrhea, abdominal distension), weight gain, increased muscle tone, akathisia, and obstructive sleep apnea-hypopnea syndrome. Additionally, safety evaluations of the two treatment regimens were conducted based on the results of electrocardiograms, blood and urine routine tests, and renal and liver function tests.

2.7. Statistical analysis

Statistical analysis was performed using SPSS25.0 software. Measurement data were expressed as mean \pm standard deviation (SD). If the data met the assumptions of normality and homogeneity of variance, an independent samples *t*-test was used. A paired samples *t*-test was applied to compare pre- and post-treatment data. If the assumptions were not met, the Mann–Whitney *U* test was employed. Count data were expressed as percentages (%) and analyzed using the chi-square test. A *P*-value < 0.05 was considered statistically significant.

3. Results

3.1. Demographic and clinical data analysis

In the control group, there were 22 males and 18 females, with an average age of 73.20 ± 5.86 years and an average disease duration of 22.88 ± 2.87 months. In the study group, there were 24 males and 16 females, with an average age of 75.35 ± 6.46 years and the same average disease duration of 22.88 ± 2.87 months. There were no statistically significant differences between the two groups in terms of age, gender, education level, MMSE score, MoCA score, ADL score, underlying diseases, nutritional and immunological indicators, and average disease duration (all $P > 0.05$). **Table 1** shows the details.

Table 1. Demographic information and basic clinical characteristics of subjects (mean \pm SD)

	Study group (<i>n</i> = 40)	Control group (<i>n</i> = 40)	<i>P</i> value
Age (years)		73.20 ± 5.86	0.123
Gender (male/female)		24/16	0.821
Education (years)		9.18 ± 2.14	0.159
Duration of illness (months)	75.35 ± 6.46 16/12	22.88 ± 2.87	0.330
MMSE score	8.50 ± 2.11 22.25 ± 2.84	15.83 ± 2.50	0.651
ADL score	15.58 ± 2.43 62.38 ± 5.66	63.00 ± 6.39	0.644
MoCA score	13.65 ± 2.41	13.95 ± 2.45	0.583
Underlying diseases	11		
Hypertension	10	13	0.808
Diabetes		8	0.790
Nutrition and immune indicators	8.34 ± 1.31 0.064 ± 0.044 58.45 ± 10.51 7.52 ± 2.02		
Hcy ($\mu\text{mol/L}$)		8.85 ± 1.77	0.147
S100 (ng/ml)		0.064 ± 0.043	0.959
IL-6 (pg/ml)		57.48 ± 9.03	0.658
TNF- α (pg/ml)		8.85 ± 1.77	0.089

3.2. Improvement in cognitive abilities and daily living abilities in two groups

After 24 weeks of treatment, both groups showed varying degrees of improvement in cognitive function and daily living abilities compared to before treatment, with statistically significant differences ($P < 0.05$). Before treatment, there were no statistically significant differences in MMSE scores, MoCA scores, and ADL scores between the two groups ($P > 0.05$). However, after treatment, the study group had significantly higher MMSE scores, MoCA scores, and ADL scores compared to the control group ($P < 0.05$). This indicates that the combination therapy of sodium oligomannate, memantine hydrochloride, and donepezil hydrochloride is more effective in improving cognitive function and daily living abilities of patients with moderate AD than the combination therapy of memantine hydrochloride and donepezil hydrochloride ($P < 0.05$). **Table 2** presents the details.

Table 2. Comparison of MMSE, MoCA, and ADL scores between two groups (mean \pm SD, points)

Group	n	MMSE		MoCA		ADL	
		Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Study group	40	15.58 \pm 2.43	17.98 \pm 2.41*	13.65 \pm 2.41	16.28 \pm 2.59*	62.38 \pm 5.66	71.67 \pm 6.82*
Control group	40	15.83 \pm 2.50	16.63 \pm 2.60*	13.95 \pm 2.45	15.08 \pm 2.54*	63.00 \pm 6.39	65.75 \pm 6.66*
<i>t</i>	-	0.173	2.408	0.552	0.583	0.211	3.903
<i>P</i>	-	0.863	0.018	2.093	0.040	0.833	< 0.001

Note: Compared with before treatment, * $P < 0.05$.

3.3. Comparison of inflammatory factor levels before and after treatment in the two groups

Before treatment, there were no statistically significant differences in the levels of Hcy, S100- β , IL-6, and TNF- α between the two groups ($P > 0.05$). After 24 weeks of treatment, the levels of Hcy, IL-6, and TNF- α decreased in both the study group and the control group ($P < 0.05$), but there was no significant change in the level of S100- β ($P > 0.05$). The levels of Hcy, IL-6, and TNF- α in the study group were significantly lower than those in the control group after 24 weeks of treatment ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of serological indicators between the two groups (mean \pm SD)

Group	n	Hcy (μ mol/L)		S100- β (ng/ml)		IL-6 (pg/ml)		TNF- α (pg/ml)	
		Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Study group	40	8.34 \pm 1.31	6.56 \pm 1.71*	0.064 \pm 0.044	0.063 \pm 0.037	58.45 \pm 10.51	38.88 \pm 11.92*	119.18 \pm 15.16	84.23 \pm 16.53*
Control group	40	8.85 \pm 1.77	8.47 \pm 1.59*	0.064 \pm 0.043	0.065 \pm 0.043	57.48 \pm 9.03	56.40 \pm 9.59*	119.45 \pm 21.71	101.73 \pm 19.03*
<i>t</i>	-	1.466	5.178	0.052	0.280	0.445	7.245	0.066	4.391
<i>P</i>	-	0.147	< 0.001	0.959	0.780	0.658	< 0.001	0.948	< 0.001

Note: Compared with before treatment, * $P < 0.05$.

3.4. Occurrence of adverse reactions in both groups

During treatment, no significant changes were observed in liver and kidney function or electrocardiogram in both groups. In the observation group, there was one case of diarrhea, one case of dry mouth, and one case of nausea

and vomiting, with an adverse reaction rate of 7.5%. In the control group, there was one case of diarrhea, two cases of dizziness, and one case of nausea and vomiting, with an adverse reaction rate of 10%. The adverse reactions were mild and resolved spontaneously in later stages. There was no significant difference in the incidence of adverse reactions between the two groups ($P > 0.05$).

4. Discussion

Alzheimer's disease, as the world's leading degenerative neurological disease, has a very high disability rate, severely affecting patients' daily lives and imposing a huge economic and caregiving burden on their families. Research shows that the number of AD patients in China is expected to exceed 30 million by 2050, and the annual medical cost for AD patients will reach up to \$1,887.18 billion^[8,9]. The pathogenesis of AD is complex, and although its etiology and pathogenesis have not been fully elucidated, many scholars and hypotheses suggest that the occurrence of AD is related to the deposition of A β , neuroinflammation caused by hyperphosphorylation of tau protein, neuronal degeneration, and neurofibrillary tangles. Additionally, the loss or dysfunction of cholinergic neurons is also an important factor that induces AD, mainly manifested by a decrease in acetylcholine (ACh) levels and an increase in acetylcholine esterase (AChE) activity^[10]. So far, no drug can reverse the progression of the disease, including the seven drugs approved by the US Food and Drug Administration for the treatment of AD. These include three acetylcholinesterase inhibitors (donepezil, galantamine, and rivastigmine), NMDAR-A (memantine, memantine-donepezil combination), and two anti-A β monoclonal antibodies approved in January 2021 and January 2023—aducanumab and lecanemab. Memantine hydrochloride mainly non-competitively blocks MDAR in a functionally dependent manner, inhibits the formation of A β deposition and its adverse reactions, readjusts the balance between inhibition and excitation, delays neurodegeneration, and improves cognitive function^[5]. Donepezil hydrochloride, as a typical cholinesterase inhibitor, can effectively regulate the level of ACh in the brain. However, as the number of intact cholinergic neurons decreases, its clinical effect gradually weakens, and it has no significant inhibitory effect on the progression of AD^[11]. Although memantine hydrochloride and donepezil hydrochloride are first-line drugs for the treatment of AD, some patients have insufficient understanding of the disease and their cognitive impairment has reached moderate dementia when seeking medical attention. In such cases, the combined use of these two drugs still cannot achieve good results, which requires continuous exploration and research to develop new drugs. Sodium oligomannate (GV-971) is a novel AD therapeutic drug originally developed in China and is the world's first drug targeting the brain-gut axis. It has a disease-modifying effect by adjusting intestinal flora imbalance and inhibiting neuroinflammation. It was conditionally approved by the China National Medical Products Administration in November 2019 for the treatment of mild to moderate AD, making it the first drug with independent intellectual property rights in China for the treatment of AD. Clinical study results show that sodium oligomannate can continuously improve the cognitive function and daily self-care ability of AD patients, while also improving patient symptoms and delaying the progression of AD, with good tolerability^[12,13].

Alzheimer's disease mostly affects elderly patients and is often accompanied by issues such as reduced digestive enzyme secretion, periodontitis, taste bud degeneration, intestinal flora imbalance, and weakened gastrointestinal motility. These patients are also highly susceptible to metabolic disorders of the three major nutrients: carbohydrates, proteins, and fats. Among these, lipid metabolism defects have a significant impact on cognitive function. Imbalances in intestinal flora can simultaneously cause lipid metabolism disorders and

increased levels of inflammatory factors in dementia patients, leading to immune system dysfunction and affecting higher nervous system functions through the brain-gut axis mechanism ^[14,15]. Sodium oligomannate capsule is a mixture of oligosaccharides with a polymerization degree of 2–10 extracted from marine brown algae. It can directly bind to multiple subdomains of A β , inhibiting the formation of A β fibers and stabilizing preformed fibers into non-toxic monomers. After oral administration, most of the ingested sodium oligomannate remains in the intestine, where it can rebuild the gut microbiota, reduce the peripheral infiltration of immune cells driven by bacterial metabolites into the brain, and inhibit neuroinflammation in the brain through the brain-gut axis. Studies have shown that sodium oligomannate improves patients' nutritional status, metabolic capacity, and immunity by enhancing the diversity and richness of gut microbiota, thus delaying the aging process of neuromotor functions in AD patients. In recent years, it has been widely used to treat patients with mild and moderate AD ^[16,17]. MMSE, MoCA, and ADL are commonly used scales for the clinical evaluation of patients' cognitive function and daily living abilities. The results of this study indicate that the combination therapy of sodium oligomannate with memantine hydrochloride and donepezil hydrochloride is more effective than the dual therapy of memantine hydrochloride and donepezil hydrochloride in improving neurological function and daily living abilities of AD patients. Additionally, Hcy, S100, IL-6, and TNF- α are important inflammatory factors, and the study results suggest that sodium oligomannate can lower the serum levels of Hcy, IL-6, and TNF- α in AD patients, improving inflammatory cell infiltration in neuronal cells. The study also demonstrates the good safety and compatibility of sodium oligomannate combined with memantine hydrochloride and donepezil hydrochloride, making it a suitable treatment option for moderate AD.

5. Conclusion

In summary, the combination therapy of sodium oligomannate capsules with memantine hydrochloride and donepezil hydrochloride has proven efficacy in the treatment of moderate AD. It can improve the cognitive function and daily living abilities of these patients, leading to an enhanced quality of life.

Disclosure statement

The authors declare no conflict of interest.

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Delivery Modes and Their Effects on Mothers and Neonates in Cases of Repeat Pregnancy with Uterine Scars

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Abstract: *Objective:* To investigate the delivery modes of women with repeat pregnancies involving uterine scars and their effects on both mothers and neonates. *Methods:* A study was conducted on 100 patients treated at Shenzhen Maternity and Child Healthcare Hospital from July 2023 to July 2024. The participants were divided into a control group and an observation group, with 50 cases in each. The division was based on the indications for prior cesarean section, cervical maturity, postpartum complications, and thickness of the cesarean scar. The control group underwent cesarean delivery, while the observation group experienced vaginal delivery. The two groups were compared in terms of intrapartum blood loss, postpartum blood loss within 2 hours, length of hospital stay, Apgar scores at 1-minute post-birth, and incidences of neonatal fever and jaundice. *Results:* The observation group had significantly lower intrapartum blood loss, postpartum blood loss within 2 hours, and shorter hospital stays compared to the control group ($P < 0.05$). Additionally, the Apgar scores at 1 minute post-birth were significantly higher in the observation group ($P < 0.05$). The incidence of neonatal fever and jaundice was significantly lower in the observation group ($P < 0.05$). These differences were statistically significant. *Conclusion:* Vaginal delivery has high clinical value for women with repeat pregnancies involving uterine scars. It reduces maternal intrapartum and postpartum blood loss, shortens hospital stays, improves neonatal Apgar scores, and decreases the incidences of neonatal fever and jaundice. This method is worthy of clinical application and promotion.

Keywords: Uterine scars; Repeat pregnancy; Delivery mode; Cesarean section; Vaginal delivery

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1. Introduction

Uterine scars result from pathological changes in tissue appearance following maternal trauma. With the implementation of China's two-child policy^[1], the cesarean delivery rate has risen significantly, leading to an increasing prevalence of uterine scars. Uterine scars compress the uterine blood vessels and nerves, altering the uterine structure and hindering normal fetal development^[2]. Therefore, the choice of delivery mode in cases of

uterine scars is crucial for both maternal and neonatal outcomes ^[3].

Although vaginal delivery carries certain risks, such as uterine rupture, in cases of uterine scars ^[4], cesarean delivery is not an absolute indication of repeat pregnancies. Vaginal delivery offers its own advantages ^[5]. This study aims to clarify the impact of different delivery modes on mothers with uterine scars during repeat pregnancies. A total of 100 patients treated at Shenzhen Maternity and Child Healthcare Hospital between July 2023 and July 2024 were analyzed, with the findings detailed as follows.

2. Materials and methods

2.1. General information

A study was conducted on 100 patients treated at Shenzhen Maternity and Child Healthcare Hospital between July 2023 and July 2024. The patients were divided into a control group and an observation group based on indications for the previous cesarean section, cervical maturity, postpartum complications, and cesarean scar thickness.

In the control group, ages ranged from 22 to 33 years, with an average age of (26.85 ± 3.30) years. Gestational periods ranged from 37 to 40 weeks, with an average gestational period of (38.50 ± 1.23) weeks. In the observation group, ages ranged from 21 to 34 years, with an average age of (26.74 ± 3.62) years. Gestational periods ranged from 37 to 44 weeks, with an average gestational period of (38.63 ± 1.31) weeks. Statistical analysis showed no significant differences in general information between the two groups.

Inclusion criteria: (1) Diagnosed at our hospital with uterine scars according to diagnostic standards ^[6]; (2) Second pregnancy; (3) Confirmed singleton pregnancy via ultrasound examination; (4) High compliance with treatment by the patient and family, and informed consent signed to voluntarily participate in the study.

Exclusion criteria: (1) Concurrent liver or kidney dysfunction; (2) Concurrent heart or lung dysfunction; (3) Coagulation disorders; (4) First pregnancy.

2.2. Methods

The delivery mode was chosen based on indications from the first cesarean section, cervical maturity, postpartum complications, and cesarean scar thickness.

Vaginal trial delivery criteria: For vaginal delivery trials, the interval between the current and previous deliveries was required to be >2 years, the previous cesarean section involved a lower uterine segment incision, no other complications or abnormalities were present, and uterine continuity was deemed good. Upon obtaining consent from the patient and family, vaginal trial delivery was conducted.

Cesarean section criteria: For cesarean section, the interval between deliveries was ≤ 2 years and surgical indications for cesarean section were present. Additionally, if poor scar healing, significant infection, or other contraindications for vaginal delivery were noted during the previous cesarean section, cesarean delivery was performed. Ultrasound examinations revealing thin lower uterine walls also warranted cesarean delivery, subject to the consent of the patient and family.

2.3. Observation indicators

The study used the following observational indicators: surgical metrics, Apgar scores at 1-minute post-birth, and incidences of neonatal fever and jaundice. Specific details are as follows:

- (1) Surgical metrics: Surgical metrics included intrapartum blood loss, postpartum blood loss within 2 hours, and length of hospital stay. These were recorded directly and used to compare data between the control and observation groups.
- (2) Apgar scores at 1 minute post-birth: The Apgar score assessed neonatal asphyxia, with scores ranging from 0 to 10. Lower scores indicated more severe asphyxia.
- (3) Incidence of neonatal fever and jaundice: Neonatal fever and jaundice during hospitalization were directly recorded, and their incidence rates were calculated as follows:
Fever incidence rate = (number of fever cases / total cases) × 100%
Jaundice incidence rate = (number of jaundice cases / total cases) × 100%

2.4. Statistical methods

Data were analyzed using SPSS 22.00 statistical software. Measurement data were expressed as mean ± standard deviation (SD) and analyzed with *t*-tests. Count data were expressed as [*n* (%)] and analyzed using χ^2 tests. A *P* value < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of surgical metrics between the two groups

This study found that the observation group had significantly lower intrapartum blood loss, postpartum blood loss within 2 hours, and length of hospital stay compared to the control group (*P* < 0.05), as detailed in **Table 1**.

Table 1. Comparison of surgical metrics between the two groups (mean ± SD)

Group	<i>n</i>	Intrapartum blood loss (mL)	Postpartum blood loss (mL, within 2 hours)	Length of hospital stay (days)
Control group	50	1,123.25 ± 185.56	332.84 ± 82.60	12.84 ± 2.56
Observation group	50	702.64 ± 100.30	142.87 ± 30.85	7.34 ± 1.38
<i>t</i>	-	14.100	15.235	13.373
<i>P</i>	-	< 0.001	< 0.001	< 0.001

3.2. Comparison of neonatal Apgar scores at 1 minute post-birth between the two groups

The results indicated that the neonatal Apgar scores at 1 minute post-birth were significantly higher in the observation group compared to the control group (*P* < 0.001), as shown in **Table 2**.

Table 2. Comparison of neonatal Apgar scores at 1-minute post-birth between the two groups (mean ± SD)

Group	<i>n</i>	Apgar score
Control group	50	6.24 ± 1.56
Observation group	50	7.69 ± 1.80
<i>t</i>	-	4.305
<i>P</i>	-	< 0.001

3.3. Comparison of neonatal postpartum fever and jaundice incidence rates between the two groups

The study results showed that the incidence rates of neonatal postpartum fever and jaundice were significantly lower in the observation group compared to the control group ($P < 0.05$). The results are detailed in **Table 3**.

Table 3. Comparison of neonatal postpartum fever and jaundice incidence rates between the two groups

Group	<i>n</i>	Fever incidence rate	Jaundice incidence rate
Control group	50	7	6
Observation group	50	1	1
χ^2	-	4.891	3.840
<i>P</i>	-	0.027	0.049

4. Discussion

In recent years, an increasing number of mothers have opted for cesarean sections ^[7], which has, in turn, contributed to a rise in the incidence of scarred uteri. This is primarily because cesarean sections are prone to causing scarring, which can alter both the shape and structure of the uterus, ultimately resulting in a scarred uterus. During pregnancy, the gestational sac may attach to the scar, surrounded by fibrous tissue and muscle layers, potentially leading to isolated conditions. In most cases, the likelihood of successful uterine pregnancy is low ^[8]. After the formation of a scarred uterus, subsequent pregnancies are associated with abnormal attachment of the gestational sac, which can easily lead to significant bleeding and, in severe cases, uterine rupture, potentially resulting in maternal mortality ^[9]. Apart from cesarean sections, other causes of a scarred uterus include uterine anomaly correction surgeries and myomectomy. A scarred uterus significantly increases the risk of uterine rupture and may also lead to ectopic pregnancies. Research has directly pointed out that the mode of delivery in subsequent pregnancies involving a scarred uterus has a substantial impact on maternal and neonatal outcomes ^[10]. Therefore, selecting an appropriate delivery method is critical for ensuring favorable outcomes for both mother and child in cases of scarred uterine pregnancies.

Based on this understanding, this study explored the effects of different delivery methods on mothers and neonates in cases of scarred uterine pregnancies. A total of 100 patients admitted to Shenzhen Maternal and Child Health Hospital from July 2023 to July 2024 were included in the study. The results revealed that intrapartum blood loss, postpartum blood loss within 2 hours, and hospital stay duration were all significantly lower in the observation group ($P < 0.05$). These findings suggest that vaginal delivery can effectively reduce intrapartum and postpartum blood loss and shorten hospital stays for mothers with scarred uterine pregnancies.

In terms of neonatal Apgar scores at 1-minute post-birth, the observation group showed significantly higher scores compared to the control group ($P < 0.05$), indicating statistical significance. This suggests that vaginal delivery can effectively improve neonatal asphyxia outcomes. Additionally, the incidence rates of neonatal postpartum fever and jaundice were significantly lower in the observation group than in the control group ($P < 0.05$), indicating that vaginal delivery can reduce the occurrence of neonatal postpartum fever and jaundice.

5. Conclusion

In summary, vaginal delivery in cases of scarred uterine pregnancies can effectively reduce maternal intrapartum and postpartum blood loss, shorten hospital stays, improve neonatal asphyxia outcomes, and decrease the incidence rates of neonatal fever and jaundice. It is, therefore, a delivery method worthy of clinical promotion and application.

Disclosure statement

The authors declare no conflict of interest.

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Clinical Study on the Modified Formula of Huang Yuanyu's Gui Fu Ling Wu Decoction for Treating Spleen-Kidney Yang Deficiency Type Diabetic Nephropathy

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Abstract: *Objective:* To evaluate the efficacy of the modified Gui Fu Ling Wu Decoction in treating diabetic nephropathy (DN) of the spleen-kidney Yang deficiency type. *Methods:* A total of 100 DN patients admitted to Changyi Traditional Chinese Medicine Hospital between August 2023 and March 2024 were included in the study. Patients were randomly divided into a control group and a study group, each comprising 50 cases, using a computerized random number generator. The control group received kallikrein treatment, while the study group received a combination of kallikrein and the modified Gui Fu Ling Wu Decoction. Blood glucose control, renal function, and inflammatory markers were assessed before and after treatment in both groups. *Results:* Before treatment, there were no significant differences in blood glucose and renal function indicators between the two groups ($P > 0.05$). After treatment, postprandial blood glucose, fasting blood glucose, 24-hour urinary protein, urinary microalbumin, serum creatinine, serum C-reactive protein (CRP), and interleukin-6 levels significantly decreased in both groups, with the study group showing superior results compared to the control group ($P < 0.05$). *Conclusion:* The combination of Gui Fu Ling Wu Decoction and kallikrein for treating spleen-kidney Yang deficiency type DN significantly improves blood glucose control, enhances renal function, and reduces inflammatory responses.

Keywords: Gui Fu Ling Wu Decoction; Diabetic nephropathy; Renal function; Inflammatory markers

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1. Introduction

With continuous socioeconomic development and evolving lifestyles, diabetic nephropathy (DN) has become more prevalent than glomerulonephritis-related diseases, imposing a greater burden on society than population aging^[1]. Clinically, DN manifests as thirst, foamy urine, and lower limb edema. Modern medicine currently lacks

specific treatment protocols, relying primarily on comprehensive symptomatic measures such as blood sugar and lipid control and dietary regulation ^[2].

As traditional Chinese medicine (TCM) techniques advance and clinical experience accumulates, TCM has demonstrated significant advantages in DN treatment, including confirmed efficacy and fewer side effects ^[3]. In the *Si Sheng Xin Yuan (Four Sacred Sources of the Heart)*, Huang Yuanyu proposed the use of Gui Fu Ling Wu Decoction to treat symptoms of “Xiao Ke” (wasting-thirst disorder) ^[4]. However, clinical research on DN-related applications of this formula remains limited.

To address this gap, a study was conducted on 100 DN patients admitted to Changyi Hospital of Traditional Chinese Medicine between August 2023 and March 2024 to investigate the therapeutic effects of Gui Fu Ling Wu Decoction on spleen-kidney Yang deficiency type DN.

2. Materials and methods

2.1. General information

A total of 100 patients with diabetic nephropathy (DN) admitted to the hospital from August 2023 to March 2024 were included in the study. Patients were randomly divided into a control group and a study group, each comprising 50 cases, using a computer-generated random number generator.

Study group: 26 males and 24 females; age range 46–76 years, mean age (61.58 ± 5.66) years; disease duration 1.2–8.3 years, mean duration (5.15 ± 1.23) years; disease stages: Stage I (13 cases), Stage II (28 cases), Stage III (9 cases).

Control group: 25 males and 25 females; age range 39–79 years, mean age (60.96 ± 5.31) years; disease duration 1.7–8.5 years, mean duration (5.33 ± 1.19) years; disease stages: Stage I (16 cases), Stage II (26 cases), Stage III (8 cases).

The study was approved by the Medical Ethics Committee of Changyi Traditional Chinese Medicine Hospital, and informed consent was obtained from all patients and their families.

2.2. Inclusion criteria

- (1) Patients meeting the diagnostic criteria for DN in both traditional Chinese and Western medicine and classified as the spleen-kidney Yang deficiency subtype ^[5,6].
- (2) Aged 18–80 years.
- (3) Microalbuminuria (MAU) > 30 mg/L, proteinuria-positive for more than three months.
- (4) Complete baseline data available.

2.3. Exclusion criteria

- (1) Patients with type 1 diabetes mellitus.
- (2) Patients receiving other DN-related treatments outside of the study.
- (3) Patients with kidney damage due to other causes.
- (4) Patients with severe infections or other organ-related diseases.
- (5) Patients with malignant tumors or autoimmune diseases.
- (6) Patients with poor compliance.

2.4. Methods

Both groups followed regular routines, engaged in appropriate physical activities, and adhered to a low-sugar, low-fat, low-salt, low-oil, high-quality low-protein diet.

Control group: Treated with kallikrein enteric-coated tablets (National Drug Approval No. H37022253, 120 U per tablet), administered orally at 120 U per dose, three times daily.

Study group: Received the modified Gui Fu Ling Wu Decoction in addition to the control treatment.

Both groups underwent continuous treatment for three months.

2.4.1. Formula of Gui Fu Ling Wu Decoction

- (1) Ingredients: *Poria cocos* (15 g), *Alismatis rhizoma* (15 g), Cinnamon twig (15 g), White peony root (12g), *Astragalus* (30 g), *Glycyrrhizae radix preparata* (6 g), *Codonopsis* (30 g), *Angelica sinensis* (10 g), Earthworm (9 g), *Salvia miltiorrhiza* (20 g), Dry ginger (6 g), Calcined Longgu (30 g, pre-decocted), Calcined oyster (30 g, pre-decocted), Aconite root (6 g, pre-decocted).
- (2) Preparation: Decoction prepared with water, reduced to approximately half a cup. Administered warm twice daily, morning and evening.

2.5. Observation indicators

- (1) Blood glucose indicators: Fasting blood glucose (FBG) and postprandial 2-hour blood glucose (PBG) levels were measured using a rapid blood glucose meter before treatment and at the end of the three-month treatment period.
- (2) Renal function indicators: 24-hour urinary protein quantification, urinary microalbumin, and serum creatinine levels were measured using an automatic biochemical analyzer before treatment and at the end of three months.
- (3) Inflammatory indicators: Serum levels of C-reactive protein (CRP) and interleukin-6 (IL-6) were measured using the ELISA method before treatment and at the end of three months.

2.6. Statistical methods

Data analysis was performed using SPSS 19.0 statistical software. Measurement data conforming to the normal distribution, as determined by the Shapiro-Wilk test, were expressed as mean \pm standard deviation (SD). Independent sample *t*-tests were used for comparisons between groups. Statistical significance was considered at $P < 0.05$.

3. Results

3.1. Comparison of blood glucose indicators between the two groups

Before treatment, there was no significant difference in blood glucose indicators between the two groups ($P > 0.05$). After treatment, both PBG and FBG levels decreased, with the study group showing significantly lower values than the control group ($P < 0.05$). See **Table 1**.

Table 1. Comparison of blood glucose indicators between the two groups (mean \pm SD)

Group	<i>n</i>	PBG (mmol/L)		FBG (mmol/L)	
		Before treatment	After treatment	Before treatment	After treatment
Study group	50	9.27 \pm 1.34	7.08 \pm 0.83*	8.06 \pm 1.12	6.04 \pm 0.83*
Control group	50	9.34 \pm 1.50	7.92 \pm 1.27*	8.17 \pm 1.30	6.97 \pm 0.94*
<i>t</i>		0.246	3.915	0.453	5.244
<i>P</i>		0.806	< 0.001	0.651	< 0.001

*Note: Compared to pre-treatment, $P < 0.05$.

3.2. Comparison of renal function indicators between the two groups

Before treatment, there were no significant differences in renal function indicators between the two groups ($P > 0.05$). After treatment, the levels of 24-hour urinary protein, urinary microalbumin, and serum creatinine decreased, with the study group demonstrating significantly lower levels than the control group ($P < 0.05$). See **Table 2**.

Table 2. Comparison of renal function indicators between the two groups (mean \pm SD)

Groups	<i>n</i>	24h urine protein (g)		MAU (mg/L)		Serum creatinine (μ mol/L)	
		Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Study group	50	5.09 \pm 1.17	3.22 \pm 0.89*	320.41 \pm 46.51	169.43 \pm 33.68*	176.14 \pm 29.35	139.36 \pm 18.83*
Control group	50	5.16 \pm 1.31	4.15 \pm 1.02*	331.27 \pm 42.28	216.34 \pm 35.13*	171.58 \pm 28.71	156.47 \pm 20.21*
<i>t</i>		0.282	4.858	1.222	6.816	0.785	4.380
<i>P</i>		0.779	< 0.001	0.225	< 0.001	0.434	< 0.001

*Note: Compared to pre-treatment, $P < 0.05$.

3.3. Comparison of inflammatory indicators between the two groups

Before treatment, there were no significant differences in inflammatory indicators between the two groups ($P > 0.05$). After treatment, serum levels of CRP and IL-6 decreased, with the study group showing significantly lower levels than the control group ($P < 0.05$). See **Table 3**.

Table 3. Comparison of inflammatory indicators between the two groups (mean \pm SD)

Groups	<i>n</i>	CRP (mg/L)		IL-6 (pg/mL)	
		Before treatment	After treatment	Before treatment	After treatment
Study group	50	22.08 \pm 3.47	12.21 \pm 2.74*	23.31 \pm 3.41	11.95 \pm 2.83*
Control group	50	21.59 \pm 3.62	17.53 \pm 2.96*	23.16 \pm 3.32	18.84 \pm 2.56*
<i>t</i>		0.691	9.326	0.223	12.767
<i>P</i>		0.491	< 0.001	0.824	< 0.001

*Note: Compared to pre-treatment, $P < 0.05$.

4. Discussion

In TCM, DN is often classified under the categories of “wasting-thirst disorder” and “edema.” Modern TCM practitioners, inspired by the core concept of “Qi circulation” in Huang Yuanyu’s *Si Sheng Xin Yuan*, suggest that when DN progresses to a certain extent, the Qi movement becomes obstructed. This results in the adverse rising of ministerial fire along the gallbladder meridian and descending along the triple burner meridian, leading to symptoms of upper heat and lower cold. Clinically, these manifest as thirst in the upper body and dribbling in the lower body, with coldness in the lower regions being predominant. Treatment should therefore primarily focus on warming the kidney water while supplementing it with clearing heart fire for balance ^[7].

In this study, the study group received Gui Fu Ling Wu Tang in addition to standard Western medicine treatment. Compared to the control group, the study group demonstrated significant reductions in blood glucose levels, urinary protein, and serum creatinine ($P < 0.05$). Elevated urinary protein, microalbumin, and serum creatinine levels are indicators of impaired glomerular filtration function and are commonly used markers to evaluate kidney function ^[8]. These results indicate that Gui Fu Ling Wu Tang is effective in improving blood glucose control and kidney function.

The underlying mechanism may be attributed to the herbal composition of Gui Fu Ling Wu Tang. In the formula, *Poria cocos* and *Alismatis Rhizoma* serve as the primary ingredients, focusing on draining dampness, transforming phlegm, and promoting the elevation and descent of spleen and stomach Qi. Cinnamon twigs and *Polygonum multiflorum* act as secondary ingredients to soothe the liver and nourish the blood while warming yang and dispelling cold. Additionally, Longgu, oyster, aconite root, and dried ginger assist in warming kidney yang and stabilizing kidney essence. Together, these herbs synergize to eliminate dampness, relieve stagnation, and strengthen the spleen and kidney ^[9].

Modern pharmacological studies support this. For example, *Poria cocos* has been shown to inhibit phosphorylation in glomerular mesangial cells by activating the p38MAPK signaling pathway, thereby reducing blood glucose levels and protecting kidney function ^[10]. Furthermore, *Alismatis Rhizoma* contains quercetin, which has been confirmed to enhance insulin efficacy, accelerate glucose metabolism, and lower blood glucose levels ^[11]. Liu *et al.* ^[12] found that the combination of *Poria cocos* and *Alismatis Rhizoma* reduced 24-hour urinary protein and serum creatinine in a rat nephropathy model, potentially by regulating lipid metabolism and renal medulla aquaporins (AQP1 and AQP2), consistent with the results of this study.

IL-6 is closely associated with the pathogenesis of DN. It plays a critical role in immune regulation and inflammation by stimulating the liver and vascular endothelial cells to promote the secretion of CRP. CRP, in turn, induces the production of IL-6, resulting in their high expression during inflammatory responses ^[13]. In this study, the levels of IL-6 and CRP were significantly lower in the study group treated with Gui Fu Ling Wu Tang compared to the control group, indicating the formula’s ability to suppress inflammatory responses. The potential mechanism may be linked to quercetin in *Alismatis Rhizoma*, which has been proven to possess antioxidant and anti-inflammatory properties by modulating the p38MAPK/NF-κB signaling pathway, thereby reducing inflammatory factor levels and alleviating kidney damage ^[14]. Moreover, anthraquinone derivatives, such as emodin found in *Polygonum multiflorum*, also exhibit strong anti-inflammatory effects ^[15].

5. Conclusion

In conclusion, the application of Gui Fu Ling Wu Tang in patients with spleen-kidney yang deficiency-type DN

demonstrates significant therapeutic efficacy. It effectively controls blood glucose, improves kidney function, and reduces inflammatory responses.

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Disclosure statement

The authors declare no conflict of interest.

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Clinical Study on the Application of Non-Catheter Tampon in Abdominal Hysterectomy

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Abstract: *Objective:* To analyze the application value of a non-catheter tampon in abdominal hysterectomy, providing a reference for related research. *Methods:* A total of 100 patients were included in this study, with data collected between January 4, 2022, and January 4, 2024. The patients were divided into two groups: the new group and the traditional group, each comprising 50 patients. *Results:* Compared with the traditional group, the new group demonstrated significantly lower intraoperative blood loss ($P < 0.05$). Additionally, the incidence of complications, operation time, hospital stay, time required to resume normal activities, and postoperative VAS scores were all significantly lower in the new group ($P < 0.05$). *Conclusion:* The application of a non-catheter tampon during abdominal hysterectomy yields satisfactory results. This approach is worthy of further clinical promotion and application.

Keywords: Built-in non-catheter tampon; Abdominal hysterectomy; Application value

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1. Introduction

Abdominal hysterectomy is an effective method for treating various uterine diseases, with surgical safety and postoperative recovery being key areas of focus. In recent years, the built-in non-catheter tampon has emerged as a novel temporary hemostatic material for the vaginal stump during surgery. It features ease of operation and a significant hemostatic effect, garnering widespread attention. Compared to traditional hemostasis methods, the built-in non-catheter tampon eliminates the need for additional catheter devices, thereby reducing procedural complexity. This innovation may offer advantages such as minimizing intraoperative bleeding, shortening operation time, and facilitating postoperative recovery.

Despite its potential, the built-in non-catheter tampon has not been extensively adopted in abdominal

hysterectomy, and its efficacy and safety require validation through rigorous clinical research. Existing studies highlight the importance of enhanced intraoperative hemostasis techniques in reducing blood loss, decreasing the need for transfusions, lowering postoperative complications, and shortening hospital stays ^[1]. Furthermore, effective hemostasis can mitigate damage to surrounding tissues during surgery, thereby reducing the risk of postoperative infections and improving wound healing quality.

The purpose of this study is to evaluate the application of the built-in non-catheter tampon in abdominal hysterectomy. By comparing it with traditional hemostasis methods, this study aims to assess its advantages in blood loss control, operation time, postoperative complications, and patient recovery. The findings will provide clinicians with a more scientific and reasonable surgical hemostasis option, potentially optimizing surgical processes, enhancing safety, and improving postoperative recovery outcomes.

Through a comprehensive analysis of existing literature and clinical practice, this study seeks to offer new insights and empirical evidence for gynecological surgery. It aims to support the development and innovation of related medical technologies, ultimately contributing to better patient prognoses.

2. Materials and methods

2.1. General information

A total of 100 patients were included in this study, with data collected from January 4, 2022, to January 4, 2024. The patients were divided into two groups: the new group and the traditional group, each comprising 50 patients. The age range was set at 30–55 years to encompass the primary reproductive age of adult women and ensure the universality and representativeness of the research. Educational background was categorized into three levels: below high school, junior college, and undergraduate or above, reflecting diverse patient demographics.

Inclusion criteria: Diagnosed with a uterine lesion requiring abdominal hysterectomy; absence of serious cardiovascular diseases, diabetes, or other significant comorbidities; no history of allergies to tampon materials; and informed consent to participate in the study.

Exclusion criteria: Presence of severe underlying diseases; pregnancy or lactation; mental illness or cognitive impairment; and previous history of abdominal surgery.

2.2. Methods

2.2.1. Traditional group

Patients in the traditional group received standard hemostasis techniques during the operation. These included electrocoagulation, sutures, local compression, and the use of hemostatic drugs as required. The procedure involved making a midline abdominal incision to expose the uterus and surrounding tissues, followed by gradual uterine removal. Bleeding was controlled using electrocoagulation for smaller vessels, sutures for larger blood vessels, gauze compression at the bleeding sites, and hemostatic drugs as necessary.

2.2.2. New group

Patients in the new group were treated with the built-in non-catheter tampon for hemostasis during surgery.

- (1) Device specifications: O.B. Built-in Non-Catheter Tampon (manufactured by Johnson & Johnson, Germany, **Figure 1**).
- (2) Main materials: Viscose fiber (rayon), PP/PE perforated film, and PET cable.

- (3) Application method: Before surgery, the tampons were sterilized using ethylene oxide. During the operation, the tampon was unpacked, and its head end was soaked in Anerdian III skin disinfectant for 10–15 seconds prior to insertion. Once the uterus was detached, the vaginal stump, approximately 3–4 cm wide, was prepared. The tail end of the tampon was inserted into the vaginal stump, and the chuck end was clamped with middle-bending pliers. The tampon was rotated until completely inserted, and the vaginal stump was then closed. The tampon was removed either before the patient left the operating room or upon returning to the ward, depending on intraoperative bleeding and suturing conditions.



Figure 1. O.B. built-in non-catheter tampon (manufactured by Johnson & Johnson, Germany)

2.2.3. Postoperative care

Regardless of the hemostasis method used, vital signs—including blood pressure, heart rate, and blood oxygen saturation—were closely monitored. Postoperative pain management strategies were implemented as needed. Additionally, patient recovery was assessed by monitoring wound healing, mobility, and potential complications.

2.3. Observation indicators

- (1) Intraoperative blood loss: Total blood loss during surgery was recorded in milliliters, encompassing all bleeding from the beginning to the end of the operation.
- (2) Operation time: Total surgical duration, including the hemostasis process, was documented.
- (3) Incidence of postoperative complications: Complications such as infection, bleeding, and wound healing issues within 30 days postoperatively were monitored and recorded.
- (4) Patient recovery: Recovery metrics included length of hospitalization, time required to resume normal activities, and postoperative pain scores.

2.4. Statistical analysis

Data were analyzed using SPSS 19.0 statistical software. Measurement data were expressed as mean \pm standard deviation (SD), and the *t*-test was employed for comparisons. Categorical data were expressed as rates (%), and the χ^2 test was utilized. A value of $P < 0.05$ was considered statistically significant.

3. Results

3.1. Blood loss during operation

The comparison of intraoperative blood loss between the two groups is detailed in **Table 1**. The average blood loss in the new group was significantly lower than that in the traditional group ($P < 0.05$).

Table 1. Blood loss during operation

Group	Average bleeding volume (mL)
New group ($n = 50$)	181.25 ± 45.25
Traditional group ($n = 50$)	251.25 ± 60.36
t	5.261
P	< 0.05

3.2. Comparison of operation time

The average operation time for the new group was 90.25 ± 1.25 minutes, which was significantly shorter than the traditional group's 121.27 ± 2.26 minutes ($P < 0.05$).

3.3. Incidence of postoperative complications

The incidence of postoperative complications was notably lower in the new group (6.00%) compared to the traditional group (16.00%). Details of specific complications are as follows:

- (1) New group: 1 case of infection, 1 case of bleeding, and 1 case of wound healing issues.
- (2) Traditional group: 3 cases of infection, 2 cases of bleeding, and 3 cases of wound healing issues.

This significant reduction in complications in the new group is supported by statistical analysis ($P < 0.05$).

3.4. Recovery of patients

Table 2 outlines the comparison of recovery indicators between the two groups. The new group demonstrated shorter hospital stays, quicker resumption of normal activities, and lower postoperative pain scores compared to the traditional group, with all differences being statistically significant ($P < 0.05$).

Table 2. Recovery of patients

Group	Length of stay (days)	Time to resume normal activities (weeks)	Postoperative pain score (points)
New group ($n = 50$)	4.15 ± 0.25	3.29 ± 0.51	2.14 ± 0.14
Traditional group ($n = 50$)	6.32 ± 0.58	5.93 ± 0.58	4.22 ± 0.13
t	4.115	5.933	5.261
P	< 0.05	< 0.05	< 0.05

4. Discussion

4.1. Treatment requirements and hemostasis standards for patients undergoing abdominal hysterectomy

Abdominal hysterectomy is a standard surgical procedure for treating benign uterine conditions, such as uterine fibroids and adenomyosis, as well as certain malignant conditions. The primary objectives of this procedure are the thorough removal of diseased tissue, symptom relief, prevention of disease recurrence, and improvement in the patient's quality of life ^[2]. Effective bleeding control during the operation is critical to ensuring surgical success and influencing postoperative recovery. Hemostasis standards require the adoption of effective measures to minimize intraoperative bleeding, maintain a clear surgical field, and reduce the risk of complications. Traditional

methods, including electrocoagulation, sutures, and local compression, have been widely applied. However, these approaches have limitations; for instance, electrocoagulation may harm surrounding tissues, while suturing and compression can extend operation times.

The built-in non-catheter tampon, as a novel hemostatic material, has garnered attention for its simplicity and effectiveness ^[3]. This tampon achieves rapid bleeding control through physical absorption and compression, reducing intraoperative bleeding and simplifying procedures without requiring additional catheter devices. Research indicates that its use may also help reduce operation time, lower postoperative complication rates, and expedite patient recovery.

4.2. Hemostasis principle of built-in non-catheter tampon in abdominal hysterectomy

The effectiveness of the non-catheter tampon in abdominal hysterectomy is attributed to its unique physical properties and hemostatic mechanism. Typically composed of highly absorbent materials, this tampon expands rapidly upon contact with blood, forming a gel-like substance that effectively fills the vaginal stump and tissue gaps. This process ensures immediate and sustained hemostasis.

The tampon's absorbency allows it to retain blood volumes several times its own weight, which is crucial for controlling intraoperative bleeding. Upon expansion, it exerts physical pressure on bleeding points, significantly reducing blood loss. The gel barrier formed promotes coagulation and accelerates the hemostatic process ^[4]. Its design facilitates easy placement in the surgical area without requiring additional instruments, streamlining the procedure and reducing operation time.

Studies have demonstrated that the tampon significantly decreases intraoperative bleeding and improves surgical efficiency. Case analyses further highlight its effectiveness in managing complex bleeding scenarios, especially in situations where traditional methods face limitations.

4.3. Application effect of built-in non-catheter tampon in abdominal hysterectomy

The findings indicate that the use of the built-in non-catheter tampon offers significant advantages over traditional methods in reducing intraoperative blood loss, operation time, hospital stay, recovery time, and postoperative pain scores. Additionally, the incidence of complications in the new group was notably lower.

During surgery, the tampon's high absorbency and rapid expansion efficiently control bleeding, minimizing intraoperative blood loss ^[5]. Its straightforward application helps reduce operation time, while its effective hemostasis mitigates tissue damage, accelerates recovery, and lowers the risk of complications. The observed reduction in postoperative pain scores may result from minimized surgical trauma and inflammation.

Despite these promising results, further studies are warranted to evaluate the long-term effects and safety of the built-in non-catheter tampon. Future research should explore its biocompatibility, absorbability, and degradation processes, as well as its applicability across diverse patient groups, cost-effectiveness, and compatibility with other surgical techniques.

4.4. Points for attention in the application of built-in non-catheter tampons during abdominal hysterectomy

The use of built-in non-catheter tampons in abdominal hysterectomy requires careful consideration of indications, surgical techniques, intraoperative monitoring, prevention of complications, patient education, postoperative management, data recording, teamwork, and continuous training. Patients undergoing anticoagulant therapy, those

with coagulation dysfunction, or individuals with known allergies to tampon materials should be excluded from this treatment option. Proper surgical techniques are crucial to ensure that the tampon effectively contacts the bleeding point without causing tissue damage.

Continuous intraoperative monitoring is necessary to evaluate the tampon's hemostatic effect and make timely adjustments as needed. Aseptic protocols must be strictly followed to prevent infections, and care should be taken to ensure complete removal of the tampon to avoid inflammatory reactions^[6]. Patient education prior to surgery is essential to enhance understanding and cooperation, while postoperative monitoring of vital signs and pain levels can facilitate the timely management of complications.

Detailed documentation of tampon usage can aid in evaluating and refining the technique, while a multidisciplinary approach ensures optimal patient outcomes and safety. Regular training and education for surgical teams are vital for improving surgical outcomes and reducing risks. Furthermore, exploring the potential application of tampons in other surgical procedures through continued research is encouraged. These measures can maximize the advantages of non-catheter tampons, reduce risks, and improve the success rate of surgeries and patient satisfaction.

4.5. Significance and limitations of this study

This study evaluated the application of built-in non-catheter tampons in abdominal hysterectomy and compared their effectiveness with traditional hemostasis methods. The findings demonstrate the potential advantages of the tampon in reducing intraoperative bleeding, shortening hospital stays, accelerating recovery, and lowering postoperative pain and complications.

However, certain limitations must be acknowledged. The study was constrained by a limited sample size, a lack of long-term follow-up data, and the absence of a cost-benefit analysis. Expanding the sample size and conducting multicenter clinical trials are recommended to enhance the generalizability of the findings. Long-term follow-up studies are essential for a comprehensive evaluation of the tampon's safety and biocompatibility. Additionally, an economic evaluation could provide valuable insights into the tampon's cost-effectiveness and inform its broader clinical adoption.

5. Conclusion

In summary, for patients undergoing abdominal hysterectomy, the application of built-in non-catheter tampons has demonstrated satisfactory outcomes. This technique is highly promising and warrants further promotion and application in clinical settings.

Disclosure statement

The authors declare no conflict of interest.

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Analysis of the Effect of Optimizing the Emergency Care Process on Patients with Acute Upper Gastrointestinal Bleeding in the Emergency Department

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Abstract: *Objective:* To analyze the effect of optimizing the emergency nursing process on the nursing effect of patients with acute upper gastrointestinal bleeding (AUGB) in the emergency department. *Methods:* 100 cases (Group A) were randomly selected from AUGB patients who had undergone the routine emergency care process in the emergency department from January 2022 to December 2022, and 100 cases (Group B) were randomly selected from AUGB patients who had undergone the optimized emergency care process in the emergency department from January 2023 to December 2023. The nursing effects of the two groups were compared. *Results:* clinical indicators that include the emergency response time, time to open the infusion channel, time from diagnosis to specialty treatment, hospitalization time, resuscitation success rate, rebleeding rate, nursing satisfaction score, post-care SAS score, and SF-36 score in Group B were better than those in Group A ($P < 0.05$). *Conclusion:* Optimization of the emergency care process for AUGB patients in the emergency department can improve the efficiency and success rate of resuscitation, reduce the risk of rebleeding, improve the mood and quality of life of patients, and make the patients more satisfied with the nursing service.

Keywords: Optimization of emergency care; Emergency department; Acute upper gastrointestinal bleeding; Resuscitation efficiency; Nursing satisfaction

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1. Introduction

The main triggers of acute upper gastrointestinal bleeding (AUGB) are rupture of esophagogastric fundal varices, peptic ulcer, gastric cancer, acute gastric mucosal damage, and other factors leading to lesions and bleeding in the gastrointestinal tract above the flexural ligament. People with this disease have a high admission rate to the emergency department. If there is too much bleeding or if the bleeding is not stopped in time, the risk of death

of the patient will be significantly increased ^[1–2]. Further optimization of the emergency care process to shorten the response time, the time to open the infusion channel, and the time from diagnosis to specialist treatment can significantly improve the success rate of treatment and prognosis ^[3–4]. This study analyzes the impact of optimizing the emergency care process in the emergency department on AUGB patients, as described below.

2. Information and methods

2.1. General information

Group A consisted of 100 cases randomly selected from the AUGB patients in the emergency department who had undergone the routine emergency care process from January 2022 to December 2022, while Group B consisted of 100 cases randomly selected from the AUGB patients in the emergency department who had undergone the optimized emergency care process from January 2023 to December 2023. Group A consisted of 60 male and 40 female patients that have an age range of 32–73 years old, with a mean value of 52.68 ± 5.34 years old; a weight range of 45.32–87.56 kg, with a mean value of 65.34 ± 6.78 kg; and causative factors that include 16 cases of gastric cancer, 6 cases of acute gastric mucosal lesions, 46 cases of portal hypertensive bleeding 46 and 32 cases of peptic ulcer. Group B consisted of 56 male and 44 female patients that have an age range of 30–75 years old, with a mean value of 52.89 ± 5.52 years old; a weight range of 45.68–87.95 kg, with a mean value of 5.67 ± 6.56 kg; and causative factors that include 19 cases of gastric cancer, 7 cases of acute gastric mucosal lesions, 43 cases of portal hypertensive hemorrhage, and 31 cases of peptic ulcer. The comparison of the general information is $P > 0.05$.

Inclusion criteria: Patients with a confirmed diagnosis of AUGB and bleeding volume > 1000 mL, comprehensive understanding of the study content and consent to participate in the study, clinical data to meet the needs of the study, able to cooperate with the completion of all examinations and assessments and a high degree of cooperation.

Exclusion criteria: Patients with a confirmed diagnosis of lower respiratory tract hemorrhage, a bleeding volume that does not meet the standard of emergency care, abnormal coagulation function, cardiac insufficiency, and so on.

2.2. Methods

2.2.1. Group A

Group A is given routine emergency nursing as follows. Registration in the emergency department, triaging the patients, assisting patients to complete relevant examinations, assessing the condition and bleeding, paying fees, opening intravenous access, rehydration and expansion, improving anemia, triage treatment according to the examination results, and assisting family members to complete hospitalization procedures.

2.2.2. Group B

Group B is given optimized emergency nursing as follows. Establishing an emergency nursing team in the emergency department with team members working together to review relevant literature, analyze the emergency in this department, and optimize the nursing process for emergency AUGB patients. The team members were trained in a unified manner, and they were allowed to be on duty only after passing the examination. The patient's vital signs indicators were monitored to assess the patient's condition and feedback on the assessment results to the emergency physician promptly so that he or she could understand the patient's condition as soon as possible. The team leader coordinates and schedules the nursing care of emergency AUGB patients for the whole treatment procedure. The emergency nursing team would rapidly complete the construction of the intravenous access, fix

the catheter properly, observe the catheter condition carefully, and ensure that the catheter will not be folded or twisted. If the catheter is blocked, the nurse would immediately aspirate the blood clot with a syringe. The nurse would evaluate the patient's actual condition and administer balanced saline or plasma substitutes if needed. If the patient is vomiting large amounts of blood, negative pressure suction is immediately applied to avoid blood blockage of the mouth, nose, and airway and ensure that the patient's airway remains open. If the patient has gone into shock, the emergency physician is assisted in performing resuscitation work. Timely feedback is provided to the emergency physician on the patient's vital signs indicators and changes in clinical symptoms.

2.3. Indicator observations

- (1) Clinical indicators: Statistics on emergency response time, time to open infusion channel, time from diagnosis to specialized treatment, hospitalization time, resuscitation success rate, and re-bleeding rate were recorded.
- (2) Nursing satisfaction score: The hospital had created a scale to evaluate the patient's nursing satisfaction, with the highest score of 100 points for each item indicating that the patient is very satisfied with the service, and the lowest score of 0 points indicating that the patient is very dissatisfied with the service.
- (3) SAS score: The SAS scale evaluates the psychological state of patients, with the highest score of 4 points for each item suggesting that the patient has serious adverse emotions, and the lowest score of 0 points suggesting that the patient has no adverse emotions.
- (4) SF-36 score: The SF-36 scale evaluates the patients' quality of life, with the highest score of 100 for each item suggesting that the patient's quality of life is very high, and the lowest score of 0 suggesting that the patient's quality of life is very low.

2.4. Statistical analysis

SPSS 25.0 was utilized to process the data, with mean \pm standard deviation (mean \pm SD) and [n (%)] indicating the measurement and count data, respectively. The t -test and χ^2 test were performed, with $P < 0.05$ indicating statistically significant.

3. Results

3.1. Comparison of clinical indicators

Group B's emergency response time, time to open infusion channels, time from diagnosis to specialized treatment, hospitalization time, resuscitation success rate, and rebleeding rate were better than that of Group A ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of clinical indicators [n (%)]

Group	n	Emergency response time (min)	Opening time of infusion channels (min)	Time from diagnosis to specialized treatment (min)	Hospitalization time (d)	Resuscitation success rate (%)	Rebleeding rate (%)
Group B	100	15.53 \pm 2.18	5.18 \pm 1.24	22.48 \pm 2.97	8.16 \pm 1.67	98	3
Group A	100	25.38 \pm 3.25	8.53 \pm 1.42	30.15 \pm 3.56	10.26 \pm 2.18	91	10
t/χ^2	-	25.169	17.769	16.643	7.647	4.713	4.031
P	-	0.000	0.000	0.000	0.000	0.029	0.044

3.2. Comparison of nursing satisfaction scores

The comparison of nursing satisfaction scores between the two groups before nursing ($P > 0.05$) and after nursing indicates that group B has higher scores than group A ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of nursing satisfaction scores (mean \pm SD; points)

Group	<i>n</i>	Proactive services	Health promotion	Communication skills	Operating level	Emergency environment
Group B	100	89.39 \pm 4.34	89.52 \pm 4.37	89.26 \pm 3.41	89.37 \pm 3.52	89.43 \pm 3.61
Group A	100	82.29 \pm 3.34	82.84 \pm 3.62	83.27 \pm 3.15	83.24 \pm 3.09	83.32 \pm 3.11
<i>t</i>	-	12.964	11.771	12.903	13.087	12.822
<i>P</i>	-	0.000	0.000	0.000	0.000	0.000

3.3. Comparison of SAS scores

The comparison of SAS scores between the two groups before nursing care ($P > 0.05$) and after nursing care indicates that group B has lower scores than group A ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of SAS scores before and after nursing (mean \pm SD; points)

Group	<i>n</i>	Anxiety		Fear		Foreboding		Panic		Sleep disorders	
		Before	After	Before	After	Before	After	Before	After	Before	After
Group B	100	3.13 \pm 0.37	0.89 \pm 0.45*	3.18 \pm 0.32	0.86 \pm 0.26*	3.14 \pm 0.42	0.83 \pm 0.21*	3.12 \pm 0.61	0.87 \pm 0.42*	3.15 \pm 0.34	0.82 \pm 0.23*
Group A	100	3.14 \pm 0.33	1.45 \pm 0.42*	3.16 \pm 0.35	1.22 \pm 0.56*	3.12 \pm 0.45	1.28 \pm 0.54*	3.16 \pm 0.59	1.44 \pm 0.39*	3.19 \pm 0.33	1.25 \pm 0.52*
<i>t</i>	-	0.201	9.097	0.421	5.830	0.324	7.766	0.471	9.945	0.844	7.562
<i>P</i>	-	0.840	0.000	0.673	0.000	0.745	0.000	0.637	0.000	0.399	0.000

Comparison with the group before care * $P < 0.05$.

3.4. Comparison of SF-36 scores

The comparison of SF-36 scores between the two groups before nursing care ($P > 0.05$) and after nursing care indicates that group B has a higher score than group A ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of SF-36 scores [mean \pm SD (points)]

Group	<i>n</i>	Somatic functioning		Social functioning		Physiological functioning		Psychological functioning		Mental health	
		Before	After	Before	After	Before	After	Before	After	Before	After
Group B	100	68.32 \pm 3.65	83.23 \pm 3.47*	68.26 \pm 3.51	84.79 \pm 5.23*	67.54 \pm 8.13	84.62 \pm 4.23*	67.41 \pm 8.06	83.39 \pm 3.46*	68.18 \pm 3.41	83.71 \pm 3.56*
Group A	100	68.13 \pm 3.42	79.26 \pm 3.25*	68.37 \pm 3.23	79.37 \pm 3.22*	67.69 \pm 8.16	79.23 \pm 3.86*	67.78 \pm 8.24	79.72 \pm 3.54*	68.65 \pm 3.46	79.53 \pm 3.67*
<i>t</i>	-	0.379	8.350	0.230	8.824	0.130	9.412	0.320	7.414	0.967	8.175
<i>P</i>	-	0.704	0.000	0.817	0.000	0.896	0.000	0.748	0.000	0.334	0.000

Comparison with the group before care * $P < 0.05$.

4. Discussion

AUGB patients are characterized by complex and variable conditions, rapid progression, and high mortality, so it is difficult to accurately determine the bleeding site promptly. Once the critical treatment time window is missed, the patient's life will be endangered as the bleeding worsens ^[5,6]. Therefore, timely diagnosis of the cause of the patient's disease and the adoption of effective symptomatic treatment measures are key to improving the success rate of resuscitation and prognosis ^[7]. The past conventional emergency care process adopted in the emergency department was ineffective in controlling the timing of resuscitation, which led to unsatisfactory results for patients with AUGB in emergency care ^[8,9]. The emergency nursing process is the basis for the emergency department to guide the emergency rescue nursing work. Through the optimization of the emergency nursing process, the division of labor and responsibilities of each emergency department nursing staff are clarified, so that they can better cooperate with the work of the emergency department doctors and reasonably shorten the response time, to strive for more time for the patient's rescue, thus improving the success rate and prognosis of the resuscitation ^[10-12].

The advantages of optimizing the emergency care process in the emergency department for AUGB patients include the following. After the admission of patients to the hospital, the emergency department medical and nursing staff use the shortest time to assess their condition, determine the main points of the resuscitation work, and quickly develop a targeted resuscitation process for them. Unified training for emergency department medical and nursing staff can improve the standardization of emergency care and avoid reducing the quality and efficiency of emergency department resuscitation work due to the shortage of skilled medical and nursing staff. After optimization, the head of the emergency department coordinates and directs the work of resuscitation of AUGB patients to ensure that each healthcare worker carries out the resuscitation work in strict accordance with his or her duties while avoiding mistakes in the process of resuscitation of AUGB patients as much as possible, to improve the safety of the resuscitation work. Experienced nurses participate in the whole nursing process of AUGB patients to ensure timely and comprehensive implementation of each nursing measure and provide timely feedback to emergency physicians on the patient's condition changes so that the physicians can perform the rescue work on time.

The results of this paper indicate that the clinical indexes, nursing satisfaction score, post-care SAS score, and SF-36 score of Group B were better than those of Group A ($P < 0.05$), confirming that the optimization of the emergency nursing process for AUGB patients in the emergency department can improve the efficiency and quality of the resuscitation, reduce the re-bleeding rate, and improve the mood and quality of life of the patients. The key to optimizing the emergency nursing process in this study is to improve the timeliness of resuscitation by analyzing and summarizing the problems encountered in the previous work of the department in resuscitating AUGB patients and the risk factors that led to the delay in resuscitation. The nursing team would then optimize the emergency nursing measures, assess the patient's condition, and rapidly open the infusion pathway to ensure that the patients received timely and effective treatment, thus improving the resuscitation success rate. Nursing staff should take the initiative to conduct effective nursing measures and preventive rescue programs to better control the patient's condition and improve the effect of resuscitation. The optimization of the emergency nursing process improves the rationality of the allocation of medical resources in the emergency department and also improves the degree of cooperation between nursing staff and emergency physicians, thus avoiding delays in resuscitation time due to miscommunication. Preparation work should also be performed before resuscitation, by soothing the emotions and improving the mood of the patients, so that the quality of life and cooperation of the patients can be improved. A cooperating patient in a good mood can improve the quality of resuscitation and reduce the rate of re-bleeding, thus improving the overall nursing care quality.

In conclusion, optimization of the emergency nursing process for AUGB patients in the emergency department can improve the efficiency and success rate of resuscitation, reduce the risk of rebleeding, improve the mood and quality of life, and make the patients more satisfied with the nursing service.

Disclosure statement

The authors declare no conflict of interest.

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Clinical Observation of Huangqi Sijun Decoction in the Treatment of Chronic Atrophic Gastritis

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Abstract: *Objective:* To evaluate the therapeutic effects of Huangqi Sijun Decoction on chronic atrophic gastritis (CAG). *Methods:* Sixty CAG patients hospitalized between January 2020 and December 2022 were selected and randomly divided into two groups using a random number table. The Traditional Chinese Medicine (TCM) group ($n = 30$) was treated with Huangqi Sijun Decoction, while the Western medicine group ($n = 30$) received omeprazole. The total effective rate, TCM syndrome scores, and serological indicators were compared. *Results:* The total effective rate in the TCM group was higher than that in the Western medicine group, while the adverse reaction rate was lower ($P < 0.05$). Before treatment, there were no significant differences in TCM syndrome scores or serological indicators between the two groups ($P > 0.05$). After treatment, the TCM group had lower TCM syndrome scores and better serological indicators compared to the Western medicine group ($P < 0.05$). *Conclusion:* Huangqi Sijun Decoction can enhance the clinical efficacy of CAG patients, prevent adverse reactions, alleviate TCM symptoms, and regulate specific levels of serological indicators, demonstrating significant therapeutic advantages.

Keywords: Huangqi Sijun Decoction; Chronic atrophic gastritis; TCM syndrome scores; Serological indicators

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1. Introduction

Chronic atrophic gastritis (CAG) is a slowly progressing digestive disease characterized by symptoms such as abdominal distension, abdominal pain, acid reflux, and belching. It is often accompanied by anemia and indigestion and increases the risk of gastric ulcers and gastric cancer^[1]. Conventional treatment typically involves oral Western medications such as omeprazole, aiming to eliminate pathogenic bacteria and stabilize the patient's condition. However, Western medications often have numerous side effects and suboptimal overall efficacy.

According to traditional Chinese medicine (TCM), CAG falls under the category of "Weipi" (stomach oppression) and is caused by liver Qi stagnation. Treatment requires detoxification, spleen awakening, and

turbidity transformation. Huangqi Sijun Decoction is the preferred prescription due to its therapeutic effects of Qi tonification, spleen strengthening, and blood replenishment ^[2]. Based on this understanding, this study selected 60 CAG patients to evaluate the therapeutic efficacy of Huangqi Sijun Decoction.

2. Materials and methods

2.1. General information

Sixty patients with CAG admitted between January 2020 and December 2022 were enrolled. Patients were randomly assigned into two groups using a random number table. The TCM group ($n = 30$) comprised 17 male and 13 female patients, aged 33–68 years, with a mean age of 52.13 ± 4.38 years and a disease course of 2–9 years (mean: 5.21 ± 0.79 years). The Western medicine group ($n = 30$) comprised 18 male and 12 female patients, aged 40–69 years, with a mean age of 51.22 ± 4.39 years and a disease course of 1–9 years (mean: 5.32 ± 0.74 years). No significant differences were observed in baseline characteristics between the two groups ($P > 0.05$).

Inclusion criteria: Endoscopic findings showing red and white gastric mucosa with a granular appearance and flat folds, confirmed as CAG; presence of typical symptoms such as abdominal distension and abdominal pain; complete clinical data; informed consent to participate in the study.

Exclusion criteria: Patients with heart, liver, or kidney dysfunction; those with malignant tumors; coagulation disorders; mental disorders; or a history of gastrointestinal surgery.

2.2. Methods

- (1) TCM group: Patients were treated with Huangqi Sijun Decoction, comprising the following ingredients: *Astragalus membranaceus* (30 g), *Poria* (10 g), *Pseudostellaria heterophylla* (30 g), *Pinellia ternata* (10 g), dandelion (30 g), stir-fried *Atractylodes* (15 g), *Oldenlandia diffusa* (30 g), cinnamon twig (10 g), *Agrimonia pilosa* (30 g), *Amomum villosum* (added later, 10 g), and *Aucklandia lappa* Decne (10 g). The herbs were decocted in water to yield 100 mL of herbal extract. Patients took one dose daily, divided into three oral administrations, for 14 consecutive days.
- (2) Western medicine group: Patients were treated with omeprazole enteric-coated capsules at a dose of 20mg twice daily (morning and evening) for 14 consecutive days.

2.3. Observation indicators

- (1) Adverse reactions: Including dizziness, gastrointestinal reactions, nausea, and rash.
- (2) TCM syndrome scores: Evaluating symptoms such as abdominal distension, abdominal pain, acid reflux, belching, and nausea with poor appetite. Each symptom was scored on a scale of 0–3, with higher scores indicating more severe symptoms.
- (3) Serological indicators: Before and after 14 days of treatment, 5 mL of venous blood was collected. After coagulation, the blood was centrifuged at 1,000 rpm with a radius of 10 cm for 10 minutes. The supernatant was analyzed using an automated enzyme-linked immunosorbent assay (ELISA) system to measure interleukin-6 (IL-6), serum gastrin-17 (G-17), and pepsinogen I (PG I).

2.4. Criteria for efficacy evaluation

- (1) Significant efficacy: A reduction of $\geq 70\%$ in TCM syndrome scores and $\geq 75\%$ in gastric mucosal lesions.

(2) Moderate efficacy: A reduction of 30–70% in TCM syndrome scores and 50–75% in gastric mucosal lesions.

(3) No efficacy: A reduction of < 30% in TCM syndrome scores and < 50% in gastric mucosal lesions.

2.5. Statistical analysis

Data were analyzed using SPSS 28.0 software. Measurement data were expressed as mean \pm standard deviation (SD) and compared using *t*-tests, while count data were expressed as [*n* (%)] and compared using χ^2 tests. Statistical significance was set at $P < 0.05$.

3. Results

3.1. Comparison of overall efficacy rates between groups

Table 1 shows that the overall efficacy rate of the TCM group was significantly higher than that of the Western medicine group ($P < 0.05$).

Table 1. Comparison of overall efficacy rates between groups [*n* (%)]

Group	n	Significant efficacy	Moderate efficacy	No efficacy	Total efficacy rate
TCM group	30	18 (60.00)	11 (36.67)	1 (3.33)	29 (96.67)
Western medicine group	30	13 (43.33)	10 (33.33)	7 (23.33)	23 (76.67)
χ^2	-	-	-	-	5.192
<i>P</i>	-	-	-	-	0.023

3.2. Comparison of adverse reaction rates between groups

Table 2 shows that the adverse reaction rate of the TCM group was significantly lower than that of the Western medicine group ($P < 0.05$).

Table 2. Comparison of adverse reaction rates between groups [*n* (%)]

Group	n	Dizziness	Gastrointestinal reaction	Nausea	Rash	Adverse reaction rate
TCM group	30	1 (3.33)	1 (3.33)	1 (3.33)	0 (0.00)	3 (10.00)
Western medicine group	30	2 (6.67)	3 (10.00)	4 (13.33)	1 (3.33)	10 (33.33)
χ^2	-	-	-	-	-	4.812
<i>P</i>	-	-	-	-	-	0.028

3.3. Comparison of TCM syndrome scores between groups

Before treatment, no significant difference was observed in TCM syndrome scores between the two groups ($P > 0.05$). After treatment, the TCM group showed significantly lower scores compared to the Western medicine group ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of TCM syndrome scores between groups before and after treatment (mean \pm SD, points)

Group	<i>n</i>	Abdominal distension and pain		Acid reflux and belching		Nausea and poor appetite	
		Before	After	Before	After	Before	After
TCM group	30	2.13 \pm 0.43	0.51 \pm 0.13	2.21 \pm 0.49	0.46 \pm 0.10	2.20 \pm 0.37	0.44 \pm 0.09
Western medicine group	30	2.15 \pm 0.41	0.95 \pm 0.21	2.24 \pm 0.44	0.79 \pm 0.17	2.24 \pm 0.33	0.69 \pm 0.15
<i>t</i>	-	0.184	9.758	0.250	9.164	0.442	7.828
<i>P</i>	-	0.854	0.000	0.804	0.000	0.660	0.000

3.4. Comparison of serological indicators between groups

Before treatment, no significant differences in serological indicators were observed between the two groups ($P > 0.05$). After treatment, the TCM group showed significantly better improvements in serological indicators compared to the Western medicine group ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of serological indicators between groups before and after treatment (mean \pm SD)

Group	<i>n</i>	IL-6 (ng/L)		G-17 (ng/L)		PGI (μ g/L)	
		Before	After	Before	After	Before	After
TCM group	30	84.98 \pm 8.12	43.22 \pm 4.62	38.77 \pm 4.91	58.66 \pm 6.34	58.33 \pm 5.80	98.26 \pm 9.46
Western medicine group	30	84.76 \pm 8.19	49.72 \pm 4.69	38.90 \pm 4.86	52.43 \pm 6.25	57.91 \pm 5.93	87.12 \pm 9.35
<i>t</i>	-	0.104	5.408	0.103	3.833	0.277	4.587
<i>P</i>	-	0.917	0.000	0.918	0.000	0.783	0.000

4. Discussion

The common cause of chronic atrophic gastritis (CAG) is *Helicobacter pylori* infection, and Western medicine often uses treatments to eradicate such pathogens, alleviate gastric mucosal inflammation, repair damaged gastric mucosa, inhibit the progression of intestinal epithelial proliferation, and ultimately improve disease prognosis^[3]. Omeprazole, a commonly used Western drug for CAG, is a proton pump inhibitor (PPI) that reduces gastric acid secretion and lowers the pH within the stomach, thereby alleviating symptoms. Additionally, omeprazole has broad-spectrum antibacterial properties, providing stable therapeutic effects^[4]. However, omeprazole alone is limited in its ability to improve gastric mucosal lesions and is associated with a higher incidence of adverse reactions. Therefore, it can be combined with traditional Chinese medicine (TCM) therapies.

In TCM, CAG falls under the categories of “Weipi” (stomach oppression) and “Weiwantong” (epigastric pain). Its causes are attributed to emotional disturbances, improper diet, and external pathogenic factors. The underlying pathology involves spleen and stomach deficiency, as well as liver-stomach disharmony, requiring treatment principles such as soothing the liver, harmonizing the stomach, strengthening the spleen, and replenishing vital energy. Huangqi Sijun Decoction is an optimized version of the traditional Sijunzi Decoction and is commonly used for conditions involving spleen and stomach qi deficiency. It enhances energy and yang, thereby improving the patient’s condition^[5].

The results of this study show that the overall efficacy rate of the TCM group was significantly higher than that of the Western medicine group ($P < 0.05$), consistent with the findings of Zhang *et al.*^[6]. The adverse reaction

rate in the TCM group was lower than in the Western medicine group, and the TCM syndrome scores in the TCM group were also lower ($P < 0.05$). This can be attributed to the fact that Huangqi Sijun Decoction, being a pure TCM formula, contains low-toxicity herbal ingredients that are less likely to cause side effects such as nausea or dizziness, offering strong therapeutic safety.

Key components of the formula include:

- (1) *Astragalus membranaceus*: Enhances surface resistance and replenishes qi.
- (2) *Agrimonia pilosa*: Aids in hemostasis, alleviates qi deficiency, and improves symptoms.
- (3) *Pseudostellaria heterophylla*: Promotes fluid production and replenishes qi.
- (4) *Aucklandia lappa* Decne: Strengthens the spleen, aids digestion, relieves pain, and promotes qi circulation.

When used together, these ingredients synergistically enhance qi, promote blood circulation, strengthen the spleen, and detoxify, thereby improving efficacy and alleviating disease symptoms.

After treatment, IL-6 levels in the TCM group were lower than in the Western medicine group, while G-17 and PG I levels were higher ($P < 0.05$). These findings suggest that Huangqi Sijun Decoction can reduce inflammatory responses and inhibit disease progression.

- (1) IL-6: An inflammatory factor that regulates immune responses and reflects the degree of infection ^[7].
- (2) G-17: Useful for early screening of gastric cancer risk and assessing the endocrine status of the gastric antrum. A decrease in G-17 levels indicates atrophic lesions in the gastric mucosa, while an increase suggests significant mucosal proliferation ^[8].
- (3) PG I: A sensitive indicator for evaluating gastric inflammation, mucosal atrophy, and precancerous lesions, as well as overall gastric function.

Treatment with Huangqi Sijun Decoction significantly improved these indicators, due to its anti-inflammatory mechanisms that suppress gastric inflammation, prevent further tissue damage, and protect gastric function ^[9,10].

5. Conclusion

In conclusion, Huangqi Sijun Decoction significantly improves the overall efficacy rate in CAG patients, reduces adverse reactions, alleviates disease symptoms, and inhibits disease progression, leading to better clinical outcomes.

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Study on the Effect of Percutaneous Pedicle Screw Minimally Invasive Surgery in the Treatment of Spinal Fractures and Its Impact on Spinal Function

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Abstract: *Objective:* To observe and study the actual effects of percutaneous pedicle screw minimally invasive surgery in the treatment of spinal fractures and its impact on spinal function. *Methods:* This study included 48 patients with spinal fractures admitted between May 2023 and May 2024. The patients were divided into a control group and an experimental group based on treatment differences, with 24 patients in each group. The control group underwent open internal fixation surgery, while the experimental group received percutaneous pedicle screw minimally invasive surgery. Clinical index improvements, cervical dysfunction index, Japanese Orthopaedic Association scores, and pain level improvements were compared between the two groups. *Results:* The intraoperative blood loss, incision length, operation time, and hospitalization duration in the experimental group were (88.63 ± 18.85) , (6.32 ± 1.05) , (73.42 ± 4.05) , and (12.58 ± 2.56) , respectively, compared to (279.95 ± 17.32) , (12.89 ± 1.36) , (89.93 ± 4.79) , and (22.41 ± 2.87) in the control group. Significant differences were observed between the groups, with the experimental group showing superior improvements across all metrics ($P < 0.05$). *Conclusion:* Percutaneous pedicle screw minimally invasive surgery shows more significant effects in treating spinal fractures, particularly in improving cervical and lumbar spine function, enhancing treatment efficacy and safety, reducing pain levels, and shortening recovery time. Clinical application and promotion are recommended.

Keywords: Percutaneous pedicle screw minimally invasive surgery; Spinal fractures; Spinal function

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1. Introduction

Spinal fractures are often caused by external forces, with thoracolumbar fractures being more prevalent. Patients may experience severe pain and deformities, potentially accompanied by spinal cord injury. The spine plays a

crucial role in protecting internal organs, maintaining balance, and supporting body weight, serving as a key structural pillar of the body ^[1,2]. Severe spinal injuries can lead to paraplegia. Clinical treatments include surgical and conservative approaches, involving fixation, traction, and reduction procedures. The primary goal is to restore spinal mobility, reduce kyphotic deformity, and maintain spinal height and curvature.

With advancements in medical technology, the advantages of minimally invasive techniques have become increasingly evident. Percutaneous pedicle screw minimally invasive surgery requires smaller incisions, results in less intraoperative bleeding, and allows for shorter recovery times. It involves puncturing through the pedicle to fix the fractured vertebra and promote gradual restoration of vertebral height ^[3,4]. This approach significantly enhances the strength of the affected vertebrae, prevents collapse, and alleviates pain.

This study compares open internal fixation surgery (control group) and percutaneous pedicle screw minimally invasive surgery (experimental group), analyzing improvements in clinical indicators, cervical dysfunction index, JOA scores, and pain levels.

2. Materials and methods

2.1. General information

This study included 48 patients with spinal fractures admitted between May 2023 and May 2024. Based on differences in treatment plans, patients were divided into a control group and an experimental group, with 24 patients in each group. In the control group, there were 15 males and 9 females, aged 26–64 years, with an average age of (43.28 ± 3.89) years. In the experimental group, there were 16 males and 8 females, aged 27–64 years, with an average age of (43.19 ± 3.24) years. Baseline data between the two groups showed no significant differences, making them comparable ($P > 0.05$).

Inclusion criteria: Patients diagnosed with spinal fractures; clear consciousness without osteoporosis; complete medical records; high cooperation from patients and their families.

Exclusion criteria: Patients with old fractures; allergy to anesthetics; not meeting surgical indications; patients with neurological dysfunction or unclear consciousness; coagulation system disorders; comorbid organ diseases; uncooperative patients or those who withdrew midway from the study.

2.2. Methods

The control group underwent open internal fixation surgery: Patients were placed in the prone position, intubated, and monitored for vital sign changes. Soft pads were placed under the chest and hips, and the injured site was determined using X-rays. The surgical incision was made in the midline posterior to the spine, centered on the damaged vertebra. Subcutaneous tissues were incised and separated to expose the spinal injury. Pedicle screws were inserted bilaterally at the injury site, and fixation was completed using connecting rods. Drainage tubes were placed as needed.

The experimental group underwent percutaneous pedicle screw minimally invasive surgery: Patients were placed in the prone position, intubated, and under general anesthesia with vital sign monitoring. Soft pads were placed under the chest and hips, and the injured spine was marked for incision. The lesion was punctured at the damaged vertebra using C-arm fluoroscopy guidance. A guidewire was inserted to reach the anterior third of the vertebra, and pedicle screws were inserted into the pedicle channels. Screws and rods were placed and secured using the C-arm for guidance. The incision was sutured after confirming fixation and reduction.

2.3. Observation indicators

- (1) Comparison of clinical improvement indicators: Intraoperative blood loss, incision length, operation time, and hospitalization duration ^[5].
- (2) Comparison of cervical dysfunction index, JOA scores, and pain improvement: The Neck Disability Index (NDI) was used to evaluate cervical dysfunction, covering aspects like pain intensity, concentration, sleep quality, lifting, and recreational activities. Scores range from 0–50, with higher scores indicating worse improvement ^[6]. The Japanese Orthopaedic Association (JOA) score was used to assess dysfunction in sensation, motor function, and bladder function, with scores ranging from 0–29, where higher scores indicate more severe dysfunction. Pain improvement was evaluated using the Visual Analog Scale (VAS), with scores ranging from 0–10, where lower scores indicate better pain improvement.

2.4. Statistical analysis

Data were processed using SPSS 26.0 software. Measurement data were expressed as mean \pm standard deviation (SD) and analyzed using *t*-tests. Categorical data were expressed as [*n* (%)] and analyzed using the χ^2 test. Statistical significance was set at $P < 0.05$.

3. Results

3.1. Comparison of clinical improvement indicators between the two groups

In the experimental group, intraoperative blood loss, incision length, operation time, and hospitalization duration were (88.63 \pm 18.85) mL, (6.32 \pm 1.05) cm, (73.42 \pm 4.05) minutes, and (12.58 \pm 2.56) days, respectively. In the control group, these values were (279.95 \pm 17.32) mL, (12.89 \pm 1.36) cm, (89.93 \pm 4.79) minutes, and (22.41 \pm 2.87) days, respectively. There were significant differences between the two groups, with the experimental group showing significantly better improvement in all indicators ($P < 0.05$). See **Table 1** for details.

Table 1. Comparison of clinical improvement indicators between the control and experimental groups (mean \pm SD)

Group	<i>n</i>	Intraoperative blood loss (mL)	Incision length (cm)	Operation time (min)	Hospitalization duration (days)
Experimental	24	88.63 \pm 18.85	6.32 \pm 1.05	73.42 \pm 4.05	12.58 \pm 2.56
Control	24	279.95 \pm 17.32	12.89 \pm 1.36	89.93 \pm 4.79	22.41 \pm 2.87
<i>t</i>	-	35.614	18.733	12.894	12.522
<i>P</i>	-	0.000	0.000	0.000	0.000

3.2. Comparison of cervical dysfunction index, JOA scores, and pain improvement between the two groups

After treatment, the scores for cervical dysfunction index, JOA scores, and pain improvement in the experimental group were (5.82 \pm 1.88), (7.52 \pm 4.01), and (1.25 \pm 0.86), respectively. In the control group, these scores were (14.77 \pm 1.96), (15.64 \pm 4.38), and (4.08 \pm 0.73), respectively. Significant differences were observed between the two groups, with the experimental group showing superior improvement in all indicators ($P < 0.05$). See **Table 2** for details.

Table 2. Comparison of cervical dysfunction index, JOA scores, and pain scores between the control and experimental groups before and after treatment (mean \pm SD)

Group	Cervical dysfunction index		JOA scores		Pain scores	
	Before	After	Before	After	Before	After
Experimental ($n = 24$)	32.58 \pm 2.05	5.82 \pm 1.88	23.71 \pm 3.08	7.52 \pm 4.01	6.02 \pm 2.63	1.25 \pm 0.86
Control ($n = 24$)	32.14 \pm 2.36	14.77 \pm 1.96	23.28 \pm 3.26	15.64 \pm 4.38	6.38 \pm 2.77	4.08 \pm 0.73
<i>t</i>	0.690	16.144	0.470	6.699	0.462	12.290
<i>P</i>	0.494	0.000	0.641	0.000	0.647	0.000

4. Discussion

For spinal patients, most experience varying degrees of neurological and organ injuries, which may be caused by external or violent factors. If treatment is not timely, it can lead to spinal deformities, significantly affecting the patient's quality of life [7-9]. Utilizing internal fixation as a treatment method can ensure spinal stability. However, performing open internal fixation surgery on patients can cause traction on the tissues surrounding the fracture. The surgery involves making large incisions and further dissecting the fracture tissues, which directly impacts muscle function. Although this method has more apparent effects and can ensure spinal stability and corrective fixation [10], it results in greater trauma to the patient's body, involves relatively complex procedures, and may lead to scarring, fibrotic edema, nerve root injury, and necrosis. These complications can directly affect postoperative recovery and result in multiple adverse sequelae.

The results of this study show that after treatment, the experimental group had cervical dysfunction index, JOA scores, and pain improvement scores of (5.82 \pm 1.88), (7.52 \pm 4.01), and (1.25 \pm 0.86), respectively, compared to the control group, which had scores of (14.77 \pm 1.96), (15.64 \pm 4.38), and (4.08 \pm 0.73), respectively. There were significant differences between the groups, with the experimental group demonstrating significantly better improvements in all indicators compared to the control group ($P < 0.05$). This indicates that while open internal fixation is a common surgical method that can reposition the vertebrae and increase vertebral height, it causes significant trauma, large wound areas prone to infection, longer postoperative recovery times, and severe pain.

With the continuous development of clinical minimally invasive techniques, the application of minimally invasive surgery in spinal fracture treatment has effectively reduced trauma to the body. Minimally invasive spinal surgery is a relatively common surgical method that involves selecting the pedicle site for puncture, and injecting fillers into the compressed vertebra to restore its height and strength, thereby avoiding vertebral collapse, significantly improving treatment safety, and markedly reducing pain symptoms [11,12]. During pedicle screw fixation, it is ensured that the screws penetrate deeply into the muscle layers. Using fluoroscopic guidance, the percutaneous minimally invasive incision allows precise identification of the fracture site for accurate operation. Assisted by a C-arm machine, damage to surrounding soft tissues is minimized, operation time is significantly shortened, blood loss is reduced, and visibility is enhanced, effectively addressing the drawbacks of open internal fixation surgery. This surgical method not only causes less trauma but also features smaller incisions, protects the patient's lumbar and back functions, ensures the actual stability of the paraspinal muscle and ligament complexes, and effectively avoids multiple postoperative adverse reactions.

5. Conclusion

In summary, in the clinical surgical treatment of spinal fracture patients, percutaneous pedicle screw minimally invasive surgery demonstrates significantly better effects. Its primary benefits include the obvious improvement of cervical and lumbar spine functions, enhanced treatment efficacy and safety, reduced pain levels, and shortened recovery time. Clinical application and promotion of this method are recommended.

Disclosure statement

The authors declare no conflict of interest.

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Study on the Clinical Effects of Neurology Nursing in the Rehabilitation Process of Stroke Patients

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Abstract: *Objective:* To explore the clinical effects of neurology nursing during the rehabilitation process of stroke patients. *Methods:* A total of 80 inpatients with stroke, admitted between July 2023 and July 2024, were selected for the study. They were randomly divided into two groups of 40 patients each. The control group received conventional nursing care, while the study group was provided with neurology nursing. The nursing outcomes of the two groups were compared in terms of: (1) rehabilitation progress, (2) nursing satisfaction, (3) psychological status, and (4) self-care ability. *Results:* The nursing efficacy and satisfaction rates in the study group were significantly higher than those in the control group ($P < 0.05$). Pre-intervention psychological scores showed no significant differences between the two groups ($P > 0.05$). Post-intervention, negative emotions in both groups were alleviated, with the study group showing greater improvement compared to the control group ($P < 0.05$). Additionally, the self-care ability scores of the study group were significantly higher than those of the control group ($P < 0.05$). *Conclusion:* Neurology nursing during the rehabilitation process of stroke patients demonstrated ideal clinical effects, positively contributing to patient recovery, alleviating negative psychological states, and proving beneficial for promotion.

Keywords: Neurology nursing; Stroke; Rehabilitation

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1. Introduction

Stroke, also known as ischemic cerebrovascular accident, is a type of cerebrovascular circulation disorder characterized by ischemic necrosis and softening of localized tissues due to ischemia and hypoxia. Clinically, it manifests as hemiplegia, aphasia, and sensory disturbances, and in severe cases, it can be life-threatening^[1]. In recent years, stroke

has emerged as a major disease threatening human health, characterized by high recurrence, high disability, and high mortality rates, as well as numerous complications. Even with effective treatment, residual sequelae often affect the patient's quality of life. Therefore, clinical management during the treatment stage should focus on improving neurological deficits and actively implementing nursing interventions to accelerate the recovery process.

Clinical studies have found that neurology nursing, with its emphasis on psychological therapies, can alleviate patients' negative emotions, help build treatment confidence, and foster a positive mindset for treatment cooperation^[2,3]. Additionally, daily life guidance and interventions, such as dietary and exercise management, play a crucial role in promoting recovery during the rehabilitation of stroke patients. This study included 80 stroke patients treated at the Affiliated Hospital of Hebei University in recent years to evaluate the clinical application and effects of neurology nursing.

2. Materials and methods

2.1. General information

A retrospective analysis was conducted on 80 stroke patients admitted to our department between July 2023 and July 2024. The patients were randomly divided into two groups using a random number table: a control group of 40 patients (24 males and 16 females, aged 49–73 years, with an average age of 58.65 ± 5.08 years) and a study group of 40 patients (14 males and 26 females, aged 48–73 years, with an average age of 58.33 ± 5.06 years). Disease severity in the control group included 8 mild cases, 22 moderate cases, and 10 severe cases, while the study group had 7 mild cases, 24 moderate cases, and 9 severe cases. There were no statistically significant differences between the two groups in terms of gender, age, or disease severity ($P > 0.05$), making them comparable for study purposes. The study was approved by the hospital ethics committee.

Inclusion criteria: Patients were included if they met the diagnostic criteria for stroke through cranial CT and other examinations, were first-time stroke patients, had stable vital signs, and provided informed consent along with their families.

Exclusion criteria: Patients were excluded if they had malignant tumors, functional abnormalities in major organs (heart, liver, kidneys), severe psychiatric disorders, cranial trauma, incomplete or inaccurate clinical data, or withdrew from the study midway.

2.2. Methods

2.2.1. Control group

The control group received conventional nursing interventions, including guidance on medication as per doctor's orders, monitoring recovery, advising on daily habits, closely observing the progression of the disease, and reporting any changes to the physician promptly.

2.2.2. Study group

In addition to conventional care, the study group received neurology nursing interventions, including:

- (1) **Psychological rehabilitation intervention:** Given the sudden onset of stroke, which significantly disrupts patients' daily lives and causes fear and anxiety, nursing staff guided patients to understand the pathogenesis of stroke, communicated effectively with them, and provided psychological counseling to reduce mental stress. Patients were encouraged to actively cooperate with clinical treatments^[4].

- (2) Rehabilitation training: Stroke-induced vascular blockage or rupture often compresses nerves, causing motor impairments. Following medication, nurses provided individualized guidance for effective motor recovery exercises, such as joint and limb activity training after stabilization, as well as practicing sitting and walking to enhance blood circulation and expedite recovery ^[5].
- (3) Complication management: To prevent complications such as stress ulcers, nurses regularly monitor patients' oral hygiene, gastric fluid, and stool color to ensure safety ^[6]. Skincare was emphasized to prevent pressure ulcers through regular position changes while maintaining clear airways and providing oral hygiene education for families to prevent infections.
- (4) Dietary guidance: Nurses developed individualized dietary plans based on patient preferences, ensuring balanced nutrition while avoiding high salt and cholesterol intake. Patients were advised to eat small, frequent meals, avoid overeating, and refrain from consuming coffee, strong tea, or spicy foods. Increased water intake was also encouraged.
- (5) Daily living guidance: Patients were trained in basic self-care activities such as washing, toileting, dressing, and eating. Nursing staff adjusted training intensity and duration according to patient tolerance, ensuring moderate exercise. Light music was suggested at night to aid sleep quality, facilitating recovery ^[7].

2.3. Observation indicators

- (1) Rehabilitation effectiveness: Patients were categorized based on recovery outcomes into three levels:
 - (a) Cured: Fully independent in daily life with clear thinking.
 - (b) Basically cured: Able to move independently with aids and retained speech functions.
 - (c) Not cured: Dependent in daily life with unclear speech and impaired cognition.
 - (d) Effectiveness rate = (Cured + Basically Cured) / Total cases × 100%.
- (2) Nursing satisfaction: Satisfaction was assessed through a questionnaire (total score: 100). Patients were categorized as fully satisfied (≥ 90 points), satisfied (60–89 points), or dissatisfied (< 60 points). Satisfaction rate = (Fully Satisfied + Satisfied) / Total cases × 100%.
- (3) Psychological state: Psychological evaluations were conducted before and after intervention using the Self-Rating Anxiety Scale (SAS, threshold: 50 points) ^[8] and Self-Rating Depression Scale (SDS, threshold: 53 points). Higher scores indicated more severe negative emotions.
- (4) Self-care ability: Self-care ability was evaluated using the Exercise of Self-Care Agency (ESCA) scale, assessing self-concept (0–36 points), responsibility (0–32 points), self-care skills (0–48 points), and health knowledge (0–56 points). Higher scores indicated better self-care ability.

2.4. Statistical analysis

Statistical analysis was performed using SPSS 23.0 software. Measurement data were expressed as mean ± standard deviation (SD), and group comparisons were conducted using *t*-tests. Count data were expressed as [*n* (%)] and compared using χ^2 tests. Statistical significance was set at $P < 0.05$.

3. Results

3.1. Comparison of rehabilitation outcomes between the two groups

After nursing interventions, the effective nursing rate of the study group was significantly higher than that of

the control group, with statistically significant differences ($P < 0.05$). The number of cured and basically cured patients in the study group was noticeably higher, while the number of uncured patients was lower than in the control group. See **Table 1**.

Table 1. Comparison of effective nursing rates between the two groups [n (%)]

Group	n	Cured	Basically cured	Uncured	Effective rate
Study group	40	27 (67.50)	12 (30.00)	1 (2.50)	39 (97.50)
Control group	40	22 (55.00)	11 (27.50)	7 (17.50)	33 (82.50)
χ^2	-	-	-	-	4.437
P	-	-	-	-	< 0.05

3.2. Comparison of nursing satisfaction between the two groups

The evaluation of neurology nursing by patients in the study group was higher than the evaluation of conventional nursing by the control group. The nursing satisfaction in the study group was significantly higher, with statistical significance ($P < 0.05$). See **Table 2**.

Table 2. Comparison of nursing satisfaction between the two groups [n (%)]

Group	n	Fully satisfied	Satisfied	Dissatisfied	Satisfaction rate
Study group	40	27 (67.50)	13 (32.50)	0 (0.00)	40 (100.0)
Control group	40	21 (52.50)	12 (30.00)	7 (17.50)	33 (82.50)
χ^2	-	-	-	-	6.709
P	-	-	-	-	< 0.05

3.3. Comparison of psychological states between the two groups

Before the intervention, both groups showed negative emotions with no significant difference in SAS and SDS scores ($P > 0.05$). After the intervention, the psychological state of both groups improved significantly, with the study group showing better results compared to the control group ($P < 0.05$). See **Table 3**.

Table 3. Comparison of psychological state scores between the two groups before and after the intervention (mean \pm SD, points)

Group	n	SAS		SDS	
		Before	After	Before	After
Study group	40	66.16 \pm 4.09	40.75 \pm 3.41	63.19 \pm 7.04	48.24 \pm 8.82
Control group	40	66.93 \pm 4.07	47.16 \pm 3.67	63.48 \pm 7.82	53.67 \pm 8.56
t	-	0.931	8.562	0.334	9.242
P	-	> 0.05	< 0.05	> 0.05	< 0.05

3.4. Comparison of self-care ability between the two groups

The study group scored significantly higher than the control group in self-concept, responsibility, self-care skills,

and health knowledge mastery, with statistically significant differences ($P < 0.05$). See **Table 4**.

Table 4. Comparison of self-care ability scores between the two groups before and after the intervention (mean \pm SD, points)

Group	<i>n</i>	Self-concept	Responsibility	Self-care skills	Health knowledge mastery
Study group	40	28.73 \pm 2.65	23.68 \pm 2.26	38.92 \pm 3.51	46.96 \pm 3.16
Control group	40	22.04 \pm 2.87	20.39 \pm 2.12	34.37 \pm 3.32	40.11 \pm 3.65
<i>t</i>	-	4.819	4.593	6.104	5.155
<i>P</i>	-	< 0.05	< 0.05	< 0.05	< 0.05

4. Discussion

With the development of the socioeconomic environment and the improvement of living standards, people's lifestyles have undergone significant changes. The accelerated pace of modern life, increased work pressure, and the influence of unhealthy habits have collectively heightened the risk of cerebral infarction. Additionally, as the aging population continues to grow, elderly individuals, who are at high risk of cerebral infarction, face serious threats to their health. This condition is characterized by high incidence, high disability and mortality rates, high recurrence rates, and numerous complications, making it one of the most common chronic cerebrovascular disorders.

Cerebral infarction, caused by atherosclerosis, results in reduced cerebral blood flow or interrupted blood supply, leading to brain ischemia and hypoxia that impair neurological function. Clinically, patients often present with symptoms such as limb numbness and facial asymmetry. Even after receiving treatment, residual neurological damage often leads to sequelae, further impacting the patient's quality of life. Therefore, during clinical treatment, proactive measures are necessary to alleviate symptoms, enhance the effectiveness of adjunct therapies, and expedite recovery. Conventional nursing interventions have traditionally focused on monitoring and managing changes in the patient's condition and addressing abnormalities promptly. However, this approach often results in slower recovery rates and suboptimal outcomes.

Neurology nursing, an emerging clinical nursing model in recent years, employs a series of intervention methods to promote recovery through multiple aspects^[9]. The data in this study show that the study group exhibited higher overall nursing efficacy, satisfaction, and self-care ability compared to the control group. Additionally, post-intervention psychological scores in the study group were significantly better than those in the control group ($P < 0.05$). These findings suggest that, compared to conventional nursing, neurology nursing helps patients build confidence in their treatment. Patients suffering from prolonged illness often experience feelings of depression and pessimism, leading to poor treatment adherence and slower recovery. Neurology nursing emphasizes psychological therapy, wherein nurses provide psychological counseling, explaining the causes of cerebral infarction and rehabilitation methods to help patients adopt a positive attitude toward their condition. This approach effectively enhances patients' psychological resilience.

Furthermore, dietary guidance provided by nurses reduces the impact of food on the disease, while rehabilitation training and physical therapy improve blood circulation and restore limb function, further accelerating recovery.

5. Conclusion

In conclusion, neurology nursing demonstrates the best outcomes in the rehabilitation of patients with cerebral infarction. It plays a positive role in accelerating recovery and alleviating symptoms, making it a clinical practice worthy of wider adoption.

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Disclosure statement

The authors declare no conflict of interest.

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Analysis of the Diagnostic Value of Blood Test Indicators for Anemia

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Abstract: *Objective:* To analyze the effectiveness of blood test indicators in the differential diagnosis of anemia. *Methods:* Sixty patients diagnosed with anemia (disease group) from June 2021 to June 2024 were selected. Based on the type of disease, the group was subdivided into iron deficiency anemia (IDA) with 31 cases, hemolytic anemia (HA) with 11 cases, and aplastic anemia (AA) with 18 cases. Based on the severity of the disease, the group was divided into mild anemia (30 cases), moderate anemia (19 cases), and severe anemia (11 cases). Sixty healthy individuals (control group) were also included, and all underwent blood tests. Comparisons were made between the red blood cell (RBC) indicators of the disease group and the control group, the blood test indicators of different types of anemia, and the serum iron levels of varying severity of anemia. *Results:* Except for red cell distribution width (RDW), the RBC indicators in the disease group were lower than those in the control group ($P < 0.05$). Comparisons of RBC indicators among different types of anemia showed significant differences ($P < 0.05$). Serum iron levels varied significantly among different degrees of anemia severity ($P < 0.05$). *Conclusion:* Blood tests can detect anemia, distinguish types of anemia, and assess anemia severity, offering high diagnostic value.

Keywords: Blood test indicators; Anemia; Differential diagnosis

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1. Introduction

The basis for diagnosing anemia is peripheral red blood cell (RBC) or hemoglobin (Hb) levels lower than normal. Common symptoms include pale complexion and dizziness, potentially leading to conditions such as erythrocytopenia or hemolytic disease. Anemia is often classified as iron deficiency anemia (IDA) or aplastic anemia (AA), with varying symptoms for different types requiring targeted treatment^[1]. Based on Hb levels, anemia can be categorized into mild, moderate, and severe, with differences in disease severity and treatment principles. Therefore, it is essential to distinguish anemia types and severity to comprehensively assess the condition.

Currently, blood testing is the primary diagnostic technique for anemia, enabling the measurement of RBC and serum iron indicators. These test results allow for the differentiation of anemia types ^[2]. Moreover, blood tests are convenient, automated, and efficient, leading to high acceptance among patients. Based on this, the study selected 60 anemia patients and 60 healthy individuals to evaluate the diagnostic role of blood test indicators in determining anemia types and severity.

2. Materials and methods

2.1. General information

The disease group included 60 anemia patients diagnosed and hospitalized between June 2021 and June 2024. Based on disease type:

- (1) Hemolytic anemia (HA): 11 cases (7 males, 4 females), aged 24–60 years, mean age (46.35 ± 3.94) years.
- (2) AA: 18 cases (11 males, 7 females), aged 22–63 years, mean age (47.01 ± 4.05) years.
- (3) IDA: 31 cases (19 males, 12 females), aged 26–63 years, mean age (47.09 ± 4.18) years.

Based on disease severity:

- (1) Mild anemia (Hb level > 90 g/L): 30 cases (17 males, 13 females), aged 25–73 years, mean age (48.11 ± 4.23) years.
- (2) Moderate anemia (Hb level 60–90 g/L): 19 cases (11 males, 8 females), aged 27–75 years, mean age (48.37 ± 4.34) years.
- (3) Severe anemia (Hb level < 60 g/L): 11 cases (7 males, 4 females), aged 22–70 years, mean age (48.91 ± 4.29) years.

The control group included 60 healthy individuals (35 males, 25 females), aged 23–66 years, mean age (48.01 ± 4.21) years. There were no significant differences between the two groups ($P > 0.05$).

Inclusion criteria: Complete clinical data; normal verbal and written communication ability; full cooperation throughout the study; informed consent provided.

Exclusion criteria: Presence of other organ diseases; mental disorders; intellectual disability; withdrawal during the study.

2.2. Methods

Participants were required to fast for 6–8 hours before testing. Blood samples (2 mL) were collected under fasting conditions and placed in anticoagulant tubes, with participant information labeled externally. The blood samples were centrifuged at 4,000 r/min to separate plasma and serum, allowing red blood cells and platelets to settle at the bottom of the tube. The supernatant was extracted, and smears were prepared. Smears were stained on glass slides to ensure clear cellular visualization. A fully automated blood cell analyzer was used to observe cell morphology, size, and other characteristics.

For venous blood collection, 3–5 mL of fasting blood was drawn and centrifuged within 2 hours under the same parameters. After serum separation, serum iron indicators were tested using a fully automated biochemical analyzer and the colorimetric method.

2.3. Observation indicators

The study observed:

- (1) RBC indicator levels in the disease and control groups.
- (2) Blood test indicator levels for different types of anemia.
- (3) Serum iron indicator levels based on anemia severity.

The normal ranges for the observed indicators are shown in **Table 1**.

Table 1. Normal ranges for different indicators

	Indicators	Abbreviation	Normal range
RBC indicators	Red blood cell count	RBC	$3.50\text{--}5.50 \times 10^{12}$ L
	Red blood cell distribution width	RDW	< 14.5%
	Mean corpuscular volume	MCV	80–97 fl
	Hemoglobin	Hb	Male: 120–160 g/L Female: 110–150 g/L
	Mean corpuscular hemoglobin	MCH	26.5–33.5 pg
	Mean corpuscular hemoglobin concentration	MCHC	320–360 g/L
Serum iron indicators	Serum ferritin	SF	Male: 15–200 µg/L Female: 12–150 µg/L
	Serum iron	SI	Male: 10.7–26.9 µmol/L Female: 9.0–23.3 µmol/L
	Soluble transferrin receptor	sTfR	≤ 20.0 nmol/L

2.4. Statistical analysis

Data analysis was performed using SPSS 28.0. Measurement data were expressed as mean ± standard deviation (SD), and comparisons between two groups were conducted using *t*-tests. Multiple group comparisons used F-tests. Count data were expressed as [*n* (%)], and χ^2 tests were applied. Statistical significance was set at $P < 0.05$.

3. Results

3.1. Comparison of RBC indicators between the disease group and the healthy group

Except for RDW, the levels of RBC indicators in the disease group were significantly lower than those in the healthy group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of RBC indicators between the disease group and the healthy group (mean ± SD)

Group	<i>n</i>	RBC ($\times 10^{12}$ L)	RDW (%)	MCV (fl)	Hb (g/L)	MCH (pg)	MCHC (g/L)
Disease	60	2.98 ± 0.41	20.31 ± 3.69	69.75 ± 8.32	81.56 ± 4.62	20.84 ± 2.66	275.65 ± 10.42
Healthy	60	4.45 ± 0.62	12.78 ± 3.15	83.99 ± 9.14	116.94 ± 5.71	29.42 ± 2.94	325.95 ± 15.34
<i>t</i>		15.319	12.022	8.924	37.312	16.763	21.010
<i>P</i>		0.000	0.000	0.000	0.000	0.000	0.000

3.2. Comparison of RBC indicators among different types of anemia

RBC, MCV, and MCHC levels in IDA patients were higher than those in AA patients. RDW levels in IDA patients were higher than those in HA and AA patients. RBC, MCV, and MCHC levels in HA patients were higher than

those in AA patients. Hb and MCH levels in IDA patients were lower than those in HA and AA patients. Hb and MCH levels in HA patients were higher than those in AA patients ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of RBC indicators among different types of anemia (mean \pm SD)

Disease type	<i>n</i>	RBC ($\times 10^{12}$ L)	RDW (%)	MCV (fl)	Hb (g/L)	MCH (pg)	MCHC (g/L)
IDA	31	2.99 \pm 0.24	22.16 \pm 2.95	70.36 \pm 4.95	72.25 \pm 6.92	19.24 \pm 2.60	280.65 \pm 10.32
HA	11	3.20 \pm 0.41	18.40 \pm 2.42	74.26 \pm 5.94	99.47 \pm 6.13	25.15 \pm 2.36	294.53 \pm 11.33
AA	18	2.81 \pm 0.33	16.32 \pm 2.04	66.14 \pm 4.02	92.12 \pm 7.02	22.14 \pm 2.31	263.86 \pm 10.75
<i>F</i>		5.710	30.064	9.823	86.690	25.024	30.170
<i>P</i>		0.005	0.000	0.000	0.000	0.000	0.000

3.3. Comparison of serum iron indicators based on anemia severity

Serum ferritin (SF) and serum iron (SI) levels in mild anemia were higher than those in moderate and severe anemia, with moderate anemia levels higher than severe anemia. The soluble transferrin receptor (sTfR) level in mild anemia was lower than that in moderate and severe anemia, with moderate anemia levels lower than severe anemia ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of serum iron indicators based on anemia severity (mean \pm SD)

Disease severity	<i>n</i>	SF (μ g/L)	SI (μ mol/L)	SfR (nmol/L)
Mild	30	13.25 \pm 2.30	9.38 \pm 1.45	50.49 \pm 6.33
Moderate	19	4.59 \pm 0.67	5.42 \pm 1.02	61.95 \pm 7.21
Severe	11	1.14 \pm 0.36	2.30 \pm 0.53	73.94 \pm 8.02
<i>F</i>		273.207	158.401	49.628
<i>P</i>		0.000	0.000	0.000

4. Discussion

A prolonged course of anemia can lead to reduced oxygen supply in the body, thereby affecting the function of multiple systems. The causes of anemia are complex, including genetic defects, malnutrition, or adverse drug reactions, with malnutrition being the most common, such as deficiencies in folic acid and iron. Additionally, chronic diseases such as rheumatoid arthritis or kidney disease are also common causes of anemia ^[3]. Anemia increases the burden on the heart, leading to cardiovascular problems or immune system damage, ultimately reducing the quality of life for patients.

Among the types of anemia, IDA is the most prevalent. Its causes include impaired iron absorption and insufficient dietary intake of iron, leading to reduced efficiency in the synthesis of Hb in red blood cells, thereby resulting in anemia. Iron is predominantly distributed in myoglobin and Hb and is an essential trace element for the body, playing a physiological role in oxygen transport ^[4]. Iron from food is absorbed through the small intestine and provides energy to cells, promoting the growth and development of red blood cells. Insufficient iron intake leads to IDA, which manifests as symptoms such as insomnia, headaches, or loss of appetite. HA is caused by the rapid destruction of red blood cells, resulting in a decreased red blood cell count. HA can be classified into

acquired and hereditary types^[5]. Acquired HA is caused by external factors, including infectious HA, autoimmune HA, and drug-induced HA. Hereditary HA is based on genetic mutations and includes conditions such as thalassemia and sickle cell anemia, characterized by functional and morphological abnormalities in red blood cells. AA is characterized by hematopoietic stem cell dysfunction or deficiency, impairing the bone marrow's ability to produce large quantities of red blood cells and platelets, which induces anemia or bleeding tendencies^[6,7]. Its causes include autoimmune diseases, prolonged exposure to chemical substances, or infections, leading to persistent immune attacks on hematopoietic stem cells, reducing the speed of blood cell differentiation and maturity. Symptoms of AA include sore throat, fever, or oral ulcers, often accompanied by bleeding tendencies such as gum bleeding^[8].

The levels of red blood cell indicators differ according to the type and severity of anemia. RBC reflects the number of red blood cells per unit volume of blood. Anemia reduces red blood cell production efficiency, disrupts the production process, and lowers RBC levels^[9]. RDW reflects the degree of variation in red blood cell volume; elevated RDW levels indicate reduced red blood cell production and increased destruction. MCV reflects the specific volume of individual red blood cells, and changes in its level can be used to evaluate red blood cell size^[10]. Hb reflects the proportion of red blood cells in whole blood and is an oxygen-transporting protein that delivers oxygen to organs and tissues. MCH reflects the Hb content within individual red blood cells, while MCHC reflects the Hb content per unit volume of red blood cells and can be used to assess the severity of anemia^[11]. Results showed that, except for RDW, the RBC indicators in the disease group were lower than those in the healthy group. Comparing RBC indicators among different types of anemia revealed statistically significant differences ($P < 0.05$). This indicates that RBC indicators can help identify anemia types, as each indicator demonstrates specific characteristics, allowing for differentiation among anemia types. The underlying reason is that blood tests comprehensively assess various indicator levels, integrate multiple parameters, and compare them to normal values, facilitating the early diagnosis of anemia types.

SF is the storage form of iron in the body and can be used to evaluate iron reserves. This indicator assesses the severity of anemia, with lower SF levels indicating more severe anemia. SI refers to the concentration of free iron in the serum and evaluates the state of the iron supply^[12,13]. Lower SI levels indicate more severe anemia. sTfR participates in the transport of iron by binding to iron carriers and transferrin, facilitating iron entry into cells. It evaluates iron supply, with higher concentrations indicating more severe anemia. Results showed significant differences in serum iron indicator levels across different anemia severities ($P < 0.05$). This suggests that serum iron indicators can effectively assess the severity of anemia. This is because serum iron indicators reflect iron reserves, supply status, and transport processes from multiple perspectives. Based on their level changes, they can predict the progression of anemia, making them effective for distinguishing disease severity^[14,15].

5. Conclusion

In summary, blood test indicators can efficiently detect anemia, determine the type and severity of anemia, and offer significant diagnostic advantages.

Disclosure statement

The author declares no conflict of interest.

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Study on the Impact of Continuing Care on Self-Care Ability and Quality of Life in COPD Patients

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Abstract: *Objective:* To explore the significance of continuing care in improving self-care ability and quality of life in patients with chronic obstructive pulmonary disease (COPD). *Methods:* A total of 60 COPD patients treated in our department between June 2023 and June 2024 were randomly divided into control and observation groups. The control group received routine care, while the observation group received additional continuing care. Self-care ability and quality of life were compared between the two groups. *Results:* After the intervention, the observation group demonstrated higher self-care ability and quality of life scores compared to the control group ($P < 0.05$). *Conclusion:* Continuing care for COPD patients has a positive impact on enhancing self-care ability and improving quality of life, making it worth recommending.

Keywords: Chronic obstructive pulmonary disease; Continuing care; Self-care ability; Quality of life

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1. Introduction

Chronic obstructive pulmonary disease (COPD) is a common chronic respiratory disease characterized by symptoms such as dyspnea, chest tightness, and coughing, with a tendency for recurrent episodes that severely impact patients' daily lives. Reports indicate that the prevalence of COPD in China is 8.2%, with a higher incidence in individuals over 40 years of age^[1]. The disease not only affects physical health but also interferes with daily functioning.

Current clinical treatment for COPD primarily focuses on symptomatic interventions. However, due to the

chronic nature and high recurrence rate of the disease, continuous treatment and out-of-hospital care are essential. Surveys suggest that over 70% of COPD patients in China express a need for continuing care ^[2], which has been shown to promote healthy behaviors and reduce rehospitalization rates.

Based on these findings, this study aims to further understand the significance of continuing care in improving self-care ability and quality of life in COPD patients.

2. Materials and methods

2.1. General information

The study included 60 COPD patients treated between June 2023 and June 2024. Patients were randomly divided into a control group (30 patients) and an observation group (30 patients). In the control group, there were 19 males and 11 females, aged 49–76 years, with an average age of 66.25 ± 6.25 years. The duration of illness ranged from 10 months to 10 years, averaging 5.26 ± 3.15 years. In the observation group, there were 17 males and 13 females, aged 48–78 years, with an average age of 67.045 ± 6.99 years. The duration of illness ranged from 5 months to 11 years, averaging 5.96 ± 2.38 years. Statistical analysis showed no significant differences in baseline characteristics such as age and gender composition between the two groups ($P > 0.05$).

Inclusion criteria: Diagnoses met the standards of the “Guidelines for the Diagnosis and Treatment of Chronic Obstructive Pulmonary Disease (2021 Revision)” ^[3]. Patients were in a stable phase of the disease, had clear consciousness, could communicate normally, and consented to participate in the study.

Exclusion criteria: Patients with other severe respiratory diseases, malignancies, or severe illnesses; patients unable to perform daily activities independently; or patients with poor overall health status.

2.2. Methods

Both groups received identical treatment and care during hospitalization, including respiratory function exercises, dietary guidance, psychological support, and medication guidance.

Control group: Upon discharge, patients received routine guidance, such as instructions on diet, medication, rehabilitation training, and reminders to return for follow-up visits when feeling unwell. Monthly telephone follow-ups were conducted to assess their condition and provide health guidance, as well as to answer patient questions.

Observation group: In addition to the guidance provided to the control group, patients received continuing care interventions, which included:

- (1) Establishment of a specialized care team: A COPD-specific continuing care team comprising an attending physician, head nurse, and primary nurse was formed to handle post-discharge follow-ups and health guidance.
- (2) Patient condition assessment: Upon discharge, the team reviewed patients’ medical records, assessed their current condition and risk factors, and developed personalized post-discharge care plans.
- (3) Implementation of continuing care:
 - (a) Patients were provided with follow-up and health education manuals upon discharge and enrolled in a continuing care WeChat group along with their family members.
 - (b) The primary nurse regularly shared videos, text, or images in the group to help patients understand their disease, self-care measures, and precautions. The nurse also responded to patient queries. Educational

content included disease mechanisms, medication, dietary guidance, activity recommendations, rehabilitation exercises, and psychological support.

- (c) The group featured a daily check-in initiative where patients recorded their rehabilitation exercises and uploaded videos to foster healthy habits ^[4]. Patients were encouraged to share self-care experiences and support one another within the group.
- (d) Monthly health lectures by COPD experts were organized to enhance patients' and families' understanding of the disease and self-care strategies.
- (e) Each patient received at least one home visit to evaluate their living environment and daily habits, with tailored suggestions for improvement. The care team also provided psychological support and helped patients build confidence in their treatment.

2.3. Observation indicators

- (1) Self-care ability: Evaluated using the Exercise of Self-Care Agency (ESCA) scale, where higher scores indicated better self-care ability.
- (2) Quality of life: Assessed using the Short Form-36 (SF-36) Health Survey, which evaluates dimensions such as general health, physical function, mental health, and social function. Each dimension has a total score of 100, with higher scores indicating better quality of life.

2.4. Statistical analysis

Data analysis was conducted using SPSS 24.0 statistical software. Continuous and categorical data were analyzed using *t*-tests and chi-squared tests, respectively. Differences were considered statistically significant at $P < 0.05$.

3. Results

3.1. Self-care ability

Before the intervention, the ESCA scale scores of both groups were similar, indicating comparable self-care abilities. Post-intervention, the ESCA scores improved in both groups, but the observation group showed significantly higher scores than the control group ($P < 0.05$), suggesting superior self-care ability. Results are shown in **Table 1**.

Table 1. Comparison of ESCA scale scores before and after nursing intervention (mean \pm SD, points)

Group	n	Health knowledge level		General self-care needs		Total self-care ability score	
		Before	After	Before	After	Before	After
Observation	30	32.20 \pm 2.10	44.25 \pm 3.95	35.23 \pm 3.20	46.69 \pm 3.75	65.26 \pm 4.12	93.36 \pm 10.12
Control	30	32.98 \pm 2.25	41.01 \pm 3.22	35.96 \pm 3.74	43.23 \pm 3.93	66.69 \pm 4.55	84.22 \pm 10.33
<i>t</i> -value		0.714	6.301	0.695	6.334	0.749	10.001
<i>P</i> -value		> 0.05	< 0.05	> 0.05	< 0.05	> 0.05	< 0.05

3.2. Quality of life

Before the intervention, the SF-36 scores of both groups were similar. Post-intervention, scores increased in both groups, with the observation group showing significantly higher scores than the control group ($P < 0.05$),

indicating better quality of life. Results are shown in **Table 2**.

Table 2. Comparison of SF-36 scale scores before and after nursing intervention (mean \pm SD, points)

Group	n	General health		Physical health		Psychological function		Social function	
		Before	After	Before	After	Before	After	Before	After
Observation	30	68.23 \pm 10.12	88.89 \pm 5.29	70.12 \pm 6.60	87.89 \pm 5.16	70.13 \pm 6.26	90.12 \pm 7.11	67.26 \pm 3.23	87.59 \pm 10.01
Control	30	68.13 \pm 10.23	83.23 \pm 5.89	71.12 \pm 6.96	81.43 \pm 6.05	70.33 \pm 6.21	85.21 \pm 5.55	67.56 \pm 2.34	87.15 \pm 5.58
<i>t</i> -value		0.029	2.892	0.498	6.993	0.165	2.950	0.024	6.540
<i>P</i> -value		> 0.05	< 0.05	> 0.05	< 0.05	> 0.05	< 0.05	> 0.05	< 0.05

4. Discussion

COPD is a complex condition characterized by a prolonged disease course and frequent complications, which significantly impact patients' normal lives and drain financial and material resources. During treatment, some patients may also experience negative emotions such as anxiety and depression. For patients in the stable phase of COPD, the focus should not only be on controlling infections and improving lung function but also on enhancing self-management abilities and improving quality of life. Traditional nursing care often emphasizes in-hospital care while neglecting post-discharge support, leading to high readmission rates and hindering recovery. This highlights the need to explore more effective nursing models.

Continuity of care, initially promoted by the Geriatric Nursing Association, is an open and extended nursing model implemented post-discharge. It ensures systematic and professional care from hospital to home ^[7]. Since COPD predominantly affects middle-aged and elderly patients, factors such as advanced age and lower education levels may hinder adherence to health guidance provided during hospitalization ^[8]. Conventional discharge guidance and telephone follow-ups are often insufficient to meet patients' needs. Continuity of care addresses these issues by centering on the patient and utilizing modern electronic information tools, home visits, and educational sessions. This approach ensures that disease-related knowledge is repeatedly conveyed, helping patients better understand and manage their conditions ^[9].

In this study, the observation group received continuity of care interventions. Beyond providing health guidance at discharge, patients were given health knowledge manuals for reference and comparison with their conditions. Patient records were established to enable more targeted follow-ups. Through the creation of a WeChat group, patients received health education regularly and exchanged self-care experiences with peers. Healthcare professionals conducted home visits to assess living environments and provide tailored guidance. Following these interventions, the observation group demonstrated significantly better self-care abilities than the control group. This improvement can be attributed to the continuous health education received and the correction of unhealthy habits with professional assistance, leading to enhanced self-management.

The observation group also reported a better quality of life than the control group. Effective interventions alleviated disease symptoms, and psychological care helped reduce emotional stress. These findings align with previous reports ^[10], confirming that continuity of care improves post-discharge life for COPD patients.

COPD patients often experience varying degrees of coughing, breathlessness, and reduced exercise tolerance,

severely affecting their lives and imposing heavy burdens on families and society. Given the need for long-term treatment, home-based care and self-care abilities are critical for disease management. Continuity of care enables patients to receive professional guidance and timely correction of unhealthy habits post-discharge, encouraging adherence to prescribed medications and exercises, thereby controlling disease progression and improving quality of life.

However, limitations in this study include inadequate control over factors such as education level, family background, and social support due to time and resource constraints. These factors may have influenced the results. Future research should account for these variables to achieve more accurate findings.

5. Conclusion

In conclusion, consistent with prior studies, this research demonstrates that continuity of care significantly enhances self-care abilities and improves the quality of life for COPD patients. It is a valuable approach worth recommending.

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Disclosure statement

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Analysis of Therapeutic Effects of Dental Arch Splint Intermaxillary Traction Combined with Rigid Internal Fixation in Patients with Facial Comminuted Fractures

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Abstract: *Objective:* To analyze the therapeutic effect of combining dental arch splint intermaxillary traction with rigid internal fixation for the treatment of facial comminuted fractures. *Methods:* Sixty patients with facial comminuted fractures admitted for treatment between July 2023 and December 2024 were selected. Using a random number table method, 30 patients were assigned to the observation group, where moderate traction using a dental arch splint combined with rigid internal fixation was applied. Another 30 patients were assigned to the control group and only received dental arch splint traction treatment. The total effective rate, postoperative recovery indicators, periodontal status, complication rate, and quality of life scores were compared between the two groups. *Results:* The total effective rate in the observation group was higher than that in the control group. The postoperative recovery indicators and periodontal status in the observation group were superior to those in the control group. The complication rate and quality of life score were lower in the observation group compared to the control group, with $P < 0.05$. *Conclusion:* Combining dental arch splint intermaxillary traction with rigid internal fixation can improve the periodontal status and quality of life of patients with facial comminuted fractures, shorten postoperative recovery time, reduce various complications, and enhance surgical efficacy.

Keywords: Dental arch splint intermaxillary traction; Rigid internal fixation; Facial comminuted fracture; Therapeutic effect

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1. Introduction

Facial tissues are relatively delicate, rich in capillaries, and externally exposed, making them susceptible to fractures caused by occupational accidents, sports injuries, and other external trauma ^[1]. Facial comminuted fractures refer to complete fractures of facial bones, altering the anatomical relationship of the maxilla and

mandible and impairing masticatory function. Additionally, facial tissues connect to the pharynx and cranial base, increasing the risk of complications such as respiratory distress and cranial injuries after fractures. Intermaxillary traction is a commonly used surgical technique for this condition, which involves resetting fractures using a dental arch splint, offering simplicity and cost-effectiveness. However, the stability of the splint is limited, making it challenging to restore occlusal relationships effectively, thereby reducing surgical efficacy. Rigid internal fixation, employing mini titanium plates, achieves ideal anatomical reduction, minimizes fixation areas, and promotes fracture healing^[2]. The combined use of these procedures offers complementary advantages, enhancing fixation stability and facilitating postoperative recovery. This study analyzed the benefits of combining these techniques in 60 patients with facial comminuted fractures.

2. Materials and methods

2.1. General information

Sixty patients with facial comminuted fractures were enrolled in this study from July 2023 to December 2024. They were randomly divided into two groups using a random number table, with 30 patients in each group. In the observation group, there were 19 males and 11 females, with an age range of 22 to 59 years and a mean age of 33.26 ± 3.71 years. The causes of fractures in this group included blunt force trauma (7 cases), falls from heights (11 cases), and traffic accidents (12 cases). Fracture locations included the maxilla (11 cases) and mandible (19 cases). In the control group, there were 20 males and 10 females, aged between 21 and 57 years with a mean age of 33.34 ± 3.89 years. Causes of fractures in this group were blunt force trauma (9 cases), falls from heights (10 cases), and traffic accidents (11 cases). Fracture locations included the maxilla (9 cases) and mandible (21 cases). A comparison of the general information between the two groups showed no statistically significant difference ($P > 0.05$).

Inclusion criteria: Diagnosis of facial comminuted fractures confirmed by imaging examination and clinical signs; adult patients; complete basic patient information; clear consciousness; ability to cooperate with the study. Exclusion criteria: Patients who do not meet the surgical indications; patients with blood system or coagulation system diseases; patients with concurrent cranial hemorrhage, trauma, or other related diseases; poor mental state; significant fluctuations in vital signs, indicating a life-threatening condition.

2.2. Methods

Preoperative imaging, including facial X-rays and CT scans, was performed to evaluate the location and severity of the fractures.

The control group underwent dental arch splint intermaxillary traction. The surgical area of the face was sterilized, general anesthesia and intubation were administered, and a dental arch splint was placed via a C-arm X-ray. Dental arch splints (with hooks) were inserted into the upper and lower dentition, stabilizing healthy teeth and then securing adjacent teeth to the fracture. Bone forceps were used to tighten the end of the wire, and a small loop ligation procedure was performed. Manual reduction was carried out at the fracture site, and the rubber band was pulled in the direction of reduction to restore the upper dentition to its original position. The treatment duration lasted for four weeks.

In the observation group, after completing the traction treatment, the rubber bands were stabilized, and rigid internal fixation was immediately performed. The surgical approach was determined based on the specific location of the fracture. The subcutaneous tissue was incised to expose the fracture site, and free soft tissue and bone fragments were cleaned. Manual reduction was performed, and micro-titanium plates were selected for fixation.

The plates were adjusted to fit snugly against the bone surface, ensuring they were perpendicular to the fracture line, with the arc and length appropriately modified to avoid contact with the dental roots and alveolar nerves. Titanium screws were used to drill holes into the plates for shaping and fixation. After confirming satisfactory occlusal alignment, the screws were tightened. The surgical site was then cleaned with physiological saline, and the skin tissue was sutured. Traction was maintained for one week postoperatively.

2.3. Observation indices

- (1) Total effective rate: Good: No facial defects or deformities, with normal anatomical structure in the fracture area. Moderate: No facial defects or deformities, but with slight anatomical deviation in the fracture area and mild periodontal inflammation. Poor: Dental damage accompanied by periodontal inflammation, facial defects or deformities, and unrecovered anatomical structure in the fracture area.
- (2) Postoperative recovery indices: Observation of the recovery time for normal mouth opening, length of hospital stay, and fracture healing time.
- (3) Periodontal status: The following were measured before surgery and after the removal of fixation devices: plaque index (PI, scored positively from 0 to 2 based on the amount of plaque); gingival index (GI, scored positively from 0 to 3 based on gingival inflammation); and debris index (DI, scored positively from 0 to 3 based on the coverage of debris).
- (4) Complication rate: Observation of the incidence of complications such as incision infection, delayed healing, restricted mouth opening, and facial deformities.
- (5) Quality of life score: Before surgery and six months after surgery, the Oral Health Impact Profile (OHIP) scale was used for measurement, which includes functional limitation (3 items), activity restrictions (5 items), pain and discomfort (3 items), and physical and psychological impairments (3 items). Each item is scored from 0 to 4, with a negative scoring system for quality of life. This means that a higher score indicates a poorer quality of life in terms of oral health.

2.4. Statistical analysis

Data were processed using SPSS28.0 software. Measurement data were expressed as mean \pm standard deviation (SD) and compared using the *t*-test. Count data were expressed as numbers and percentages [*n* (%)] and compared using the chi-square test. Statistical significance was set at $P < 0.05$.

3. Results

3.1. Comparison of total effective rate between the two groups

The total effective rate of the observation group was higher than that of the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of total effective rate between two groups [*n* (%)]

Group	<i>n</i>	Good	Moderate	Poor	Total effective rate
Observation group	30	17 (56.67)	12 (40.00)	1 (3.33)	96.67 (29/30)
Control group	30	12 (40.00)	10 (33.33)	8 (26.67)	73.33 (22/30)
χ^2	-	-	-	-	6.405
<i>P</i>	-	-	-	-	0.011

3.2. Comparison of postoperative recovery indicators between the two groups

Based on **Table 2**, the postoperative recovery indicators of the observation group were significantly better than those of the control group ($P < 0.05$).

Table 2. Comparison of postoperative recovery indicators (mean \pm SD, weeks)

Group	<i>n</i>	Recovery time of normal mouth opening	Length of hospital stay	Time for fracture healing
Observation group	30	1.82 \pm 0.64	5.71 \pm 1.03	6.72 \pm 1.54
Control group	30	2.19 \pm 0.77	6.48 \pm 1.55	7.98 \pm 1.58
<i>t</i>	-	2.024	2.266	3.128
<i>P</i>	-	0.048	0.027	0.003

3.3. Comparison of periodontal status between the two groups

Before surgery, there was no significant difference in periodontal status between the two groups ($P > 0.05$). However, after surgery, the periodontal status of the observation group was significantly better than that of the control group ($P < 0.05$), as presented in **Table 3**.

Table 3. Comparison of periodontal status between the two groups (mean \pm SD, scores)

Group	<i>n</i>	PI		GI		DI	
		Pre-operation	Post-operation	Pre-operation	Post-operation	Pre-operation	Post-operation
Observation group	30	0.78 \pm 0.19	1.19 \pm 0.38	1.15 \pm 0.40	2.20 \pm 0.31	1.05 \pm 0.43	2.14 \pm 0.36
Control group	30	0.80 \pm 0.23	0.95 \pm 0.33	1.12 \pm 0.39	1.89 \pm 0.27	1.07 \pm 0.41	1.89 \pm 0.31
<i>t</i>	-	0.367	2.612	0.294	4.130	0.184	2.882
<i>P</i>	-	0.715	0.011	0.770	0.000	0.854	0.006

3.4. Comparison of complication rates between the two groups

As shown in **Table 4**, the complication rate in the observation group was lower than that in the control group ($P < 0.05$).

Table 4. Comparison of complication rates between the two groups [*n* (%)]

Group	<i>n</i>	Incision infection	Delayed healing	Restricted mouth opening	Facial deformity	Incidence rate
Observation group	30	0	1 (3.33)	1 (3.33)	0	6.67 (2/30)
Control group	30	1 (3.33)	3 (10.00)	4 (13.33)	1 (3.33)	30.00 (9/30)
χ^2	-	-	-	-	-	5.455
<i>P</i>	-	-	-	-	-	0.020

3.5. Comparison of quality of life scores between the two groups

Before surgery, there was no significant difference in quality of life scores between the two groups ($P > 0.05$). However, after surgery, the quality of life scores in the observation group were lower than those in the control group ($P < 0.05$), as demonstrated in **Table 5**.

Table 5. Comparison of quality of life scores between two groups (mean \pm SD, points)

Group	n	Functional limitation		Activity restrictions		Pain and discomfort		Physical and mental defects	
		Pre-operation	Post-operation	Pre-operation	Post-operation	Pre-operation	Post-operation	Pre-operation	Post-operation
Observation group	30	8.65 \pm 1.42	4.15 \pm 0.53	12.65 \pm 1.63	6.55 \pm 1.20	9.02 \pm 1.27	4.03 \pm 0.39	7.11 \pm 1.23	3.68 \pm 0.52
Control group	30	8.70 \pm 1.46	5.64 \pm 0.66	12.69 \pm 1.65	7.99 \pm 1.25	9.05 \pm 1.22	5.12 \pm 0.45	7.15 \pm 1.27	4.14 \pm 0.57
<i>t</i>	-	0.134	9.641	0.094	4.552	0.093	10.026	0.124	3.266
<i>P</i>	-	0.893	0.000	0.925	0.000	0.926	0.000	0.902	0.002

4. Discussion

The maxillofacial bones are prominent and anatomically one of the weaker areas of the human skeletal system, making them prone to comminuted fractures under the impact of violent forces. Additionally, the maxillofacial region is attached to muscles such as the anterior belly of the digastric and genioglossus muscles. Post-fracture, these attached muscles may be pulled, leading to soft tissue damage and reduced masticatory function, which significantly impacts the patient's daily life [3].

Surgical treatment can restore the original facial morphology and the anatomical structure of the maxillofacial bones, thereby improving their physiological function. Traction is a commonly used surgical method that involves the use of a dental arch splint for fixation, which achieves good reduction results. However, the prolonged fixation period increases the difficulty of maintaining oral hygiene and raises the risk of infections. Moreover, the limited stability of traction techniques can prolong fracture healing, presenting certain surgical limitations. Rigid internal fixation significantly enhances the stability of fracture ends and restores maxillomandibular mobility [4,5]. Mini titanium plates, commonly used in this procedure, exhibit high biocompatibility and malleability, making them easy to shape. They can precisely adjust the morphology of the jawbone and adhere closely to the bone surface, ensuring excellent repositioning. Furthermore, this procedure features a simplified operation with minimal trauma, reducing traction time and delivering superior efficacy.

The results showed that the total efficacy rate in the observation group was higher than that in the control group, and postoperative recovery indicators were superior ($P < 0.05$). These findings are consistent with the study by Jiang and Wang [6], indicating high reliability and validity in this study. Specific analysis reveals that traction procedures can bind dental arch splints to the maxillary and mandibular dental arches, utilizing the elastic force of rubber bands to generate traction, which aids in jawbone correction. Internal fixation procedures allow for direct visualization during jawbone repositioning and the use of mini titanium plates to reduce the likelihood of fracture displacement, thereby improving fixation effectiveness. The mini titanium plates also exhibit strong resistance to bending and compression, adhering to the bone surface for extended periods and promoting fracture healing. Titanium screws, used in the procedure, are highly compatible with tissues and bond strongly with bone, sustaining intermaxillary traction for prolonged periods without loosening. This ensures long-term surgical efficacy [7]. The combined use of these two procedures generates a synergistic effect by stabilizing fracture ends through different mechanisms, resulting in higher total efficacy and shorter postoperative recovery times. The periodontal condition in the observation group was better than that in the control group ($P < 0.05$). This is because

combined surgery maintains the structural stability of the maxillofacial bones without negatively impacting periodontal or oral mucosal tissues. It causes no significant foreign body sensation, restores oral function, and improves periodontal health^[8]. The complication rate in the observation group was lower, and their quality of life scores were higher than those in the control group ($P < 0.05$). This is attributed to the biomechanical alignment of repositioning treatments in the combined procedure, which minimizes trauma and avoids needle injuries associated with traditional treatments, thereby preventing infections and other complications. The high comfort level of the combined surgery also facilitates oral hygiene maintenance, allowing for rapid restoration of dental function and the prevention of postoperative complications. Effective fracture repositioning and expedited healing shorten the recovery time for patients' daily abilities, enabling them to return to a normal lifestyle and enhancing their overall quality of life^[9,10].

5. Conclusion

In summary, combined surgery enhances the overall efficacy of treating facial comminuted fractures, shortens the recovery period, protects periodontal tissues, reduces surgical complications, and comprehensively improves postoperative quality of life.

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Effect of Artificial Hip Replacement Surgery on the Treatment of Intertrochanteric Femur Fractures in Elderly Patients and Its Impact on Hip Joint Function and Quality of Life

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Abstract: *Objective:* To evaluate the treatment effect of total hip arthroplasty (THA) for intertrochanteric femur fractures (IFF) in elderly patients. *Methods:* Thirty-two elderly patients with IFF admitted to the hospital from August 2021 to August 2024 were selected and randomly divided into two groups using a random number table. The experimental group (16 patients) underwent THA surgery, while the control group (16 patients) underwent proximal femoral nail antirotation (PFNA) surgery. Hip joint function and quality of life indicators were compared between the two groups. *Results:* Before surgery, there was no significant difference in hip joint function and quality of life scores between the two groups ($P > 0.05$). However, at six months postoperatively, the experimental group had higher hip joint function and quality of life scores compared to the control group ($P < 0.05$). The total effective rate was higher in the experimental group than in the control group ($P < 0.05$). The complication rate in the experimental group was similar to that in the control group ($P > 0.05$). *Conclusion:* THA can improve the clinical efficacy of elderly patients with IFF, minimize postoperative complications, effectively restore hip joint function, and optimize postoperative quality of life.

Keywords: Artificial hip replacement surgery; Intertrochanteric femur fractures; Elderly patients; Hip joint function; Quality of life

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1. Introduction

The causes of intertrochanteric femur fractures (IFF) include bone fragility, osteoporosis, and physical function decline. Patients often experience symptoms such as loss of lower limb function and lower limb pain, with a high disability rate^[1]. Proximal femoral nail antirotation (PFNA) is a commonly used surgical procedure for this condition, capable of stabilizing the fracture site and maintaining joint stability. However, due to osteoporosis,

patients are unable to bear weight early postoperatively, resulting in prolonged bed rest and an increased risk of complications such as pressure ulcers, leading to generally poor surgical outcomes. Additionally, elderly patients often have reduced physiological function and numerous comorbidities, making them less tolerant of surgical treatment. Therefore, alternative surgical approaches are needed ^[2]. Total hip arthroplasty (THA) has demonstrated significant advantages in treating this condition, as it can quickly improve hip joint function and achieve better long-term outcomes. This study evaluated the therapeutic effects of THA in 32 elderly IFF patients.

2. Materials and methods

2.1. General information

A total of 32 elderly patients with IFF admitted between August 2021 and August 2024 were enrolled in the study. Patients were randomly divided into two groups using a random number table. The experimental group consisted of 16 patients, including 11 males and 5 females, aged between 62 and 87 years, with an average age of 72.68 ± 2.94 years. The duration of illness ranged from 3 to 31 hours, with an average of 19.86 ± 2.76 hours. All cases involved fragility fractures. The control group consisted of 16 patients, including 10 males and 6 females, aged between 61 and 88 years, with an average age of 72.91 ± 2.83 years. The duration of illness ranged from 4 to 30 hours, with an average of 19.93 ± 2.57 hours. All cases involved fragility fractures. A comparison of general data between the two groups showed no statistically significant differences ($P > 0.05$).

Inclusion criteria: Diagnosis of IFF confirmed by multiple imaging examinations such as X-ray or CT; age > 60 years; normal skin condition in the surgical area; complete clinical data; meeting surgical indications; informed consent for the surgical plan. Exclusion criteria: Accompanied by open injuries; accompanied by heart, liver, kidney, or other lesions; combined with old fractures; suffering from other types of orthopedic diseases; accompanied by joint diseases.

2.2. Methods

The experimental group underwent THA surgery. Spinal-epidural combined anesthesia or general anesthesia was administered. Patients were positioned on the healthy side. A curved incision, centered on the greater trochanter, measuring 12–15 cm, was made on the lateral side of the hip joint. The skin, subcutaneous tissue, and deep fascia were incised. The fascia lata was separated along with the tensor fasciae latae, and the anterior one-third of the gluteus medius was dissected. The anterior joint capsule was incised to fully expose the fractured joint. Following osteotomy, the femoral neck was severed, exposing the femoral head, which was removed. The acetabulum was then prepared by thoroughly removing the cartilage, down to the subchondral bone, and washed extensively. A suitable prosthesis was placed. The femoral canal was reamed until the cortical bone was reached. An appropriately sized prosthetic stem was selected and inserted into the femoral canal. A femoral head of suitable length was installed, and the stability and tension of the prosthetic joint were assessed, along with the range of motion. Once the results were satisfactory, the canal was rinsed with saline, a drainage tube was placed, and the incision was closed.

The control group underwent PFNA surgery using the same anesthesia method. Fracture conditions were evaluated, and a urinary catheter could be placed. Patients were positioned supine, ensuring comfort, with the healthy lower limb moderately flexed. A soft cushion was used to slightly elevate the pelvis. The surgical area was disinfected, and a film was applied over the perineum. During fracture reduction, detailed observation was

performed using a C-arm X-ray machine. Once reduction was successful, an incision measuring 3–5 cm was made above the greater trochanter. The skin was separated, and hemostasis was achieved using an electrocautery device. The position of the gluteus medius was identified, followed by blunt dissection to fully expose the apex of the greater trochanter. A guide pin was inserted approximately one-third anterior to this point, and a reaming tool was used to prepare the canal. The femoral canal near the proximal femur was reamed using the guide pin, and the main nail was gradually screwed in. A spiral blade guide was used for positioning, and a longitudinal incision measuring 2 cm was made. The targeting device was used to align the guide pin, which was inserted to reach approximately 1 cm below the cartilage of the femoral head. The position of the guide pin was observed and reduction was evaluated. The channel was reamed along the guide pin, and a spiral blade of appropriate specifications was inserted, followed by the distal locking screw. Once all procedures were completed, the targeting device was removed, and the proximal tail cap was tightened. After confirming satisfactory results, instruments were counted, a drainage tube was placed, and the incision was sutured.

Both groups remained bedridden for more than 6 hours postoperatively and received anti-infection, pain management, and thrombosis prevention treatments. Drainage tubes were removed 1–2 days after surgery, and patients were mobilized 3–7 days postoperatively.

2.3. Observation indices

- (1) Hip joint function score: The Harris Hip Score was used to evaluate hip joint function. It included dimensions for pain (44 points), range of motion (5 points), deformity (4 points), and function (47 points), totaling 100 points. A higher score indicated better hip joint function.
- (2) Quality of life score: The General Quality of Life Inventory-74 (GQOL-74) was used, consisting of four dimensions, each scored out of 100. Higher scores indicated better quality of life.
- (3) Total effective rate: This was evaluated using the Harris Hip Score. Significant efficacy was defined as a score >90, moderate efficacy as a score of 70–90, and no efficacy as a score <70.
- (4) Complication rate: Complications such as included pressure ulcers and deep vein thrombosis (DVT) in the lower limbs were observed.

2.4. Statistical analysis

The data were processed using SPSS28.0 software. Measurement data were expressed as mean \pm standard deviation (SD) and compared using the *t*-test. Count data were expressed as numbers and percentages [*n* (%)] and compared using the chi-square test. Statistical significance was set at $P < 0.05$.

3. Results

3.1. Comparison of hip function scores between the two groups

Before surgery, there was no difference in hip function scores between the two groups ($P > 0.05$). At six months postoperatively, the hip function scores of the experimental group were higher than those of the control group ($P < 0.05$), as presented in **Table 1**.

Table 1. Comparison of hip function scores between the two groups (mean \pm SD, points)

Group	n	Pain		Range of motion		Deformity		Function	
		Pre-operation	Post-operation	Pre-operation	Post-operation	Pre-operation	Post-operation	Pre-operation	Post-operation
Experimental group	16	23.62 \pm 2.91	35.19 \pm 3.10	2.05 \pm 0.43	4.03 \pm 0.26	1.55 \pm 0.32	3.02 \pm 0.31	27.75 \pm 2.86	39.35 \pm 3.29
Control group	16	23.41 \pm 2.88	31.53 \pm 3.08	2.07 \pm 0.41	3.57 \pm 0.31	1.57 \pm 0.43	2.59 \pm 0.27	27.71 \pm 2.91	34.15 \pm 3.24
<i>t</i>	-	0.205	3.350	0.135	4.548	0.149	4.184	0.039	4.505
<i>P</i>	-	0.839	0.002	0.894	0.000	0.882	0.000	0.969	0.000

3.2. Comparison of quality of life scores between the two groups

Before surgery, there was no difference in the quality of life scores between the two groups ($P > 0.05$). However, six months after surgery, the quality of life scores of the experimental group were higher than those of the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of quality of life scores between the two groups (mean \pm SD, score)

Group	n	Material life		Physical function		Psychological function		Social function	
		Pre-operation	Post-operation	Pre-operation	Post-operation	Pre-operation	Post-operation	Pre-operation	Post-operation
Experimental group	16	78.95 \pm 6.23	91.20 \pm 5.33	79.32 \pm 6.10	92.35 \pm 4.18	74.18 \pm 4.92	92.83 \pm 4.45	76.33 \pm 4.15	91.29 \pm 4.07
Control group	16	79.08 \pm 6.21	86.15 \pm 5.27	79.26 \pm 6.08	88.03 \pm 4.11	75.02 \pm 4.33	87.03 \pm 4.01	76.29 \pm 4.20	87.12 \pm 4.03
<i>t</i>	-	0.059	2.695	0.028	2.948	0.513	3.873	0.027	2.912
<i>P</i>	-	0.953	0.011	0.978	0.006	0.612	0.001	0.979	0.007

3.3. Comparison of the total effective rate between the two groups

Based on **Table 3**, the total effective rate of the experimental group was higher than that of the control group ($P < 0.05$).

Table 3. Comparison of the total effective rate between the two groups [n (%)]

Group	n	Significant effect	Preliminary effect	No effect	Total effective rate
Experimental group	16	10	5	1	93.75 (15/16)
Control group	16	5	5	6	62.50 (10/16)
χ^2	-	-	-	-	4.571
<i>P</i>	-	-	-	-	0.033

3.4. Comparison of complication rates between the two groups

The complication rate of the experimental group was similar to that of the control group ($P > 0.05$), as presented in **Table 4**.

Table 4. Comparison of complication rates between the two groups [*n* (%)]

Group	<i>n</i>	Pressure ulcers	DVT	Pulmonary infection	Urinary tract infection	Incidence rate
Experimental group	16	1	0	1	0	12.50 (2/16)
Control group	16	1	1	1	1	25.00 (4/16)
χ^2	-	-	-	-	-	0.821
<i>P</i>	-	-	-	-	-	0.365

4. Discussion

Intertrochanteric femoral fractures are a common type of fracture in the elderly, primarily caused by aging, osteoporosis, and external factors such as falls or traffic accidents ^[3]. This condition is often accompanied by displaced fractures and poor femoral stability, which impact lower limb mobility and cause severe pain. Various treatment methods are available, including conservative and surgical approaches. However, conservative treatment has limitations, such as a prolonged recovery period, resulting in suboptimal clinical outcomes. Additionally, elderly patients often suffer from osteoporosis and require prolonged bed rest post-fracture, increasing the risk of adverse events like bone loss. Therefore, surgical intervention is generally necessary for these patients ^[4]. At present, common surgical options include intramedullary fixation, extramedullary fixation, and artificial joint replacement, often supplemented by progressive functional training of the knee and ankle joints to restore joint function ^[5].

Proximal femoral nail antirotation surgery is a widely used procedure for IFF. It is designed to align with the biological structure of the human body, featuring straightforward surgical steps. The insertion of screws during the procedure creates adequate pressure on the lateral femoral wall, thereby stabilizing joint function ^[6]. The use of helical blades simplifies the surgical process, reduces abnormal bone loss, and increases cancellous bone density, providing strong anti-rotational effects. However, this technique requires preoperative traction and reduction and demands a high level of surgical expertise, posing challenges to surgical safety ^[7]. THA, on the other hand, involves a comprehensive preoperative assessment of the elderly patient's bone health to determine the most suitable surgical plan. THA effectively utilizes prosthetics to prevent complications associated with internal fixation, such as screw cutting or varus deformities, thus reducing fracture healing time.

The results showed that at six months post-surgery, the hip joint function scores in the experimental group were significantly higher than those in the control group ($P < 0.05$). These findings align with the study conducted by Liu ^[8]. Additionally, six months post-surgery, the quality of life scores and overall effectiveness rates in the experimental group were higher than those in the control group ($P < 0.05$), while the complication rates in the experimental group were comparable to those in the control group ($P > 0.05$). Analysis suggests that THA allows for effective management of soft tissues around the femoral head and femoral neck during surgery and facilitates hip joint replacement with prosthetics that provide strong stability, enabling early joint function recovery. The prosthetics used in THA are designed to match the biomechanical and anatomical features of the trochanteric region, offering excellent fixation ^[9]. Moreover, the prosthetic's extended length increases the interface between the medullary cavity and the prosthetic stem, enhancing the contact area and distributing stress more evenly, thereby improving joint stability. Crucially, the artificial prosthetic tightly integrates with the femoral bone, evenly distributing forces generated by the prosthetic to the distal femur, preventing long-term prosthetic failure. This design also allows for earlier postoperative functional training, significantly improving the patient's quality of life ^[10].

5. Conclusion

In conclusion, THA enhances hip joint function and quality of life in IFF patients, improves surgical efficacy, and minimizes the incidence of postoperative complications. It is a highly feasible surgical option and can be considered the preferred treatment method for IFF patients.

Disclosure statement

The authors declare no conflict of interest.

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Research Progress on Risk Factors for Endometrial Lesions in Asymptomatic Postmenopausal Women with Endometrial Thickening

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Abstract: As of 2023, endometrial cancer (EC) ranks second among malignant tumors of the female reproductive system in China, following cervical cancer, posing a significant burden on the country's healthcare system. Postmenopausal asymptomatic endometrial thickening is primarily benign, often involving endometrial polyps. However, previous clinical studies indicate a relatively high malignancy rate for postmenopausal endometrial polyps, suggesting the necessity for active intervention, particularly in cases with high-risk factors for EC. This article reviews the research progress on risk factors for endometrial lesions in postmenopausal patients with asymptomatic endometrial thickening, aiming to provide insights for clinical diagnosis and treatment.

Keywords: Postmenopause; Asymptomatic endometrial thickening; Endometrial lesions; Risk factors

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1. Introduction

The incidence of endometrial cancer (EC) in China is on the rise. According to data released by the National Cancer Center in 2023, there were 71,100 new cases of uterine cancer, making it the second most common malignancy in the female reproductive system, following cervical cancer ^[1]. After menopause, ovarian function gradually declines, and estrogen levels decrease significantly, typically resulting in the thinning of the endometrium. However, in some women, the endometrium may abnormally thicken, which, if left untreated, could

increase the risk of developing EC. The exact mechanisms of malignant transformation in endometrial lesions remain unclear but are influenced by multiple factors, including obesity, hormone replacement therapy during menopause, and hypertension. Studies have shown that a body mass index (BMI) exceeding 23 kg/m², the presence of hypertension or diabetes, more than three pregnancies, more than two deliveries, and menopausal status are independent risk factors for malignant transformation in patients with endometrial lesions^[2]. In clinical practice, the management of postmenopausal patients with asymptomatic endometrial thickening requires a multi-layered screening approach and individualized treatment strategies to mitigate the risk of malignant transformation. This study aims to review the primary risk factors and potential mechanisms of endometrial lesions in postmenopausal patients with asymptomatic endometrial thickening, explore the relationship between metabolic diseases such as obesity and hypertension and endometrial lesions, and summarize related screening methods and treatment strategies to provide scientific evidence for clinical management.

2. Causes of asymptomatic endometrial thickening after menopause

The formation of asymptomatic endometrial thickening in postmenopausal women involves a variety of physiological and pathological factors, including changes in the endocrine environment and localized tissue hyperplasia. Normal menstrual cycles rely on stable regulation by the hypothalamic-pituitary-gonadal axis. However, in postmenopausal women, the declining function of this axis and fluctuating hormone levels lead to an inability of the endometrium to transition normally from the proliferative to the secretory phase. This results in excessive endometrial growth, breakthrough or withdrawal bleeding, and potentially endometrial lesions. Research has shown that 84.3% of patients with asymptomatic postmenopausal endometrial thickening have intrauterine lesions, and the detection rate of malignancy increases with endometrial thickness^[3].

Endometrial polyps are among the common causes of asymptomatic endometrial thickening in postmenopausal women. Polyps form from localized hyperplasia of endometrial glands and stroma. In postmenopausal women, due to the progressive atrophy of the uterine cavity, polyps are often flattened and adhere closely to the endometrial surface, presenting as uniform or irregular thickening on ultrasound. These lesions are frequently asymptomatic, and even when detected during routine examinations, distinguishing between benign polyps and potential malignancies via imaging is challenging, complicating clinical management^[4]. Submucosal fibroids, which grow into or protrude into the uterine cavity, are another critical factor contributing to endometrial thickening post-menopause. Although estrogen levels decrease after menopause, existing submucosal fibroids may undergo cystic degeneration or softening during hormonal regression, protruding into the uterine cavity and appearing as thickened endometrium on ultrasound. Infections and chronic inflammation also contribute to asymptomatic endometrial thickening. Declining estrogen levels weaken the natural barrier function of the vagina and uterine cavity, making local tissues more susceptible to pathogenic invasion. The resulting inflammatory responses may cause endometrial congestion and edema, manifesting as thickened endometrium or intrauterine fluid accumulation on imaging. Additionally, postmenopausal women often experience inflammation-related endocrine and immune dysfunction, disrupting the normal balance of the endometrium and promoting cellular hyperplasia^[5].

3. Screening methods for asymptomatic endometrial thickening in postmenopausal women

Transvaginal ultrasonography (TVUS) is the most commonly used initial screening tool, valued for its non-

invasive, convenient, and efficient characteristics. TVUS effectively visualizes endometrial thickness and uterine cavity structures. For instance, a study by Fu *et al.* ^[6] demonstrated that TVUS has high accuracy in diagnosing endometrial lesions. By analyzing hemodynamic parameters such as resistance index (RI), pulsatility index (PI), total blood flow area (TAP), and imaging features, TVUS can differentiate between polyps and malignancies. These lesions show distinct hemodynamic profiles: malignancies typically present with greater endometrial thickness and clearer endometrial-myometrial junctions but lower rates of homogenous internal echoes compared to polyps. However, TVUS has limitations when screening asymptomatic postmenopausal women. Studies suggest that while the negative predictive value of endometrial thickness is high, the specificity for absolute lesion risk is insufficient, leading to false positives. The positive predictive value ranges from 0–20%, while the negative predictive value is as high as 98–100% ^[7]. Saline infusion sonohysterography (SIS) enhances diagnostic accuracy by injecting saline into the uterine cavity for ultrasound imaging, allowing for clearer visualization of uterine lesions and reduced false positives. For example, research by Palermo *et al.* ^[8] found SIS to have a specificity of 84.47% and a sensitivity of 100% in diagnosing asymptomatic postmenopausal endometrial thickening. Hysteroscopy (HS) and endometrial histopathological examination remain the gold standards for diagnosing endometrial thickening. These methods allow direct visualization of intrauterine lesions and precise sampling for pathological analysis ^[9]. However, HS is invasive and may pose risks such as cervical dilation difficulties, uterine perforation, or infection. Thus, it is recommended for patients with endometrial thickness exceeding critical values and significant high-risk factors.

4. Endometrial sampling techniques for screening endometrial lesions

Endometrial cytology testing (ECT) uses an endometrial sampling device to collect exfoliated cells, which are then analyzed using thin-layer liquid-based cytology (LBC) technology. This non-invasive method is effective for screening endometrial lesions. LBC technology improves the sensitivity and specificity of screenings by removing blood and mucus and enhancing the uniformity and quality of cell samples. Common endometrial sampling devices include Tao Brush, Li-Brush, and SAP-1, which mechanically collect exfoliated cells from the uterine cavity. Cytological smear technology clearly presents pathological features of nuclei and cytoplasm, aiding in the diagnosis of lesions. Research indicates that ECT achieves sensitivity rates of 75–96% and specificity rates of 83–100% for diagnosing endometrial cancer and atypical hyperplasia, demonstrating significant diagnostic value. Wen *et al.* ^[10] conducted a study using ECT combined with the SAP-1 endometrial sampler on 1,045 postmenopausal women. The results showed an accuracy rate of 93.4%, a sensitivity of 72.4%, a specificity of 99.1%, a positive predictive value of 95.5%, and a negative predictive value of 93.0% for diagnosing endometrial cancer and atypical hyperplasia. Similarly, research by Wu ^[11] demonstrated that liquid-based cytology testing of the endometrium is highly reliable for diagnosing endometrial lesions in postmenopausal women. This method is simple, minimally invasive, and associated with minimal bleeding, offering significant advantages.

5. Risk factors for endometrial lesions in postmenopausal women with asymptomatic endometrial thickening

5.1. Obesity and postmenopausal hormone therapy

Obesity is a significant risk factor for asymptomatic endometrial thickening in postmenopausal women, closely associated with endocrine disorders, metabolic imbalances, and chronic inflammation. Obesity affects female

fertility through metabolic disturbances, such as hyperandrogenism, insulin resistance-related hyperandrogenemia, and high leptin levels. After menopause, when ovarian function declines, adipose tissue becomes the primary source of estrogen. Aromatase, highly expressed in adipose tissue, converts androstenedione to estrone, which is subsequently converted to estradiol. This continuous estrogen stimulation, without progesterone counteraction, leads to prolonged endometrial hyperplasia, increasing the risk of lesions and potential malignancy ^[12]. For instance, research by Wang *et al.* ^[13] found that in patients with postmenopausal asymptomatic endometrial thickening of ≥ 5 mm, the incidence of endometrial lesions was significantly higher in obese individuals compared to those with normal weight. Chronic low-grade inflammation is another hallmark of obesity, with adipose tissue secreting large amounts of pro-inflammatory factors such as tumor necrosis factor- α and interleukin-6. These factors exacerbate systemic metabolic imbalances, promote abnormal cell proliferation, and increase the risk of endometrial cancer ^[14]. Menopausal hormone therapy, while alleviating menopausal symptoms, also increases the risk of endometrial thickening by elevating estrogen levels, especially in the absence of progesterone counteraction. For example, Zheng's ^[15] research found that combining triptorelin acetate with hormone replacement therapy to treat infertility in patients with polycystic ovary syndrome resulted in increased endometrial thickness, raising the risk of endometrial lesions.

5.2. Hypertension

Hypertension influences the development of endometrial lesions through multiple physiological pathways. It causes structural damage to vascular walls and endothelial dysfunction, increasing endometrial inflammation and angiogenesis, thereby creating favorable conditions for lesion development. Prolonged hypertension also stimulates the hypothalamic-pituitary-ovarian axis, disrupting normal function and causing fluctuations in estrone levels, which may trigger endometrial-related lesions ^[16]. For instance, Long's ^[17] research indicated that hypertension significantly increases the risk of endometrial atypical hyperplasia and endometrial cancer, highlighting it as a critical risk factor for endometrial lesions in postmenopausal asymptomatic endometrial thickening.

6. Conclusion

This article emphasizes the role of risk factors such as obesity, menopausal hormone therapy, and hypertension in promoting endometrial thickening and lesions, exploring their underlying mechanisms. Addressing these risk factors requires strengthening individualized screening strategies in clinical management. High-risk populations should be monitored early using transvaginal ultrasound, endometrial sampling, and hysteroscopy. If endometrial thickening exceeds clinical thresholds or imaging suggests potential lesions, prompt intervention is essential to reduce the incidence of malignant transformation, ultimately improving patient prognosis and quality of life.

Disclosure statement

The authors declare no conflict of interest.

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Review of the Application of HAPA Theory in Orthopedic Postoperative Patients

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Abstract: The Health Action Process Approach (HAPA), developed by German psychologist Schwarzer in the 1980s, provides a comprehensive framework for understanding and influencing health behavior change. By dividing behavior change into three dynamic stages—pre-intention, intention, and action—HAPA highlights the critical role of self-efficacy as a driving force in adopting healthier behaviors. This stage-based approach addresses the limitations of continuous health behavior models by emphasizing individual differentiation and recognizing that behavior change is not linear but progresses through distinct phases. HAPA theory has demonstrated significant potential in clinical applications, particularly in orthopedic postoperative patients. Its implementation facilitates the development of positive behavioral intentions, enhances self-efficacy, and supports sustained health action, ultimately improving patients' health outcomes and quality of life. Tailored interventions based on HAPA stages ensure that patients receive appropriate guidance and support throughout their recovery journey. Despite its successes, limitations remain. Future research should focus on expanding the application of HAPA to various orthopedic conditions and developing more targeted behavioral plans and health education programs to optimize patient rehabilitation. Additionally, further exploration is needed to sustain HAPA's effectiveness during long-term recovery. Strengthening interdisciplinary collaboration and integrating HAPA with other theoretical models could create a more comprehensive health behavior education system, providing robust support for orthopedic patients and advancing their overall recovery and well-being.

Keywords: Health Action Process Approach; Application; Orthopedic; Review

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1. Introduction

Health Action Process Approach (HAPA) is a health behavior theory developed by German psychologist Schwarzer in the 1980s, based on the “self-efficacy” model^[1]. This theory conducts an in-depth exploration of health behaviors, dividing health behavior change into three dynamic stages: pre-intention, intention, and action^[2]. HAPA emphasizes

the critical importance and driving role of self-efficacy in fostering health behavior change ^[3]. By tailoring intervention measures to an individual's stage of behavior change, HAPA promotes healthier behavioral intentions, thereby addressing the limitations of continuous health behavior models. Specifically, HAPA acknowledges individual differentiation and highlights that behavior change is not a continuous process but unfolds in distinct stages. Its clinical application encourages patients to develop positive intentions and maintain health actions.

2. Basic framework of HAPA theory

2.1. Theoretical basis

The HAPA theory draws primarily from Bandura's self-efficacy theory ^[4], which asserts that an individual's belief in their ability to successfully perform a behavior is a key determinant of behavior change. According to HAPA, self-efficacy significantly impacts both the initiation of new behaviors and the ability to overcome obstacles during the maintenance phase, ultimately ensuring sustained healthy behavior changes. HAPA also incorporates elements of social cognitive theory ^[5], which considers behavior change a complex interplay of cognitive, emotional, and social factors. Social cognitive theory posits that behavior is influenced not only by internal cognition and emotions but also by the social environment and interactions. Integrating these principles, HAPA emphasizes the importance of health risk perception—such as recognizing the harm caused by inactivity or an unhealthy diet—as the first step toward behavior change. The model stresses the need for individuals to believe in their capacity for change, create actionable plans, and act with the support of social and environmental factors. This comprehensive approach makes HAPA a robust framework for explaining and promoting health behavior change ^[6].

2.2. HAPA theory: Stages of healthy behavior change

2.2.1. Pre-intention stage

This initial stage is critical for initiating health behavior change. During this phase, individuals have not yet formed a concrete determination to act but begin contemplating health-related issues. The pre-intention stage comprises three core elements: danger perception, outcome expectation, and action self-efficacy. Firstly, danger perception refers to an individual's awareness of health risks, which may arise from physical discomfort, medical diagnoses, health education, or social comparisons. This awareness can prompt individuals to consider whether action is necessary to improve their current state. Secondly, outcome expectation plays a pivotal role in fostering a willingness to change behavior. It involves anticipating positive outcomes, such as alleviating discomfort, restoring function, or enhancing quality of life. These anticipated benefits motivate individuals to adopt new health behaviors. Lastly, action self-efficacy is the individual's confidence in their ability to perform healthy behaviors and achieve desired results. This confidence often stems from peers' successful experiences, encouragement from others, and personal optimism about achieving goals. These three factors—danger perception, outcome expectation, and action self-efficacy—interact synergistically to ignite an individual's initial willingness to adopt healthy behaviors. When sufficiently developed, these factors enable the transition to the next stage: the intention stage, where individuals begin planning specific health actions ^[7].

2.2.2. Intention stage

At this stage, individuals have a clear intention to act but have not yet taken action. They prepare specific steps (action plans) for behavior change and develop strategies (coping plans) to address potential challenges.

Action self-efficacy continues to provide motivation, while coping self-efficacy—the confidence to overcome difficulties—empowers individuals to persist despite obstacles. Upon initiating these actions, individuals transition to the action stage.

2.2.3. Action stage

Individuals actively implement healthy behaviors based on their behavior plans. However, they are likely to encounter various challenges and obstacles that may lead to intentions or actions of giving up. In such situations, restoring self-efficacy becomes critical. This involves helping individuals regain or maintain confidence through strategies such as successful experiences, vicarious experiences, verbal encouragement, emotional regulation, and goal breakdown. By strengthening self-efficacy, individuals are more likely to sustain or restore healthy behaviors, thereby achieving long-term behavioral change. **Figure 1** shows the theoretical framework of HAPA.

HAPA theory provides a robust theoretical foundation for promoting health behavior change and has demonstrated a wide range of applications, particularly in clinical practice. Its application in postoperative orthopedic patients has shown significant results.

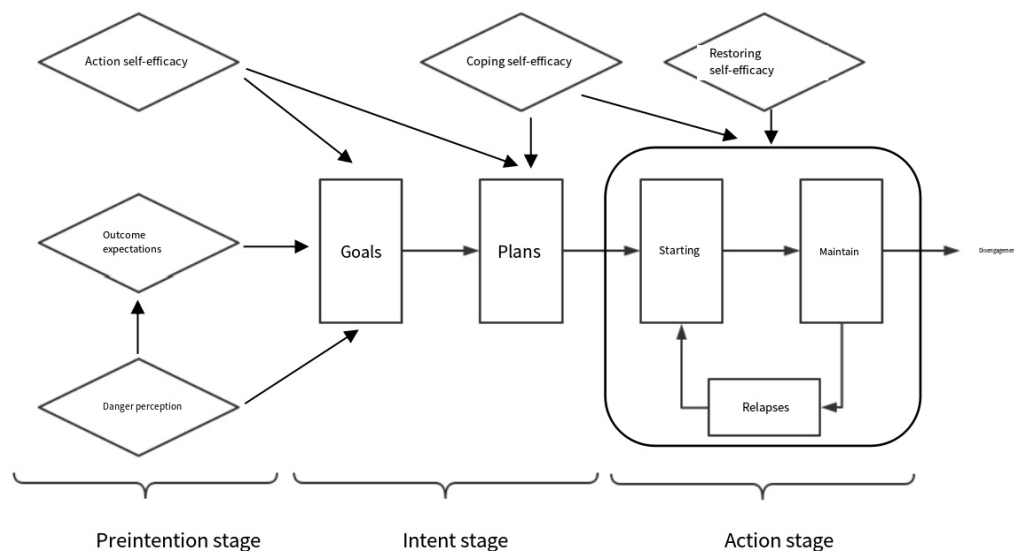


Figure 1. Theoretical framework of HAPA

3. Application of HAPA theory in orthopedic postoperative patients

3.1. Patients with femoral neck fracture after artificial hip replacement

Kou *et al.*^[8] innovatively integrated the HAPA model with phased rehabilitation nursing strategies, conducting in-depth research specifically on the rehabilitation process of elderly patients with femoral neck fractures undergoing unilateral artificial hip replacement. They refined the journey of patients' health behavior transformation into four key stages: pre-intention, intention formation, action planning, and actual action implementation. Results demonstrated that phased rehabilitation care based on the HAPA model alleviated movement fear and improved hip function. Targeted interventions at different behavioral stages significantly enhanced exercise compliance, self-efficacy, and mental well-being, reducing anxiety and depression while improving rehabilitation outcomes. This approach provides a clear, systematic framework for nursing teams to evaluate patients' mental states and

behavioral changes, enhancing the precision and effectiveness of care. Li and Huang ^[9] explored the application of HAPA-based menu nursing in elderly patients undergoing total hip replacement. Their findings revealed that HAPA-guided interventions effectively improved psychological states and hip function recovery, optimizing patients' quality of life and rehabilitation outcomes. Additionally, Bai ^[10] developed a perioperative rehabilitation nursing plan for elderly patients based on the HAPA model. Results showed the program significantly promoted hip function recovery, gait stability, self-care ability, and pain and anxiety relief in elderly patients undergoing hip replacement.

3.2. Patients with lumbar disc herniation accompanied by sciatica

Scholars ^[11] developed a HAPA-based rehabilitation program for patients with lumbar disc herniation and sciatica. Using literature review, group discussions, and Delphi expert consultations, the program was tested in clinical trials. Findings revealed that HAPA-guided interventions effectively bridged the gap between knowledge and action, improving adherence to functional exercises, alleviating anxiety and depression, and enhancing self-efficacy. These improvements significantly contributed to achieving satisfactory rehabilitation outcomes.

3.3. Patients after lower extremity fracture surgery

Wang *et al.* ^[12] implemented an intervention based on the HAPA theory for 91 patients following lower limb fracture surgery, comparing the results with a control group of the same size that received standard postoperative care. Through detailed observation and data collection, the study found that patients receiving HAPA-guided intervention showed significant improvements in mental health, quality of life, and disease awareness compared to the control group. Specifically, these patients demonstrated a more positive attitude when facing rehabilitation challenges post-surgery and adapted more effectively to daily life. Moreover, they gained a deeper and more comprehensive understanding of their condition. This finding not only validates the effectiveness of HAPA theory in rehabilitative interventions for lower limb fracture patients but also provides substantial evidence and guidance for future clinical practice in related fields.

3.4. Individualized health education for patients after orthopedic surgery

The individualized health behavior change program, based on the HAPA theory, enhances health behavior and self-efficacy in patients after orthopedic surgery, promoting postoperative rehabilitation ^[9]. This program offers tailored guidance at different stages of health behavior, helping patients establish healthy living habits and improve their overall quality of life.

3.4.1. Evaluation and individualized formulation

During the initial stage of admission, when patients are in the pre-intention phase, the HAPA model aids in improving their cognition and motivation toward postoperative health behavior change ^[13]. After surgery, with changes in their personal beliefs and support from the medical team, patients transition into the intention or action phase. At this stage, patients' needs vary based on factors such as age, gender, type of surgery, and physical condition. The application of the HAPA theory requires a comprehensive assessment of the patient, including their physical function, psychological state, social support, and other aspects. This assessment can be conducted through questionnaires or interviews, allowing the HAPA program implementation team to create a personalized rehabilitation plan based on the results. This individualized approach ensures the safety and effectiveness of the

rehabilitation process, helping patients better adapt to rehabilitation and improving the overall outcome.

3.4.2. Improvement of self-efficacy and confidence

HAPA theory underscores the significance of self-efficacy in driving health behavior change ^[14]. By offering positive feedback—such as providing patients with rehabilitation knowledge, sharing success stories, offering professional guidance, and establishing behavioral contracts—patients' self-efficacy and motivation to adopt healthy behaviors can be enhanced. This improvement in self-efficacy encourages active participation in behavioral plans, which, in turn, leads to better rehabilitation outcomes. Moreover, by cooperating more effectively with the team's behavioral plan, patients can take an active role in their recovery. In the early stages of orthopedic postoperative rehabilitation, many patients, due to prior trauma, may have misconceptions or a lack of understanding about exercise. They may worry about the negative impact of physical activity or feel anxiety, depression, or fear, leading them to resist engaging in exercise. This fear of physical activity can hinder rehabilitation, so it is crucial to focus on boosting patients' self-efficacy and confidence to help them overcome these challenges.

3.4.3. Developing and executing an action plan

HAPA theory emphasizes that, in health behavior management, the team and the patient should collaboratively create a specific action plan, which includes setting health behavior change goals, selecting methods, and developing training schedules ^[15]. This cooperative process deepens patients' understanding and engagement with their health behavior change following orthopedic surgery and enhances the individualization and effectiveness of the plan. A key component is the creation of a detailed and flexible action plan, which serves as the foundation for implementation. The next step is to outline the schedule, specifying the content, intensity, frequency, and duration of daily or weekly exercises, as well as a clear timeline for behavior change, ensuring each step progresses toward the stated goal. This plan should be adjusted according to the patient's health behavior stage, physical responses, or other circumstances. While encouraging patients to actively participate in the behavior change training to ensure the plan's successful implementation, it is also important to emphasize that patients should take ownership of their own behavior change process. Over time, they should learn self-management and self-motivation, actively seeking help when facing difficulties. The implementation team should continue to provide support through regular check-ins, phone calls, or online communication, addressing any questions and offering necessary guidance.

3.4.4. Improving compliance

Based on the HAPA theory, the personalized action plan for orthopedic postoperative patients should not only consider their specific circumstances and needs but also incorporate small goal-setting and positive feedback. These elements, along with educational strategies and implementation support, help enhance patients' self-efficacy. This can be achieved through methods such as sharing success stories and role-playing exercises, which improve patients' confidence and their ability to complete and adhere to the action plan ^[16]. HAPA theory also underscores the importance of social support in behavior change. Therefore, in the postoperative recovery phase, the involvement of the patient's family and friends is crucial. Encouraging active communication between patients and the HAPA team provides emotional support and practical help when difficulties arise. Pain is often a significant barrier to patient compliance after orthopedic surgery ^[17], so effective pain management strategies—such as medication, physical therapy, and psychological intervention—are essential. By reducing pain, these strategies can

improve patients' participation and compliance in health behavior change.

3.4.5. Action control and supervision

In the transition from intention to action, HAPA theory also highlights the role of action control in health behavior change ^[18]. To ensure sustained and effective behavior change, patients must continuously monitor their own actions, while the implementation team provides external supervision of individual behaviors ^[19]. To support this, the team must establish a systematic and efficient feedback and evaluation mechanism. This mechanism should focus on regular, comprehensive assessments of patients' progress. It involves not only the collection and analysis of objective data, such as the number and duration of rehabilitation exercises and functional recovery levels, but also subjective feedback, including patient satisfaction, pain self-assessments, and changes in mental state. By combining both subjective and objective information, the implementation team can identify effective strategies and obstacles in the behavior change process, enabling them to make necessary adjustments. Additionally, encouraging patients to engage in self-monitoring and record-keeping enhances their autonomy and participation. Recording their behavior change journey allows patients to visualize their progress, adjust their strategies when faced with challenges, and find solutions that work best for them. This ability to self-manage and self-adjust plays a crucial role in facilitating postoperative rehabilitation and improving patients' overall quality of life.

4. Limitations

While the HAPA theory has demonstrated significant potential in promoting health behavior change in orthopedic postoperative patients, there are still several limitations and challenges. These include the need for long-term follow-up observations and effect evaluations, as well as the relatively limited application of HAPA theory in orthopedic postoperative care. In conclusion, while the application of HAPA theory in the rehabilitation of orthopedic patients post-surgery holds great promise, it must be further refined to better address individual differences and the dynamic nature of the rehabilitation environment. This would enhance the theory's adaptability and effectiveness in diverse clinical settings.

5. Conclusion and prospects

The application of HAPA theory in orthopedic postoperative patients has yielded impressive results, improving not only the health status of patients but also enhancing their self-efficacy and quality of life ^[20]. Looking ahead, the application of HAPA theory should be expanded to encompass a broader range of orthopedic conditions post-surgery. Developing more targeted behavioral plans and health education programs will provide more effective support for patients' rehabilitation. Furthermore, in-depth discussions are needed regarding the theory's role in long-term recovery and the importance of interdisciplinary collaboration. Combining HAPA with other theoretical models and approaches will contribute to a more comprehensive and robust health behavior change education system, ultimately optimizing patient recovery and well-being.

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Analysis of the Effectiveness of Continuous Nursing Interventions in Elderly Patients with COPD in the Stable Phase and Frailty

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Abstract: *Objective:* To evaluate the effectiveness of continuous nursing interventions in elderly patients with COPD in the stable phase and frailty. *Methods:* Sixty elderly patients with COPD in the stable phase and frailty, treated between January 2024 and August 2024, were selected as the study subjects. Patients were randomly divided into two groups (30 each) using a drawing method. Patients who drew a black token were assigned to the intervention group and received continuous nursing interventions, while those who drew a red token were assigned to the nursing group and received standard nursing care. The quality of care between the groups was compared. *Results:* Pulmonary function indicators in the intervention group were significantly better than those in the nursing group ($P < 0.05$). Immune function in the intervention group was also significantly higher than in the nursing group ($P < 0.05$). Before the intervention, there was no significant difference in self-care ability between the two groups ($P > 0.05$). However, post-intervention, both groups showed improved self-care abilities, with the intervention group scoring significantly higher than the nursing group ($P < 0.05$). Similarly, before the intervention, there was no significant difference in quality-of-life scores ($P > 0.05$), but post-intervention, both groups exhibited increased scores, with the intervention group outperforming the nursing group significantly ($P < 0.05$). *Conclusion:* Continuous nursing interventions significantly improve outcomes in elderly patients with COPD in the stable phase and frailty, warranting broader implementation.

Keywords: Continuous nursing; Stable COPD; Elderly patients; Pulmonary function; Immune function

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1. Introduction

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable respiratory disease, predominantly affecting the elderly. With worsening environmental pollution, its clinical prevalence has been rising. Patients in the acute phase typically require hospitalization, but they are discharged upon reaching the stable phase. To further improve the prognosis of elderly patients with stable COPD and frailty, implementing continuous nursing interventions is essential. Recent reports^[1,2] confirm that continuous nursing interventions can significantly improve pulmonary function, enhance immunity, and strengthen self-care ability and quality of life in such patients. To validate these findings, this study selected 60 elderly patients with stable COPD and frailty treated between January and August 2024, divided them into intervention and nursing groups, and compared the quality of care provided.

2. Materials and methods

2.1. Basic information

Sixty elderly patients with COPD in the stable phase and frailty, treated between January 2024 and August 2024, were selected as the experimental observation subjects. Using a random draw method, patients were divided into two groups of 30 each. Those drawing black token were included in the intervention group and received continuous nursing interventions, while those drawing red token were included in the nursing group and received routine nursing care. The intervention group consisted of patients aged 60–78 years, with an average age of 69.39 ± 0.67 years, including 17 males and 13 females. The nursing group included patients aged 62–80 years, with an average age of 70.14 ± 0.83 years, consisting of 16 males and 14 females. There were no significant differences in age or gender between the two groups ($P > 0.05$), indicating comparability.

Inclusion criteria: (1) Ethical approval for the experiment was obtained; (2) Patients met the diagnostic criteria for COPD confirmed by ultrasound^[3]; (3) Patients understood the experimental content and agreed to participate.

Exclusion criteria: (1) Patients with mental disorders; (2) Patients with immune diseases; (3) Patients with heart, liver, or kidney dysfunction; (4) Patients with impaired consciousness^[4].

2.2. Methods

The nursing group implemented basic nursing measures: Patients were provided with a high-nutrition, high-vitamin, high-protein, and easily digestible diet, including eggs, fish, and lean meat, with frequent small meals to ensure adequate caloric intake. Fresh fruits and vegetables such as apples, oranges, cabbage, and tomatoes were emphasized, while spicy, indigestible, and greasy foods like chili, raw onions, glutinous rice, and fatty meat were minimized. Smoking and alcohol were prohibited to prevent increased phlegm and worsening cough symptoms. Patients were guided in the proper use of bronchodilators and informed about the importance of adhering to medication. They were advised to exercise regularly to enhance immunity, maintain personal hygiene (e.g., rinsing the mouth after meals), ventilate rooms daily for fresh air, and take precautions during significant temperature changes.

The intervention group implemented continuous nursing measures: Building on the nursing group's measures, additional continuous nursing interventions were implemented: (1) Medication guidance: Patients were guided to use corticosteroids, antibiotics, and inhalers based on symptoms such as cough, sputum, and wheezing, in line with medical advice. (2) Smoking cessation encouragement: Personalized smoking cessation plans were developed, and patients signed agreements for gradual cessation. Successful quitters were invited to share experiences, and families were encouraged to supervise. (3) Rehabilitation interventions: Patients were taught limb exercises and

given nursing plans upon discharge, encouraging activities like walking and stair climbing, with a recommended schedule of twice daily for 30 minutes each. Follow-ups were conducted via home visits or phone calls. (4) Home oxygen therapy: Patients were advised to inhale oxygen before exercise, meals, and at night, with a daily limit of 4 hours. Oxygen flow rates were maintained at 1.0–2.5 mL/min, using nasal cannulas or masks as appropriate. (5) Psychological support: To address anxiety, depression, or other negative emotions, staff closely monitored patients' mental states, communicated with families, and encouraged support and understanding to foster a positive mindset during treatment. (6) Respiratory interventions: (i) Long breathing: Patients were guided to stand straight, relax muscles, inhale through the nose, and exhale through the mouth. A ratio of 3:1 was maintained for inhalation to exhalation, with a breathing frequency of 16 times per minute, avoiding dizziness. (ii) Chest breathing: Patients were instructed to keep an upright posture with arms crossed on the chest. During exhalation, arms were raised slowly, expanding the chest before inhaling. (iii) Walking breathing: Patients were guided to take two steps per breath initially, increasing to five steps per breath with 30-second intervals. Training duration and intensity were tailored to individual conditions, following a gradual progression principle.

2.3. Evaluation criteria

- (1) Lung function indicators such as FVC (forced vital capacity), FEV1 (forced expiratory volume in one second), and PEF (peak expiratory flow) were analyzed ^[5].
- (2) Through blood tests, CD3, CD4, CD8, and CD4/CD8 ratios were analyzed ^[6].
- (3) The ESCA Self-Care Ability Measurement Scale was used for evaluation, which includes levels of health knowledge, self-care skills, self-concept, and self-care responsibility. The scale is scored on levels 1–4, with a total score range of 0–172 points. Higher scores indicate stronger self-care ability ^[7].
- (4) The SF-36 scoring scale was used for assessment, covering four aspects. Scores range from 0–100, with higher scores closer to 100 indicating better quality of life, demonstrating a positive correlation ^[7].

2.4. Statistical methods

SPSS22.0 software was used for analysis. Measurement data were expressed as mean \pm standard deviation (SD) and tested using the *t*-test. Count data were expressed as percentages and tested using the chi-square test. A *P*-value < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of lung function indicators between groups

The lung function indicators in the intervention group were significantly better than those in the nursing group (*P* < 0.05). **Table 1** shows the details.

Table 1. Comparison of lung function indicators between groups (mean \pm SD)

Group	FVC (L)	FEV1 (L)	PEF (L/s)
Intervention group (<i>n</i> = 30)	2.56 \pm 0.75	1.57 \pm 0.53	4.79 \pm 0.74
Nursing group (<i>n</i> = 30)	1.34 \pm 0.46	1.33 \pm 0.28	2.24 \pm 0.72
<i>t</i> value	7.206	6.382	11.505
<i>P</i> value	< 0.05	< 0.05	< 0.05

3.2. Comparison of immune function between groups

The immune function in the intervention group was significantly higher than that in the nursing group ($P < 0.05$). **Table 2** presents the results.

Table 2. Comparison of immune function between groups (mean \pm SD, scores)

Group	CD3	CD4	CD8	CD4/CD8
Intervention group ($n = 30$)	66.37 \pm 2.47	47.56 \pm 3.33	27.36 \pm 1.35	1.47 \pm 0.46
Nursing group ($n = 30$)	62.28 \pm 2.38	11.27 \pm 2.25	30.17 \pm 1.37	1.62 \pm 0.13
<i>t</i> value	8.635	38.056	14.352	4.163
<i>P</i> value	< 0.05	< 0.05	< 0.05	< 0.05

3.3. Comparison of self-care abilities between groups

Before the intervention, the self-care abilities of the groups were relatively similar, with no statistically significant difference ($P > 0.05$). After the intervention, both groups showed improvement in self-care abilities. However, the intervention group demonstrated significantly better self-care abilities compared to the control group ($P < 0.05$). The details are shown in **Table 3**.

Table 3. Comparison of self-care abilities between groups (mean \pm SD)

Group	Health knowledge level		Self-concept		Sense of responsibility for self-care		Self-care skills	
	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Intervention group ($n = 30$)	22.52 \pm 1.37	34.55 \pm 1.48	10.68 \pm 1.29	23.58 \pm 6.39	12.13 \pm 1.15	16.27 \pm 1.28	14.76 \pm 1.45	21.59 \pm 1.53
Nursing group ($n = 30$)	22.62 \pm 1.16	28.73 \pm 1.35	10.94 \pm 1.43	15.26 \pm 6.17	11.12 \pm 1.17	15.19 \pm 1.19	14.74 \pm 1.24	19.27 \pm 1.36
<i>t</i> value	1.776	5.047	0.127	10.164	1.048	5.264	0.826	6.472
<i>P</i> value	0.282	0.000	0.841	0.000	0.295	0.000	0.425	0.000

3.4. Comparison of quality of life between groups

Before the intervention, the quality-of-life scores between the groups were relatively close and showed no statistical significance ($P > 0.05$). After the intervention, the quality-of-life scores increased in both groups, with the intervention group scoring higher than the nursing group (**Table 4**). The difference between the groups was statistically significant ($P < 0.05$).

Table 4. Comparison of quality of life between groups (mean \pm SD, scores)

Group	Vitality		Mental health		Physiological function		Overall health	
	Pre-inter- vention	Post-inter- vention	Pre-inter- vention	Post-inter- vention	Pre-inter- vention	Post-inter- vention	Pre-inter- vention	Post-inter- vention
Intervention group (<i>n</i> = 30)	78.47 \pm 3.85	95.44 \pm 3.52	77.26 \pm 3.72	92.47 \pm 3.28	78.68 \pm 3.35	93.54 \pm 3.27	76.36 \pm 3.17	93.47 \pm 3.28
Nursing group (<i>n</i> = 30)	77.45 \pm 3.32	86.25 \pm 4.15	78.45 \pm 3.71	86.56 \pm 4.23	77.29 \pm 3.26	87.17 \pm 4.15	77.47 \pm 3.65	87.42 \pm 4.73
<i>t</i> value	0.413	6.154	0.564	8.246	0.445	7.124	0.334	7.057
<i>P</i> value	> 0.05	< 0.05	> 0.05	< 0.05	> 0.05	< 0.05	> 0.05	< 0.05

4. Discussion

The clinical prevalence and mortality rate of COPD are relatively high. Due to its slow progressive development, COPD significantly impacts patients' work capacity and quality of life. Although symptoms may alleviate during the stable phase following an acute exacerbation, lung function continues to deteriorate. Reduced immune function and exposure to various harmful substances exacerbate the disease, leading to recurrent episodes and potentially triggering a range of cardiopulmonary complications. The goal of stable-phase treatment is to prevent acute exacerbations of COPD, enhance daily living capabilities, accelerate lung function recovery, and prevent further decline in lung function^[8,9].

Continuous nursing care, as a modern nursing approach, ensures systematic intervention for patients outside the hospital. This involves medication guidance, home oxygen therapy, psychological support, rehabilitation interventions, respiratory therapy, and encouragement to quit smoking. These measures help patients adopt healthy eating habits, safely use medications, promote early recovery of physical functions, and achieve self-care, thereby improving nursing outcomes and significantly enhancing patients' quality of life. Experimental results indicate that the intervention group had more favorable lung function indicators than the nursing group and demonstrated higher immune function. Before the intervention, self-care abilities were comparable between groups; after the intervention, both groups showed improvement, with the intervention group exhibiting superior self-care abilities. Similarly, while quality-of-life scores were similar initially, post-intervention scores improved in both groups, with the intervention group achieving higher scores. These findings align with previous research^[10-12], adding representativeness to the study.

5. Conclusion

In conclusion, continuous nursing interventions in elderly COPD patients during the stable phase of frailty effectively improve their condition, enhance quality of life and lung function, and merit broader implementation.

Disclosure statement

The authors declare no conflict of interest.

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The Clinical Significance of the Emergency Green Channel in the Treatment of Patients with Acute Chest Pain

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Abstract: *Objective:* To analyze the clinical significance of the emergency green channel in the treatment of patients with acute chest pain. *Methods:* Sixty patients with acute chest pain treated between September 2022 and July 2024 were selected as the subjects of this study. They were divided into groups based on the order of treatment: the first 30 patients were included in the Green Channel group, where the emergency green channel was employed, while the remaining 30 patients were placed in the Regular Emergency group, receiving standard emergency treatment. The rescue time, hospitalization time, pain scores, incidence of adverse reactions, and quality of life between the Green Channel group and the Regular Emergency group were compared. *Results:* The rescue time and hospitalization time of the Green Channel group were shorter than those of the Regular Emergency group, with statistical significance ($P < 0.05$). The pain scores at 30, 60, 120, and 240 minutes after rescue in the Green Channel group were lower than those in the Regular Emergency group, with statistical significance ($P < 0.05$). The incidence of adverse reactions such as recurrent acute attacks, arrhythmia, heart failure, stroke, and shock in the Green Channel group was lower than that in the Regular Emergency group, with statistical significance ($P < 0.05$). The treatment satisfaction rate and success rate in the Green Channel group were 93.33% and 93.33%, respectively, while those in the Regular Emergency group were 73.33% and 73.33%. Both the satisfaction and success rates in the Green Channel group were higher than those in the Regular Emergency group, with statistical significance ($P < 0.05$). The quality of life in the Green Channel group was also higher than that in the Regular Emergency group, with statistical significance ($P < 0.05$). *Conclusion:* The emergency green channel plays a significant role in the treatment of patients with acute chest pain and is worthy of widespread clinical application.

Keywords: Emergency green channel; Patients with acute chest pain; Rescue time; Hospitalization time; Pain score; Incidence of adverse reactions

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1. Introduction

Acute chest pain is characterized by a sudden onset and unknown etiology, affecting the physical and mental health

of patients while potentially threatening their lives ^[1]. To promptly determine the cause and assess the severity of the condition, ensuring the patient receives successful treatment, the emergency green channel was introduced. Recent reports indicate that the emergency green channel has notable clinical significance in the treatment of patients with acute chest pain ^[2]. It can shorten rescue times, reduce mortality rates, and ensure the patient's safety ^[3]. To verify this report, this study selected 60 patients with acute chest pain treated between September 2023 and July 2024 as the subjects of analysis, comparing the outcomes of the emergency green channel and regular emergency treatments, including rescue time, hospitalization time, pain scores, incidence of adverse reactions, and quality of life.

2. Materials and methods

2.1. General information

Sixty patients with acute chest pain treated between September 2022 and July 2024 were selected as subjects for this study. The patients were grouped based on the order of treatment: the first 30 patients were included in the Green Channel group, where the emergency green channel was employed, and the remaining 30 patients were placed in the Regular Emergency group, receiving standard emergency treatment. In the Green Channel group, the ages ranged from 42 to 79 years, with a mean age of (62.65 ± 4.27) years, consisting of 16 males and 14 females. In the Regular Emergency group, the ages ranged from 43 to 81 years, with a mean age of (63.31 ± 5.66) years, consisting of 17 males and 13 females. The basic data of the study subjects showed no significant differences and were comparable ($P > 0.05$).

Inclusion criteria: This study was approved by the Ethics Committee. All subjects voluntarily participated in the experiment, were diagnosed in accordance with the criteria for treating acute chest pain, were informed of the study content, and agreed to cooperate with the experimental procedures.

Exclusion criteria: Patients with heart, liver, or kidney dysfunction; those with mental disorders; uncooperative individuals; and those with unclear consciousness were excluded ^[4-5].

2.2. Methods

Patients in the Regular Emergency group with acute chest pain underwent standard emergency procedures, which included reception, hospitalization, diagnosis, and treatment.

Patients in the Green Channel group with acute chest pain followed the emergency Green Channel procedure: First, after the reception, triage was immediately performed, and the nurse guided the patient to the chest pain center. The doctor was informed in advance of the patient's symptoms and specific manifestations via internal phone communication. Second, during the waiting period, a preliminary evaluation of the patient's condition was conducted by considering pulse, blood pressure, body temperature, heart rate, and facial color, to determine the presence of arrhythmias, hypotension, or dyspnea, aiding further diagnosis and treatment. Additionally, the severity of the patient's condition was assessed and classified using red, yellow, and blue indicators: yellow indicated critical emergency patients whose condition was life-threatening, red indicated severe emergency patients whose condition was serious but not immediately life-threatening, and blue indicated ordinary emergency patients whose condition was stable and not life-threatening, allowing for a reasonable arrangement of rescue operations. Finally, blood and secretion samples were collected, and the laboratory department was contacted for urgent testing. Communication with the physician during patient transfer included whether to establish an intravenous line in advance and implement relevant interventions, such as administering cardiotonic drugs and

angiotensin. Furthermore, patients and their families were settled appropriately, and the number of personnel in the green channel area was controlled to ensure unobstructed passage.

2.3. Evaluation criteria

- (1) Record the rescue time and hospitalization time of patients with acute chest pain.
- (2) The degree of pain at 30, 60, 120, and 240 minutes after rescue in patients with acute chest pain was assessed using the Visual Analog Scale (VAS) pain score, with a total score of 10 points. Scores of 1–3 indicated mild pain, 4–6 indicated moderate pain, and 6–10 indicated severe pain ^[6].
- (3) The incidence of adverse reactions (such as recurrent acute attacks, arrhythmia, heart failure, stroke, and shock) in patients with acute chest pain was observed and recorded. Incidence rate = number of cases of occurrence / total number of cases $\times 100\%$ ^[7].
- (4) The satisfaction with the treatment among patients with acute chest pain was surveyed using a questionnaire filled out by the patients themselves. The total score was 100 points, with scores above 70 indicating satisfaction, scores below 30 indicating dissatisfaction, and scores in between indicating moderate satisfaction. Overall satisfaction rate = (number of satisfied + moderately satisfied patients) / total number of cases $\times 100\%$. The number of successful treatments was also recorded, with the success rate calculated as = number of successful treatments / total number of cases $\times 100\%$ ^[8].
- (5) The quality of life of patients with acute chest pain was assessed using the SF-36 scale, which includes eight dimensions. Each dimension is scored out of 100, with higher scores indicating better quality of life ^[9].

2.4. Statistical analysis

Statistical analysis was conducted using SPSS 26.0. Count data were expressed as [n (%)], and the chi-squared test (χ^2 test) was used. Measurement data were expressed as mean \pm standard deviation (SD), and the t -test was used. Statistical significance was set at $P < 0.05$.

3. Results

3.1. Comparison of rescue time and hospitalization time between the Green Channel group and the Regular Emergency group in acute chest pain patients

As shown in **Table 1**, the rescue time and hospitalization time of patients in the Green Channel group were shorter than those in the Regular Emergency group, with statistically significant differences ($P < 0.05$).

Table 1. Comparison of rescue time and hospitalization time between the Green Channel group and the Regular Emergency group (mean \pm SD)

Group (n)	Rescue time (min)	Hospitalization time (days)
Green Channel Group ($n = 30$)	36.17 \pm 1.69	11.64 \pm 3.14
Regular Emergency Group ($n = 30$)	62.38 \pm 3.58	15.59 \pm 3.16
t -value	35.174	4.182
P -value	0.000	0.000

3.2. Comparison of pain scores between the Green Channel group and the Regular Emergency group in acute chest pain patients

Table 2 shows that the pain scores of patients in the Green Channel group at 30 min, 60 min, 120 min, and 240 min after rescue were lower than those in the Regular Emergency group, with statistically significant differences ($P < 0.05$).

Table 2. Comparison of pain scores between the Green Channel group and the Regular Emergency group (mean \pm SD, points)

Group (n)	30 min after rescue	60 min after rescue	120 min after rescue	240 min after rescue
Green Channel Group (n = 30)	2.04 \pm 2.62	2.17 \pm 1.57	1.47 \pm 0.53	0.67 \pm 0.38
Regular Emergency Group (n = 30)	4.16 \pm 1.33	4.47 \pm 1.28	3.56 \pm 0.72	2.16 \pm 0.44
t-value	4.274	6.056	12.156	22.814
P-value	0.000	0.000	0.000	0.000

3.3. Comparison of adverse reaction incidence between the Green Channel group and the Regular Emergency group in acute chest pain patients

Table 3 shows that the incidence of adverse reactions, such as recurrent acute episodes, arrhythmias, heart failure, stroke, and shock, was lower in the Green Channel group than in the Regular Emergency group, with statistically significant differences ($P < 0.05$).

Table 3. Comparison of adverse reaction incidence between the Green Channel group and the Regular Emergency group [n (%)]

Group (n)	Recurrent acute episode	Arrhythmia	Heart failure	Stroke	Shock
Green Channel Group (n = 30)	2 (6.67)	2 (6.67)	1 (3.33)	1 (3.33)	2 (6.67)
Regular Emergency Group (n = 30)	8 (26.67)	9 (30.00)	8 (26.67)	9 (30.00)	8 (26.67)
χ^2 -value	4.258	5.277	4.841	7.674	4.341
P-value	0.032	0.018	0.011	0.004	0.036

3.4. Comparison of treatment satisfaction and success rates between the Green Channel group and the Regular Emergency group in acute chest pain patients

The treatment satisfaction and success rates of patients in the Green Channel group were 93.33% and 93.33%, respectively, while those in the Regular Emergency group were 73.33% and 73.33%. The Green Channel group had higher treatment satisfaction and success rates than the Regular Emergency group, with statistically significant differences ($P < 0.05$). See **Table 4**.

Table 4. Comparison of treatment satisfaction and success rates between the Green Channel group and the Regular Emergency group [*n* (%)]

Group (<i>n</i>)	Satisfied	Moderately satisfied	Dissatisfied	Total satisfaction rate	Treatment success rate
Green Channel Group (<i>n</i> = 30)	12 (40.00)	16 (53.33)	1 (3.33)	28 (93.33)	28 (93.33)
Regular Emergency Group (<i>n</i> = 30)	10 (33.33)	12 (40.00)	8 (26.67)	22 (73.33)	22 (73.33)
χ^2 -value				8.541	8.541
<i>P</i> -value				< 0.05	< 0.05

3.5. Comparison of quality of life between the Green Channel group and the Regular Emergency group in acute chest pain patients

Table 5 shows that the Green Channel group had higher scores in mental health (MH), emotional role (RE), social functioning (SF), vitality (VT), bodily pain (BP), role-physical (RP), physical functioning (PF), and general health (CH) compared to the Regular Emergency group, with statistically significant differences ($P < 0.05$).

Table 5. Comparison of quality of life between the Green Channel group and the Regular Emergency group (mean \pm SD, points)

Group (<i>n</i>)	MH	RE	SF	VT	BP	RP	PF	CH
Green Channel Group (<i>n</i> = 30)	93.12 \pm 3.45	95.03 \pm 3.18	92.47 \pm 3.28	93.47 \pm 3.28	92.22 \pm 3.65	92.04 \pm 3.17	93.46 \pm 3.71	95.67 \pm 3.33
Regular Emergency Group (<i>n</i> = 30)	84.05 \pm 2.47	84.22 \pm 2.44	84.38 \pm 2.28	84.55 \pm 2.57	85.63 \pm 2.47	85.25 \pm 2.54	84.56 \pm 2.67	86.17 \pm 2.54
<i>t</i> -value	9.185	11.295	9.142	10.286	9.596	9.097	11.295	9.142
<i>P</i> -value	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

4. Discussion

Acute chest pain is one of the common symptoms of cardiovascular diseases. Due to its complex manifestations, the severity can vary, making it essential to accurately assess the type of chest pain, such as distending pain, dull pain, oppressive pain, stabbing pain, or burning pain, in order to implement targeted treatment and improve rescue efficiency^[10-11].

The Green Channel is an important system in emergency departments. Though its treatment process is more complex and involves more steps compared to conventional emergency care, it does not prolong rescue time but instead enhances rescue efficiency and reduces mortality rates. The application of the Green Channel in the rescue of acute chest pain patients can accelerate the reception process, facilitate diagnosis and condition assessment, and aid in the swift triage and information transfer of patients. After receiving the patient, basic rescue measures such as oxygen therapy are administered, which helps prevent deterioration of the condition and sudden death. Intravenous access is established and blood samples are obtained, which benefits subsequent examinations and treatment^[12].

Transportation is a critical part of the process. Since unstable vehicle movement may exacerbate the patient's condition, enhancing monitoring during transport is crucial. Upon arrival at the hospital, the Green Channel is utilized to quickly move the patient to the resuscitation room, where the emergency department is already prepared for rescue based on the patient's pre-received information. The patient can be treated immediately, and admission procedures are completed after the rescue. Based on this approach, the use of the Green Channel significantly reduces rescue time and improves efficiency.

The results of this experiment show that the Green Channel group had shorter rescue and hospitalization times compared to the Regular Emergency group. The pain scores at 30, 60, 120, and 240 minutes after rescue were lower in the Green Channel group than in the Regular Emergency group. The incidence of adverse reactions such as recurrent acute episodes, arrhythmias, heart failure, stroke, and shock was lower in the Green Channel group. The satisfaction and success rates of treatment in the Green Channel group were 93.33%, compared to 73.33% in the Regular Emergency group. These findings are consistent with those of previous scholars^[13-15], fully validating the clinical significance of the Green Channel in the treatment of acute chest pain patients, as well as confirming the research value of this experiment.

5. Conclusion

In conclusion, the Green Channel in emergency departments has significant clinical importance in the treatment of acute chest pain patients. It reduces the incidence of adverse reactions, shortens rescue and hospitalization times, improves quality of life, and promotes early recovery, making it suitable for widespread implementation.

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Disclosure statement

The authors declare no conflict of interest.

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Research Progress on Health Literacy in Patients with Chronic Kidney Disease

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Abstract: Chronic kidney disease (CKD) is characterized by high morbidity, high mortality, and poor prognosis, while health literacy is the goal of health education and an important outcome of health promotion, crucial for improving health outcomes. Therefore, this paper reviews the conceptual evolution, theoretical models, and assessment tools of health literacy, as well as the current status, influencing factors, and intervention strategies of health literacy in CKD patients. The aim is to raise awareness among healthcare professionals regarding health literacy in CKD and to provide a reference for further research on health literacy in CKD patients.

Keywords: Chronic kidney disease; Health literacy; Influencing factors; Measurement tools; Intervention

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1. Introduction

Chronic kidney disease (CKD) is characterized by renal structural or functional abnormalities persisting for more than three months. In the early stages, it often presents with no obvious clinical symptoms. However, as the residual renal units become unable to compensate for the body's needs, it primarily manifests itself in a series of symptoms, including oliguria, proteinuria, anemia, endocrine and metabolic disorders, and is characterized by high

morbidity, high mortality, poor prognosis, and high medical costs ^[1].

According to statistics, there are 697.5 million CKD patients worldwide, accounting for 9.1% of the global population. China has the largest number of CKD patients, accounting for 19% of the global total ^[2]. World Health Organization (WHO) statistics indicate that the incidence of CKD in China is as high as 10.8%, and the number of individuals affected by the disease is approximately 150 million ^[3]. As renal function gradually declines, patients may develop various complications, such as water-electrolyte disorders, metabolic acidosis, and cardiovascular disease, leading to a significantly increased risk of adverse outcomes ^[4]. When the disease progresses to end-stage renal disease, renal replacement therapy, such as hemodialysis, peritoneal dialysis, and kidney transplantation, becomes the last resort for patients to maintain their lives, imposing a heavy financial burden on patients, families, and society.

CKD treatment primarily focuses on slowing the decline of renal function and preventing complications ^[5]. Previous studies have demonstrated that CKD patients with poor knowledge of the disease, limited health information support, and poor disease management skills experience faster disease progression and are more likely to have adverse outcomes ^[6]. Therefore, improving patients' ability to acquire, understand, and utilize health information is essential for enhancing health behaviors and delaying disease progression, a concept known as health literacy. Health literacy is the goal of health education and an important outcome of health promotion, significantly contributing to improved health outcomes. This paper reviews the conceptual evolution, theoretical models, and measurement tools of health literacy, the current status, influencing factors, and intervention strategies of health literacy in CKD patients, aiming to provide references for further research on health literacy in CKD patients. The ultimate goal is to improve the level of health literacy in CKD patients, enhance their ability to self-manage their diseases, delay disease progression, improve health outcomes, and enhance their quality of life.

2. Conceptual evolution of health literacy

In 1974, the American scholar Simonds was the first to introduce the term “health literacy” in *Health Education as Social Policy* ^[7]. In 1998, the World Health Organization (WHO) defined health literacy as “a cognitive and social skill that determines an individual’s motivation and ability to acquire, understand, and utilize information to promote and maintain health” ^[8]. In 1999, the American Medical Association (AMA) defined functional health literacy as “a set of interacting competencies such as performing basic reading and numeracy in a healthcare setting” ^[9].

In 2000, Professor Nutbeam defined health literacy as “the personal, cognitive, and social skills of individuals to access, understand, and utilize information to promote and maintain good health” ^[10]. In 2004, the National Library of Medicine (NLM) defined health literacy as “an individual’s ability to access and understand basic health information and services and to use them to make good decisions to maintain and promote one’s health” ^[11]. This definition was adopted by the Healthy People 2010 program in the U.S. In 2005, Guo *et al.* introduced the term “health literacy” to China, and the NLM definition of health literacy was adopted in domestic governmental documents on health literacy ^[12].

In 2010, McCormack *et al.* defined health literacy as “the extent to which individuals are able to access, process, understand, and communicate health-related information needed to make informed health decisions” ^[13]. In 2020, the U.S. Healthy People 2030 plan defined health literacy in terms of both individuals and organizations, emphasizing the important role of organizations that provide health-related information and services in improving

health literacy^[14].

At present, the international definition of health literacy has not been fully unified^[15]. Scholars have elaborated on it from different perspectives. To summarize, health literacy extends beyond basic reading, writing, and numeracy, encompassing a comprehensive skill set for acquiring, understanding, and utilizing health information.

3. Theoretical models of health literacy

3.1. The health literacy model

In 2000, Professor Nutbeam proposed a health literacy model based on a public health perspective, which divides health literacy into three levels: functional health literacy, interactive health literacy, and critical health literacy^[10]. Functional health literacy refers to the basic reading and writing skills needed by individuals in everyday situations, including general medical knowledge such as safety, nutrition, medication, and first aid. This level primarily focuses on individuals' mastery of health knowledge. Interactive health literacy is a more advanced cognitive ability that emphasizes an individual's willingness to improve health, motivation, and confidence to implement health actions. This level focuses on the development of personal skills, including the ability to access health information, utilize media, and communicate effectively. Critical health literacy represents the highest level of cognition and skills, involving the use of critical thinking to analyze health information. Individuals with critical health literacy are better equipped to utilize health information and have greater agency, control, and decision-making power over life events and health conditions compared to those at the first two levels.

3.2. The health literacy skills conceptual framework

In 2012, Squiers *et al.* developed the health literacy skills (HLS) conceptual framework, which describes the relationship between health literacy and health-related outcomes^[16]. This framework explains how health literacy operates at the individual level while recognizing the influence of external factors such as family, environment, community, culture, and media. Health literacy is considered a multidimensional and dynamic construct, divided into four main components: (1) factors influencing the development and use of health literacy skills; (2) health-related stimuli; (3) health literacy skills required to understand stimuli and perform tasks; and (4) mediating variables between health literacy and health outcomes. Additionally, the framework identifies four dimensions of health literacy: print literacy, numeracy, communication, and information-seeking skills. Demographics, personal resources, competencies, and prior knowledge are several interrelated contextual factors that influence an individual's health literacy skills. According to an ecological perspective, health-related behaviors and outcomes are influenced by multiple dimensions, including individual, system, and societal levels, and these factors interact at different levels.

3.3. Integrated conceptual model of health literacy

In 2012, Sørensen *et al.* argued that most existing health literacy models, despite recognizing the multidimensional nature of health literacy, are incomplete, static, and lack clear causal pathways of action^[17]. In response to these shortcomings, an integrated conceptual model of health literacy was proposed, drawing upon medical and public health perspectives. At the core of the model are competencies related to the processes of accessing, understanding, evaluating, and applying health information, each representing a dimension of health literacy.

These competencies require specific cognitive skills and depend on the quality of the information provided. Access to health information depends on comprehension, time, and credibility. Comprehension of information depends on expectations, perceived utility, individualization of outcomes, and interpretation of causality. Processing and evaluation of information depend on complexity, terminology, and partial comprehension of information. Effective communication and utilization depend on understanding of information. This process generates knowledge and skills that enable patients in healthcare settings, individuals at risk for disease, and those involved in health promotion to apply their general literacy, digital skills, and health literacy skills to obtain, understand, critically analyze, evaluate, and independently act on health information.

3.4. The health literacy intervention model

In 2018, Geboers *et al.* concluded that existing models provide valuable insights into the potential determinants of health literacy and the mediating role between health literacy and health outcomes but offer limited guidance for developing comprehensive interventions^[18]. To address this gap, they developed the health literacy intervention model. The interventions in the model target both individuals with low health literacy and health service professionals, encompassing the following strategies: (1) strengthening social support systems for individuals; (2) empowering individuals with low health literacy; (3) improving communication between individuals and health professionals and strengthening interactions between individual characteristics and health system needs; (4) enhancing healthcare professionals' health literacy capacity; and (5) improving health system communication and accessibility, reducing care barriers to enhance quality of care or patient safety. The model emphasizes the dynamic interaction between low-health literacy individuals and health professionals, highlighting the synergistic effect of combined interventions.

4. Measurement tools for health literacy

There is a wide variety of health literacy measurement tools, with a predominance of universal measurement tools. Early health literacy measurement tools focused solely on the functional health literacy dimension and had limitations, such as the Rapid Estimate of Adult Literacy in Medicine (REALM)^[19] and the Short Test of Functional Health Literacy in Adults Scale (S-TOFHLA)^[20]. As research has progressed, the understanding of health literacy has broadened, and the demand for comprehensive health literacy measurement tools has increased. In recent years, scholars have developed specific measurement tools for chronic disease populations, such as diabetic patients^[21] and cancer patients^[22]. In 2016, Shih *et al.*, a Taiwanese scholar in China, developed a specific measurement tool for health literacy in hemodialysis patients, which demonstrated good reliability and validity but limited use^[23]. In 2021, Wei *et al.* developed a specific measurement tool for health literacy in CKD patients, available in both Taiwanese and Mandarin versions, and validated for good reliability and validity^[24].

4.1. Health Literacy Management Scale (HeLMS)

In 2013, Professor Jordan *et al.* developed the HeLMS based on in-depth interviews and a conceptual framework^[25]. The scale assesses individuals' competencies and their broader social and environmental contexts, encompassing eight dimensions: attitudes to health, knowledge of health information, social support, socioeconomic factors, access to GP healthcare services, communication with health professionals, proactivity, and use of health information. The scale consists of 29 items rated on a 5-point Likert scale, with higher scores indicating higher

levels of health literacy. The Cronbach's alpha coefficient for each dimension of the scale ranged from 0.82 to 0.89, demonstrating good reliability.

4.2. Health Literacy Questionnaire (HLQ)

In 2013, Osborne *et al.* developed the HLQ to address the limitations of the HeLMS and assess the health literacy needs of a broader range of individuals and organizations ^[26]. The scale comprises nine subscales with 44 items, covering: perceived understanding and support from healthcare providers, having enough information to manage health, actively managing one's own health, health-related social support, the ability to assess health information, the ability to interact with healthcare providers, the ability to navigate the healthcare system, the ability to find health information, and the ability to understand and utilize health information. The Cronbach's alpha coefficient of the scale is 0.77. In recent years, the HLQ has become one of the most widely used health literacy instruments in public health and health services research, and it has been translated into various languages, including Korean ^[27], Arabic ^[28], and Portuguese ^[29].

4.3. The European Health Literacy Survey Questionnaire (HLS-EU-Q)

Sørensen *et al.* concluded that existing health literacy measurement tools had limitations and redefined the meaning and conceptual framework of health literacy ^[17]. In 2013, the HLS-EU-Q was developed to measure health literacy in European populations ^[30]. The scale assesses the ability to access, understand, evaluate, and utilize health-related information in three domains: healthcare, disease prevention, and health promotion. It consists of 47 items rated on a 4-point Likert scale, with higher scores indicating higher levels of health literacy. In 2017, Duong *et al.* validated the scale in six Asian countries, and Cronbach's alpha coefficients of the translated scales exceeded 0.90, demonstrating good reliability and validity ^[31]. In 2018, Finbråten *et al.* developed a simplified version, the 12-item European Health Literacy Questionnaire (HLS-Q12) ^[32]. In 2023, the HLS-Q12 was validated in patients with chronic diseases, confirming its good reliability ^[33].

4.4. The Health Literacy Scale for Chronic Disease Patients

Based on the HeLMS developed by Professor Jordan, Chinese scholar Sun compiled the Health Literacy Scale for Chronic Disease Patients in 2012, tailored to China's national conditions and population characteristics ^[34]. The scale includes four dimensions and 24 items: information acquisition ability, communication and interaction ability, willingness to improve health, and willingness to provide financial support. The Likert 5-point scale is used, with higher scores indicating higher levels of health literacy. Scores of 96 or more are considered indicative of good health literacy, while scores below 96 suggest a lack of health literacy. The Cronbach's alpha coefficient of the scale is 0.894, indicating good reliability.

4.5. All Aspects of Health Literacy Scale (AAHLS)

In 2013, Chinn *et al.* developed the AAHLS, a short health literacy measurement tool, based on Nutbeam's health literacy model ^[35]. The scale includes four dimensions and 14 items: ability to use written health information, communication with healthcare providers, ability to evaluate and apply health information, and individual autonomy. The first 12 items are scored on a 3-point Likert scale, and items 13 and 14 are two-category multiple-choice questions. Higher total scores indicate higher levels of health literacy. The Cronbach's alpha coefficient of the total scale is 0.75. In 2017, Chinese scholars Wu *et al.* adapted the scale for Chinese contexts, resulting

in the Chinese version of the Comprehensive Health Literacy Scale (C-AAHLS) ^[36]. The C-AAHLS includes three dimensions and 11 items, scored on a 4-point Likert scale, and it has demonstrated good reliability with a Cronbach's alpha coefficient of 0.811.

5. Research status of health literacy among CKD patients

In 2009, Devraj *et al.* suggested that health literacy plays a crucial role in kidney disease, pioneering a new research direction in health literacy for CKD ^[37]. Subsequently, related studies have flourished, encompassing cross-sectional studies, qualitative studies, intervention studies, and systematic evaluations. In 2019, a cross-sectional study conducted in Norway revealed that health literacy among patients with CKD stages 3 to 5 was moderately high, with the highest scores on the subscale "feeling understood and supported by healthcare providers" and the lowest scores on the subscale "ability to assess health information" ^[38]. The results indicated that gender, education, type of prescription medication taken, and depressive symptoms were associated with health literacy. In 2024, Singaporean scholar Ho *et al.* surveyed 289 CKD patients and found that 31.1% had limited health literacy, and health literacy was associated with gender and level of self-care ^[39].

A longitudinal qualitative study conducted in-depth interviews with 24 CKD patients, revealing that these patients had insufficient health literacy, barriers to self-management, and inadequate support from healthcare professionals ^[40]. The study emphasized the need for further optimization measures to improve patients' health literacy and the support capacity of healthcare professionals.

Research on health literacy in CKD patients in China began relatively late, with most existing studies focusing on status quo surveys, analysis of influencing factors, and correlation analysis with other variables. Qualitative studies and interventional studies are relatively scarce. In 2013, a questionnaire survey conducted by Sun *et al.* on 80 CKD patients hospitalized in Beijing, China, found that 71.2% of the CKD patients had low health literacy ^[41]. Around 2019, cross-sectional studies in Sichuan and Hunan provinces, China, revealed that the health literacy of CKD patients was moderately low, with CKD stage 5 patients exhibiting even greater deficiencies ^[42-44]. Cross-sectional studies from 2021 onward indicated that the health literacy of CKD patients had improved to a moderately high level ^[45-47]. In conclusion, although the health literacy of CKD patients in China has shown improvement in recent years, the overall situation remains suboptimal.

6. Factors influencing health literacy in CKD patients

6.1. Demographic factors

Age ^[42], literacy ^[46,48], occupation ^[45,46], mode of residence ^[46], per capita monthly household income ^[42,48], mode of payment for healthcare ^[42], and smoking status ^[49] have been found to be associated with the level of health literacy in CKD patients. Demographic factors can help healthcare professionals identify CKD patients with limited health literacy, providing a foundation for effective interventions.

6.2. Disease-related factors

Some studies have shown that the number of hospitalizations ^[46], frequency of hemodialysis ^[44], number of prescribed medications ^[38], and severity of comorbidities ^[48] are important factors influencing health literacy in CKD patients. Additionally, Chen investigated the correlation between nutrition and health literacy in CKD

patients, finding that better nutritional status was associated with higher levels of health literacy^[43].

6.3. Psycho-cognitive factors

Zhang *et al.* found a negative correlation between fear of disease progression and health literacy^[45], indicating that CKD patients with lower levels of fear were better able to utilize information to address their health concerns. Studies have also shown a positive correlation between health literacy and self-efficacy, with higher self-efficacy associated with higher health literacy^[50]. This mutual reinforcement is consistent with the findings of Kazak *et al.*^[51] and Ho *et al.*^[39]. Stømer *et al.* pointed out a correlation between health literacy and depressive symptoms in CKD patients^[38]. These findings highlight the importance of psychological and cognitive factors in influencing health literacy among CKD patients and emphasize the need for their improvement.

6.4. Family and social support

Family and social support play a crucial role in the health literacy of CKD patients, providing information, resources, and emotional support to help patients better manage their disease and improve their quality of life. A qualitative study revealed that family understanding and support were facilitators of health literacy in CKD patients^[52]. Studies have shown a positive correlation between social support and health literacy, with higher social support associated with better access to health information and improved self-management abilities^[53]. Kita *et al.* demonstrated a link between health literacy and socialization activities in CKD patients^[54]. Additionally, research has indicated a correlation between health literacy and disease burden in CKD patients^[55].

6.5. Healthcare delivery system

Studies have shown a strong relationship between the health literacy of CKD patients and interactions with healthcare providers^[49,55]. Effective communication between healthcare providers and patients can improve patient health behaviors, optimize health decision-making, and play a key role in enhancing health literacy. In the context of complex diseases with multimorbidity, decentralized healthcare issues can make it challenging for CKD patients to navigate the healthcare system^[56]. Therefore, strengthening communication to improve the accessibility of healthcare services and establishing long-term mechanisms for health literacy improvement is crucial.

6.6. Information and media support

Studies have shown that information navigation biases and media use barriers influence health literacy. Compared to younger CKD patients, older patients may be less receptive to electronic information. Smartphone-based educational methods, such as WeChat and apps, may be less accessible to some older CKD patients. Additionally, the existing health information may be obscure and difficult to comprehend, further hindering patients' access to health information^[52]. Therefore, patients should be guided to actively utilize modern media while improving their ability to identify reliable health information.

7. Intervention strategies for health literacy in CKD patients

7.1. Multiform interventions

Huang *et al.* designed a one-on-one health literacy education program involving the distribution of health education brochures and the viewing of health education videos^[57]. The results demonstrated that this program

was effective in improving the health literacy of CKD patients and clinical outcomes. Fu *et al.* applied humanized care to CKD patients, and the study results showed that, compared to conventional care, humanized care improved patients' health literacy levels, comfort, and satisfaction, making it worthy of clinical promotion ^[58]. Deng *et al.* utilized the Feynman-style learning method to enhance patients' health literacy ^[59]. The results indicated that this method contributed to improved health literacy, self-management behaviors, and quality of life in ESRD patients, demonstrating its clinical value. Nong *et al.* employed the teach-to-fish health education model for CKD patients, effectively improving patients' health literacy and self-management abilities ^[60]. These findings suggest that healthcare professionals can actively explore diverse intervention models to better meet the health needs of patients.

7.2. Multicomponent intervention

Multicomponent intervention is a strategy that combines multiple approaches to achieve optimal intervention outcomes. Boonstra *et al.* developed a four-component intervention for CKD patients and healthcare professionals based on intervention mapping theory ^[61]. The intervention included: (1) improving the awareness and knowledge of CKD patients; (2) enhancing patients' motivation for self-management; (3) enhancing patients' self-management ability; and (4) enhancing healthcare professionals' competence. The intervention was delivered through videos and manuals, and the results showed that the multicomponent intervention was feasible and met the needs of healthcare professionals and CKD patients.

7.3. eHealth interventions

With the increasing popularity of the internet and the advancement of information technology, mHealth has gained significant attention. The use of online media for health education and medical services has become a prominent trend. Eneanya *et al.* assisted CKD patients with decision-making through a supportive renal care video, and the results showed a significant improvement in patient knowledge and high levels of patient satisfaction and acceptability of this video decision aid ^[62]. Muscat *et al.* developed the Success app to support active participation in self-management and decision-making for Australian CKD patients requiring dialysis ^[63]. The intervention covered diet, fluids, medications, physical activity, mood, and supportive care. The study demonstrated that e-health interventions can improve self-management in CKD patients, optimize healthcare utilization, and enhance patient outcomes.

8. Conclusion

The current state of health literacy among CKD patients is not optimistic. Improving patients' health literacy and enhancing their self-management abilities is crucial for effective disease management. While research on health literacy in CKD patients has been steadily progressing, the focus has primarily been on patients undergoing hemodialysis or peritoneal dialysis. Objective, practical, and specific assessment tools remain limited, and there is a relative scarcity of intervention studies in China.

It is recommended to prioritize attention to patients in the early stages of CKD, as this can significantly contribute to delaying disease progression. Additionally, the development of a scientific and systematic intervention program is essential to enhance the health literacy of CKD patients and improve their overall health outcomes.

Disclosure statement

The authors declare no conflict of interest.

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Comparative Effect of Balance Rhythm Dance and Aerobics on Motor Function Rehabilitation in Elderly Women

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Abstract: *Objective:* To investigate the effect of a self-developed balance rhythm dance program on the rehabilitation of motor function and the reduction of fall risk in elderly women with diminished balance function. *Methods:* Fifty elderly women with reduced balance function, admitted to the Qingbar Elderly Care Center of Chongqing Medical University from December 2022 to December 2023, were randomly selected and divided into two groups. The aerobic exercise group (25 patients) received traditional treatment and rehabilitation nursing, while the balance rhythm dance intervention group (25 patients) received the balance rhythm dance intervention in addition to traditional treatment and rehabilitation nursing. The Unified Parkinson's Disease Rating Scale (UPDRS) and Berg Balance Scale (BBS) were used as evaluation indicators to compare the intervention effects between the two groups. *Results:* The data revealed that the balance rhythm dance intervention significantly improved the motor ability and balance function of elderly women in the intervention group ($P < 0.01$), with statistically significant differences observed. *Conclusion:* The balance rhythm dance program plays a critical role in promoting the rehabilitation of motor function and balance ability in elderly women, effectively enhancing their quality of life.

Keywords: Balance rhythm dance; Fall risk; Elderly women; Motor function

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1. Introduction

With the acceleration of population aging, China has entered the era of an aging society. Pelvic fractures, often

referred to as the “last fracture of life,” have become increasingly prevalent, significantly increasing family burdens and government medical expenditures. Statistics indicate that at least 25 million falls occur annually among approximately 20 million elderly individuals in China, with elderly women being particularly vulnerable. Due to physiological changes such as declining estrogen levels, reduced musculoskeletal mass, and slower neural responses, their balance function is markedly impaired.

In light of this situation and elderly women’s preference for aesthetically appealing exercise routines, the First Affiliated Hospital of Chongqing Medical University, in collaboration with the Qingbar Elderly Care Center and health experts from Chongqing Vocational Nursing College, developed the balance rhythm dance program. This innovative rehabilitation method fills a gap in the current market by integrating proven rehabilitation training systems such as SMT and Otago, both domestically and internationally, to create practical, aesthetic, simple, and cost-effective home-based rehabilitation solutions.

The balance rhythm dance program, specifically designed for individuals with reduced balance function, employs scientifically designed dance movements to enhance coordination and balance. The ultimate aim is to improve the quality of life of elderly individuals. This study explores the effects of balance rhythm dance as an intervention for the rehabilitation of motor function in elderly women with diminished balance function, providing a scientific basis and reference for clinical rehabilitation practices ^[1-3].

2. Materials and methods

2.1. General information

This study randomly selected 50 elderly women with reduced balance function who were admitted to the Qingbar Elderly Care Center of Chongqing Medical University between December 2022 and December 2023.

Inclusion criteria: (1) Active elderly individuals aged 60–70 years (no major illnesses within the past year or in the stable stage of chronic disease); (2) Inability to walk independently; (3) Presence of balance disorders; (4) Clear mind, normal cognitive function, and normal or corrected vision.

Exclusion criteria: (1) Moderate or severe lower back pain (Oswestry Low Back Pain Questionnaire score ≥ 21); (2) Cognitive impairment (Mini-Mental State Examination [MMSE] score < 17); (3) Severe muscle, bone, and joint diseases or deformities, severe osteoporosis, or walking distance < 300 meters; (4) Current engagement in balance training activities (e.g., Tai Chi or pilates).

2.2. Methods

Fifty elderly women with reduced balance function were randomly divided into two groups: the aerobics group and the rhythm dance group. Each group participated in a 30-minute session once a day, five times a week, for six weeks.

2.2.1. Aerobics group

This group consisted of 25 elderly women with reduced balance function. In addition to conventional medical treatment and health education, participants received standard aerobic exercise training commonly employed in local nursing homes in Chongqing ^[4-7]. The specific exercises included:

- (1) Head movement: Use the head as a pen tip to “write” in the air, then draw circles clockwise and counterclockwise for approximately 2 minutes.

- (2) Chest expansion: Stand with slightly bent knees, extend the arms forward through the chest, then straighten the knees while swinging the arms sideways. Repeat five cycles.
- (3) Cross swings: Drop both arms, cross the palms near the abdomen, and open and close the arms. Repeat 5–8 times.
- (4) Circular palm movements: Position the palms about 10 cm apart and move them in clockwise and counterclockwise circles near the navel. Perform 20 laps in each direction.
- (5) Lunges with chest expansion: Perform standing lunges while extending and folding the arms, coordinating upper and lower limb movements. Alternate legs and repeat 10 cycles.
- (6) Relaxation: Take deep breaths and shake the limbs to relax.

2.2.2. Rhythm dance group

This group included 25 elderly women with reduced balance function. In addition to conventional medical treatment, health education, and routine rehabilitation training, participants performed balance rhythm dance exercises. These exercises were accompanied by a cheerful rhythm and guided by an augmented reality (AR) training system that provided feedback and correction^[8–10]. The training methods were as follows:

- (1) Warm-up stage:
 - (a) Head movement: Stand straight, look ahead, and turn the head to the right and left as far as possible. Repeat 3–5 times in each direction.
 - (b) Neck movement: Adduct the chin while keeping the neck stable and upright. Repeat 3–5 times.
 - (c) Lateral walking: Walk four steps to the right and left while keeping the body facing forward. Repeat on both sides.
 - (d) Leg lifts and heel raises: Perform tiptoe movements and heel raises.
- (2) Balance dance stage:
 - (a) Figure-of-eight walking: Walk back and forth in a figure-of-eight pattern, alternating clockwise and counterclockwise. Repeat two cycles.
 - (b) Toe walking: Walk on the toes for 10 steps, then lower the heels and turn around. Repeat 2–3 times.
 - (c) Trunk rotation: Rotate the upper body to the right and left while keeping the hips stable. Repeat 2–3 cycles in each direction.
- (3) Relaxation stage with a balance ball:
 - (a) Knee joint stretch: Sit on a chair, extend one leg, and lean the upper body toward the thigh. Alternate legs.
 - (b) Trunk movement: Hold the balance ball and move it around the body in the largest possible range. Repeat 2–3 times.

2.3. Evaluation indicators

- (1) Unified Parkinson's Disease Rating Scale (UPDRS): The UPDRS is a clinical tool for assessing symptoms of Parkinson's disease, particularly motor balance disorders. It evaluates daily living activities, behavior and emotion, mental state, motor function, and treatment complications. Higher scores indicate more severe disease and greater mobility impairment^[11].
- (2) Berg Balance Scale (BBS): The BBS is a specialized scale for assessing balance function. It evaluates walking, standing, and turning balance. Higher scores indicate better balance performance^[12].

2.4. Statistical analysis

Statistical analysis was performed using SPSS 24.0. Measurement data were expressed as mean \pm standard deviation (SD). Data normality was tested using the Shapiro-Wilk test, and the *F*-test was applied for variance homogeneity. For normally distributed data, the paired *t*-test was used for within-group comparisons, while the chi-squared test and Wilcoxon signed-rank test were used for non-normally distributed data. Two-factor repeated measures analysis of variance was employed for between-group comparisons. Pearson correlation analysis was conducted for normally distributed variables, and Spearman's test was applied for non-normally distributed variables. Linear regression analysis was used to further explore variable correlations. Statistical significance was set at $P < 0.05$.

3. Results

3.1. Changes in UPDRS total scores

Table 1 shows that the total UPDRS scores of the patients in both the aerobics group and the rhythm dance group before the intervention were relatively similar, showing no significant difference. After six weeks of intervention, the UPDRS scores in both groups decreased. However, the decrease in the rhythm dance group was statistically significant ($P = 0.001$), indicating a notable improvement in motor function.

Table 1. Comparison of UPDRS total scores between the two groups before and after intervention

Group	Before intervention	After intervention	Difference significance test (<i>P</i> value)
Aerobics group	45.6 \pm 10.2	42.8 \pm 9.5	0.08 (Not significant)
Rhythm dance group	46.1 \pm 9.8	38.5 \pm 8.7	0.001 (**)

3.2. Changes in BBS scores

The baseline BBS scores were similar in both groups before the intervention, with no significant differences. After six weeks of intervention, the BBS scores in the aerobics group increased slightly but did not reach statistical significance. In contrast, the rhythm dance group exhibited a significant improvement, with an average increase of nearly 7 points, resulting in a statistically significant difference ($P = 0.001$), as shown in **Table 2**.

Table 2. Comparison of BBS scores between the two groups before and after intervention

Group	Before intervention	After intervention	Difference significance test (<i>P</i> value)
Aerobics group	42.3 \pm 7.6	44.1 \pm 7.2	0.15 (Not significant)
Rhythm dance group	41.8 \pm 7.9	48.6 \pm 6.8	0.001 (**)

3.3. Changes in other evaluation indicators

The baseline scores for quality of life, gait analysis, and muscle strength testing were similar in both groups before the intervention, indicating homogeneity at baseline. After the intervention, the rhythm dance group demonstrated more pronounced improvements in all three indicators. The changes in gait analysis and muscle strength testing in the rhythm dance group were statistically significant ($P < 0.01$), highlighting the effectiveness of the intervention (**Table 3**).

Table 3. Comparison of other evaluation indicators between the two groups before and after intervention

Evaluation indicator	Group	Before intervention	After intervention	Difference significance test (P value)
Quality of life questionnaire scores	Aerobics group	65.2 ± 12.4	67.1 ± 11.9	0.20 (Not significant)
	Rhythm dance group	64.8 ± 12.7	72.3 ± 11.5	0.01 (*)
Gait analysis (step length/m)	Aerobics group	2.3 ± 0.5	2.4 ± 0.4	0.30 (Not significant)
	Rhythm dance group	2.2 ± 0.6	2.7 ± 0.5	0.005 (**)
Muscle strength testing (kg)	Aerobics group	4.1 ± 1.0	4.3 ± 0.9	0.10 (Not significant)
	Rhythm dance group	4.0 ± 1.1	4.8 ± 1.0	0.001 (**)

4. Discussion

4.1. Balanced rhythmic dance can significantly improve overall motor function

After six weeks of rehabilitation nursing intervention, the UPDRS scores in the aerobics group did not show significant changes. In contrast, the UPDRS scores in the rhythmic dance group decreased significantly compared to pre-intervention scores, indicating a pronounced effect of the intervention. The balance rhythm dance significantly improved activities of daily living, behavior and emotion, mental state, motor examination, and treatment complications in elderly women with reduced balance function. This improvement in various domains led to a notable enhancement in overall motor function ^[13].

4.2. Balanced rhythmic dance effectively improves balance function

Balance dysfunction substantially impacts patients' ability to perform activities of daily living ^[14]. The study revealed that BBS scores in elderly women significantly increased following the intervention of balance rhythm dance. These improvements were notably greater compared to the aerobic exercise group, highlighting the advantages of the rhythmic dance intervention. The findings demonstrate that balance rhythm dance can effectively enhance the balance function of elderly women, facilitating daily activities, reducing the risk of falls, and promoting a healthier lifestyle ^[15].

4.3. Conclusion and limitations

In conclusion, balance rhythm dance has a significant positive effect on motor function rehabilitation in elderly women with reduced balance function. It aids in improving balance function, lowering the risk of falls, alleviating the fear of falling, and enhancing self-care abilities and quality of life.

However, this study has several limitations. The sample size was relatively small, which may affect the reliability and generalizability of the findings. Additionally, the short intervention duration limited the observation of the long-term effects of the balance rhythm dance. Furthermore, variations among patients that could influence the outcomes were not fully accounted for. Future studies should aim to address these limitations by increasing sample sizes, extending intervention durations, and conducting more detailed analyses to explore and innovate in this field.

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Disclosure statement

The authors declare no conflict of interest.

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Expression and Diagnostic Value of D-Dimer, CRP, and IL-6 in Children with *Mycoplasma Pneumonia*

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Abstract: *Objective:* To investigate the expression and diagnostic value of D-dimer, CRP, and IL-6 in children with *Mycoplasma pneumonia*. *Methods:* A total of 100 children diagnosed with *Mycoplasma pneumonia* from the pediatric department of the First Affiliated Hospital of Shaoyang University, admitted between November 2023 and June 2024, were selected for the study. According to the severity of the condition, they were divided into two groups: a mild group (50 cases) and a severe group (50 cases). After treatment, they were further divided into an effective group (63 cases) and a non-effective group (37 cases) based on the treatment outcomes, to compare their diagnostic values. *Results:* The levels of D-dimer, CRP, IL-6, length of hospital stay, fever resolution time, cough resolution time, and the time for lung rales to disappear were higher in the severe group than in the mild group ($P < 0.05$). The levels of D-dimer, CRP, and IL-6 in the non-effective group were higher than those in the effective group ($P < 0.05$). In this study, using pathological results as the “gold standard,” it was found that the positive detection rate for the combined detection of D-dimer, CRP, and IL-6 was higher than the detection rate for each of D-dimer, CRP, and IL-6 alone, suggesting that the combined diagnosis had a higher positive detection rate ($P < 0.05$). Compared with D-dimer, CRP, and IL-6, the combined sensitivity, specificity, and accuracy were all higher ($P < 0.05$). *Conclusion:* D-dimer, CRP, and IL-6 are closely related to *Mycoplasma pneumonia* in children and can serve as auxiliary diagnostic tools for *Mycoplasma pneumonia* in children, offering significant value.

Keywords: *Mycoplasma pneumonia* in children; D-dimer; CRP; IL-6

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1. Introduction

Mycoplasma pneumoniae pneumonia (MPP) primarily affects children and adolescents. The pathogenesis of this disease is complex, and it is widely believed that it is closely related to immune responses triggered by inflammatory mediators^[1]. In pediatric MPP cases, in addition to lung damage, damage to multiple systems such as the skin, digestive system, and central nervous system can also occur. Therefore, early identification and

targeted treatment of MPP are of crucial importance in reducing the risk of complications in affected children ^[2]. C-reactive protein (CRP), as an acute-phase protein, plays a key role in the progression of many diseases, and its levels gradually increase during inflammatory responses ^[3]. Interleukin-6 (IL-6), as a key cytokine, is a significant marker for diagnosing MPP and helps clinicians better understand the infection status. D-dimer, a unique fibrin degradation product, is generated through the interaction of fibrin monomers and activators and is considered a specific marker of the fibrinolytic system ^[4]. Based on this, this study investigates the expression and diagnostic value of D-dimer, CRP, and IL-6 in children with MPP.

2. Materials and methods

2.1. General information

A total of 100 children diagnosed with MPP at the First Affiliated Hospital of Shaoyang University were selected as the research subjects. Based on the severity of the condition, they were divided into a mild group (50 cases) and a severe group (50 cases). Among them, the mild group consisted of 31 boys and 19 girls, with an average age of (6.63 ± 3.11) years; the severe group consisted of 23 boys and 27 girls, with an average age of (7.06 ± 2.97) years. The general data of both groups were balanced and comparable ($P > 0.05$).

Inclusion criteria:

- (1) Mild group: Children with symptoms such as fever and cough, clinically diagnosed according to the MPP diagnostic criteria in the 8th edition of Practical Pediatrics by Chu Futang, and who did not meet the criteria for severe community-acquired pneumonia in children ^[5]. Additionally, the children had not received treatment for MPP before admission.
- (2) Severe group: Children with symptoms such as fever and cough, clinically diagnosed according to the MPP diagnostic criteria in the 8th edition of Practical Pediatrics by Chu Futang, and who had not received treatment for MPP before admission. They met any of the following criteria:
 - (a) Persistent high fever (above 39°C) for ≥ 5 days or fever for ≥ 7 days, with no decreasing trend in the peak temperature.
 - (b) The appearance of wheezing, shortness of breath, difficulty breathing, chest pain, hemoptysis, etc. These symptoms were associated with severe lesions, complicating bronchitis, asthma exacerbation, pleural effusion, or pulmonary embolism.
 - (c) The occurrence of extra-pulmonary complications, but without meeting critical illness criteria.
 - (d) Oxygen saturation $\leq 93\%$ during rest while inhaling air.
 - (e) Radiological findings, one of the following:
 - (i) More than 2/3 of a single lung lobe involved, with uniform high-density consolidation or involvement of two or more lung lobes with high-density consolidation (regardless of the area affected), possibly accompanied by moderate to large pleural effusion or localized bronchiolitis.
 - (ii) Diffuse involvement of a single lung or $\geq 4/5$ of bilateral lung lobes with bronchiolar involvement.

Exclusion criteria: (1) Children in the recovery phase of MPP; (2) those with previous chronic pulmonary diseases; (3) children with congenital or secondary immunodeficiency diseases or connective tissue diseases, etc.

2.2. Methods

Monitoring methods: Blood samples of 3 mL of fasting venous blood were collected on the 2nd day of admission and the day before discharge from both the mild and severe groups. The blood was centrifuged, and the serum

was stored in a low-temperature refrigerator (4–8°C). CRP levels were detected using the AU5800 fully automatic biochemical analyzer (Beckman, USA), employing the turbidimetric immunoassay method. D-dimer levels were measured using the Sysmex CS-5100 fully automatic coagulation analyzer (Sysmex, Japan), using the immunoturbidimetric method. IL-6 levels were measured using the BD FACSCanto II detector (BD, USA), employing the multiplex bead-based immunofluorescent assay method. All tests were strictly performed according to the manufacturer's instructions.

2.3. Observation indicators

2.3.1. Comparison of D-dimer, CRP, and IL-6 levels between the two groups

D-dimer, CRP, and IL-6 levels in the two groups of children were compared and analyzed by professional medical staff.

2.3.2. Comparison of related indicators between the two groups

Hospital stay duration, fever resolution time, cough resolution time, and lung rales disappearance time were compared and analyzed by professional medical staff.

2.3.3. Efficacy analysis of D-dimer, CRP, and IL-6 levels in the two groups

D-dimer, CRP, and IL-6 levels in the two groups were compared and analyzed according to different clinical efficacy by professional medical staff.

2.3.4. Comparison of D-dimer, CRP, and IL-6 with “gold standard” testing

D-dimer, CRP, and IL-6 tests were performed on all subjects, and statistical analysis of the resulting data was conducted using the following formulas:

$$\text{Positive predictive value} = \frac{a}{a + b} \times 100\%$$

$$\text{Negative predictive value} = \frac{d}{c + d} \times 100\%$$

Where: a = true positive; b = false positive; c = false negative; d = true negative.

2.3.5. ROC curve analysis of D-dimer, CRP, IL-6, and combined tests for the diagnostic value of MPP in children

The sensitivity, specificity, and accuracy of four testing methods for diagnosing MPP in children were compared.

$$\text{Sensitivity} = \frac{a}{a + c} \times 100\%$$

$$\text{Specificity} = \frac{d}{d + b} \times 100\%$$

$$\text{Accuracy} = \frac{a + d}{\text{total number of cases}} \times 100\%$$

2.4. Statistical processing

Data processing was performed using SPSS 26.0 statistical software. Measurement data were expressed as mean \pm standard deviation (SD). For group comparisons, *t*-tests were used. Count data were expressed as [*n* (%)], and χ^2

tests were used for group comparisons. A P value < 0.05 was considered statistically significant.

3. Results

3.1. Comparison of D-dimer, CRP, and IL-6 levels between the two groups

As shown in **Table 1**, the levels of D-dimer, CRP, and IL-6 in the severe group were higher than those in the mild group, with significant differences ($P < 0.05$).

Table 1. Comparison of D-dimer, CRP, and IL-6 levels between the two groups (mean \pm SD)

Group	n	CRP (mg/L)			D-dimer (mg/L)			IL-6 (pg/mL)		
		Admission	Discharge	Difference	Admission	Discharge	Difference	Admission	Discharge	Difference
Mild group	50	9.78 \pm 1.56	1.30 \pm 0.36	8.48 \pm 1.20	0.44 \pm 0.09	0.26 \pm 0.07	0.18 \pm 0.02	1.54 \pm 1.02	5.13 \pm 0.89	3.34 \pm 0.13
Severe group	50	25.75 \pm 2.39	1.35 \pm 0.68	24.40 \pm 1.71	0.62 \pm 0.15	0.27 \pm 0.12	0.35 \pm 0.03	2.48 \pm 1.15	14.35 \pm 1.65	9.33 \pm 0.50
<i>t</i>		39.570	0.459	53.890	7.276	0.509	33.340	4.323	34.780	21.035
<i>P</i>		0.001	0.646	0.001	0.001	0.611	0.001	0.001	0.001	0.001

3.2. Comparison of related indicators between the two groups

As shown in **Table 2**, the hospital stay, fever resolution time, cough resolution time, and lung rales disappearance time in the severe group were higher than those in the mild group, with significant differences ($P < 0.05$).

Table 2. Comparison of related indicators between the two groups (mean \pm SD, days)

Group	n	Hospital stay	Fever resolution time	Cough resolution time	Lung rales disappearance time
Mild group	50	6.00 \pm 0.65	3.00 \pm 0.36	4.00 \pm 0.68	5.00 \pm 0.41
Severe group	50	7.00 \pm 0.78	4.00 \pm 0.40	5.00 \pm 0.77	6.00 \pm 0.63
<i>t</i>		6.964	13.140	6.883	9.407
<i>P</i>		0.001	0.001	0.001	0.001

3.3. Efficacy analysis of D-dimer, CRP, and IL-6 levels in the two groups

As shown in **Table 3**, the levels of D-dimer, CRP, and IL-6 in the non-effective group were higher than those in the effective group, with significant differences ($P < 0.05$).

Table 3. Efficacy analysis of D-dimer, CRP, and IL-6 levels in the two groups (mean \pm SD)

Group	n	CRP (mg/L)			D-dimer (mg/L)			IL-6 (pg/mL)		
		Admission	Discharge	Difference	Admission	Discharge	Difference	Admission	Discharge	Difference
Effective	63	13.19 \pm 2.36	1.20 \pm 0.39	12.50 \pm 1.97	0.51 \pm 0.29	0.22 \pm 0.36	0.26 \pm 0.07	1.98 \pm 1.01	5.59 \pm 2.39	3.46 \pm 1.38
Non-effective	37	25.96 \pm 3.26	1.50 \pm 1.02	21.79 \pm 2.24	0.57 \pm 0.39	0.30 \pm 0.41	0.26 \pm 0.02	2.56 \pm 1.13	22.73 \pm 5.69	19.03 \pm 4.56
<i>t</i>		22.620	2.094	21.630	0.877	1.019	0.001	2.653	21.010	25.280
<i>P</i>		0.001	0.038	0.001	0.382	0.310	0.925	0.009	0.001	0.001

3.4. Comparison of D-Dimer, CRP, IL-6 with “gold standard” testing

As shown in **Table 4**, using pathological results as the “gold standard,” it was found that the number of positive cases for combined testing of D-dimer, CRP, and IL-6 was higher than that for each individual test, indicating a higher positive detection rate for the combined diagnostic approach, with significant differences ($P < 0.05$).

Table 4. Comparison of D-dimer, CRP, IL-6 with “gold standard” testing

Gold Standard	D-Dimer			CRP			IL-6			Combined Testing		
	Positive	Negative	Total	Positive	Negative	Total	Positive	Negative	Total	Positive	Negative	Total
Positive	47	3	50	43	7	50	45	5	50	49	1	50
Negative	6	44	50	9	41	50	7	43	50	2	48	50
Total	53	47	100	52	48	100	52	48	100	51	49	100

3.5. ROC curve analysis of D-dimer, CRP, IL-6, and combined testing for the diagnostic value of MPP in Children

As shown in **Table 5** and **Figure 1**, compared to D-dimer, CRP, and IL-6, the combined test exhibited higher sensitivity, specificity, and accuracy, with significant differences ($P < 0.05$).

Table 5. ROC curve analysis of D-dimer, CRP, IL-6, and combined testing for the diagnostic value of MPP in children

Examination method	AUC value	Z value	P value	Sensitivity (%)	Specificity (%)	Accuracy (%)	95% CI
D-dimer	0.516	2.548	0.001	88.67	93.61	91.00	0.524–0.952
CRP	0.541	2.412	0.001	82.69	85.41	84.00	0.512–0.912
IL-6	0.462	2.105	0.001	86.53	89.58	88.00	0.457–0.847
Combined detection	0.526	2.841	0.001	96.07	97.95	97.00	0.502–0.881

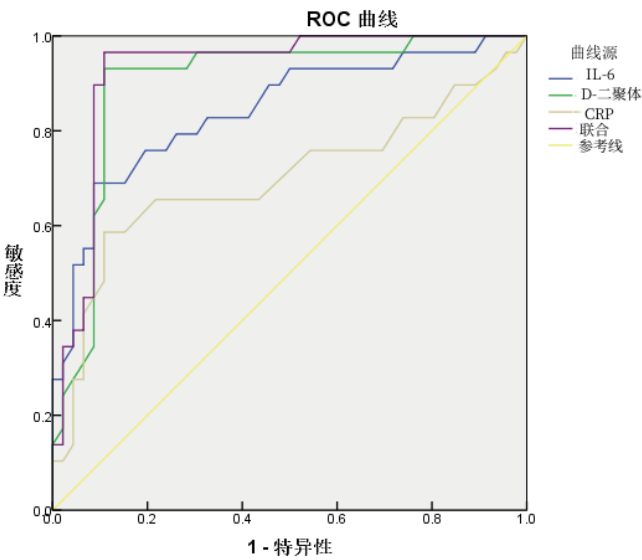


Figure 1. ROC curve analysis of D-dimer, CRP, IL-6, and combined testing for the diagnostic value of MPP in children

4. Discussion

MPP is a common disease in children during the autumn, with symptoms including fever, cough, and sore throat. Due to the lack of etiology-based diagnosis, there is a tendency to overuse antibiotics when treating bacterial and atypical pathogen mixed infections. Therefore, early etiological diagnosis and the development of treatment plans based on biomarkers are crucial for treatment and prognosis^[6,7]. MPP is related to immunological characteristics and inflammatory factors, and finding serological markers is important for diagnosis and prognosis^[8].

CRP is an inflammatory marker that increases in serum during bacterial infections, activates the complement system, and releases inflammatory mediators. It is a marker of infection or tissue damage^[9,10]. CRP levels are associated with the progression of MPP. IL-6 is an inflammatory factor, highly expressed in critically ill patients, and regulates the inflammatory response. D-dimer reflects hypercoagulability and endothelial dysfunction^[11]. The results of this study show that the levels of D-dimer, CRP, and IL-6 were higher in the severe group, indicating that children in the severe group had more severe infections, stronger pathogen invasiveness, and more intense inflammatory responses. This led to impaired immune function, reduced ability to clear inflammatory factors, and a sustained inflammatory response, resulting in elevated levels of D-dimer, CRP, and IL-6. The study also found that the severe group had longer hospitalization times, fever resolution times, cough resolution times, and lung rales disappearance times. Additionally, in the non-effective group, D-dimer, CRP, and IL-6 levels were higher, indicating that children in the severe group required more prolonged treatment and observation, with more severe lung inflammation. The weakened cough reflex led to prolonged cough resolution times and slower disappearance of lung rales, which extended the fever resolution time. Children in the non-effective group faced more severe pathogen invasion, leading to more intense inflammatory responses and reduced ability to clear pathogens, thereby sustaining the inflammatory response and increasing D-dimer, CRP, and IL-6 levels.

Clinical investigations show that D-dimer, CRP, and IL-6 have high diagnostic value in pediatric MPP, and they are expected to provide strong support for early diagnosis and treatment^[12]. In this study, using pathological results as the “gold standard,” it was found that D-dimer testing had 47 true positives and 6 true negatives, CRP testing had 43 true positives and 9 true negatives, and IL-6 testing had 45 true positives and 7 true negatives. The combined testing of the three had 49 true positives and 2 true negatives. This indicates that the combined testing of the three is more effective than single tests of D-dimer, CRP, or IL-6, with detection rates similar to the “gold standard.” D-dimer showed a sensitivity of 88.67%, specificity of 93.61%, and accuracy of 91.00%. CRP testing had a sensitivity of 82.69%, specificity of 85.41%, and accuracy of 84.00%. IL-6 testing had a sensitivity of 86.53%, specificity of 89.58%, and accuracy of 88.00%. Combined testing of all three showed a sensitivity of 96.07%, specificity of 97.95%, and accuracy of 97.00%. These results show that the combined test offers higher sensitivity, specificity, and accuracy compared to single tests. ROC curve analysis indicates that using the combined test provides superior diagnostic performance for pediatric MPP, making it a better tool for diagnosis and offering better clinical support. It is worth further promoting and applying.

5. Conclusion

In conclusion, D-dimer, CRP, and IL-6 have high predictive value for pediatric *Mycoplasma pneumonia* and are worthy of clinical promotion and use.

Disclosure statement

The authors declare no conflict of interest.

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A Scoping Review on the Professional Self-Concept of Undergraduate Nursing Students

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Abstract: *Objective:* To conduct a scoping review of research on the professional self-concept (PSC) of undergraduate nursing students, comprehensively analyzing its status, influencing factors, and significance, and providing a reference for enhancing the PSC of undergraduate nursing students in China. *Methods:* Using the methodological framework of Arksey and O'Malley's scoping review, six literature databases were searched, including CNKI, Wanfang, Chinese Biomedical Literature Database, PubMed, Web of Science, and ScienceDirect. Studies on the factors influencing undergraduate nursing students' PSC from database inception to July 31, 2023, were reviewed and data extracted. *Results:* A total of 1,955 articles were retrieved, and 27 studies were included. The current status of PSC primarily focuses on self-perception. Factors influencing undergraduate nursing students' PSC are mainly individual and demographic, while external factors include various teaching methods and environments. PSC impacts professional maturity, mental health, self-concept, and pre-internship stress among nursing students. *Conclusion:* PSC profoundly influences undergraduate nursing students' future career choices and professional development. Nursing educators and administrators should adopt measures to enhance and improve PSC levels, thereby fostering a larger pool of nursing professionals.

Keywords: Undergraduate nursing students; Professional self-concept; Scoping review

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1. Introduction

Professional self-concept (PSC) refers to one's current understanding and full experience of their role, encompassing emotional and ideological expressions regarding this role^[1]. The professional self-concept of nurses is an internalized set of values and beliefs formed through their work processes, serving as a critical indicator and influencing factor for personal growth and career planning^[2,3]. Nursing students, as the reserve force of the nursing profession, have PSC levels directly tied to their job intentions, work enthusiasm, and clinical competencies.

In the nursing field, the PSC of nursing students has garnered increasing attention^[4]. However, a systematic review and evaluation of the definition and influencing factors of PSC in nursing are lacking in China. This deficiency hinders accurate guidance for subsequent interventions aimed at enhancing PSC levels among nursing

students.

A scoping review can provide a comprehensive overview of PSC research progress, significance, and practical applications, offering valuable information for its improvement. This study, based on the methodological framework of Arksey and O'Malley, aims to conduct a scoping review of PSC's definition, influencing factors, and significance, with the goal of offering effective recommendations for enhancing the PSC of undergraduate nursing students in China.

2. Materials and methods

2.1. Identifying the research questions

Currently, nursing schools lack a systematic review and evaluation of the definition of nursing PSC and its influencing factors on undergraduate nursing students. Therefore, this study focuses on the following questions:

- (1) What is the current status of nursing PSC?
- (2) What are the influencing factors of nursing PSC?
- (3) How does nursing PSC impact undergraduate nursing students?

2.2. Literature search

The search keywords in this study were developed based on the PCC framework ^[5], where the population (P) is undergraduate nursing students (baccalaureate nursing students/nursing undergraduates), the concept (C) is PSC, and the context (C) involves the definition, influencing factors, and significance of PSC.

Key search terms included “baccalaureate nursing students,” “nursing undergraduates,” “professional self-concept,” “护理本科生” (nursing undergraduates), “本科护生” (baccalaureate nursing students), and “专业自我概念” (professional self-concept). Searches were conducted in six databases: CNKI, Wanfang, Chinese Biomedical Literature Database, PubMed, Web of Science, and ScienceDirect. The search covered the inception of each database through July 31, 2023.

For Chinese databases, the CNKI search example was: (SU= ‘专业自我概念’) AND (SU= ‘本科护生’ OR ‘护理本科生’).

For English databases, the PubMed search example was: ((baccalaureate nursing students OR nursing undergraduates) AND (professional self-concept)).

2.3. Inclusion and exclusion criteria

- (1) Inclusion criteria:
 - (a) Articles published in Chinese or English with full-text availability.
 - (b) Studies with participants who are nursing undergraduates.
- (2) Exclusion criteria:
 - (a) Duplicate publications or articles without full-text access.
 - (b) Studies of other types, including systematic reviews, protocols, editorials, book reviews, conference abstracts, and news reports.

2.4. Literature screening and data extraction

The retrieved articles were imported into EndNote for duplicate removal. At least two researchers reviewed the

titles and abstracts to perform an initial screening based on the inclusion and exclusion criteria, removing irrelevant articles. A secondary screening was conducted by reading the full text to finalize the included articles.

Data extraction from the final included studies covered details such as the authors, year of publication, country, research objectives, research tools, and findings.

3. Results

3.1. Literature screening results

A total of 1,955 articles were retrieved. After removing 178 duplicates, 1,700 articles unrelated to the topic were excluded based on title and abstract screening. After a full-text review, 50 more articles were excluded, leaving 27 articles for final inclusion. Among them, 21 were in Chinese, and 6 were in English, published between 2009 and 2023. The literature screening process is shown in **Figure 1**.

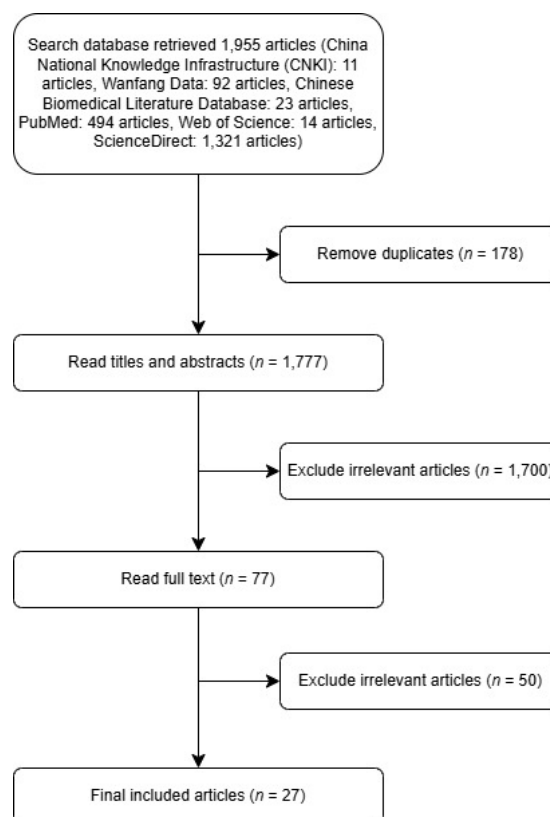


Figure 1. Flowchart of literature screening

The basic information of the included articles is shown in **Table 1**.

Table 1. Basic information of included articles

First author (year)	Country	PSC definition category	Research objective	Research tool	Key findings
Yanan Leng (2019) ^[1]	China	①④	To explore the relationship among PSC, clinical practice behaviors, and professional identity during internships	PSCNI, Self-Assessment Scale for Clinical Practice Behaviors, PIQNS	A clearer understanding of PSC is linked to more active clinical behaviors and a stronger professional identity
Chunzhi Yang (2023) ^[2]	China	①	To explore the relationship between professional self-concept (PSC) and career maturity in nursing undergraduates before internships	General information questionnaire, PSCNI, CMS	Higher PSC levels correlated with higher career maturity levels
Saumisa Mohajer (2023) ^[6]	Malaysia	④	To examine the impact of a hybrid professional portfolio learning model on PSC during internships	General information questionnaire, NPSC	The hybrid portfolio model improved various dimensions of PSC
Lu Zhou (2022) ^[7]	China	②	To explore how self-compassion and PSC mediate the relationship between perceived social support and mental health	SEM, Multigroup SEM	Increased perceived social support, self-compassion, and PSC promoted mental health, with PSC mediating between self-compassion and work practice
Guyong Yang (2022) ^[8]	China	②	To investigate the relationship between career ability development and PSC during clinical internships	PSCNI, General information questionnaire, Undergraduate Career Ability Scale	PSC increased during clinical practice; higher PSC linked to higher professional competence
Fangfei Lyu (2022) ^[9]	China	②⑤	To examine the levels and interrelationship of career maturity, psychological resilience, and PSC in senior nursing students	CMS, CD-RISC2, PSCNI	PSC directly or indirectly influenced career maturity via psychological resilience; PSC positively correlated with career maturity and resilience
Miao Huang (2021) ^[10]	China	②	To investigate the redefinition of PSC among nursing students during COVID-19 and its impact on professional attitudes	PSCNI, Nursing Professional Commitment Scale, Nursing Career Identity Scale	A deeper understanding of PSC was associated with stronger professional commitment and career identity
Yi-Chuan Chang (2021) ^[11]	China	②	To examine the growth trajectory of PSC over two years in students pursuing two-year or four-year nursing degrees	NSCI-C, CCTDI	Positive correlation between critical thinking affective disposition, classroom atmosphere, and PSC growth trajectory
Jing Zhang (2020) ^[12]	China	③	To explore the correlation between PSC and future time perspective among nursing undergraduates	PSCNI, GFTP	Broader future time perspective correlated with higher PSC levels
Min Zhu (2019) ^[13]	China	④	To investigate the status and influencing factors of PSC among applied nursing undergraduates	General information questionnaire, PSCNI	Gender, grade, choice of nursing as a preference and affinity for the profession influenced PSC
Aizhen Chen (2018) ^[14]	China	⑤	To assess the application of reflection-based teaching methods in clinical nursing education	PSCNI, Clinical Practice Ability Scale, Clinical Nursing Teacher Evaluation Scale	Reflection-based teaching improved PSC scores
Guirong Yang (2017) ^[15]	China	②	To investigate the correlation between self-concept and PSC	Tennessee Self-Concept Scale, PSCNI	Moderate positive correlation between self-concept and PSC
Shengfeng Wang (2017) ^[16]	China	④	To explore trends and factors influencing PSC in four-year nursing undergraduates	General information questionnaire, PSCNI	A positive influence of research participation, desired future job rank, and planned nursing career duration on PSC

Table 1 (Continued)

First author (year)	Country	PSC definition category	Research objective	Research tool	Key findings
Yumei Qi (2017) ^[17]	China	②⑤	To examine the impact of industry-academic collaboration on PSC	PSCNI	Industry-academic teaching models improved PSC levels
Wen Zhang (2016) ^[18]	China	②⑥	To analyze the correlation between anticipatory adaptation and PSC	Anticipatory Adaptation Scale, PSCNI	Stronger anticipatory adaptation linked to more positive PSC
Yansheng Ye (2016) ^[19]	China	②⑥	To explore the relationship between emotional resilience and PSC during internships	Adolescent Emotional Resilience Questionnaire, PSCNI	Better emotional resilience linked to higher PSC
Lingci Ou (2016) ^[20]	China	⑥	To study the relationship between nursing education environment, PSC, and critical thinking ability in private colleges	General information questionnaire, DREEM, PSCNI, CTDL-CV	A positive educational environment promotes the formation of positive PSC
Meichun Wu (2015) ^[21]	China	④⑥	To analyze the relationship between PSC and subjective career barriers and assess the impact of attribution training on PSC	General information questionnaire, PSCNI, Subjective Career Barriers Questionnaire	PSC is influenced by attitudes toward nursing, academic performance, and family income; attribution training stabilized professional attitudes
Qian Wu (2015) ^[22]	China	④	To explore the relationship among emotional intelligence (EI), PSC, and caring ability in undergraduate nursing students	General information questionnaire, EIS, PSCNI, CAI	Higher emotional intelligence is associated with stronger PSC and greater caring ability
Fangfei Lv (2015) ^[23]	China	②	To study the impact of case-based learning (CBL) on the PSC of nursing interns	PSCNI	Case-based learning significantly improves PSC in nursing interns
Wenping Zhang (2014) ^[24]	China	④⑥	To examine the relationship between depressive emotions and PSC in nursing undergraduates	PSCNI, SCL-90	Higher PSC levels are associated with lower scores on depressive factors, indicating better mental health
Li Zhang (2014) ^[25]	China	⑥⑦	To investigate the relationship among PSC, learning strategies, and learning engagement	PSCNI, College Student Learning Strategies Scale, College Student Learning Engagement Scale	Learning engagement and strategies are positively correlated with PSC
Hui Yuan (2014) ^[26]	China	④⑥	To explore the relationship between pre-internship stress and PSC in nursing undergraduates	Pre-Internship Stress Questionnaire for Nursing Undergraduates, PSCNI	PSC is negatively correlated with pre-internship stress
Yuxia Rao (2014) ^[27]	China	④⑥	To investigate the relationship between PSC and mental health in nursing undergraduates	PSCNI, SCL-90	PSC is negatively correlated with mental health issues
Xue Bai (2014) ^[28]	China	⑥	To investigate the status and influencing factors of PSC in intern nursing students	General information questionnaire, PSCNI	Gender, institutional attributes, origin, and choice of nursing influenced PSC dimensions
Haifen Kang (2011) ^[29]	China	⑧	To explore the status and influencing factors of PSC among nursing undergraduates	PSCNI	Demographic variables have a predictive effect on PSC
Jose Maria (2009) ^[30]	Scotland	②	To explore the role of perceived emotional intelligence in the personality control dimension of PSC	TMMS, NEO-FFI, TSCS	Positive correlation between clarity, emotional repair in perceived emotional intelligence, and PSC

Note: PSC definition categories: ①, Values and beliefs; ②, Self-perception; ③, Self-attitude; ④, Perception; ⑤, Key indicator of professional philosophy; ⑥, Reflection of professional behavior orientation; ⑦, Self-esteem; ⑧, Personal and self-characteristics related to occupation.

3.2. Definition of professional self-concept in nursing

Some studies suggest that professional self-concept is essentially a form of self-cognition. Lu Zhou ^[7], Guyong Yang ^[8], and Miao Huang ^[10] propose that professional self-concept in nursing is a self-cognition formed by nursing students during their transition to becoming nurses, reflecting their professional philosophy.

Other studies argue that professional self-concept is a type of perception. Research by Saumisa Mohajer ^[6], Min Zhu ^[13], and Yanan Leng ^[11] suggests that professional self-concept in nursing represents a sustained series of professional attitudes associated with the profession, reflecting nursing professionals' perceptions of their knowledge, self-esteem, and professional behavioral orientation.

Chunzhi Yang and colleagues ^[2] describe professional self-concept in nursing as internalized values and beliefs, encompassing information and beliefs about roles, values, and behaviors. Other studies argue that professional self-concept is a form of self-attitude ^[12], self-esteem ^[25], or a collection of professional, self-related traits ^[30].

3.3. Influencing factors of undergraduate nursing students' professional self-concept

3.3.1. Personal factors

An analysis of the included literature reveals that demographic factors influencing nursing students' professional self-concept include gender, whether they are the only child, academic year, place of origin, and affinity for nursing.

Haifen Kang ^[29] found that gender significantly impacts the overall score and satisfaction dimension of professional self-concept among nursing undergraduates, with male students scoring lower in overall professional self-concept, flexibility, and skill dimensions than female students. This finding aligns with Min Zhu's research ^[13]. Additionally, being an only child affects the skill dimension, with non-only children scoring higher than only children ^[29].

Academic year significantly influences the overall average score and various dimensions of professional self-concept, with findings from Haifen Kang ^[29] and Min Zhu ^[13] showing that nursing students' professional attitudes have matured over the years. Place of origin notably affects communication dimensions ^[29], differing slightly from Xue Bai's findings ^[28], which suggest that students from urban areas score higher in communication and satisfaction dimensions than those from rural areas.

Some studies indicate that students' affinity for nursing positively correlates with higher professional self-concept scores ^[10,13,21]. Meichun Wu and colleagues ^[21] found that students' average grades and family per capita income also influence their professional self-concept. Regarding voluntary choice, research by Xue Bai ^[28] and Min Zhu ^[13] shows statistical significance only in the satisfaction dimension.

Shengfeng Wang ^[16] found that factors such as teachers' enthusiasm for nursing research, future career duration, and desired professional titles significantly influence professional self-concept.

Beyond demographic factors, personal attributes such as self-concept, emotional intelligence, learning strategies, and critical thinking also play roles. Guirong Yang ^[15] found a moderate positive correlation between self-concept and professional self-concept. Research by Yansheng Ye ^[19], Qian Wu ^[22], and Jose Maria ^[30] show that emotional intelligence, emotional resilience, and perceived emotional abilities are positively correlated with professional self-concept.

Li Zhang ^[25] concluded that higher levels of learning strategies lead to a more positive professional self-concept. Yi-Chuan Chang ^[11] found that critical thinking promotes positive growth in professional self-concept.

over a 2–4 year trajectory. Jing Zhang^[12] demonstrated that broader future time perspectives correlate with higher professional self-concept levels, while Wen Zhang^[18] noted that stronger forward adaptability predicts a more positive professional self-concept among nursing interns.

During the COVID-19 pandemic, Miao Huang^[10] observed that professional commitment and occupational identity positively influenced professional self-concept. However, Guyong Yang^[8] found that while professional self-concept increased during clinical practice, the impact of professional competence on self-concept remains unverified.

3.3.2. External factors

Teaching methods influence undergraduate nursing students' professional self-concept. Research by Aizhen Chen^[14], Yumei Qi^[17], and Fangfei Lv^[23] indicates that reflective teaching methods based on objective teaching and case-based learning (CBL) can enhance professional self-concept. Industry-education-research teaching models also improve professional self-concept.

Saumisa Mohajer^[6] discovered that professional portfolio learning plans enhance nursing undergraduates' professional self-concept in clinical practice. Social and environmental factors also play a role. Lingci Ou^[20] found that better nursing education environments foster more positive professional self-concepts. Lu Zhou^[7] showed that social support promotes professional self-concept, while Yi-Chuan Chang^[11] found that classroom atmosphere positively impacts professional self-concept growth.

Institutional attributes also influence professional self-concept. Xue Bai^[29] found that students from Western medical universities scored higher in professional self-concept than those from traditional Chinese medical universities.

3.4. Significance of professional self-concept in nursing

Professional self-concept significantly impacts the career development of undergraduate nursing students. Studies by Chunzhi Yang^[2], Fangfei Lyu^[9], Miao Huang^[10], and Yanan Leng^[1] indicate that higher professional self-concept levels correlate with greater career maturity and stronger professional identity.

Notably, there is debate regarding the impact of professional self-concept on mental health. Research by Lu Zhou^[7] and Wenping Zhang^[24] suggests that higher professional self-concept scores indicate better mental health among nursing students. In contrast, Yuxia Rao^[27] found that higher professional self-concept levels correlate with poorer mental health.

Guyong Yang^[8] observed that professional self-concept affects the development of professional competence. Guirong Yang^[15] found a positive correlation between professional self-concept and self-concept, with both exerting positive influences. Earlier studies by Hui Yuan^[26] found that higher awareness of professional self-concept reduces pre-internship stress among nursing undergraduates.

4. Discussion

4.1. Nursing professional self-concept reflects professional behavioral orientation

American occupational psychologist Super proposed in his career development theory that professional self-concept is a component of an individual's overall self-concept and plays a central driving role in career choice and development^[31]. Earlier international studies provided valuable data and insights for clinical nursing practitioners,

educators, and managers, expanding the scope of nursing research and advancing the global exploration of self-concept and professional self-concept in the nursing field ^[32].

With the increasing number of undergraduate nursing graduates each year, they are becoming the backbone of the nursing workforce in China. Therefore, nursing educators should assess the professional self-concept of nursing students early, implement measures to stabilize their professional self-concept and help establish clear professional behavioral orientations.

4.2. The complex factors influencing undergraduate nursing students' professional self-concept

The factors influencing PSC are complex, encompassing personal factors as well as educational methods, teaching environments, and the broader healthcare system ^[2,22]. Variations in whether a student is an only child, family income, or place of origin ^[21,28,29] may result from differences in familial and societal circumstances. Differences in PSC scores across academic years stem from varying levels of exposure to the nursing profession, shaping students' perceptions ^[13,29]. Subjective factors like affinity for nursing and choice of major also lead to differences in PSC scores ^[13,28].

Beyond personal factors, the impact of the teaching environment and educational methods on PSC cannot be ignored. Classroom atmosphere, for instance, can create a positive learning environment that increases students' interest in nursing ^[11]. Reflective teaching models based on objective-oriented teaching, CBL, and industry-education-research models effectively combine theory with practice to enhance PSC ^[6,14,17,23].

Nursing educators should prioritize understanding students' attitudes toward nursing, develop actionable strategies to cultivate positive and stable professional attitudes, and continuously improve PSC. They should also recognize the unique characteristics of students at different educational levels and academic years, paying special attention to those in the bottom one-third of academic performance ^[25].

To achieve this, efforts should focus on optimizing humanities courses, strengthening practical training, and increasing clinical behavior practice. Effective teaching models such as CBL and industry-education-research approaches should be employed during academic study. During internships, hospitals should select competent clinical nursing instructors as mentors. Nursing managers could encourage undergraduate nursing students to actively participate in nursing research to foster positive PSC, ensure workforce stability, promote nursing discipline development, and enable hierarchical management within clinical hospitals. This approach allows nurses with different educational backgrounds and qualifications to maximize their potential and ignites enthusiasm among undergraduate nurses ^[16].

4.3. Insights for the rational application of professional self-concept

PSC has a significant impact on nursing students' future career choices, and improving and stabilizing PSC is crucial for the nursing profession's development. Nursing educators should update training programs in line with clinical changes to enhance students' understanding of PSC, internalize professional commitment, and strengthen professional identity ^[10].

PSC not only affects career maturity but also has implications for students' mental health. A study analyzing the prevalence of depression among Chinese university students from 1997 to 2015 found a prevalence rate of 23.8% ^[33]. In the context of PSC, perceptions of satisfaction and skills are key factors contributing to depressive emotions. Affirming professional values and abilities is critical for preventing depression among nursing

undergraduates.

Therefore, educators should pay close attention to students' daily lives and mental health, focusing on improving professional satisfaction and comprehensive skills. They can also encourage students to enhance their PSC through extracurricular resources, such as books and online materials, to support nursing PSC education.

5. Conclusion

This study systematically reviewed and analyzed the meaning, influencing factors, and significance of PSC in undergraduate nursing students. Current research, both domestically and internationally, has focused primarily on the status quo and influencing factors of PSC in undergraduate nursing students, with limited exploration of systematic and standardized strategies to enhance PSC. Future research should prioritize qualitative and interventional studies in this area to develop effective strategies for improving PSC. Such efforts will provide theoretical guidance and practical evidence for enhancing the professional self-concept of undergraduate nursing students, increasing their career maturity, stabilizing and improving their employment rates in the nursing industry, and cultivating more qualified nursing professionals to advance the field.

Disclosure statement

The authors declare no conflict of interest.

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