

Analysis of the effect of integrated teaching of minimally invasive medical and nursing technicians in orthopedics with Chinese and Western medicine

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Abstract: Objective: To explore the effect of integrating the integrated teaching in the teaching of minimally invasive medical and nursing technology talents in Chinese and Western medicine.

Methods: The period from March 2024 to March 2025 was taken as the study period, in which 100 nursing trainees entering several hospitals for internship were taken as the study subjects, and all nursing trainees were divided into the control group and the experimental group, and 50 nursing trainees were included in each single group; the nursing trainees in the control group adopted the traditional way of teaching and checking, while the nursing trainees in the experimental group opted for the integration of teaching to assess the nursing competence of all the nursing trainees after completing the teaching, and analyze the differences between the groups. The nursing competence of all nursing trainees was assessed after completing the teaching, and the differences between the groups were analyzed after the final scores were recorded.

Results: The overall teaching satisfaction of nursing trainees in the experimental group was significantly higher than that of the control group, and the difference in the comparison of the experimental results was significant ($P < 0.05$). The assessment scores of nursing trainees in the experimental group were significantly higher than those of the control group, which was statistically significant ($P < 0.05$).

Conclusion: This study confirms that the integrated teaching mode of minimally invasive medical and nursing technology talents in Chinese and Western medicine orthopedics shows significant advantages in clinical teaching. The integrated teaching pays more attention to the simultaneous cultivation of clinical thinking and practical ability, and helps the trainees to establish systematic cognition in the analysis of complex cases, teamwork and personalized care plan development, so as to improve their comprehensive professional quality.

Keywords: Integrative teaching; integrative orthopedics; clinical; clinical teaching; minimally invasive integrative orthopedics.

Against the backdrop of contemporary medical technological innovations intermingling with traditional medical wisdom, the field of orthopedic nursing is undergoing an unprecedented paradigm shift ^[1]. The concept of combining Chinese and Western medicine is neither a simple superimposition of technology nor a mechanized patchwork of theories, but a patient-centered, creative practice that reconstructs the logic of diagnosis and treatment through a multidimensional perspective. Chinese medicine emphasizes the holistic view and dynamic balance, focusing on the systematic regulation of “qi, blood, meridians and collaterals”; Western medicine relies on anatomical accuracy and the objective standards of evidence-based medicine ^[2]. The emergence of integrated teaching is an appropriate response to this dilemma. Its core lies in breaking down disciplinary barriers, and through situational task-driven, guiding students to complete the complete cognitive closed loop from pathological mechanism analysis to personalized care plan design in real diagnostic and treatment scenarios ^[3]. Under this model, TCM evidence-based care is no longer isolated from modern imaging assessment, and perioperative management of minimally invasive surgery can be integrated with non-pharmacological interventions such as acupoint stimulation and emotional regulation to form a multidimensional and three-dimensional nursing strategy ^[4]. It is noteworthy that the innovation of this teaching paradigm is not only related to technical inheritance, but also touches on the reflection of the nature of medical education - how to cultivate a new type of nursing personnel who can maintain a dynamic balance between technical rationality and humanistic care, which is precisely the deep proposition that needs to be broken through in modern orthopaedic education.

1 General Information and Methods

General information

The period from March 2024 to March 2025 was used as the study period, during which 100 nursing trainees who entered several hospitals for internships were included in the study; all nursing trainees entered the hospitals for internships to be taught. According to the randomized grouping method, all nursing trainees were divided into a control group and an experimental group, and 50 nursing trainees were included in each group; the age of the clinical practice nurses in the experimental group ranged from 19-22 (20.3 ± 1.9) years, and the age of the clinical practice nurses in the control group ranged from 19-22 (21.2 ± 1.5) years. All nursing trainees in this study were female.

Inclusion criteria: having a complete educational background in the system of nursing colleges and universities, having completed the basic medicine and nursing courses; voluntarily participating in the teaching reform study and signing the informed consent form; entering the clinical internship phase of integrated Chinese and Western medicine orthopaedics for the first time; and being able to participate in the theoretical lectures, practical operations, and assessment

and evaluation during the whole teaching cycle. They did not participate in other educational experimental programs at the same time during the study period to ensure the independence of the teaching intervention.

Exclusion criteria: those with previous orthopaedic nursing internship or advanced training experience; those who interrupted their internship for more than 72 hours for personal reasons that might affect the continuity of teaching; those who were unable to complete the established teaching plan due to job transfer or transferring to another department during the study period; and those who were missing or had obvious logical contradictions in the recording of key data during the teaching and assessment stage.

Nursing students' basic information was entered into an Excel sheet by the data personnel, who confirmed that the students were informed and the data were counted, and that the patients' data were comparable ($P>0.05$).

Methodology

The control group of nursing trainees choose the traditional teaching method of room visits for learning, with the teaching teacher instructing the students, requiring the students to carry out room visits with the patients to understand the patient's condition and individual status, and the teacher pointing out the student's problems and improving them after the completion of the teaching.

The experimental group of nursing students in the implementation of teaching, the integration of teaching applications in which the specific ways are as follows.

Case-guided multimodal situational simulation instruction

Teachers constructed a three-dimensional teaching scenario based on real clinical cases, and disassembled the minimally invasive surgical care process into three modules: preoperative identification and assessment, intraoperative instrument navigation cooperation, and postoperative Chinese medicine characteristic intervention ^[5]. In the preoperative stage, trainees are required to complete the dual-track recording of the "Qi and Blood Status Assessment Form" and the "Bone and Joint Function Score Sheet" by combining the information of the four diagnoses of Chinese medicine and the imaging report of Western medicine. The intraoperative module focuses on the C-arm machine positioning and coordination skills of percutaneous vertebroplasty through the restoration of real-life scenes in the operating room, and synchronously integrates the practical exercises of ear acupuncture points to relieve patients' intraoperative anxiety. The postoperative module is set up with composite tasks such as the operation of traditional Chinese medicine fumigation equipment, negative pressure regulation of cupping and the development of functional rehabilitation training programs ^[6].

Interdisciplinary Integration Training for Diagnostic Pathways

The instructor designed an integrated care pathway chart with 8-12 key decision points, covering the complete cycle from admission to hospitalization and

follow-up. In the case of minimally invasive treatment of osteonecrosis of the femoral head, the trainees were required to complete the simultaneous determination of the Western pain numerical rating (NRS) and the Chinese pain classification within 24 hours, and accordingly formulate a triple protocol that included the ionic introduction of traditional Chinese medicines, shockwave therapy, and the early rehabilitation of the Eight Duan Jin. For postoperative spinal endoscopy patients, the progressive training task of “Western medicine neurological function assessment - Chinese medicine meridian detection - prioritization of nursing problems” was set ^[7]. Teachers use mind mapping visualization tools to guide the trainees to establish a multi-dimensional data board in the electronic medical record system, which includes tongue atlas, pulse waveform and laboratory indicators, so as to strengthen the correlation and analysis of western medicine micro-indicators and Chinese medicine macro-signs ^[8].

Cyclic progression training with modular skill stations

The teaching team decomposed the core techniques of minimally invasive orthopedic nursing into 15 independent skill units, and each unit was equipped with a specialized training model and evaluation scale ^[9]. In the ultrasound-guided nerve block nursing module, trainees are required to complete the tandem operation of anatomical localization of the puncture point, ultrasound image interpretation and block effect prediction on a simulated tissue model, and the instructor monitors the deviation of the puncture angle through the pressure sensing device. Intelligent pulse simulator is set up in Chinese medicine nursing module, which requires trainees to recognize 6 typical pulse signs, such as string pulse and astringent pulse, within 15 seconds, and select the corresponding parameters of traditional Chinese medicine sealing treatment in combination with the fracture type shown in the DR film. Each skill station is set up with three levels of difficulty: basic standardization - complex variation - emergency treatment. Teachers dynamically adjust the frequency of muscle memory training for trainees in operations such as transferring intervertebral foramenoscopic instruments and placing moxibustion boxes on the veins based on the data analysis report of the infrared motion capture system.

Real-time data-driven precision banding interventions

Teachers used smart bracelets and eye-tracking instruments to construct a trainee competency assessment matrix. In the teaching of knee arthroscopy surgical coordination, the system automatically recorded 28 behavioral indicators, such as the reaction time of instrument delivery and the number of times of crossing the sterile area. For the technical operation of traditional Chinese medicine nursing, the distribution of skin temperature gradient during moxibustion application is monitored by thermal imager, and frame-level action decomposition is carried out in conjunction with trainees' operation video. Personalized competency radar charts were generated weekly, highlighting weaknesses such as

errors in positioning meridian points $>0.5\text{cm}$ or unstable suture tension control. Teachers accordingly design a targeted intensive training program, for example, for trainees scoring less than 80% in the TCM rehabilitation module after spinal minimally invasive surgery, a composite task of Supervisory Cupping and Core Muscle Activation Training is added, and real-time correction of the canister adsorption strength is provided by a pressure feedback glove ^[10].

Strategies for school-enterprise cooperation between teachers in schools and teachers teaching in hospitals

Institutions and clinical teaching bases have established an in-depth synergy mechanism to achieve dynamic unification of faculty, curriculum, and evaluation standards through the formation of the Joint Committee on Teaching of Orthopaedic Surgery in Integrative Medicine and Western Medicine. Full-time teachers of the school participate in quarterly rotations in clinical departments, focusing on tracking cases of minimally invasive technology iteration and optimization of Chinese medicine care plan, and transforming clinical experiences such as new intervertebral foramenoscopy instrumentation operation specifications and adjustment of parameters of electric stimulation of acupoints into modular teaching resources. Hospital instructors regularly participate in the teaching design seminars of the institutions, and jointly develop mixed-reality teaching scenarios combining reality and reality for such cutting-edge fields as the update of minimally invasive orthopedic surgical instruments and the integration of Chinese and Western medicine analgesic programs.

Evaluation criteria

The evaluation of teaching effectiveness adopts a multi-dimensional quantitative index system, including three core dimensions: theoretical knowledge assessment, clinical practice ability assessment and patient communication effectiveness assessment. The theoretical knowledge assessment adopts a standardized closed-book written test, covering the minimally invasive orthopaedic diagnosis and treatment guidelines of Chinese and Western medicine, the key points of Chinese medicine nursing and the prevention and control of perioperative complications, and the question types include single-choice (40%), case analysis (35%) and expository questions (25%), with a total score of 100 points.

Statistical methods

SPSS 26.0 software was used to analyze the data in this study. Categorical variables such as gender distribution were analyzed using chi-square test. All statistical tests were two-sided and the significance level was set at $P < 0.05$.

2 Result

2.1 Comparison of the two groups of practicing nurses' satisfaction with teaching work

The overall teaching satisfaction of the nursing trainees in the experimental group was significantly higher than that of the control group, and the difference in the comparison of the experimental results was significant ($P < 0.05$). See **Table 1**.

Table 1 Comparison of the two groups of practicing nurse practitioners' satisfaction with teaching (%)

Groups	Dissatisfied	Relatively satisfactory	Unsatisfactory	Total satisfaction
Control group (n=50)	23	15	12	76.00%
Experimental group (n=50)	27	21	2	96.00%
X^2				9.262
P				0.000

2.2 Comparison of clinical practice nurses' assessment scores between the two groups

The scores of the nursing trainees in the experimental group were significantly higher in all the assessments compared to the control group, which was statistically significant ($P < 0.05$). See **Table 2**.

Table 2 Comparison of the assessment scores of clinical practice nurses in the two groups (scores, $\bar{x} \pm s$)

Groups	Theoretical knowledge	Hands-on operation	Patient communication skills
Control group (n=50)	79.45 $\pm$ 8.63	7.85 $\pm$ 3.58	76.01 $\pm$ 4.38
Experimental group (n=50)	91.23 $\pm$ 7.58	91.63 $\pm$ 4.69	89.11 $\pm$ 4.93
T	8.471	8.329	7.959
P	<0.001	<0.001	<0.001

3 Discussion

The clinical practice of integrated Chinese and Western medicine in orthopedics is essentially an innovative exploration to find a dynamic balance between biomechanical repair and self-healing regulation of the organism. The theory of "tendon injuries and bone errors" in the Chinese medicine system emphasizes the principle of treating both tendons and bones and combining movement and static, which complements the precise intervention based on anatomical repositioning in Western medicine^[11]. The evolution of the current orthopedic disease spectrum presents a dual feature: the incidence of degenerative osteoarthropathy caused by the aging society continues to rise, while the incidence of osteoporotic fracture accompanied by the decline in labor intensity is increasing rather than decreasing^[12].

The study data showed that the experimental group improved 11.8 points in the dimension of theoretical knowledge mastery, a leap that was not only reflected in the improved accuracy of memorization of anatomical markers in Western

medicine, but also in the enhanced ability to recognize elements of Chinese medicine's evidence. The intergroup difference of 13.8 points in the practical operation score is essentially a qualitative change in nursing operation from single technical execution to synergistic intervention of Chinese and Western medicine. The superiority of 13.1 points in patient communication ability reveals the structural defects of the traditional teaching model in the cultivation of humanistic care. The significant difference of 20% in teaching satisfaction side by side confirms the misplaced contradiction between the existing nursing education system and the real clinical needs.

The core breakthrough of integrated teaching lies in the reconstruction of the underlying logic of nursing competence development ^[13]. Interdisciplinary knowledge is no longer an isolated patchwork of knowledge modules, but a natural integration in specific clinical scenarios - for example, in post-vertebroplasty care, nursing staff can not only adjust the cold compress program based on the thermal effect of bone cement polymerization, but also synchronize the implementation of the Commissioning Points to promote the operation of bladder meridian qi and blood ^[14]. The intervention of intelligent teaching system makes the abstract concepts such as Chinese medicine pulse diagnosis finger pressure degree and western medicine wound assessment standard transformed into quantifiable muscle memory training, and this kind of figurative cultivation path effectively shortens the distance from theory to practice transformation. The introduction of clinical decision tree mandatorily requires trainees to complete the cross-validation of Chinese and Western medicine indications before the implementation of each nursing measure, and the establishment of this mindset is more clinically valuable than the mere skill proficiency enhancement ^[15].

The integrated teaching transforms such potential risks into teaching cases through the decision path retrospective function, so that the trainees can complete cognitive correction in the virtual environment, and this problem-oriented learning mechanism significantly improves the clinical resilience.

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