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The Development of Multi-modal, pH-sensitive Quantum Dots for the Detection of Breast Cancer

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Abstract: In the current decade, a significant amount of women have been diagnosed with breast cancer. There is a one in eight chance that women will develop breast cancer. It consists of a high fatality rate and tragic death due to the existing barriers set by current methods that are accessible as a treatment for breast cancer. For example, most treatment plans include a combination of surgery, radiation, hormone therapy, chemotherapy, and targeted therapies. However, due to the collateral damage from multiple follow-up surgeries and subsequent infections, some patients are even averse to starting or continuing treatment. Chemotherapy can result in fatigue, pain in the fingers and feet, increased risk of infection, and more. Hormone therapy can result in similar symptoms but also include nausea, muscle and joint pain, and headaches. Especially breast biopsy, the removal of a sample of breast tissue for diagnosis, is very painful for patients. It takes multiple days to get a diagnosis. It also results in soreness, swelling, or bruising at the biopsy site. This article will attempt to address the current limitations of breast cancer diagnosis by suggesting an innovative method on multimodal pH and progesterone-sensitive quantum dots to detect breast cancer faster and cheaper. Just a sample of blood is needed from the patient, and the quantum dot sensor will detect the cancerous cells through the emission of wavelengths of about 475 and 1300 nm with a cyan color and infrared radiation. These wavelengths can be translated to quantitative graphs with a spectrophotometer. With its optical sensor, the quantum dot will significantly reduce the price of getting a diagnosis, and it will be able to diagnose the patient almost immediately. Further, it does not require a trained professional to diagnose, which is a significant improvement over the current techniques.

Keywords: pH-lemon sensor; Breast cancer; Quantum dots; Progesterone; Multimodal

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1. Introduction

1.1. Breast cancer

Breast cancer is a disease where breast cells grow unmanageably to form tumors. Progressive states of severity

indicate four stages of breast cancer; pathologists determine stages and look at cell morphology, making visual inspection (**Figure 1**)^[1]. It is known that 23% of breast cancers are not diagnosed accurately (false-negative)^[2]. Therefore, this research will develop an innovative method for multi-modal identification and validation. Furthermore, abundant and complex steps of redundant examination and guided biopsy are required to clarify the existence of cancer cells. Hence, this study will use a primarily accurate method to simplify detecting cancer cells. This study will be making prominent use of pH sensors, thus identifying the pH of the cells; the extracellular pH of cancer cells is between 6.7 and 7.1, while the normal cell is around 7.4^[3-4].

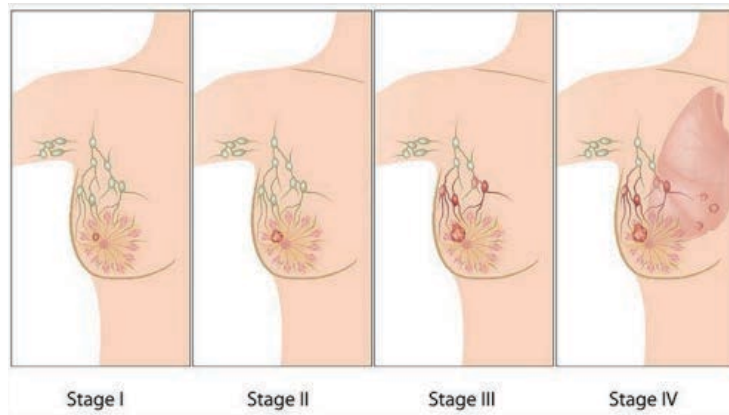


Figure 1. Examination diagram of breast cancer, ordered by stage of its severity

Malignant tumors are cancerous and aggressive because they spread (metastasize) to other parts of the body as they invade and damage surrounding tissues. However, benign tumors are noncancerous and do not spread, so they do not cause systemic health issues compared to malignant tumors (**Figure 2**)^[5].

Despite the numerous treatments for breast cancer, this study wanted to propose a new detection method that utilizes quantum dots, pH sensors, and progesterone hormones. This innovative method aims to allow for early detection of breast cancer stage, which can enhance survival and treatment.

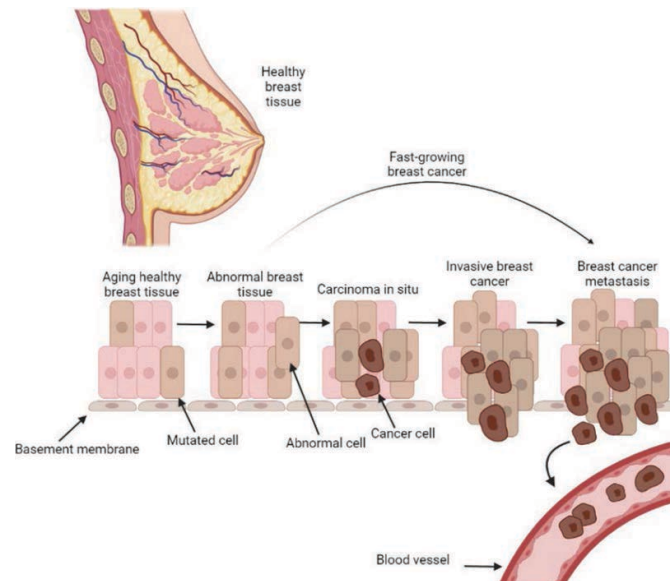


Figure 2. Diagram of the progression of breast cancer and how the cancer cells travel to other parts of the body by categorizing benign and malignant tumors

1.2. Quantum dots

A multi-modal sensor serves to have two different signals from the same probe which are anatomical and metabolic. Here, the usage of quantum dots in the process will be anatomical. Quantum dots are nanocrystalline semiconductors that exhibit three-dimensional quantum confinement. They are band gap tunable, meaning their optical and electric properties can be engineered to fit certain properties. The specific wavelengths and properties are dependent on size and shape (**Figure 3**) ^[6]. The size directly influences the energy levels that quantum dots' electrons can occupy. These electrons can move to a higher energy level when energy is absorbed. When returning to their original level, they emit energy in the form of light. The energy levels between the levels depend on the size of the quantum dot. Smaller quantum dots emit light with shorter wavelengths and vice versa. Quantum dots are applied to different fields, such as photovoltaics, light-emitting diodes, photoconductors and photodetectors, biomedicine and environment, and catalysis ^[7]. The original research was primarily done in group IV and III-V elements, such as Cadmium and Lead. However, Cadmium has been proven to be toxic due to the release of free Cd^{2+} ions and the generation of reactive oxygen species (ROS) ^[8]. The research investigating the cellular uptake amounts of four types of CdSe/ZnS quantum dots by *Phanerochaete chrysosporium* indicated that these four types of quantum dots were highly accumulated in the mycelia. Light irradiation causes the photooxidation of quantum dots in living cells, which causes electron transfer from quantum dots to O_2 . This generates ROS, which forms hydroxyl radicals when the unpaired holes on the quantum dots react with water. Serious harm such as metabolic dysfunction, DNA nicking and breaking, and even cell death, can be caused by these hydroxyl radicals ^[9]. Lead quantum dots can cause oxidative stress, direct damage to the cell membrane, morphological alterations, genotoxicity, and various types of cell death, such as apoptosis and necrosis ^[10]. Today, there are nontoxic alternatives such as indium, carbon, phosphorous, or graphene. This study will be using silicon for the material, which is also safe. Neither acute nor chronic (14 days) toxicity was observed by cell morphology, viability, ATP production, ROS production, and DNA damage at doses of $50\text{--}200\text{ }\mu\text{g mL}^{-1}$ ^[11]. This study has chosen silicon out of other nontoxic materials because it can emit wavelengths of about 1300 nm, enough to be detected through the breast tissue ^[12].

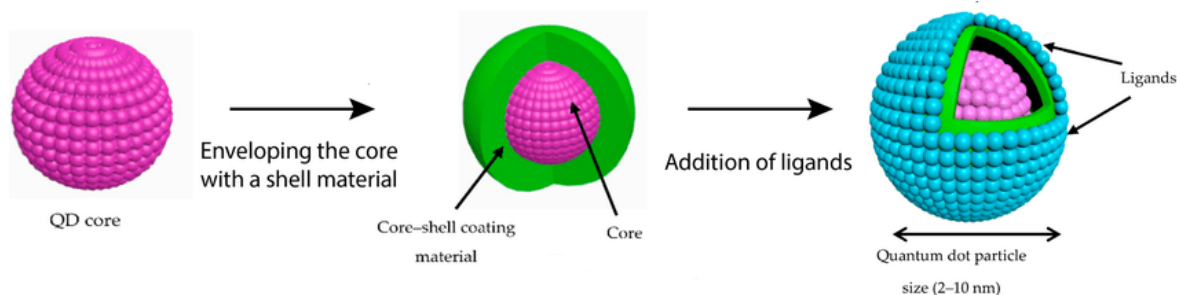


Figure 3. Schematic of the new quantum dot sensor through chemical functionalization with shell material and ligands

1.3. pH sensor

Focusing on the metabolic, the multi-modal sensor will serve to determine the function of the cells using a pH sensor. The pH sensor indicates the acidity and alkalinity of a substance. This study will measure the pH of the cancer cells to determine the acidity and provide validity of cancer cells. This study has chosen to use a visual pH sensor called “pH-Lemon”, which was developed by researchers at the University of California, San Diego. Specifically, it was pioneered by Martin Griesbeck and colleagues. This pH sensor is based on the fusion of two fluorescent proteins, mTurquoise2 and Enhanced Yellow Fluorescent Protein (EYFP) for acidic compartments

(**Figure 4**)^[3, 13]. Based on the fusion of mTurquoise2 and EYFP, the pH spectrum investigated can detect the pH range from 2 to 10. Some publications report different ranges of numbers, but this study will use this range as it is the most relevant for the proposal made. To briefly explain the conventional pH range that applies to most pH-related theories: if the value x is the pH of something specified, the substance is acidic when x is lower than 7, if x equals 7 the substance is neutral, and if it is greater than 7, it is alkaline^[13–14]. Connecting it to the color spectrum, it has a color range from cyan to yellow. Additionally, this study will be taking advantage of a fluorescence detection system to validate the results and enhance the degree of accuracy. Here, the fluorescence ratio will be converted into pH levels and this study will calculate the average pH level from both optical inspection–color spectrum of pH-lemon sensor and statistical inspection which is a fluorescence detection system.

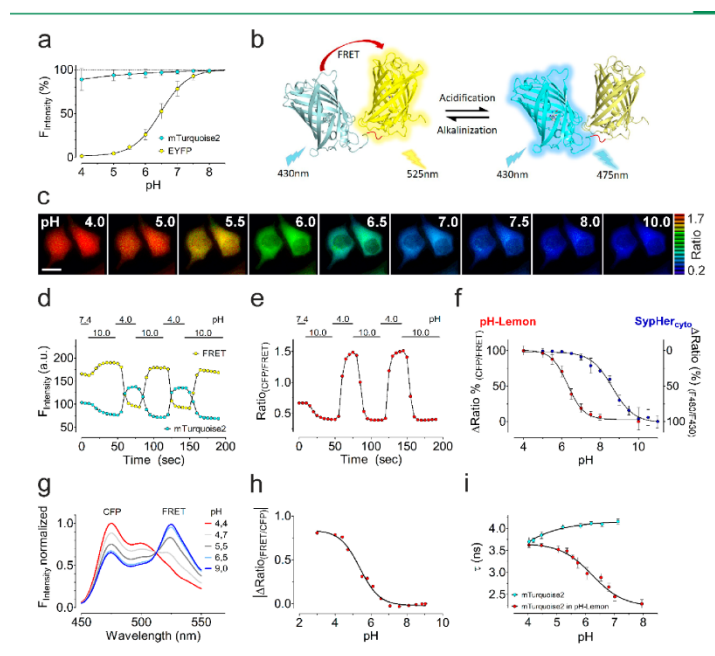


Figure 4. Characterization of mTurquoise2, EYFP, and pH-Lemon in cells, in situ (a–f), and in vitro (g–i). (a) Impact of pH on the fluorescence intensities of mTurquoise2 and EYFP. i) Representative fluorescence lifetimes of mTurquoise2 alone (cyan circles) or mTurquoise2 as FRET donor within pH-Lemon (red circles) at different pH. Data represents an average \pm SD of 3–58 cells per pH

1.4. Progesterone

Progesterone is an endogenous steroid hormone that plays a crucial role in the human reproductive system because it produces signaling events that stimulate crucial chemical messengers (**Figure 5**)^[15]. Since this hormone is necessary for pregnancy, it is also named the “pregnancy hormone” because it supports women to get pregnant and maintain pregnancy. Prolonged exposure to increased progesterone levels induces early menarche, late menopause, and shorter menstrual cycles. As a result, there is an increased risk of breast cancer. However, early full-term pregnancies play a role in protecting against progesterone receptor (PR-positive) breast cancers^[16]. Therefore, an increased risk of cancer risk is associated with a shorter menstrual cycle as a result of higher progesterone levels during the luteal phase, which occurs after ovulation in the menstrual cycle to prepare the body for potential pregnancy^[17].

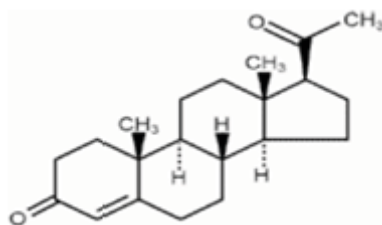


Figure 5. Chemical structure of progesterone

2. Method and approach

This study will measure the pH utilizing the pH-sensitive sensor and quantum dot to simplify the redundant biopsy process. Firstly, this study will purchase the quantum dot from the following companies: Nanosys Inc. (Shoei Electronic Materials Inc.), NnCrystal US Corporation (NN-Labs), and Quantum Materials Corporation with the sensor attached to the blood sample. The sensor sample will be measured in the cuvette spectrophotometer to determine the wavelength of the color and the color of the pH sensor. The fluorescence will indicate if the sample contains cancer cells. The first aim is to create a polyethyleneimine-modified quantum dot (**Figure 6**).

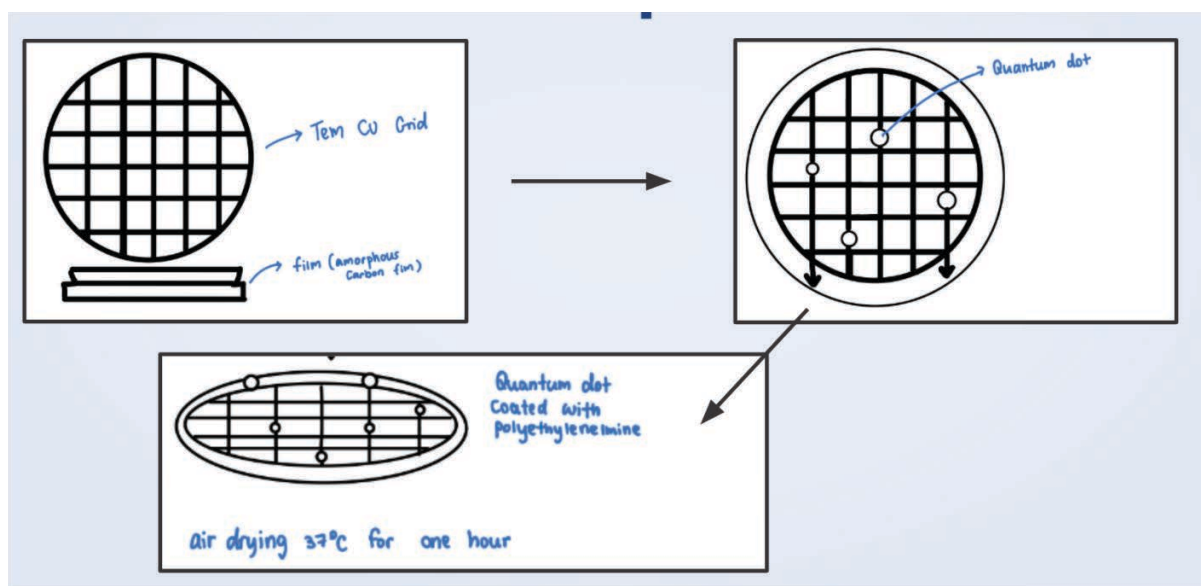


Figure 6. Diagram of the first step of the first aim, where this study coats the surface of the quantum dot with polyethyleneimine

The first step is to coat the surface of our quantum dot with polyethyleneimine (PEI). PEI is a fundamental and positively charged polymer with repeating units composed of the amine group and two carbon aliphatic CH_2CH_2 spacers^[18–19]. The amine groups will be able to bind with the bromine-tethered progesterone, which will then bind to the progesterone receptors on the breast cancer cells. The surface passivation of PEI with rich amino groups supports stabilizing the surface energy traps on the quantum dot^[20–22]. This study will then drop the quantum dot solution onto a copper grid, followed by air drying at 37°C for one hour and the copper mesh

will be coated with an amorphous carbon film. More specific steps are entailed in Yang's research paper, which states: "The effect of quantum dot size and poly(ethylenimine) coating on the efficiency of gene delivery into human mesenchymal stem cells" (**Figure 7**)^[23].

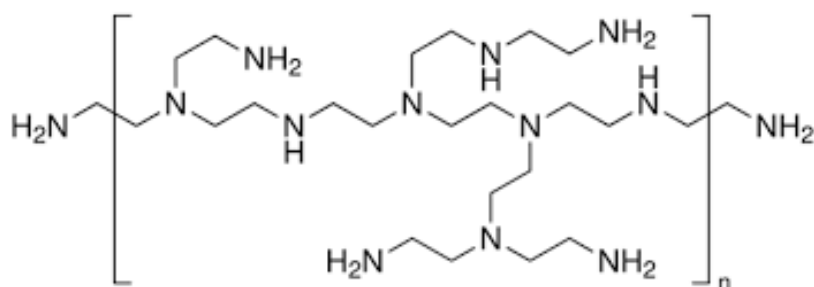


Figure 7. The chemical structure of a polyethylenimine

After coating the quantum dot with PEI, this study will purchase the bromine-modified progesterone and bind it with a quantum dot. From 21-hydroxyprogesterone, the neutral series of conjugates with zero and six-carbon spacers (1, 2) will be synthesized, as shown in **Figure 8**. The synthesis of 1 will begin with the bromination of the 21-hydroxyl group utilizing carbon tetrabromide and triphenylphosphine. To bind the finished bromine-tethered progesterone with the quantum dot, this study will use Do3A, t-Bu ester K₂CO₃, and 40% of NBu₄OHCH₃CN at 90 degrees. By using PEI (2.71 g, 6.9 mmol), quantum dots, K₂CO₃ (2.86 g, 20.7 mmol), and a catalytic amount of 40% Tetrabutylammonium Hydroxide in anhydrous acetonitrile, the mixture will be refluxed for 16 hours. The reaction will occur when the mixture is monitored by TLC and concentrated in a vacuum. The crude residue will be purified by flash column chromatography with dichloromethane: methanol (15:1), an eluent to afford a quantum dot bond with bromine-tethered progesterone. (**Figure 9**)^[24].

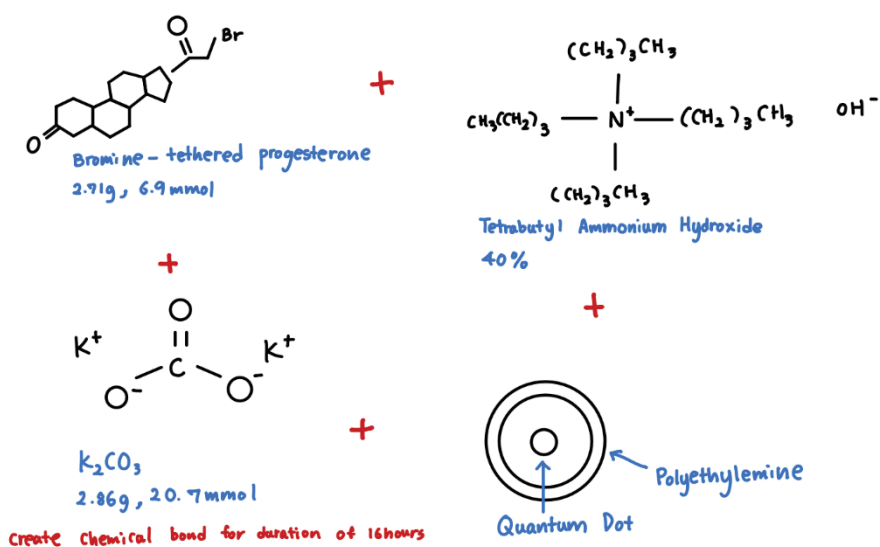


Figure 8. Step two of the first aim where this study functionalizes the coated quantum dot with the bromine-tethered progesterone by creating a chemical bond for a duration of 16 hours

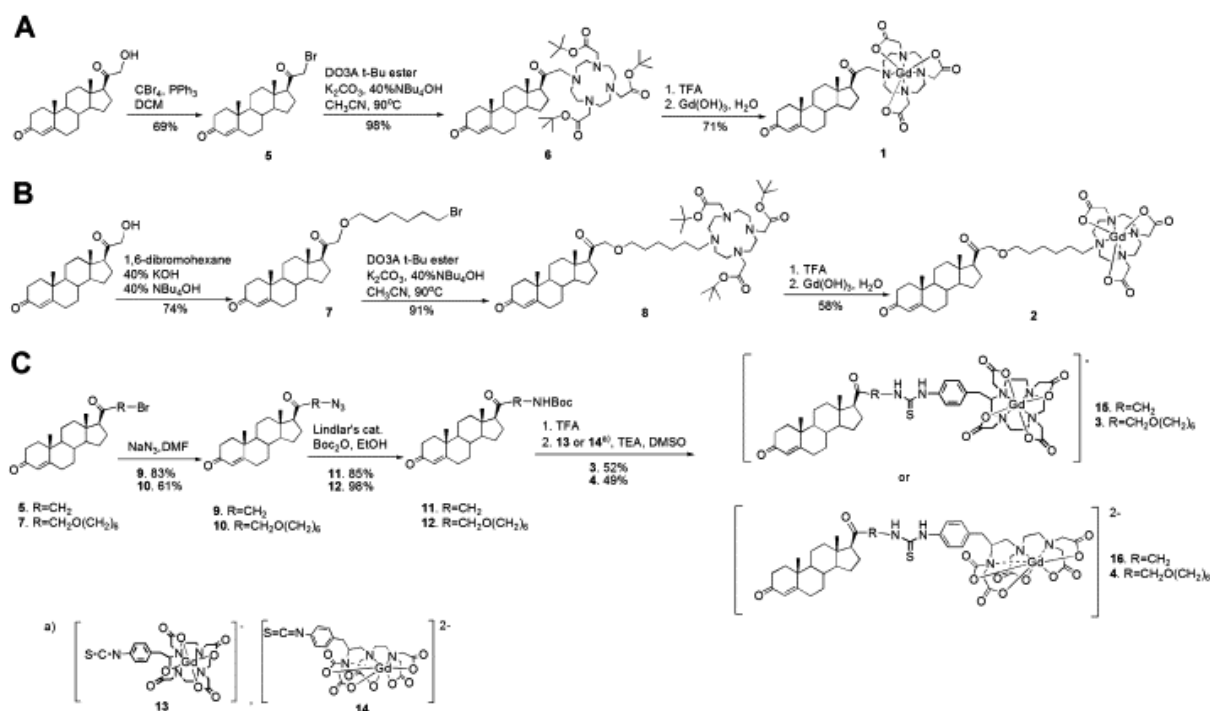


Figure 9. Diagram of the production of bromine-tethered progesterone. Instead of utilizing the DO3A-tris t-butyl ester in step 6, this study will bind the progesterone with the functionalized quantum dot

The study then collected the product after the successful functionalization of quantum dots. Now, this study combines quantum dots, polyethyleneimine, and progesterone, and modifies it with a pH-lemon sensor molecule. This study will have a multimodal sensor to ensure accurate and responsive detection. Firstly, this study will prepare the pH lemon sensor by engineering the pH-lemon genetic construct, which consists of two proteins—pH-stable mTurquoise2 fused to the pH-sensitive EYFP.

The study will then check whether the solution from part A (quantum dot-polyethyleneimine-progesterone) is well spread in a suitable buffer. Afterward, this study will use EDC (1-ethyl-3-(3-dimethylaminopropyl) carbodiimide) and NHS (N-hydroxysuccinimide) to activate carboxyl groups on the quantum dot and polyethyleneimine surface, which forms an NHS ester that can react with the amine groups on the pH-Lemon sensor^[25]. Then, This study will combine the activated quantum dot solution, polyethyleneimine, and progesterone conjugate with the purified pH-Lemon sensor for pH detection. The reaction will undergo a while, and the changes will be monitored through the fluorescence properties of the pH-Lemon sensor^[3]. Afterward, this study will set up the fluorescence detection system using a fluorescence microscopy setup capable of detecting both quantum dot fluorescence and the pH-Lemon's signal. This study will then observe the pH color change from cyan to yellow by exciting at the appropriate wavelength for pH-Lemon, which has a constant range for each fluorescence protein.

The pH-lemon sensor can attach to the cancer cells and glow in the indicated color in the pH-lemon spectrum. The wavelength also depends on the type of pH sensor used. Looking at the wavelength of each protein, mTurquoise2 has an excitation range of 420–450 nm and an emission range of 460–490 nm (**Figure 10**)^[26–27]. Contrastingly, EYFP has an excitation range of 490–520 nm and an emission range of 520–550 nm (**Figure 11**)^[28]. Energy transfer theory will be applied to the emission of wavelengths. The study has selected

mTurquoise2 as the protein that emits, and EYFP is the absorber; mTurquoise2 will emit in wavelengths of 460–520 nm, and EYFP will absorb at a higher nm. As mentioned above, it will emit a wavelength of 530–560 nm when excited. Thus, the excited protein, EYFP, will produce a yellow color. Following emission ranges allow pH-lemon sensors to measure pH changes meticulously through visible shifts in the fluorescence intensity and wavelength of two proteins—mTurquoise2 and EYFP—especially in the acidic to neutral range, approximately from 4 to 7.5. The study will convert the fluorescence ratio gained through the calibration curve to determine pH values accurately. This is vital for the research since it is suitable for measuring extracellular pH in abundant conditions ^[29].

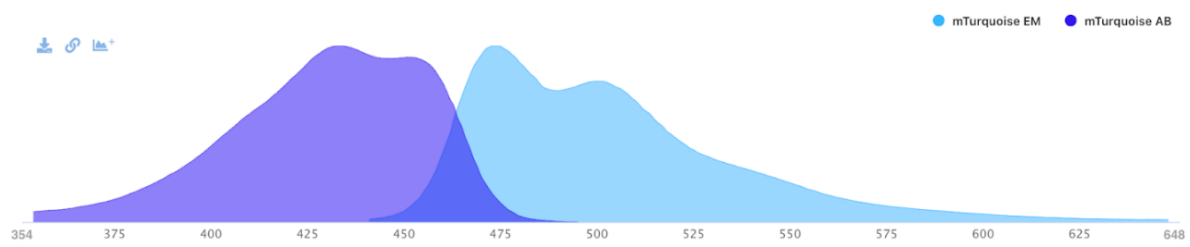


Figure 10. Wavelength graph of mTurquoise2

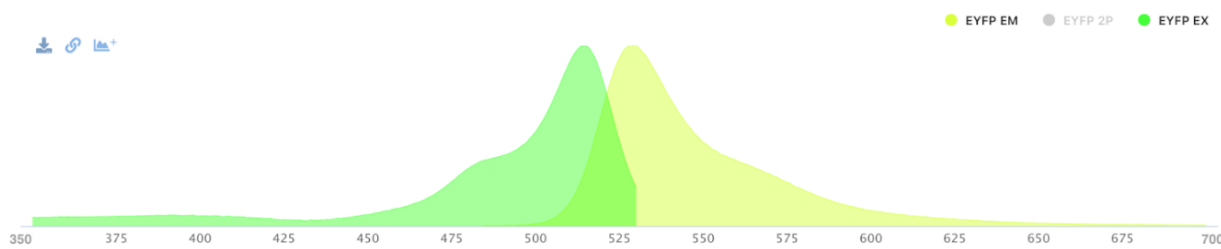


Figure 11. Wavelength graph of EYFP (Enhanced Yellow Fluorescent Protein)

3. Characterization

First, the study will sample blood from a potential breast cancer patient. The location will be in the upper outer quadrant, where about 52% of breast cancers are found. If no cancer cells are found, the study will sample blood from the other quadrants ^[30–31]. Then, insert the quantum dot sensor and observe changes in the color of the sample. In a cuvette spectrophotometer, input the blood and the quantum dot sensor solution and translate the wavelengths into a graph of two peaks — one for the pH sensor, in between wavelengths of 460 to 560 nm, and one for the quantum dot, of about 1300 nm. If two peaks reaching a maximum at about 475 nm and 1300 nm are detected, it would indicate the presence of a breast cancer cell and its location.

4. Expected results

After the experiment, here are the expected outcomes. The experiment has two parts, which are labeled as A and B in total. Firstly, in the former part, when the quantum dot attaches itself to the cell, the progesterone will bind

to the progesterone receptor on the surface of cancer cells and emit a wavelength of about 1300 nm, which will be detectable by the spectrophotometer. Moving on to the latter part, when a pH-lemon sensor attaches itself to the cancerous cells that were profound from quantum dots, it will detect the lower pH by lighting up with cyan color and producing excitation wavelength in the range of 420–450 nm with mTurquoise2 as a critical indicator. Nonetheless, when it is a normal cell, it will detect higher pH, appearing as a yellow color and producing excitation wavelengths in the range of 490–520 nm EYFP as a critical indicator ^[26–28].

5. Discussion and conclusion

The two possible pitfalls of the detection method are: 1) If the pH-lemon sensor produces overlapping wavelength peaks when comparing the emitted light for the extracellular pH of a cancer cell and a normal cell, it means that it is hard to differentiate wavelengths from a cancer cell versus a normal cell. Since the cancer cell's extracellular pH is from 6.7 to 7.1 while the normal cell's extracellular pH is about 7.4, perhaps the sensor cannot accurately emit easily differentiated wavelengths for each. 2) The fluorescence is not robust enough for researchers to detect easily. To overcome these possible pitfalls, the solution is to 1) find a more sensitive pH sensor with a narrow pH range, which will provide a more accurate result, and 2) choose an alternative quantum dot of Cd/Pb Core-Shell proven to have wavelengths of 1500–1700 nm, or find a nontoxic quantum dot with a higher wavelength ^[32].

For possible future research, the researchers will first develop and test the current design for the quantum dot sensor. If it succeeds, the researchers will develop, test, and modify the current quantum dot sensor to eliminate cancer cells. This will vastly improve the future of both diagnosing and treating breast cancer. Furthermore, if the technology works, it will make the breast cancer detection method a cost-effective, fast way to assess whether the patient has breast cancer and, if so, locate its cells and organs. Instead of misdiagnosing 20% of the total breast cancer patients who need treatment, this will hopefully diagnose all the patients. With its low cost, perhaps more of the younger population will visit for screening. Since the technology does not require a trained professional, it can be applied to save patients in areas where trained professionals are unavailable. Improving the problem of biopsy and other diagnosis methods in the past, the innovative quantum dot sensor diagnosis will detect cancer cells within hours.

In conclusion, this study proposed a pH-sensitive quantum dot sensor for detecting progesterone receptors for earlier detection and diagnosis of breast cancer patients. The proposal includes two approaches to enhance the effectiveness of the detection method. The cost-effectiveness of this quantum dot sensor will significantly encourage patients with breast cancer to be diagnosed, particularly among the younger population, to visit the hospital for a quick breast cancer screening, which can lead to higher survival rates. Through improved detection, this quantum dot sensor's successful validation and effectiveness could enhance the lives of many breast cancer patients.

Disclosure statement

The authors declare no conflict of interest.

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Research on the Effect of Diversified Rehabilitation Nursing on Postoperative Recovery of Patients with Thoracolumbar Osteoporotic Fractures after PKP

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Abstract: *Objective:* To study the effect of diversified rehabilitation nursing on the postoperative recovery of patients with thoracolumbar osteoporotic fractures after PKP. *Methods:* The recovery of patients in the new group (diversified rehabilitation nursing) was compared with that of the traditional group (standard nursing). *Results:* The new group showed better performance in pain control, activity ability, quality of life, length of hospital stay, and complications. *Conclusion:* Diversified rehabilitation nursing effectively promotes postoperative recovery after PKP and reduces the risk of complications.

Keywords: Diversified rehabilitation nursing; Postoperative PKP; Recovery; Complications

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1. Introduction

Osteoporotic fractures are one of the common diseases among the elderly, and fractures of the thoracolumbar region have the most significant impact on a patient's quality of life. With the intensifying aging of the population, the incidence of such fractures has been increasing year by year, imposing a heavy burden on patients and their families. Percutaneous kyphoplasty (PKP), as a minimally invasive surgical method, has been widely used in the clinical treatment of thoracolumbar osteoporotic fractures due to its advantages such as small trauma, fast recovery, and few complications^[1]. However, the postoperative recovery of patients is not always ideal, especially for elderly patients, whose complex physiological and psychological states make postoperative recovery face more challenges. Therefore, how to promote patients' postoperative recovery and improve their quality of life through effective rehabilitation nursing measures has become an important topic in clinical nursing work. In recent years, diversified rehabilitation nursing, as a comprehensive nursing model covering multiple aspects such as physical therapy, psychological support, nutritional guidance, and rehabilitation

education, has gradually received attention for its potential to promote patients' postoperative recovery. Studies have shown that diversified rehabilitation nursing can significantly improve key indicators such as pain control, activity ability, and quality of life of patients while reducing the incidence of complications ^[2]. However, current research on the application of diversified rehabilitation nursing in the postoperative recovery of patients with thoracolumbar osteoporotic fractures after PKP is still relatively limited, and there are certain differences in the results of different studies, which are related to various factors such as research design, sample size, and implementation details of rehabilitation nursing programs. Based on this, this article analyzes the effect of diversified rehabilitation nursing on the postoperative recovery of patients with thoracolumbar osteoporotic fractures after PKP, as follows.

2. Materials and methods

2.1. Baseline information

A total of 106 patients were selected as study subjects from January 5, 2023, to January 5, 2024. Based on differences in intervention methods, they were divided into a new treatment group (53 patients) and a traditional treatment group (53 patients). The new treatment group consisted of 25 males and 28 females, with an age range of 65.28 to 89.36 years and a mean age of 72.25 ± 1.28 years. The traditional group comprised 26 males and 27 females, with an age range of 66.28 to 89.11 years and a mean age of 72.38 ± 1.67 years. Upon comparison, there were no significant differences in baseline characteristics between the two groups ($P > 0.05$), indicating comparability.

Inclusion criteria: diagnosis of thoracolumbar osteoporotic fracture confirmed by imaging examination; treatment with percutaneous kyphoplasty (PKP); patient or family member consent to participate in the study and signed informed consent.

Exclusion criteria: severe cardiac, pulmonary, liver, kidney, or other organ dysfunction; mental illness or cognitive impairment that precludes cooperation with rehabilitation therapy; malignant tumors or blood system diseases; severe infectious diseases; other serious illnesses affecting rehabilitation; and severe postoperative complications.

2.2. Methods

Patients in the traditional treatment group received standard postoperative care, including wound care, pain management, and basic daily living assistance. Additionally, doctors performed regular rounds, provided medication guidance, and conducted health education. After 24 hours postoperatively, patients were encouraged to perform bed activities such as turning over and sitting up, while 48 hours postoperatively, they began bedside activities like standing and walking.

The new treatment group received a diversified rehabilitation nursing program that incorporated personalized rehabilitation plans based on traditional nursing. This program specifically included physical therapy (heat therapy, electrotherapy, and ultrasonic therapy) to promote blood circulation, reduce pain, and accelerate fracture healing. Occupational therapy focuses on teaching daily living skills to improve self-care abilities. Psychological counseling provides emotional support, helping patients establish a positive mindset and enhance confidence in their recovery. Nutrition guidance offered personalized dietary recommendations based on patients' nutritional status to promote fracture healing. Rehabilitation education educated patients

and their families on precautions during the recovery process and how to perform rehabilitation exercises at home. Finally, patients in the new treatment group underwent regular weekly assessments of their rehabilitation progress, with adjustments made to their rehabilitation plans based on these assessments to ensure the effectiveness and adaptability of the nursing program.

2.3. Observation Indicators

2.3.1. Analyze the details of pain scores, activity levels, and quality of life before and after intervention in both groups

The Visual Analog Scale (VAS) was used to evaluate patients' pain levels. The VAS score ranges from 0–10, where 0 represents no pain and 10 represents the most severe pain. The Barthel Index was used to assess patients' activities of daily living (ADL). The index specifically consists of 10 ADLs with a total score of 100, where a higher score indicates better activity levels. The SF-36 health survey questionnaire was used to evaluate patients' quality of life. The SF-36 contains 8 dimensions, and a higher score represents a better quality of life for the patient.

2.3.2. Analyze the details of fracture healing time, hospital stay, and bone density comparison between the two groups

Bone density of the lumbar spine and proximal femur was measured by dual-energy X-ray absorptiometry (DXA).

2.3.3. Analyze the details of the incidence of complications in both groups

Record any complications that occurred during the patient's hospital stay, such as infection, thrombosis, fractures, etc., and calculate the incidence of complications.

2.4. Statistical principle

SPSS 19.0 statistical software was used for data analysis. Measurement data were expressed as (Mean \pm SD) and analyzed using the *t*-test. Count data were expressed as rates (%) and analyzed using the χ^2 test. A *P*-value < 0.05 was considered statistically significant.

3. Results

3.1. Details of pain scores, activity levels, and quality of life before and after intervention in both groups

Table 1 shows the comparison of pain scores, activity levels, and quality of life before and after intervention in both groups.

Table 1. Comparison of pain scores, activity levels, and quality of life before and after intervention in both groups (Mean \pm SD, scores)

Observation indicators	Before intervention in the traditional group (n = 53)	After intervention in the traditional group (n = 53)	<i>t</i>	<i>P</i>	Before intervention in the new treatment group (n = 53)	After intervention in the new treatment group (n = 53)	<i>t</i>	<i>P</i>
Pain score (VAS)	7.65 \pm 1.42	4.56 \pm 1.09	4.552	<0.05	7.78 \pm 1.39	3.21 \pm 0.87	8.264	<0.05
Activity level (Barthel Index)	58.54 \pm 12.45	76.41 \pm 14.21	15.258	<0.05	57.89 \pm 12.67	85.67 \pm 11.34	20.264	<0.05
Quality of life (SF-36 score)	45.37 \pm 10.15	62.45 \pm 9.87	16.969	<0.05	44.89 \pm 10.02	70.23 \pm 8.45	18.093	<0.05

3.2. Comparison of fracture healing time, hospital stay, and bone density between the two groups

Table 2 shows the comparison of fracture healing time, hospital stay, and bone density between the two groups.

Table 2. Details of fracture healing time, hospital stay, and bone density comparison between the two groups

Observation indicators	Traditional group (n = 53)	New treatment group (n = 53)	<i>t</i>	<i>P</i>
Fracture healing time (days)	98.57 \pm 14.21	85.43 \pm 11.97	18.526	<0.05
Hospital stay (days)	13.65 \pm 2.89	11.23 \pm 2.47	5.226	<0.05
Bone density (g/cm ²)	0.86 \pm 0.12	0.92 \pm 0.11	5.294	<0.05

3.3. Details of comparison of complication rates between the two groups

Table 3 shows the comparison of complication rates between the two groups.

Table 3. Comparison of complication rates between the two groups

Types of complications	Traditional group (n = 53)	New treatment group (n = 53)
Infection	12 (22.64%)	5 (9.43%)
Thrombosis	8 (15.09%)	2 (3.77%)
Re-fracture	5 (9.43%)	1 (1.89%)

4. Discussion

In this study, the novel group receiving diversified rehabilitation nursing had significantly lower postoperative VAS scores compared to the traditional group. Specifically, the average VAS score in the novel group was 3.21 \pm 0.87, while it was 4.56 \pm 1.09 in the traditional group. This significant difference ($P < 0.01$) directly reflects the clear advantages of diversified rehabilitation nursing in pain management. The pain management strategies in diversified rehabilitation nursing include physical therapy, pharmacological treatment, cognitive behavioral therapy, and relaxation techniques. Physical therapy, especially the application of thermotherapy and electrotherapy, facilitated pain relief by promoting blood circulation and reducing the release of inflammatory mediators. Furthermore, personalized pain management plans, involving regular pain assessments and timely adjustments to analgesic dosages, played a crucial role in pain control. It is noteworthy that patients in the novel

group received physical therapy once a day for 30 minutes, which effectively maintained continuity in pain control ^[3]. Cognitive behavioral therapy also helped reduce pain perception by modifying patients' cognitive and emotional responses to pain. Postoperative pain is not only a physiological experience but also accompanied by psychological reactions. Psychological interventions such as psychological counseling and relaxation training helped alleviate anxiety and depression, which often exacerbate pain perception. Additionally, pain education implemented in the novel group improved patients' knowledge and self-management abilities regarding pain. Through pain education, patients understood the physiological and psychological mechanisms of pain and learned effective self-management techniques such as deep breathing and progressive muscle relaxation. By increasing the temperature of local skin and muscles, thermotherapy promotes blood circulation, reduces muscle tension, and alleviates pain. In this study, the application of thermotherapy decreased patients' pain scores by an average of 1.5 points, particularly noticeable in the early postoperative period. Moreover, electrotherapy reduces pain by blocking pain signals through nerve stimulation. In the novel group, the use of electrotherapy lowered VAS scores by an average of 1.2 points. Following physical therapy, patients required approximately 20% less analgesic medication compared to the traditional group, indicating that physical therapy can enhance drug efficacy and reduce side effects. The satisfaction rate with physical therapy was remarkably high in the novel group, reaching 90%. This reflects patients' strong recognition of such non-pharmacological pain management methods. In this study, the treatment team tailored personalized physical therapy plans for each patient based on specific factors such as pain location, pain nature, and patient preferences. This personalized approach not only improved treatment effectiveness but also enhanced patient compliance ^[4]. In this research, diversified rehabilitation nursing demonstrated significant effects on improving the activity level of patients with thoracolumbar osteoporotic fractures after PKP surgery. Using the Barthel Index as an assessment tool, the study found that the novel group's ability to perform activities of daily living was significantly higher than that of the traditional group. This indicates that diversified rehabilitation nursing plays a positive role in promoting functional recovery. Specifically, the average Barthel Index score in the novel group was 85.67, considerably higher than the traditional group's 76.41, a statistically significant difference. This improvement was largely attributed to personalized occupational therapy plans tailored to patients' specific conditions, including functional exercises, transfer training, and balance training, which directly addressed their functional impairments. Early rehabilitation intervention was also a key factor in enhancing activity levels. Patients in the novel group began receiving rehabilitation training early after surgery, effectively avoiding the risks of muscle atrophy and joint stiffness. Additionally, the implementation of a comprehensive rehabilitation strategy, including psychological support, nutritional guidance, and rehabilitation education, provided support for patients' holistic recovery. The high level of patient engagement in the rehabilitation process and regular assessments and adjustments based on their progress and feedback further contributed to the positive outcomes.

The personalized occupational therapy plan covers a range of activities, specifically including bed mobility training, transfer ability training, balance and coordination training, as well as retraining for activities of daily living (ADL). For patients who have difficulty moving in bed, a progressive bed activity plan has been designed, ranging from simple rolling-over training to sitting-up training, enabling patients to gradually improve their bed mobility. For patients with poor balance, targeted training can be conducted through balance pads and balance training software to enhance their balance ability. Occupational therapists also conduct detailed assessments of the patient's home environment and provide corresponding home modification suggestions based on the assessment results, such as installing handrails and adjusting furniture height, to ensure the

patient's safety and self-care ability at home. After personalized occupational therapy, patients can significantly improve their transfer (such as from bed to chair) and balance (such as standing and walking) abilities. Among them, the average improvement rate of transfer ability is 28%, and the average improvement rate of balance ability is 22%. Patient education is another important aspect of personalized occupational therapy. Therapists educate patients on how to perform daily activities correctly, such as getting up, sitting down, and walking, which can reduce the pressure on the spine and avoid secondary injuries. The educational content also includes pain management skills, nutritional guidance, and lifestyle adjustments.

In the new group, the "physical functioning" dimension score of the SF-36 questionnaire increased by 15%, the "role functioning-physical" dimension score increased by 18%, the "emotional well-being" dimension score increased by 20%, and the "social functioning" dimension score increased by 17%. These improvements not only indicate that patients have recovered physically but also reflect positive changes in their psychological and social aspects. Through diversified rehabilitation nursing, patients in the new group have better managed their pain, thereby reducing the interference of pain in their daily lives. Furthermore, the enhancement of patients' activity abilities enables them to participate more confidently in daily activities. The recovery of such abilities directly affects patients' role functioning and sense of self-worth. In this study, patients in the new group received psychological support services including psychological counseling, stress management, and emotional regulation. These services help patients better cope with the stress and challenges of postoperative recovery, thereby improving emotional well-being. Educating patients on rehabilitation training, nutrition management, and lifestyle adjustments can make them feel more in control and secure, directly promoting the improvement of their social functioning and overall health perception.

The reduction in hospital stay is mainly attributed to several key components of diversified rehabilitation nursing, with early rehabilitation intervention being one of the critical factors. Patients in the new group began receiving rehabilitation training early after surgery, specifically including bed activities, transfer training, and walking training. Such early activities can help reduce the risk of postoperative complications and accelerate the recovery process. By providing personalized training for patients with limb dysfunction, they can quickly restore their ability to perform daily activities independently, thereby reducing hospital stays. After surgery, patients in the new group received more intensive rehabilitation services, including physical therapy, occupational therapy, and psychological support. These intensive rehabilitation services not only improve patients' rehabilitation efficiency but also enhance their confidence and motivation, promoting rapid recovery. For patients, a shorter hospital stay means reduced hospitalization costs, thereby lowering their economic burden. At the same time, early discharge can help patients return to their families and society faster, improving their quality of life. For hospitals, a shorter hospital stay can increase the bed turnover rate, optimize medical resource allocation, help hospitals accommodate more patients, and effectively improve the efficiency of medical services.

In this study, the incidence of complications in the new group was significantly lower than that in the traditional group. Specifically, the incidence of infection, thrombosis, and refracture in the new group was 9.43%, 3.77%, and 1.89%, respectively, compared to 22.64%, 15.09%, and 9.43% in the traditional group. This significant difference ($P < 0.01$) confirms the importance of diversified rehabilitation nursing in preventing postoperative complications.

In the new group, more active rehabilitation activities such as early bed mobility and walking training helped promote blood circulation and reduce the probability of thrombosis. Physical therapy in rehabilitation nursing, including muscle massage and joint mobility training, also helped prevent muscle atrophy and joint

stiffness, while effectively reducing the occurrence of infection and other complications. Early activity can promote the discharge of lung secretions and reduce the incidence of lung complications. Through education, patients can understand the importance of postoperative complication prevention measures such as appropriate position changes, deep breathing exercises, and early activities. The provision of nutritional guidance in the new group enhanced patients' immunity and tissue repair capabilities by improving their nutritional status, thereby reducing the risk of infection. Good nutritional status is crucial for postoperative recovery and can help reduce the occurrence of complications. The involvement of psychological support in the new group helped improve patients' compliance with rehabilitation training and reduce the risk of complications by alleviating anxiety and depression.

The regular intervention of physical therapy, such as leg muscle massage and the use of anti-thrombosis pumps, effectively promoted blood circulation, reduced venous stasis in the lower extremities, and prevented the occurrence of thrombosis. At the same time, the implementation of occupational therapy helped patients restore daily living skills, improve self-care abilities, and reduce the risk of lung infections caused by prolonged bed rest. Nutritional guidance improves patients' nutritional status, and enhances immunity and tissue repair capabilities, providing an important material basis for postoperative recovery. Health education raised patients' awareness of postoperative complication prevention, enabling them to take effective self-management measures such as appropriate position changes and deep breathing exercises, thereby reducing the risk of complications. This nursing model not only improved the quality of postoperative recovery for patients but also significantly reduced the risk of complications, providing an effective nursing strategy for clinical care.

Disclosure statement

The authors declare no conflict of interest.

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The Effect of Nursing Intervention Application in Patients with Diabetes Mellitus and Urinary Tract Infection

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Abstract: *Objective:* To analyze the effect of using a comprehensive nursing intervention model for patients with diabetes mellitus and urinary tract infections. *Methods:* 60 patients with diabetes mellitus combined with urinary tract infection who were admitted to the hospital from November 2021 to November 2023 were randomly divided into the observation group and the control group, and were treated with conventional nursing interventions and comprehensive nursing interventions respectively. The nursing status of the two groups was compared and analyzed. *Results:* After the intervention, the observation group showed lower levels of fasting blood glucose and other indicators, and lower anxiety and depression scores, $P < 0.05$. After the intervention, the observation group's blood creatinine and other biochemical indicators improved significantly, $P < 0.05$. *Conclusion:* For the treatment of patients with both diabetes mellitus and urinary tract infections, nursing staff should pay attention to the development of nursing interventions to enhance the level of patients' glucose control, improve the patients' bad moods, and improve patients' therapeutic efficacy.

Keywords: Diabetes mellitus; Patients with urinary tract infections; Nursing interventions; Application

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1. Introduction

An in-depth analysis of the physiological characteristics of diabetic patients reveals that they are chronically hyperglycemic, leading to metabolic disorders and severe electrolyte imbalances, which significantly increase the likelihood of complications. Among the main pathological mechanisms of diabetes, it is mainly related to problems such as insufficient insulin secretion or impaired pancreatic islet function. With the prolongation of the disease, patients may face a variety of complications that can damage key tissues such as the heart and nerves, leading to multi-organ dysfunction and seriously affecting the quality of daily life. In addition, diabetic patients have a

relatively weakened immune system, which makes them more susceptible to the threat of bacterial infections, especially urinary tract infections, which are at a significantly higher risk. When diabetic patients develop symptoms of urinary tract infection, the condition tends to deteriorate rapidly due to the superimposed influence of various factors such as the environment, which not only seriously affects the improvement of the quality of life of the patients, but also imposes more stringent requirements on the development of nursing care. In the nursing process of such patients, in addition to cooperating with the doctor to impose appropriate antibacterial drugs for patients, special attention should also be paid to the adjustment of nursing interventions. Through the relevant studies, the active implementation of nursing interventions in the care of patients with diabetes mellitus combined with urinary tract infection can effectively improve the clinical symptoms of patients and further enhance the effect of glycemic control ^[1]. The purpose of this study is to explore the application effect of nursing interventions in patients with both diabetes mellitus and urinary tract infection, to effectively improve the nursing program for patients with diabetes mellitus, and to provide a scientific basis.

2. Information and methods

2.1. General information

The research subjects selected for this study were patients with diabetes mellitus combined with urinary tract infections admitted to the hospital from November 2021 to November 2023, totaling 60 cases, which were randomly divided into two groups. In the observation group, there were 19 males and 11 females, with a mean age of 45.36 ± 5.36 years and a mean disease duration of 7.36 ± 3.56 years. In the control group, there were 18 males and 12 females, with a mean age of 45.43 ± 5.32 years and a mean disease duration of 7.51 ± 3.42 years. The data of the two groups were analyzed, showing no significant difference ($P > 0.05$).

Inclusion criteria: Patients with diabetes mellitus and symptoms of urinary tract infection were selected.

Exclusion criteria: Patients with urologic disease or cognitive abnormalities were excluded.

2.2. Methodology

Both groups underwent conventional treatment, such as glycemic control therapy and antibiotic therapy, which may involve oral hypoglycemic drugs or insulin, and antibiotic therapy such as ceftriaxone and levofloxacin was given to the patients.

2.2.1. Control group control methods

Routine nursing interventions, such as instructing patients to take medications, regularly testing patients' blood glucose levels, and implementing routine education and dietary interventions.

2.2.2 Control methods for the observation group

Comprehensive nursing interventions were used. One is to focus on blood sugar control. If the patient is in a state of high blood sugar for a long time, the rate of bacterial growth and reproduction is relatively fast, which leads to symptoms such as urinary tract infection. Therefore, attention should be paid to the patient's blood glucose control to improve the level of prevention and treatment of urinary tract infections. Nursing staff can combine the actual condition of the patient's condition, guide the patient to take hypoglycemic drugs, such as bimatoprost, or guide the patient to inject insulin. Combined with the patient's body indexes, take into account the patient's dietary preferences, adjust the patient's dietary structure, and improve the level of calorie intake

control ^[2]. At the same time, nursing staff can guide patients to carry out exercises, such as playing Tai Chi, etc., to enhance the insulin sensitivity of patients and improve the effectiveness of patients' blood glucose control.

Secondly, general care measures are implemented. Nursing staff should inform patients to increase the amount of drinking water appropriately, preferably more than 2500 ml, to enhance the balance of patients' body fluids, to increase the frequency of patients' urinary elimination, so that the residence time of bacteria in the bladder has been shortened, and to enhance the level of bladder flushing ^[3]. At the same time, nursing staff should monitor the patient's condition and do a good job of recording information.

Thirdly, infection control care is carried out. After the application of antibiotics, the patient's condition should be observed to confirm whether the patient has any adverse reactions, explain the drug-related knowledge to the patient, inform the patient of the value of the drug application, enhance the patient's compliance, and guarantee the implementation of infection control measures.

Fourth, symptomatic care is practiced. If a diabetic patient has a urinary tract infection, the main manifestation is fever, and as the patient's body temperature rises, they may have chills or other symptoms. Nursing staff should pay attention to the implementation of warming measures, and instruct the patient to cover with thick bedding. When the patient's fever subsides, if the patient's clothing is soaked with sweat, the clothing and bed linen should be changed in time to improve the patient's comfort ^[4]. At the same time, warm water can also be used to scrub the patient. If the patient has a high fever, ice can be used to improve the level of physical cooling. If the patient has waist and abdominal pain phenomenon, the nursing staff can massage the pain area, or use hot compresses to reduce the patient's pain.

Fifth, nursing staff should focus on hygiene care to improve health. If the patient is a woman, let her make use of clean and sterile soft paper after urination to clean the perineum and perianal urine, improve the cleanliness of the perineum, and ensure the dryness of the perineum ^[5]. After defecation, the anus should be cleaned and the perineum should be washed regularly with water once a day. After urination and defecation, male patients should flush the urethra or perianal area, etc. with the help of water, and instruct patients to change their underwear daily.

Sixth, psychological care is provided. With the increase in the age of diabetic patients, their body functions show certain characteristics of decline, and the difficulty of their condition control is relatively high, patients may produce a lot of bad emotions, such as anxiety. The patients taking the corresponding medication for a long time may lead to a variety of complications and reduce the quality of life of the patients, so pessimism and disappointment during the treatment process may promote adverse effects. Therefore, nursing staff should pay attention to the psychological care of patients, perform face-to-face mode of communication with patients, enhance the patient's trust in the nursing staff, let the patient take the initiative to talk about their demands, analyze the causes of patients' bad mood, combined with the patient's personality characteristics, to establish a targeted psychological guidance strategy to improve the patient's negative emotions and improve the patient's confidence in treatment. At the same time, nursing staff can carry out health education, explaining to patients the etiology of the disease mechanism and care. They can use video playback and picture explanations to strengthen the patient's understanding of the relevant knowledge and improve the patient's awareness of self-management ^[6].

2.3. Observation of indicators

The patient's fasting blood glucose and other indicators were measured with the help of a blood glucose tester.

Patients' emotional status was assessed by SAS and SDS scales. Patients' levels of blood urea nitrogen and blood creatinine were measured using a fully automated biochemical analyzer.

2.4. Statistical treatment

During data processing, SPSS 23.0 was applied, and the count data were rowed χ^2 test. Measurement data line t -test. If $P < 0.05$, the difference between the data was significant.

3. Results

3.1. Blood glucose indicators

As shown in **Table 1**, after the intervention, the blood glucose level was relatively lower in the observation group, $P < 0.05$.

Table 1. Glycemic indexes before and after intervention in both groups (Mean \pm SD)

Groups	Samples	Fasting blood glucose (mmol/L)		Postprandial 2h blood glucose (mmol/L)		Glycosylated Hemoglobin (%)	
		Pre-treatment	Post-treatment	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
Observation group	30	12.21 \pm 1.78	6.32 \pm 0.97	15.65 \pm 1.32	8.92 \pm 1.57	11.32 \pm 2.04	6.27 \pm 0.72
Control group	30	12.24 \pm 1.64	8.26 \pm 0.87	15.71 \pm 1.29	11.27 \pm 1.18	11.29 \pm 2.08	9.01 \pm 0.95
t	-	0.658	9.543	0.862	8.857	0.746	9.842
P	-	0.509	0.001	0.535	0.004	0.627	0.001

3.2. Psychological state

As shown in **Table 2**, after the intervention, SAS and SDS scores were relatively lower in the observation group, $P < 0.05$.

Table 2. Psychological state scores before and after the intervention in both groups (Mean \pm SD)

Groups	Samples	SAS score		t	P	SDS scores		t	P
		Pre-intervention	Post-intervention			Pre-intervention	Post-intervention		
Observation group	30	77.45 \pm 4.23	41.26 \pm 3.24	9.957	0.001	77.32 \pm 5.64	42.24 \pm 3.37	10.567	0.001
Control group	30	77.56 \pm 4.26	54.23 \pm 4.31	8.247	0.010	77.28 \pm 5.72	57.32 \pm 5.26	9.862	0.001
t	-	0.577	12.524	-	-	0.239	13.125	-	-
P	-	0.612	0.001	-	-	0.842	0.001	-	-

3.3. Biochemical indicators

As shown in **Table 3**, after the intervention, the blood urea nitrogen and blood creatinine levels were relatively higher in the observation group, $P < 0.05$.

Table 3. Blood urea nitrogen and serum creatinine levels before and after intervention in both groups (Mean \pm SD)

Groups	Samples	Blood urea nitrogen (mmol/L)		<i>t</i>	<i>P</i>	Blood creatinine (μ mol/L)		<i>t</i>	<i>P</i>
		Pre-intervention	Post-intervention			Pre-intervention	Post-intervention		
Observation group	30	6.26 \pm 0.78	8.58 \pm 0.83	12.364	0.001	102.68 \pm 11.26	140.23 \pm 10.51	14.367	0.001
Control group	30	6.24 \pm 0.81	7.08 \pm 0.52	11.567	0.001	102.62 \pm 11.21	113.24 \pm 11.24	13.264	0.001
<i>t</i>	-	0.862	11.034	-	-	0.757	10.239	-	-
<i>P</i>	-	0.435	0.001	-	-	0.534	0.001	-	-

4. Discussion

In recent years, China's aging population has gradually increased, coupled with certain changes in people's living habits, making the prevalence of diabetes increase. Analysis of the physiological characteristics of diabetic patients shows that a long state of high blood sugar can cause certain abnormalities in organ function, and the body resistance becomes relatively weak, increasing the susceptibility of patients to pathogenic bacteria, easily leading to urinary infections and other symptoms. With the increase of the patient's disease time, the plasma osmolality is increased, the sugar metabolism is in a state of disorder, the glycolysis ability is relatively weak, the phagocytosis ability of macrophages and so on is decreased, which will enhance the risk of the patient's urinary tract infection. At the same time, in patients with metabolic system disorders, the protein decomposition rate is relatively fast, synthesis efficiency is not high, immunoglobulin synthesis has a certain degree of deficiency, and the patient's immunity is relatively low, providing convenient conditions for the colonization of pathogenic bacteria. In addition, the blood flow rate of diabetic patients is relatively slow, there is a certain lack of blood circulation, and the clearance efficiency of pathogenic bacteria is relatively low, which will enhance the growth and reproduction rate of pathogenic bacteria ^[7].

In the clinical field, when treating patients with diabetes mellitus combined with urinary tract infections, not only will conventional hypoglycemic drugs and antibiotics be applied, but also nursing interventions will be implemented. Among them, blood glucose control nursing interventions can be carried out to reduce patients' blood glucose concentration through glucose-lowering drugs or insulin, guide patients to form good living habits, regular exercise, healthy diet, and so on, to improve the effect of blood glucose control and alleviate patients' infection symptoms. The results of this study showed that after the intervention, the blood glucose level of the observation group was relatively low. The reason is mainly the implementation of the patient's blood glucose control measures based on the actual condition of the patient's condition, the use of drug therapy, and so on, to promote the reduction of the patient's blood glucose level ^[8]. At the same time, the nursing staff will adjust the patient's dietary structure, increase the patient's intake of crude fiber food, control the patient's calorie intake, supplemented by exercise, and so on, to guide the patient to form a healthy lifestyle, improve the patient's hemodynamic indexes and other indicators of the improvement of the level of the patient, to alleviate the patient's clinical symptoms.

The results of this study showed that after the intervention, the anxiety and depression scores of the patients

in the observation group were relatively low. The reasons may be due to the relatively high degree of attention of nursing staff to the psychological emotions of patients. Through verbal communication and observation of patients' demeanor and behavior to confirm the existence of patients' bad emotions, explore the causes of patients' bad emotions, establish personalized psychological care measures, and do a good job of patients' psychological appeasement work to improve patients' confidence in treatment, so that the patients take the initiative to participate in the treatment^[9]. At the same time, the implementation of health education measures, through video pictures, manuals, and other methods, will inform patients of disease-related knowledge, so that patients fully grasp the key points of disease care and enhance the patients' self-care awareness, so the patient's state of mind is more stable.

Through this study, it was found that after the intervention, the observation group's life indicators improved significantly. The reason may be because the improvement of the patient's blood glucose control level will further improve the patient's metabolic disorders and other conditions, which makes the patient's urinary tract infection symptoms improve and promotes the improvement of the patient's blood creatinine and other levels^[10].

In conclusion, for the treatment of diabetes mellitus and urinary tract infection patients, the optimization of nursing interventions, such as dietary care, glycemic control, and psychological care can improve the stability of the patient's blood glucose and other indicators, alleviate the patient's bad mood, promote the reduction of clinical symptoms, and improve the patient's quality of life.

Disclosure statement

The authors declare no conflict of interest.

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Effect of Rehabilitation Nursing Intervention on the Quality of Life of Neurological Patients with Cerebral Hemorrhage Sequelae

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Abstract: *Objective:* To analyze the effect of rehabilitation nursing intervention on the quality of life of neurological patients with sequelae of cerebral hemorrhage. *Methods:* 70 patients with cerebral hemorrhage and sequelae who were admitted to the hospital from February 2022 to February 2024 were randomly divided into the observation group and the control group, and were subjected to conventional nursing measures and rehabilitation nursing intervention modes respectively to analyze the effects of the interventions in the two groups. *Results:* After the intervention, the observation group had lower nerve damage, stronger independent self-care ability, and better recovery of limb function, $P < 0.05$. After the intervention, the observation group had higher quality of life scores, and lower probability of complications, $P < 0.05$. *Conclusion:* the neurology department involves relatively more patients with cardiovascular and cerebrovascular diseases, and the presence of cerebral hemorrhage in the patients may lead to several sequelae, which will affect the daily lives of the patients. The implementation of rehabilitation nursing interventions can improve the recovery rate of patients' neurological function and limb function, improve patients' self-care ability, and maintain patients' quality of life.

Keywords: Rehabilitation nursing interventions; Neurology; Cerebral hemorrhage sequelae; Quality of life; Effects

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1. Introduction

Cerebral hemorrhage occurs when a blood vessel in a patient's brain is not traumatized but ruptures spontaneously, causing blood to collect in the brain parenchyma. The main group of this disease is stroke patients, accounting for 20%–30% of the cases. Once a patient suffers from cerebral hemorrhage, their limb function will have certain problems, such as muscle weakness, which may lead to dizziness and headache, and may even lead to consciousness disorder, which will increase the disability rate of the patient and jeopardize their life safety. Clinical investigation results show that if patients suffer from cerebral hemorrhage,

the probability of sequelae is relatively high, such as hemiplegia, which makes patients suffer from speech dysfunction and limb dysfunction, improving the degree of neurological damage and affecting the daily life of patients ^[1]. Therefore, attention should be paid to the care of patients with sequelae of cerebral hemorrhage, and a rehabilitation nursing intervention system should be established based on patients' treatment to improve patients' physical quality and enhance their self-care ability so that their daily lives will gradually become normal. Among them, the utilization of the rehabilitation nursing model combined with the rehabilitation needs of patients to adjust the nursing program, enhance the physical vitality of patients, stabilize the psychological state of patients, and allow patients to actively participate in rehabilitation training to accelerate the rate of recovery of patients. This study analyzes the application effect of the rehabilitation nursing intervention model to provide support for the optimization of nursing programs for patients with sequelae of cerebral hemorrhage.

2. Information and methods

2.1. General information

At the time of this study, the selected research subjects were all patients with cerebral hemorrhage and they were all accompanied by certain sequelae. The treatment time was between February 2022 and February 2024, totaling 70 cases, which were randomly divided into the observation group and the control group. In the observation group, there were 20 male and 15 female cases with an average age of 56.48 ± 4.69 years. In the control group, there were 21 men and 14 women with an average age of 56.53 ± 4.72 years. The analysis of the data of the two groups shows no significant difference, $P > 0.05$.

Inclusion criteria: Patients who were diagnosed with cerebral hemorrhage by CT examination were selected. Patients who had no problems with missing personal data and voluntarily cooperated with the study were selected.

Exclusion criteria: Exclude patients with malignant tumor diseases or those who withdrew from the treatment midway. Exclude patients who have been in a state of coma for a long time.

2.2. Methodology

2.2.1. Control group control methods

The routine nursing intervention model is applied. The nursing staff should consult the basic information of the patient to ensure the comprehensiveness of the patient's personal information, such as the history of disease, allergy, and so on, to consider the requirements of neurology nursing and implement the basic nursing measures. Additionally, they should supervise the patients' medication status, ensure the standardization of patients' medication, inform the patients of the precautions related to hospitalization, and carry out routine educational work.

2.2.2. Control methods for the observation group

The rehabilitation nursing intervention model is applied. One is to increase health education. When carrying out health education, nursing staff should update the education path, no longer confined to the traditional education manual, and instead use new media technology, such as video and photos, to reduce the difficulty of patients' learning, incorporate the etiology of the sequelae of cerebral hemorrhage mechanism and other related knowledge, explaining the relevant points of rehabilitation nursing care to patients, to enhance the awareness of patients' self-care, and to improve the degree of cooperation of the patients ^[2]. At the same time, the

nursing staff should adjust their language expression with the basic information of the patient's cultural level, improve the patient's information reception level, improve the patient's cognitive structure, and create a good environment for the implementation of rehabilitation nursing measures.

Secondly, psychological care is carried out. Generally speaking, if patients have sequelae of cerebral hemorrhage, their physical activity ability is relatively weak, language expression ability decreases, and the ability of patients to live independently decreases, increasing the psychological pressure of the patients, which in turn produces negative emotions, and the enthusiasm of patients to participate in rehabilitation training decreases, which is not conducive to the improvement of the level of patient's rehabilitation ^[3]. Nursing staff should analyze the basic information of the patient, such as family economic status, combined with the personality characteristics of the patient. Through verbal communication, explore the causes of the patient's bad mood, establish targeted psychological guidance measures, cooperate with the patient's family members, give psychological support to the patient, improve the encouragement of the patient, cite successful cases of rehabilitation, and improve the patient's confidence in rehabilitation. In this process, nursing staff should communicate with the patient's family, so that the family appropriately increases the time to accompany the patient, so that the patient's mood is more stable, to achieve effective control of the stress response.

Thirdly, rehabilitation and exercise care. If the patient is in the acute morbidity period, nursing staff should combine the requirements of treatment, assist the patient in adjusting their position, such as a healthy side-lying position or flat lying position, and regularly assist the patient in turning over, to reduce the incidence of pressure ulcers ^[4]. At the same time, nursing staff should observe the recovery status of patients, and after their condition is stabilized, guide patients to carry out passive exercises, such as massage, assist patients in doing joint extension and flexion exercises, and so on, to improve the recovery rate of patients' limb function. When exercising patients in the recovery period, patients should be guided to carry out bed exercises, such as changing their position or sitting up training, and guide patients to control the healthy side of the muscle to complete their position change, to enhance the level of self-care of the patient's life.

Fourthly, cognitive function care is carried out. When nursing patients with cognitive impairment, the nursing staff should select appropriate cognitive training programs according to the actual condition of the patients, based on the patient's interest preferences, play the patient's favorite music, or guide the patient to read text fragments, to improve the level of cognitive ability recovery of the patients. At the same time, nursing staff can also allow patients to touch their surrounding objects and say the names of different objects, training patients in visual and tactile feedback ability ^[5]. In addition, nursing staff should observe the patient's demeanor and behavior, assess the degree of cognitive impairment, and formulate a targeted nursing program to improve the recovery of cognitive function.

2.3. Observation of indicators

The NIHSS scale was utilized when measuring the patients' neurological impairment.

The Barthel Index was utilized when measuring the patient's ability to care for themselves independently. To measure the patient's limb function, the FMA scale was applied. The SF-36 scale was applied when measuring patients' quality of life scores.

Patients were statistically analyzed for the chance of complications.

2.4. Statistical treatment

In the data processing session, SPSS 23.0 was applied, and the χ^2 test was performed for count data. Measurement data line t -test. If $P < 0.05$, the difference between the data is significant.

3. Results

3.1. Neurological function, physical function, and independent living ability

As shown in **Table 1**, after the intervention, the observation group had lower nerve damage, better independent self-care ability, and better limb function recovery, $P < 0.05$.

Table 1. Neurological function, limb function, and independent living ability before and after intervention in both groups (Mean \pm SD)

Groups	Samples	Score		<i>t</i>	<i>P</i>
		Pre-intervention	Post-intervention		
NIHSS score					
Observation group	35	19.01 ± 2.13	7.11 ± 1.34	11.325	0.001
Control group	35	18.96 ± 2.16	12.58 ± 1.43	10.524	0.001
<i>t</i>	-	0.282	9.634	-	-
<i>P</i>	-	0.734	0.001	-	-
BI score					
Observation group	35	45.39 ± 4.01	81.36 ± 3.48	14.867	0.001
Control group	35	45.43 ± 3.94	71.53 ± 2.89	11.967	0.001
<i>t</i>	-	0.109	10.425	-	-
<i>P</i>	-	0.911	0.001	-	-
FMA scores					
Observation group	35	35.68 ± 3.21	71.36 ± 3.18	15.347	0.001
Control group	35	35.76 ± 3.16	52.23 ± 2.74	11.684	0.001
<i>t</i>	-	0.368	10.564	-	-
<i>P</i>	-	0.698	0.001	-	-

3.2. Quality of life

As shown in **Table 2**, after the intervention, the quality of life scores were higher in the observation group, $P < 0.05$.

Table 2. Quality of life scores before and after intervention in both groups (Mean \pm SD)

Groups	Samples	Physiological function		Pain in the body		Social function		Emotional function	
		Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Observation group	35	55.63 \pm 5.42	82.42 \pm 2.56*	59.23 \pm 5.26	81.71 \pm 3.08*	60.29 \pm 5.35	83.68 \pm 4.26*	61.38 \pm 6.21	81.38 \pm 3.47*
Control group	35	55.72 \pm 5.34	72.16 \pm 3.67*	59.27 \pm 5.21	68.06 \pm 3.24*	60.32 \pm 5.32	72.24 \pm 3.21*	61.41 \pm 6.19	70.28 \pm 2.36*
<i>t</i>	-	0.642	10.623	0.952	13.024	1.041	11.267	1.157	11.157
<i>P</i>	-	0.518	0.001	0.336	0.001	0.234	0.001	0.263	0.001

3.3. Incidence of complications

As shown in **Table 3**, the complication rate was lower in the observation group, $P < 0.05$.

Table 3. Complication rates in the two groups [n (%)]

Groups	Samples	Pneumonia	Stress ulcer	Urinary tract infection	Pressure ulcer	Total
Observation group	35	0 (0.00)	1 (2.86)	0 (0.00)	0 (0.00)	1 (2.86)
Control group	35	1 (2.86)	2 (5.71)	1 (2.86)	2 (5.71)	6 (17.14)
χ^2	-	-	-	-	-	9.634
<i>P</i>	-	-	-	-	-	0.001

4. Discussion

Among cerebrovascular diseases, the incidence of cerebral hemorrhage is relatively high, causing structural ischemic damage to the brain of patients, increasing the degree of cerebral nerve damage of patients, which leads to different types of sequelae, such as physical dysfunction and cognitive dysfunction, prolonging the recovery time of the patient's condition, lowering the prognosis level of the patient, and increasing the disability rate of the patient, which puts forward a higher demand for the patient's nursing interventions. If conventional nursing interventions are used, the life and safety of patients can be maintained and the stability of patients' vital signs can be guaranteed [6]. However, it does not pay attention to the recovery effect of patients, and does not formulate targeted and relatively comprehensive nursing measures, which is not conducive to the enhancement of the level of rehabilitation of patients, and restricts the enhancement of the ability of patients to take care of their own lives. The utilization of the rehabilitation nursing intervention model will pay attention to the recovery status of patients, analyze the physiological and psychological conditions of patients, assess the cognitive function of patients, adjust and improve the rehabilitation training program, improve the recovery rate of patients, and enhance the ability of patients to take care of their own lives.

Through this study, it was found that after the intervention, the observation group's neurological functional deficits improved significantly, with better self-care ability and a higher level of limb function recovery. Generally speaking, limb dysfunction is one of the main sequelae of patients with cerebral hemorrhage, which makes the whole body motor function of the patients subject to certain limitations, and may even appear as

symptoms such as paralysis, affecting the daily life of the patients. The implementation of rehabilitation nursing interventions will analyze the rehabilitation status of patients, assess the degree of limb dysfunction, implement the principle of early detection and early intervention, massage patients in stable condition, assist bedridden patients in carrying out joint movements, improve the level of hemodynamic improvement of patients, and reduce the degree of neurological impairment of patients. At the same time, the nursing staff will guide patients to carry out self-care ability exercises, such as dressing and eating, to reduce the impact of the disease on patients' daily lives ^[7].

The results of this study showed that after the intervention, the observation group had a higher quality of life score. This may be because the rehabilitation training program not only pays attention to the patient's limb recovery status but also pays attention to the patient's mental health level, actively carries out psychological care, combines the patient's personality characteristics and family background, supplemented by communication, analyzes the causes of the patient's psychological problems, adjusts the psychological guidance program, lets the patients correctly look at the rehabilitation training, improves the patient's enthusiasm to participate in the program, and improves the patient's rehabilitation level. This program was developed to improve the quality of life of the patients ^[8-9]. At the same time, the recovery of patients' limb ability can help patients enhance their self-care ability and improve their living standards.

Through this study, it was found that the complication rate of the observation group was lower. This may be because the implementation of a rehabilitation nursing intervention strategy will pay attention to the patient's complication status, assist the patient in adjusting their position regularly, and reduce the probability of pressure ulcer problems. At the same time, nursing staff guide patients to carry out limb function recovery exercises and cognitive function training to improve the cognitive structure of the patient, improve the patient's degree of cooperation, enhance the patient's hemodynamic improvement level, and realize the effective prevention and control of complications ^[10].

In conclusion, in the nursing process of patients with sequelae of cerebral hemorrhage, attention should be paid to the utilization of the rehabilitation nursing intervention model, focusing on the psychological state and condition development of patients, adjusting the patient care strategy, improving the limb function training program, optimizing the cognitive function nursing process, and establishing a diversified healthcare pathway, to enhance the patient's confidence in the treatment, improve the symptoms of dysfunction, and increase the patient's ability of life self-care.

Disclosure statement

The authors declare no conflict of interest.

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A Clinical Study of Integrated Healthcare Management in Process Optimization in an Adult Inguinal Hernia Day Unit

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Abstract: The purpose of this study is to explore the effectiveness of the application of the integrated medical and nursing management model in the optimization of the adult inguinal hernia day ward process. 105 patients who received adult inguinal hernia day surgery treatment in a hospital of general surgery from May 2023 to April 2024 were selected and grouped according to the time node of the introduction of the medical and nursing integration day ward management mode (12 October 2023). 52 patients before the introduction of the mode were included in the control group, while the other 53 patients after the introduction were included in the observation group. A comparative analysis was made for the differences in pre-hospital examination completion rate, day surgery failure rate, average length of stay, hospitalization cost, overall satisfaction, and incidence of adverse events between the two groups under different management modes. The results showed that the prehospital examination completion rate of the observation group (100%) was higher than that of the control group (59.62%), the day surgery failure rate (1.89%) was lower than that of the control group (30.77%), the average length of stay (5.03 ± 1.58 d) was shorter than that of the control group (7.82 ± 1.64 d), and the average cost of hospitalization ($8,108.2 \pm 264.6$ yuan) was less than that of the control group ($9,235.6 \pm 375.5$ yuan). The differences were all statistically significant ($P < 0.05$). The total satisfaction of patients in the observation group (98.11%) was significantly higher than that of the control group, and the differences were all statistically significant ($P < 0.05$). In the control group, there was one case of mislabeling of the surgical site, three cases of missing medical documents, two cases of medication dosage errors, two cases of anesthesia accidents, and one case of surgical instruments or gauze left behind, with a total incidence rate of 17.31%. In the observation group, there was only 1 case of missing medical documents and 1 case of medication dosage error, with an incidence rate of 3.77%, and the difference between the groups was statistically significant ($P < 0.05$). In conclusion, the implementation of integrated medical and nursing management for patients undergoing inguinal hernia surgery can effectively increase patients' willingness to undergo pre-hospital examination, reduce the day surgery failure rate, shorten the hospital stay, reduce hospital expenses, and reduce the risk of adverse events such as mislabeling of the surgical site, missing medical documents, medication dosage errors, anesthesia accidents, and surgical instruments or gauze left behind, which is highly satisfactory to the patient group. Hence, it is recommended to promote and apply this procedure in other departments.

1. Introduction

Inguinal hernia is a common clinical surgical disease, which is mainly manifested by the protrusion of abdominal contents at the weak point of the abdominal wall. With the aging of the population and changes in people's lifestyles, the incidence of inguinal hernia is gradually increasing, which has a serious impact on the life, health, and quality of life of the patient group ^[1]. Inguinal hernias in adults are mainly treated by surgery, and the day surgery model has gradually become the trend in inguinal hernia treatment because of its advantages of reducing hospitalization time, lowering healthcare costs, and improving patient comfort. However, surgical management under the daytime ward model still faces many challenges, such as unsatisfactory management of the linkage between preoperative preparation, postoperative monitoring, post-discharge follow-up, and so on. It is necessary to accelerate the implementation of daytime ward process optimization to fully improve the prognosis of patients ^[2]. Based on the optimization of the ambulatory ward process under the integrated healthcare management model, such as based on the conventional process, the integrated healthcare management is a highly efficient management model based on the close cooperation between the doctors and the nursing team, aiming to improve the patient's treatment effect and satisfaction by optimizing the nursing process, strengthening the collaboration between doctors and nurses, and improving the communication between the doctors and the patients ^[3]. In the traditional surgical process, doctors and nursing teams carry out preoperative, intraoperative, and postoperative management independently of each other, and this separated working method easily leads to asymmetric information, poor communication, and low efficiency, which ultimately affects surgical outcomes and patient satisfaction. Especially in the mode of the daytime ward, the time of surgery and nursing is more compact, and the requirement for teamwork is higher. Therefore, applying integrated healthcare management to the day surgery process of adult inguinal hernia to optimize the whole surgical management process is an important means to improve clinical outcomes, reduce complications, and enhance patient satisfaction ^[4]. This study aims to investigate the application effect of integrated healthcare management mode in the optimization of the day ward process of adult inguinal hernia by comparing the surgical indexes and prognosis of the two groups of patients under the traditional nursing mode and the integrated healthcare management mode.

2. Information and methodology

2.1. General information

105 patients who underwent day surgery for adult inguinal hernia in an institution of general surgery from May 2023 to April 2024 were selected and grouped according to the time node of the introduction of the model of integrated medical and nursing day ward management (12 October 2023). 52 patients before the introduction of the model were included in the control group, of which 31 were male and 21 were female, with an age range of 18–76 years, a mean of 59.56 ± 10.72 years, and a duration of illness of 12.17 ± 2.45 d. The other 53 patients after the introduction of the model were included in the observation group, of which 33 were male and

20 were female, with an age range of 18–75 years, a mean of 59.62 ± 10.72 years, and a duration of illness of 12.17 ± 2.45 d. In both groups, tension-free inguinal hernia repair under epidural anesthesia was chosen and all patches were made with Johnson & Johnson UMS3cm and UHSL. The study was approved for implementation by the ethical committee of the hospital.

Inclusion criteria: Adult patients aged between 18 and 76 years old, diagnosed with unilateral or bilateral inguinal hernia, and meeting the indications related to tension-free repair of inguinal hernia. No serious cardiovascular or respiratory diseases and able to tolerate surgery and anesthesia. No acute preoperative infection or other systemic diseases that require postponement of surgery. Patients and their families have a full understanding and informed consent of the surgical plan and the integrated medical and nursing management model and voluntarily participate in this study.

Exclusion criteria: Patients with severe cardiovascular, respiratory, hepatic, or renal insufficiency or other systemic diseases that are not suitable for surgery. Acute preoperative infection, severe anemia, or other conditions that are not suitable for surgery in the daytime ward. Patients who are allergic to anesthetic drugs or have contraindications to anesthesia. Patients with a previous history of inguinal hernia surgery or other complicated abdominal surgery that increases the risk of surgery.

2.2. Methodology

2.2.1. The control group adopts the conventional day surgery nursing process

(1) Doctors, nurses, and patients complete their respective duties and tasks, and outpatient doctors identify adult inguinal hernia patients who are eligible for day surgery and prescribe the corresponding preoperative examinations. (2) Patients complete the admission and preoperative preparations and come to the hospital at the appointed time to undergo surgery, postoperative checkups, and medication changes. (3) Outpatient nurses are responsible for registering the information, booking the time for surgery, and informing the relevant notes. (4) Ward nurses complete the relevant procedures, perioperative nursing care and precautions, and so on, for the hospital. (4) Ward nurses complete the procedures related to hospital admission, perioperative care, and precautions.

2.2.2. The observation group adopts the medical and nursing integration management mode based on the control group

- (1) The construction of healthcare integration management mode. 1) Set up a healthcare integration cooperation group, which is headed by the department director and the head nurse, and select senior specialist nurses to participate. Form a process optimization group consisting of day clinic specialist nurses, ward specialist doctors, and ward specialist nurses, and set up a WeChat group for healthcare integration in the day wards that includes the surgeon. 2) Formulate a communication system for healthcare integration, a performance assessment system, a job management system, and a training system. 3) Define the work tasks of the process optimization team, team members work together to sort out the original process, assess the problems and reasons for the process, and design a patient-centered process optimization plan, reflecting simplicity, safety, and efficiency.
- (2) The optimization of the day surgery nursing process under the integrated management model of medical and nursing care. 1) Based on the routine process, add outpatient appointment reception nurses to check and remind patients to stay in the hospital, to reduce the incomplete issuance of checklists or patients'

misremembering the appointment time to not be able to operate as scheduled. 2) Full-time nurses in the ward and doctors to complete the assessment of the preoperative period, the improvement of the medical record, and the development and implementation of psychological care, and health promotion. The nurses and doctors work together to complete the preoperative assessment, improve the patient's condition, develop and implement psychological care, health education, activity decision-making, pain management, and prevention of postoperative complications. After the operation, the nurses and doctors work together to complete the education of discharged patients and change the medication the next morning. 3) Carry out multi-form health education for patients of different ages in different phases and with different focuses. Before admission, the nursing staff adopts various forms of guidance such as verbal education, issuing paper education sheets, video education after scanning the two-dimensional code, as well as slides and videos in the hospital to increase the ways for patients to understand the relevant knowledge. The outpatient clinic focuses on introducing the flow of the day ward, explaining the examination items, and tracking the examination results. After hospitalization, the nursing staff focuses on the introduction of surgical methods of cooperation and the precautions to be taken after discharge. 4) Using the PDA scanning code reader to scan the patient's wristband in the anesthesia system to confirm the content of the patient's preoperative handover, and at the same time to check the medical record of the surgical safety checklist, surgical patient handover transfer order, and so on, to check the information before handing over the patient to the operating room.

2.3. Observation indicators

Statistical analysis of patients' pre-hospital examination completion rates, day surgery failure rates, average length of stay, and hospitalization costs.

Patient satisfaction with care management was investigated using the hospital's satisfaction questionnaire.

The ratio of the number of cases of adverse events such as wrong identification of the surgical site, missing medical documents, wrong dosage of medication, anesthesia accidents, surgical instruments or gauze left behind, and so on, to the total number of cases of surgery during daytime surgery in the two groups was counted.

2.4. Statistical methods

SPSS 24.0 statistical software was applied to analyze and process the relevant data. Measured data were expressed as (Mean \pm SD) and compared with the *t*-test; count data were expressed as *n* and compared with the χ^2 test. $P < 0.05$ was used to indicate that the difference was statistically significant.

3. Results

3.1. Comparison of pre-hospital examination completion rate, day surgery default rate, average length of stay, and hospitalization costs between the two groups of patients

The pre-hospital examination completion rate of the observation group was higher than that of the control group, the day surgery failure rate was lower than that of the control group, the average length of stay was shorter than that of the control group, and the average hospitalization fee was less than that of the control group, and the differences were statistically significant ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of pre-hospital examination completion rate, day surgery default rate, average length of stay, and hospital costs between the two groups of patients

Groups	Completion rate of pre-hospital examinations (n, %)	Day surgery default rate (n, %)	Average length of hospitalization (Mean \pm SD, d)	Comparison of average hospitalization costs (Mean \pm SD, \$)
Control group ($n = 52$)	31 (59.62)	16 (30.77)	7.82 \pm 1.64	9235.6 \pm 375.5
Observation group ($n = 53$)	53 (100)	1 (1.89)	5.03 \pm 1.58	8108.2 \pm 264.6
χ^2 / t	26.7548	16.1363	8.8782	17.8112
P	0.0000	0.0001	0.0000	0.0000

3.2. Comparison of patient satisfaction between the two groups

The total patient satisfaction of the observation group (98.11%) was significantly higher than that of the control group, and the difference was statistically significant ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of overall patient satisfaction between the two groups (n, %)

Groups	Satisfied	Very satisfied	Unsatisfied	Total satisfaction
Control group ($n = 52$)	18 (34.62)	23 (44.23)	11 (21.15)	41 (78.85)
Observation group ($n = 53$)	31 (58.49)	21 (39.62)	1 (1.89)	52 (98.11)
χ^2				9.6258
P				0.0019

3.3. Comparison of the occurrence of surgical adverse events between the two groups

The incidence rate of patients in the observation group experiencing adverse events such as mislabeling of the surgical site, missing medical documents, wrong dosage of medication, anesthesia accidents, and surgical instruments or gauze left behind was 3.77%, which was significantly lower than that of the control group, which was 17.31%. The difference was statistically significant ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of adverse surgical events between the two groups

Groups	Incorrect labeling of surgical site	Missing medical documentation	Incorrect dosage of medication	Anesthetic accident	Surgical instruments or gauze left behind	Rate of occurrence
Control group ($n = 52$)	1	3	2	2	1	9 (17.31)
Observation group ($n = 53$)	0	1	0	1	0	2 (3.77)
χ^2						5.1263
p						0.0236

4. Discussion

Patients with inguinal hernias are usually symptomatic and mildly painful and can lead to serious complications if left untreated. Therefore, the efficiency and safety of day surgery is particularly important. With the

advancement of medical technology and the change of medical model, day surgery has gradually become an important mode of inguinal hernia treatment for adults, and the application of day ward management mode not only helps to reduce the length of hospitalization of patients, but also effectively reduces the medical cost, and at the same time reduces the time of contact between patients and the hospital, and reduces the risk of nosocomial infections ^[5]. For adult patients, the choice of day surgery can minimize disruption to their lives and work during hospitalization and enhance the treatment experience ^[6]. In addition, the daytime ward management mode can optimize the allocation of hospital resources to the greatest extent possible, alleviate the tension of medical resources, and improve the utilization rate of the ward, which not only helps to shorten the waiting time of patients in the hospital but also accelerates the recovery process of patients. At the same time, through the rational arrangement of surgery and nursing care, patients can complete the preoperative examination, surgery, postoperative monitoring, and discharge preparation in a shorter period, thus effectively controlling medical costs and improving patient satisfaction ^[7]. Although day ward management plays an important role in the treatment of patients with inguinal hernia, there are still many shortcomings in the traditional management mode. (1) Limited beds in the department, too many booked patients, and patients forgetting the appointment time and missing the appointment. (2) Short contact time, inpatient process, and teaching effect of the disease-related knowledge are not good ^[8]. (3) There are many outpatients, the preoperative examination project prescribed by the doctor is incomplete, and the patient cannot find the doctor. (4) The daytime surgical turnover is faster, affecting the completeness of the medical record, accuracy and the site of the operation, the dose of medication, and so on. There are errors and risks of anesthesia accidents, surgical instruments or gauze left behind, and so on ^[9]. To effectively circumvent these shortcomings, the implementation of integrated medical and nursing management is particularly urgent.

The results of this study showed that after the implementation of the process optimization of the adult inguinal hernia day ward based on the integrated management model of healthcare and nursing, the completion rate of pre-hospital examination of patients in the observation group reached 100%, which was significantly higher than that of the control group, which was 59.62%, indicating that under this model, the nursing staff and the outpatient doctors were able to work closely together and that by strengthening the checking of the preoperative examination and the appointment reminder, they could effectively avoid the problems caused by the lack of complete information or time. Reducing inadequate preoperative preparation due to errors and omissions not only improved the efficiency of surgical scheduling but also ensured foolproof preoperative preparation. The rate of day surgery missed appointments for patients in the observation group was only 1.89%, significantly lower than the 30.77% in the control group. This indicates that through the integrated healthcare management model, the healthcare team can more effectively track patients' pre-operative preparations and appointments to ensure that they come to the hospital on time to receive their surgeries. At the same time, the full-time nurses and doctors complete the preoperative assessment and health education together, and through a variety of educational means, patients can more comprehensively understand the surgical process and precautions, which enhances the patients' surgical compliance. The average length of stay and hospital costs of patients in the observation group were also significantly lower than those of the control group, which indicates that the optimization of ambulatory ward management based on the integrated management model of healthcare and nursing has not only improved the efficiency of the hospital but also raised patients' awareness of the financial burden by optimizing the allocation of resources and accelerating the turnover of the wards so that more patients can benefit from the efficient surgical services ^[10]. The incidence rate of adverse events for

patients in the control group was 17.31%, while it was only 3.77% in the observation group. This indicates that the healthcare team can carry out pre-surgical safety checks and post-surgical follow-ups in a more refined manner under the integrated model, which can significantly reduce errors due to improper healthcare coordination and ensure surgical safety.

In conclusion, integrated healthcare management in adult inguinal hernia day ward process optimization significantly improves patient outcomes and satisfaction, reduces healthcare costs and adverse events, and has important clinical promotion value.

Disclosure statement

The authors declare no conflict of interest.

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The Role of Psychological Intervention in Enhancing the Psychological Resilience of Women Undergoing Artificial Abortion

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Abstract: This article underscores the significance of psychological intervention in bolstering the psychological resilience of women undergoing artificial abortion. Through individual and group psychological interventions, women are assisted in coping with negative emotions, augmenting their psychological resilience, and fostering mental health and growth. The article further analyzes disparities in psychological intervention among women with varying characteristics, emphasizing the importance of familial and societal support, and cultural backgrounds.

Keywords: Artificial abortion; Psychological resilience; Psychological intervention; Mental health; Psychological support

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1. Introduction

With societal progression and changing ideologies, artificial abortion has emerged as a common remedial measure following contraceptive failure. Globally, approximately 53 million cases of artificial abortion occur annually, and in China, a populous nation, the number is considerably high. Artificial abortion not only imposes physical trauma on women but also exerts profound psychological impacts. In this context, women's psychological resilience becomes a pivotal factor in coping with stress and restoring mental health.

Women undergoing artificial abortion commonly experience negative emotions such as anxiety, depression, and guilt, which not only affect their daily lives but also potentially lead to psychological disorders. Research indicates that psychological resilience plays a significant role in mitigating psychological trauma and promoting mental health among these women.

However, the question of how to enhance women's psychological resilience during the artificial abortion process remains urgent. As an effective tool, psychological intervention has been widely employed in clinical practice. It aims to provide professional psychological support and guidance, assisting individuals in identifying

and addressing psychological issues, and ultimately enhancing their psychological qualities and coping abilities.

2. Overview of the psychological status of women undergoing artificial abortion

The psychological impact of artificial abortion on women is profound and complex, involving not only emotional fluctuations but also a range of psychological issues. After experiencing artificial abortion, women generally feel a deep sense of sadness and loss, often accompanied by guilt and a sense of sin, as they may view the abortion as giving up on life. This psychological burden can increase over time, leading to long-term emotional distress. Simultaneously, anxiety and depression are common psychological responses after abortion. Women may worry about their ability to conceive again in the future and doubt their fertility, and this uncertainty can trigger psychological unease and fear. Furthermore, artificial abortion may also strain interpersonal relationships, especially with partners, potentially causing rifts due to emotional stress and communication barriers brought on by the abortion, and even affecting the structure and atmosphere of the entire family.

The types and manifestations of psychological issues are diverse. Some women may experience symptoms of psychological trauma, such as flashbacks, nightmares, and hypervigilance, which are indications of post-traumatic stress disorder. Depression can cause women to lose interest in daily activities, feel helpless and hopeless, and severely affect their quality of life. Anxiety may manifest as excessive worrying, nervousness, and fear of specific things. Additionally, confusion about self-identity and conflicts in values are issues that women may face after abortion. They may question their role and the value of life, and this inner struggle can further exacerbate psychological pain. Therefore, psychological support and professional counseling are particularly important for women who have experienced artificial abortion to help them overcome psychological shadows and regain balance in life.

3. The role of psychological resilience in women after abortion

Psychological resilience refers to the process of individuals actively adapting to adversity. Individuals with high levels of resilience possess greater cognitive flexibility, enabling them to adjust their cognition after traumatic events, maintain a good psychological state, successfully cope with such events, and achieve personal growth^[1]. In the context of induced abortion, women's psychological resilience manifests in how they effectively cope with psychological pressure, maintain psychological balance, and ultimately achieve psychological recovery and growth after experiencing physical and emotional trauma. The concept of psychological resilience emphasizes individuals' inherent strength and resources in adversity, making it a key factor in women's psychological recovery after abortion. Women with high psychological resilience can more quickly take effective measures after negative life events, reducing the impact of such events on their emotions, and potentially transforming negative emotions into motivation for problem-solving, ultimately achieving the goal of alleviating postpartum depression. However, premature primiparas with low psychological resilience may not be able to achieve the aforementioned state. Psychological resilience is a universally present ability or potential influenced by individuals' internal and external environmental factors. It can be learned, applied, and improved through cultivation and training^[2].

4. Psychological intervention strategies and methods

4.1. Individual psychological intervention strategies

Individual psychological intervention strategies focus on providing tailored psychological support for each woman. This strategy recognizes that every woman's experiences, emotional reactions, and resilience are unique. Through one-on-one counseling sessions, psychologists utilize various psychological techniques such as cognitive behavioral therapy (CBT), acceptance and commitment therapy (ACT), and emotionally focused therapy (EFT) to help individuals identify and adjust cognitive patterns that cause psychological distress, address unresolved grief and guilt, and enhance self-compassion and self-efficacy. Personalized interventions also include mindfulness meditation training, teaching women how to reduce psychological pain through awareness and acceptance of current experiences.

4.2. Group psychological intervention strategies

Group psychological intervention strategies harness the power of the collective, providing a supportive environment for women facing similar challenges. In group counseling, members can share their stories in a safe, non-judgmental space, thereby reducing feelings of isolation and shame. Through interactions and shared activities such as discussion groups, art therapy, and workshops, members not only learn new coping strategies but also draw inspiration from the experiences and strengths of others ^[3]. Group interventions also promote social learning, where members improve their coping mechanisms by observing and modeling the positive behaviors of others.

4.3. The role of family and social support in psychological intervention

The role of family and social support in psychological intervention cannot be ignored. As the most direct social support network for individuals, the attitudes and behaviors of family members have a profound impact on women's psychological recovery. Psychological intervention strategies should include family counseling to enhance family members' understanding, communication, and support capabilities. Furthermore, social support systems, including friends, community resources, and professional organizations, also provide women with necessary emotional and practical help. Social support can be achieved through various forms, such as support groups, online forums, and community education activities, which all help to break the silence and stigma surrounding abortion, creating a more inclusive and supportive environment for women.

5. Research on the role of psychological intervention in enhancing the mental resilience of women undergoing artificial abortion

5.1. The impact of psychological intervention on mental resilience

The role of psychological intervention in enhancing the mental resilience of women undergoing artificial abortion cannot be underestimated. The latest research results indicate that professional psychological support can not only alleviate psychological pressure but also significantly improve the mental resilience of these women ^[4]. There are various forms of psychological intervention, including psychological counseling, group counseling, mindfulness meditation, and emotional management.

During psychological counseling, professional psychologists provide personalized counseling based on the specific situation of women, helping them understand that abortion is not a personal failure but a possible difficult situation in life. This understanding helps them correctly recognize and accept the fact of abortion,

thereby reducing the guilt and shame caused by abortion. Group counseling provides a mutually supportive platform where women can share their experiences and feelings, find resonance, reduce loneliness, and enhance their sense of belonging. Mindfulness meditation training teaches women how to relax their minds and bodies through meditation and breathing exercises, improving their ability to cope with stress and enhancing inner peace ^[5]. Emotional management teaches them how to identify and express their emotions, as well as how to effectively manage and regulate emotions to avoid negative impacts on life caused by emotional fluctuations. Through these psychological interventions, women can better utilize their internal resources and actively seek and use external support, thereby significantly improving their psychological resilience. Research has found that women who receive psychological intervention recover faster psychologically after abortion, and their level of mental resilience is also higher. This is not only reflected in their ability to quickly emerge from the shadow of abortion but also in their more positive and resilient attitude when facing other challenges in life ^[6]. Additionally, psychological intervention has brought significant improvements in quality of life. After undergoing psychological intervention, these women have not only recovered psychologically but have also seen improvements in their social functioning, family relationships, and job performance.

5.2. Analysis of differences in psychological intervention on the psychological resilience of female abortion patients with different characteristics

The effectiveness of psychological intervention in enhancing the psychological resilience of women undergoing induced abortion varies depending on individual characteristics. The following analysis focuses on several key characteristics:

5.2.1. Age differences

Young women may feel particularly helpless and confused after experiencing an abortion due to their limited life experience and psychological maturity. They may lack effective coping mechanisms for unexpected events and struggle with emotional fluctuations, sometimes even falling into depression and anxiety. Psychological intervention during this critical period is crucial. Through one-on-one personalized psychological counseling, these young women can gradually learn how to identify and express their emotions, how to quickly recover from setbacks, and how to build a more positive and resilient self-image.

Group counseling activities provide these women with an opportunity to share their feelings and experiences with others who have undergone similar experiences. Such interactions not only offer them an outlet for emotional expression but also help them realize that they are not alone. In the group setting, they can learn coping strategies from others, gain empathy, and receive support. This collective strength provides significant comfort and growth for them psychologically ^[7]. Through a series of carefully designed activities and discussions, these young women gradually overcome psychological obstacles and enhance their confidence and courage to face future challenges while encouraging each other.

5.2.2. Educational level differences

Women with higher levels of education demonstrate significant advantages during psychological intervention. They typically have stronger information retrieval and analytical skills, enabling them to understand the theoretical foundation and practical application of psychological intervention more deeply. When participating in cognitive behavioral therapy (CBT), these women often quickly grasp how to identify and challenge their

negative thoughts, thereby changing unreasonable beliefs and behavioral patterns. They can flexibly apply CBT techniques, such as thought records and situational simulations, to gradually overcome the psychological obstacles caused by abortion. Similarly, when engaging in mindfulness practices, women with higher education levels better understand the core concept of mindfulness. Through daily meditation and breathing exercises, they improve their awareness and acceptance of current emotions. This rapid mastery and effective application of psychological intervention techniques make them more adept at coping with the psychological stress after abortion, significantly enhancing their psychological resilience ^[8]. Their self-regulation abilities improve, enabling them to recover from the shadow of abortion more quickly and re-engage in life.

5.2.3. Social support differences

Social support is a crucial factor influencing psychological resilience. Women with a stable social support system feel more secure during psychological intervention, thereby enhancing their psychological resilience. Encouragement and support from family members, friends, and colleagues provide them with emotional support, helping them better adapt and recover during the psychological intervention process. Encouraging the establishment and maintenance of social connections during psychological intervention can further strengthen women's psychological resilience.

5.2.4. Differences in mental health status

For women with poor mental health, psychological intervention becomes key to enhancing their psychological resilience. These women may already be burdened with psychological issues such as anxiety and depression, and the experience of miscarriage can exacerbate their psychological difficulties ^[9]. With professional psychological intervention, they can gradually learn a series of effective strategies to cope with stress. For example, through relaxation training, they learn techniques such as deep breathing and progressive muscle relaxation to alleviate physical tension and anxiety. During emotional expression sessions, they are encouraged to openly discuss their feelings and express their inner pain and struggles through activities like drawing and journaling. Furthermore, psychological intervention teaches them problem-solving skills, such as how to set goals, analyze the causes and consequences of problems, and how to develop and implement solutions. These strategies not only help them improve their mental health in the present but also enhance their psychological resilience in facing future challenges. Through these specific intervention measures, these women gradually rebuild their self-confidence and learn how to take care of themselves in adversity, becoming more resilient and stronger psychologically ^[10].

6. Conclusion

This article delves into the psychological intervention strategies for enhancing the resilience of women undergoing induced abortion. It analyzes the differences among women with various characteristics during the intervention and emphasizes the significance of family, social support, and cultural backgrounds. Hopefully, this article can serve as a reference for related research and practice, assisting more women in overcoming psychological shadows, regaining confidence in life, and facing the future with a more positive mindset.

Disclosure statement

The author declares no conflict of interest.

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Study on the Application Effect of Walk-around Management Mode in Special Outpatient Clinics

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Abstract: *Objective:* To explore and analyze the application effect of the walking management mode in special outpatient clinics. *Methods:* Data on patient satisfaction, complaint volume, consultation efficiency, and nursing service workload before and after implementing the walking management mode in the hospital's special outpatient clinics were compared. *Results:* After implementing the walking management mode, patient satisfaction and consultation efficiency were significantly improved, the average number of complaints per person was reduced, and the average number of daily services was increased. The differences were statistically significant. *Conclusion:* The use of the walking management mode in special outpatient clinic nursing work can improve the quality and efficiency of outpatient nursing, increase patient satisfaction by increasing the number of proactive services, and is worthy of promotion and application.

Keywords: Walk-around management mode; Outpatient clinics; Patient satisfaction; Nursing efficiency

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1. Introduction

In the overall planning of hospital management, outpatient patient management is an important aspect. Factors such as the large number of outpatient patients, complex disease types, varying levels of education, and patients' unfamiliarity with the hospital environment and consultation process often lead to overcrowded outpatient clinics, low consultation efficiency, and poor patient experience. Inefficient outpatient services not only result in a poor experience for medical staff and patients but also lead to a certain degree of waste of medical resources. The traditional outpatient guidance management mode is decentralized and passive, passively accepting inquiries from patients and their families, following routine procedures, and having limited guidance and dispersal capabilities. Patients demand faster, more convenient, and higher-quality medical services. Therefore, optimizing the outpatient service model, improving the overall quality of outpatient services, and increasing patient satisfaction with medical treatment are urgent issues that need to be addressed in hospital outpatient clinics.

As an important component of medical services, special outpatient clinics' continuous innovation and optimization of their nursing service models are crucial for improving patient satisfaction and the quality of medical services. Traditional special outpatient clinic nursing services are usually based on fixed locations, resulting in lower service efficiency. Walking management is a proactive and flexible management model that allows managers to obtain richer and more direct insights into employees' work problems and understand work difficulties through walking around ^[1]. In the field of healthcare and nursing, walking management is often applied to outpatient patient management. Under this model, nursing staff are not fixed in one location but actively move among patients to provide more personalized services. Compared to the traditional fixed service model, walking management helps to more comprehensively understand patients' needs, respond to their questions promptly, and improve the quality and efficiency of services. By providing comprehensive personalized services, it may have a positive impact on outpatient patient management ^[2-6].

This study aims to explore the application effects of the walking management mode in special outpatient clinics. By comparing the data collected during the implementation of the walking management mode from 2022 to 2023 with the data from the traditional special outpatient nursing mode from 2018 to 2022, the study analyzes various indicators including patient satisfaction (measured by the number of outpatient complaints and patient satisfaction scales), outpatient visit efficiency (measured by patient waiting time, payment time, inspection waiting time, and medicine collection time), and the service volume of outpatient nursing staff (measured by the average daily service frequency and average daily walking steps). This analysis aims to assess the practical application effects of the walking service mode in special outpatient nursing services.

2. Materials and methods

2.1. Data sources

The data comes from the special outpatient complaint data of Beijing Jishuitan Hospital in 2022 and 2023 (including doctor-patient office, medical service department, and online platform), as well as the statistical system data of the hospital's special outpatient departments including patient waiting time (from registration to consultation), payment time (from payment order to payment), inspection waiting time (from inspection order to inspection start), and medicine collection time (from prescription order to medicine collection)).

2.2. Methods

A non-concurrent controlled study was conducted. The control group consisted of 98 patients' satisfaction rating data and special outpatient nursing service data collected during the implementation of the traditional special outpatient nursing service mode from October to December 2022. The experimental group consisted of 90 patients' satisfaction rating data and special outpatient nursing service data collected during the implementation of the walking management mode from January to March 2023. Traditional outpatient nursing includes triage, patrol, treatment, and care, while the implementation of walking management mainly includes: 1) Pre-service: data collection, information verification, and classification management of initial and follow-up visits. 2) Active service: regular patrols, communication to understand needs, timely identification, and resolution of problems. 3) Post-diagnosis guidance: appointment scheduling for inspections, pathology consultations, and rehabilitation guidance. Regular summary and discussion meetings are also held for continuous improvement.

2.3. Observation indicators

This study compared patient satisfaction and the number of complaints in the special-needs clinic before and after implementing ambulatory management. To evaluate nursing services, the study designed a specialized patient satisfaction assessment scale. The nursing service satisfaction scale mainly includes five evaluation indicators: medical environment, consultation order, quality service, professional level, and medical experience. The study adopted the Likert 5-level evaluation model, namely, very satisfied (5), relatively satisfied (4), average (3), dissatisfied (2), and very dissatisfied (1), with a total score of 25. The study collected data on the efficiency of patient visits to the special-needs clinic (waiting time for consultation, payment, examination, and medicine collection). Wearable devices were used to record data such as the number of services and steps taken by special-needs nursing staff during their working hours. This allowed us to compare the impact of ambulatory management on clinic efficiency and nursing workload.

2.4. Statistical analysis

We processed the data using SPSS 22.0 statistical software. The measurement data was expressed as “mean \pm standard deviation”, and the t-test was used to compare the mean values between groups. The test level was set at $\alpha=0.05$, and a P-value less than 0.05 was considered statistically significant.

3. Results

3.1. Increased patient satisfaction and decreased complaints before and after implementing ambulatory management

Patient satisfaction is one of the important indicators to measure the quality of nursing services. The research results showed that the satisfaction scores of special-needs clinic patients before and after adopting ambulatory management were 15.11 ± 2.24 and 16.59 ± 1.77 , respectively, and the difference was statistically significant ($P < 0.001$). This improvement was mainly reflected in the increased scores for consultation order ($P < 0.001$) and service quality ($P < 0.01$) shown in **Table 1**. This was also reflected in the number of complaints in the special-needs clinic. Although the total number of complaints showed an increasing trend year by year, after implementing ambulatory management, the number of complaints per 10,000 visits to the special-needs clinic decreased from 9.92 to 5.67 in 2023. Among them, complaints about medical resources, outpatient services, and medical staff decreased significantly (**Table 2**).

Table 1. Patient satisfaction scores in the special-needs clinic before and after implementing ambulatory management

Satisfaction scores	October-December 2022 ($N = 98$)	January-March 2023 ($N = 90$)	P value
Clinic environment	2.84 ± 0.99	3.03 ± 0.79	$P > 0.05$
Consultation order	2.77 ± 0.94	3.52 ± 0.95	$P < 0.001$
Quality service	2.84 ± 0.99	3.22 ± 0.92	$P < 0.01$
Professional level	3.84 ± 0.99	3.94 ± 0.71	$P > 0.05$
Treatment experience	2.84 ± 0.99	3.03 ± 0.79	$P > 0.05$
Total score	15.11 ± 2.24	16.59 ± 1.77	$P < 0.001$

Table 2. Complaint quantity and correction values in special needs outpatient clinics from 2022 to 2023

	2022	2023	2022	2023
Special needs clinic visits	32260 people	81135 people	Complaints/10,000 visits	Complaints/10,000 visits
Medical staff	7	9	2.17	1.11
Clinic service	9	6	2.79	0.74
Medical policy	4	12	1.24	1.48
Medical fees	4	9	1.24	1.11
Medical resources	5	2	1.55	0.25
Medical quality	3	8	0.93	0.99
Total	32	46	9.92	5.67

3.2. Implementing mobile management improves the efficiency of outpatient visits

Through statistical analysis of patients' waiting times for consultation, examination, medicine collection, and payment, this study found that the use of mobile management mode reduced the waiting time for patients in various stages of outpatient visits, thereby improving the efficiency of medical visits as shown in **Table 3** ($P < 0.05$, $P < 0.001$)

Table 3. Outpatient efficiency

Patient waiting duration	October-December 2022	January-March 2023	<i>P</i> value
Waiting for consultation	98.47 ± 41.79	61.11 ± 29.01	$P < 0.001$
Examination	15.13 ± 5.37	11.07 ± 7.46	$P < 0.05$
Medicine collection	4.4 ± 1.24	1.47 ± 0.51	$P < 0.05$
Payment	2.95 ± 1.17	2.24 ± 1.12	$P < 0.001$

3.3. Ambulatory management significantly increases the number of outpatient services and workload

A prominent feature of the ambulatory management model in outpatient clinics is the proactive approach, inquiry, and service provided by nurses. Comparing the average daily service frequency and number of steps between the two service models, the study found that implementing the ambulatory management model across different nursing positions resulted in a higher number of services provided, along with an increase in the number of steps taken by nursing staff as shown in **Table 4** ($P < 0.05$, $P < 0.01$, $P < 0.001$).

Table 4. Statistics on the average daily service frequency and number of steps taken by nursing staff in specialty outpatient clinics ($N = 21$)

	Nursing position	October-December 2022	January-March 2023	<i>P</i> value
Average daily service frequency	Triage	194.86 ± 91.7	330.17 ± 16.29	$P < 0.01$
	Treatment and care	194.29 ± 63.70	310.86 ± 22.08	$P < 0.001$
	Patrol	191.29 ± 67.51	298 ± 23.48	$P < 0.001$
Number of service steps	Triage	7266.29 ± 917.39	9775.43 ± 997.52	$P < 0.001$
	Treatment and care	8662.43 ± 963.2	11627 ± 946.63	$P < 0.001$
	Patrol	8420.71 ± 1440.26	10710.57 ± 1563	$P < 0.05$

4. Discussion

Research both domestically and internationally has shown that implementing ambulatory management in outpatient clinics can change the management model for outpatient patients, enhance service philosophy, ensure work quality, improve the work experience of medical staff and patient satisfaction, better implement quality nursing services, and provide a good guarantee for the development of outpatient management work [1–9]. This study evaluated the application effects of ambulatory management in special-needs outpatient nursing work from several perspectives, including patient satisfaction, outpatient efficiency, and nursing workload. By comparing differences in patient satisfaction, complaint volume, outpatient efficiency, and nursing workload before and after implementing ambulatory management, this study found that ambulatory management can improve patient satisfaction and reduce the average number of complaints per person. This suggests that the ambulatory management model can better meet patients' personalized needs and enhance their satisfaction with medical services. With the improvement of complaint mechanisms and increasing awareness, although the number of outpatient complaints has increased year by year, there has been a significant decrease in the number of complaints per capita regarding outpatient services, medical resources, and medical staff after implementing ambulatory management. This may be because ambulatory management can more timely identify and resolve patients' problems, reducing the accumulation of dissatisfaction among patients. Outpatient congestion and unclear instructions often lead to inefficient consultations, examinations, and payments, resulting in low consultation efficiency. Patients who lack guidance can also exacerbate outpatient congestion. The proactive management model significantly improves consultation efficiency by having nursing staff actively inquire and guide each patient, promptly resolving their issues. Ambulatory management also places higher demands on nursing staff, manifesting in increased service frequency and walking steps. This may be related to nurses being able to proactively move among patients and complete tasks more efficiently. However, it may also be a necessary means to serve more patients and improve service efficiency. Overall, adopting the ambulatory management model in special-needs outpatient clinics allows nursing staff to more flexibly adapt to patients' needs and provide more caring and personalized nursing services. This, in turn, enhances patient satisfaction, reduces potential complaints, and improves the overall quality and efficiency of medical services.

Disclosure statement

The authors declare no conflict of interest.

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Research on the Development of Traditional Chinese Medicine Health Care in Guilin

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Abstract: *Objective:* To understand the cognition and demand of elderly people in Guilin for traditional Chinese medicine health and its influencing factors, and to propose relevant health management measures, take measures to improve the health of the population, and promote the sustainable development of the traditional Chinese medicine health industry. *Method:* A self-designed questionnaire was used to conduct an on-site survey of 261 elderly people in Guilin Xiyanghong Elderly Care Center from March to April 2023, with the elderly as the research subjects. *Result:* (1) The elderly in Guilin have a low level of understanding of traditional Chinese medicine for health and wellness; (2) Elderly people with chronic diseases have a higher demand for traditional Chinese medicine for health and wellness; (3) Educational background, marital status, and number of children are the influencing factors of TCM health and wellness cognition, with marital status having the greatest impact on TCM health and wellness cognition; (4) Age, educational background, chronic disease status, and source of medical expenses are the influencing factors of the demand for traditional Chinese medicine health and wellness, with educational background having the greatest impact on the demand for traditional Chinese medicine health and wellness. *Conclusion:* (1) Elderly people have insufficient awareness of traditional Chinese medicine for health and wellness, and it is necessary to strengthen health education and promote health concepts. (2) The elderly and chronic patients are the population that needs to be focused on in the future development of the health industry. Traditional Chinese medicine therapy has significant advantages in the prevention and treatment of chronic diseases, which can improve the management technology of traditional Chinese medicine for chronic diseases and provide targeted diagnosis and treatment plans to meet the health needs of the people.

Keywords: Guilin; Traditional Chinese medicine health care; Health management; Old people

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1. Introduction

The “Healthy China 2030” Planning Outline points out that it is necessary to implement the Healthy China

strategy, combine the advantages of traditional Chinese medicine and health management, explore the health security model of traditional Chinese medicine, combine health management, health culture, health insurance, traditional Chinese medicine health care and the development of preventive disease treatment services, and implement the health project of traditional Chinese medicine to treat preventive diseases. It is also necessary to encourage social forces to set up institutions for the integration of medical care and elderly care, promote the integrated development of traditional Chinese medicine and elderly care, promote the integration of medical care and elderly care, and strengthen the health management of the elderly. Nowadays, the pace of social and economic development is rapid ^[1-3]. Traditional Chinese medicine health care conforms to the needs of the development of the times and is a key project to build a healthy China. Traditional Chinese medicine health care and health management are guided by the idea of “curing diseases before they occur”, to improve people’s health. TCM health management comprehensively uses the theoretical ideas of TCM such as “preventive treatment”, “holistic concept”, “syndrome differentiation and treatment”, and health management theory and methods to carry out TCM information collection, health monitoring, health assessment, and health intervention for the sick population, to achieve the goal of disease prevention and treatment ^[4-5]. Traditional Chinese medicine health care is not only suitable for the prevention of diseases but also for the treatment of diseases ^[6-7].

1.1. The concept of healthcare

The definition of the concept of health care has not yet formed a unified understanding among scholars at home and abroad. The concept of health care first appeared in foreign “horticultural therapy”, in which the word “health care” is translated from “wellness”, which is a combination of wellbeing (self-realization) and fitness (health preservation) ^[8]. In 1959, Halbert Dunn, a United States physician, first proposed the term health care, believing that health care is the harmony and unity of people’s thoughts, spirits, and external environment, and is a higher state of health preservation — a state of self-satisfaction. In 2004, Liu Liqin, the first scholar in China to propose the term “health care”, used the word “health care” in his research on the development of forest parks, but did not clearly define it. Subsequently, the concept of “health and wellness” has been applied to the field of tourism research, and the concept of “health and wellness” has been interpreted with an understanding of common sense, without systematic analysis and establishment of a conceptual system ^[8]. There are great differences between relevant research results at home and abroad in terms of research perspective and research content. Foreign research on health care focuses on medical treatment, health, pension, and other aspects, and the research content is biased toward health economics. The research on healthcare in China focuses on the industrial perspective, mainly the practical research of healthcare industry projects, such as the development model and development dilemma of the healthcare industry ^[9].

1.2. Health care industry

Traditional Chinese medicine (TCM) health care, which is derived from the health care industry, has three mainstream models: preventive treatment, health preservation, and tourism experience. At present, the development of TCM health care is in its infancy, and there is still a lack of research on TCM health care, mainly on TCM health tourism ^[10]. In his research on the development of TCM health tourism products, Gan Yonghe proposed targeted development strategies for different product categories based on consumer preferences. The theoretical research on health care in traditional Chinese medicine lags behind the development of practice, and scholars at home and abroad have not yet formed a unified concept of health care, and there is

a lack of a systematic theoretical system [3, 5, 7]. At present, there is no such thing as a healthcare industry in foreign countries, but it is called a health industry, and the most studied one is health tourism ^[1]. According to the different natural resources, the health care industry can be divided into several categories, such as traditional Chinese medicine health care, hot spring health care, marine health care, climate health care, and forest health care ^[1].

This paper takes the elderly in Guilin Sunset Red Elderly Care Center as the research object, and explores the influencing factors of the cognition and demand of traditional Chinese medicine health care through the combination of theoretical research and empirical research, so as to further discover and solve the problems. Providing high-quality traditional Chinese medicine healthcare services to meet people's healthcare needs can better promote the sustainable development of Guilin's healthcare industry.

2. Methods

This study followed a four-step process to extract and analyze data from the accreditation reports: (1) data sourcing, (2) data extraction, (3) data labeling, and (4) data analysis.

2.1. Data sourcing

In this study, 261 elderly people from Guilin Sunset Red Elderly Care Center were selected as the research subjects, and questionnaires were conducted in the field from March 2023 to April 2023. A total of 261 questionnaires were distributed and 261 were recovered, with a recovery rate of 100%, of which 251 were valid, with an effective rate of 97%.

Inclusion Criteria: Residence in a nursing center; Those who voluntarily cooperate with the investigation; Those who have experienced traditional Chinese medicine health care projects. Exclusion Criteria: Consciousness or psychiatric disorders; refusal to participate in the survey; Those who are unable to sit in bed; People with hearing impairments.

2.2. Data extraction

According to the needs of the research, the questionnaire on the cognition and needs of traditional Chinese medicine among the elderly was designed according to the relevant literature and the questionnaire of the relevant online platform, and the content of the questionnaire was determined after the review and approval of the instructor. The questionnaire consists of two parts: (1) a survey on the awareness and demand of the elderly for TCM health care; and (2) Basic personal information. There are a total of 28 questions, including multiple-choice questions, sequencing questions, and open-ended questions. The questionnaire star was used to collect and enter the survey data.

2.3. Data labelling

In this study, the investigators were composed of the author and four other students who went to the research site to carry out the investigation.

2.3.1. Pre-survey

With the consent of the management of the nursing center, 9 elderly people living in the Guilin Sunset Red Elderly Care Center were selected, the purpose and method of the investigation were informed, and the

elderly in the elderly care center were communicated and pre-surveyed. Through the problems found in the communication process with the elderly and the feelings and opinions of the elderly on the survey after the survey, the number of questionnaire questions and the way of asking questions were revised and improved.

2.3.2. Survey methodology

In this study, a questionnaire survey was used to conduct an on-site survey of the elderly. Before the survey, the other 4 students were asked to read the questionnaire, and then the questions raised were answered one by one, and the survey methods and precautions were informed. For those who can complete it on their own, a paper version of the questionnaire will be issued for them to read and fill in on their own. For those who are unable to complete it on their own, the investigators will fill in the questionnaire through communication and questions, entering the answers into the questionnaire star. All questionnaires will be collected immediately after completion.

2.4. Data analysis

The collected data were analyzed and screened, 10 invalid questionnaires were removed, the sorted data were entered and exported using the questionnaire star, and then the data were statistically analyzed by SPSS 27.0 software. Qualitative data were expressed as composition ratios, and descriptive statistical analysis was carried out; The quantitative data were expressed by ($\bar{x} \pm SD$), and the independent samples *t*-test and one-way ANOVA were used to analyze whether there was any difference in the variables' cognition and demand for TCM health care in the elderly. Multiple linear regression analysis was used to analyze the influencing factors of each variable on the cognition and demand for traditional Chinese medicine health care in the elderly. $P < 0.05$ indicates statistically significant.

3. Results

3.1. Demographic analysis

The demographic analysis included variables such as personal basic information, educational background, marital status, number of children, occupation, chronic diseases, sources of medical expenses, and place of origin. In the sample, the number of males was 127, accounting for 50.6%; The number of females was 124, accounting for 49.4%. Most of the respondents were in the age group of 50–70, accounting for 92.8%, and the remaining 7.2% were 71 and above. Primary school education was the most prevalent among respondents, accounting for 45.8%. The number of married people is the largest, accounting for 94.0%, and the number of unmarried is 0. Of the respondents, 167 (66.5%) had three or more children, 80 (31.9%) had two children, 4 (1.6%) had only one child, and none had no children. The number of workers in the business and services sectors was the largest, accounting for 44.2%. Of the sample, 82.5% had a chronic disease and 17.5% did not have a chronic disease. Medical insurance is the most common source of medical expenses, accounting for 75.3%; 16.7% were self-financed, 7.2% were publicly funded, and 0.8% were from other sources. Of these, 190 (75.7%) were from Guilin City and 61 (24.3%) were from other regions.

3.2. Analysis of the overall situation of TCM healthcare cognition and demand

In terms of health care cognition, the surveyed users have a medium level of understanding of TCM health care, with an average score of 3.50 (the highest score is 5). It can be seen that the interviewed users have a certain

understanding and recognition of traditional Chinese medicine health care. In addition, the respondents had a moderate level of interest in TCM, with an average score of 3.85 (the highest score was 5). At the same time, the surveyed users have a certain agreement on the importance of health care, with an average score of 3.79 (the highest score is 5). The respondents' cognition of health care exceeded 3 points, which indicated that the interviewed users had a certain cognition and understanding of health care, and could better accept the concepts related to health care, but there were still some people who did not have a high level of understanding of traditional Chinese medicine health care.

In terms of health care needs, the surveyed users had a higher attitude towards whether they were willing to repeat the experience of TCM health care projects, with an average score of 3.09 (the highest score was 4). This indicates that the respondents have a certain interest and demand for TCM healthcare projects, but may not have fully grasped the true value of healthcare (**Table 1**)

Table 1. Analysis of the overall situation of respondents' awareness and demand for TCM health care ($n = 251$)

Dimension	Item	Minimum	Maximum	Mean	Standard deviation
Health care cognition	Degree of understanding of Chinese medicine health care	2	5	3.50	0.641
	How to evaluate your interest in Chinese medicine	1	5	3.85	1.196
	How to view the importance of healthcare	1	5	3.79	1.212
Health care needs	After experiencing the TCM healthcare project, are you willing to repeat the experience	1	4	3.09	0.923

From the above independent sample t -test, it can be seen that the significance of each dimension of respondents' cognition and demand for TCM health care was greater than 0.05, so there was no significant difference in health care cognition and demand between different genders. Different genders did not affect the perception and demand for TCM health care. From the above independent sample t -test, it can be seen that there are significant differences in the interest in traditional Chinese medicine, the importance of health care, and the willingness to repeat the experience between respondents with and without chronic diseases ($P < 0.05$), and the scores of respondents with chronic diseases in these aspects are significantly higher than those without chronic diseases. There was no significant difference in the understanding of TCM health care ($P > 0.05$). There are differences in the perception and demand for TCM health care with or without chronic diseases. People with chronic diseases pay more attention to TCM health care, attach more importance to health care, and are more willing to experience TCM health care programs repeatedly, while there is no significant difference in the degree of understanding of TCM.

3.3. The multiple linear regression analysis

The results of multiple linear regression analysis showed that the measured variables included in the regression model could explain 38% of the cognitive degree of TCM health care, the Durbin-Watson value was 2.027, which was around 2. There was no multicollinearity between the variables, and there were statistically significant differences in education, marital status, and occupation on TCM healthcare cognition ($P < 0.05$). Education, marital status, and occupation are the influencing factors of TCM healthcare cognition. Among them, marital status has the greatest impact on the cognition of TCM health care, followed by academic qualifications.

The results of multiple linear regression analysis showed that the measured variables included in the regression model could explain 19% of the demand for TCM health care, the Durbin-Watson value was 2.084, and there was no multicollinearity between the variables around 2, and there were statistically significant differences in age, education, chronic disease and source of medical expenses on the demand for TCM health care ($P < 0.05$). Age, education, chronic diseases, and sources of medical expenses are the influencing factors for the demand for TCM health care. Among them, academic qualifications have the greatest impact on the demand for TCM health care, followed by the source of medical expenses and whether they suffer from chronic diseases. Age is negatively correlated with the dependent variable, and the older the age, the lower the willingness to repeat the TCM health care program, that is, the smaller the demand for TCM health care.

4. Discussion

The awareness of the elderly in Guilin is at a medium level, indicating that the elderly have a certain cognition and understanding of traditional Chinese medicine health care, but the level of understanding is not high, and there are still some people who have a low awareness of traditional Chinese medicine health care. Among the elderly in this survey, 45.8% have a primary school education, so their education level is not high. Due to the limitation of education level, nearly half of the elderly cannot fully understand TCM health care. The survey results show that 45.42% of people prefer the combination of traditional Chinese medicine and Western medicine after illness, and nearly half of the elderly will still choose Western medicine, which is not conducive to the development of traditional Chinese medicine health care. Therefore, it is necessary to increase the publicity of traditional Chinese medicine health care and further improve the awareness of the elderly on traditional Chinese medicine health care.

The elderly in Guilin have a high degree of demand for traditional Chinese medicine healthcare programs, but they have not yet fully grasped the true value of healthcare. Since the elderly in this survey all live in nursing institutions and have experienced TCM healthcare projects, it shows that they all need TCM healthcare or disease treatment to some extent. Therefore, relevant institutions and staff must provide more in-depth and professional TCM healthcare services to meet the healthcare needs of the elderly and improve their healthcare experience.

At present, the healthcare function of traditional Chinese medicine in the treatment of diseases has gradually weakened, and traditional Chinese medicine in China is mainly used for disease treatment, which will lead to a low degree of understanding of the prevention and health management services and intervention effects of traditional Chinese medicine among the elderly, as they only understand some traditional Chinese medicine techniques, such as moxibustion, scraping, cupping, traditional Chinese medicine, and so on.

5. Conclusion

The elderly have insufficient awareness of traditional Chinese medicine health care, so it is necessary to strengthen health education and promote the concept of health. The elderly and people with chronic diseases are the groups that need to be focused on in the future development of the healthcare industry, and TCM therapy has significant advantages in the prevention and treatment of chronic diseases, which can improve the management technology of TCM chronic diseases and provide targeted diagnosis and treatment plans to meet the health care needs of the people. The sample size of this study is limited to Guilin Sunset Red Elderly Care

Center, and the research scope needs to be expanded and the sample size should be increased to strengthen the representativeness of the sample. In this study, the questionnaire was designed by the author so the reliability and validity of the questionnaire could be further strengthened to improve the reliability of the study. Due to my limited time, energy, and level, some of the analyses in the research may not be comprehensive and in-depth enough and need to be further explored and improved in future related research.

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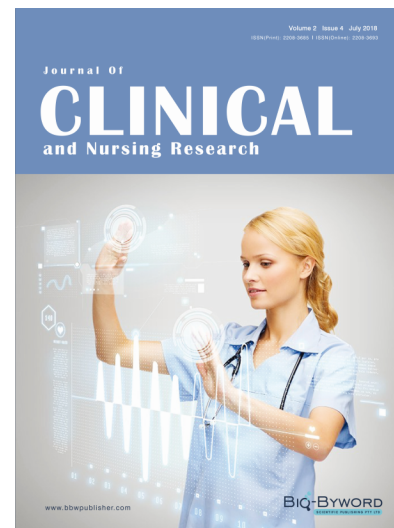
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