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Application and Effect Evaluation of Typical Critical Situation Simulation Teaching in Operating Room in Stratified Training of Nurses

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Abstract: *Objective*: To explore the application effect of typical critical situation simulation teaching in the operating room in the stratified training of nurses, and to provide practical basis for optimizing the training system of operating room nurses and improving their clinical emergency response capacity. *Methods*: A total of 50 operating room nurses in a tertiary hospital were selected and divided into N0~N1 grade (junior group), N2 grade (middle group) and N3–N4 grade (senior group) according to their professional titles, working years and post capabilities. A 6-month stratified training with typical critical situation simulation was implemented. Before and after the training, theoretical assessment, operational skill scoring, emergency response capacity scale and professional identity scale were used to evaluate the effect, and training satisfaction was collected simultaneously. *Results*: After training, the scores of theoretical knowledge, operational skills and emergency response capacity of nurses in the three groups were significantly higher than those before training ($p < 0.05$), and the improvement range of team cooperation capacity in the senior group was better than that in the junior group ($p < 0.05$); the score of professional identity increased significantly ($p < 0.05$), and the total training satisfaction reached 95.0%. *Conclusion*: The stratified teaching with typical critical situation simulation in the operating room can effectively improve the professional competence and professional identity of nurses at all levels, adapt to the needs of standardized training, and is worthy of popularization and application.

Keywords: Operating room; Critical situation; Simulation teaching; Stratified training of nurses; Application

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1. Introduction

The operating room is an important place for emergency treatment, rescue and therapy of patients, characterized by frequent emergencies, heavy tasks and a large workload. The main critical situations include sudden changes in vital signs, anesthetic accidents, and massive intraoperative hemorrhage. Nurses' psychological quality, professional competence and emergency response level have a direct impact on the success rate of surgery and the level of medical care. With the improvement of medical standards and

people's health awareness, the public has put forward higher requirements for the quality and ability of operating room nursing staff [1]. However, in the traditional training process, nurses mainly receive theoretical knowledge and observe standardized skill demonstration procedures, lacking opportunities for practical operation and practice. Once an emergency occurs, it is difficult to ensure the standardization of disposal methods, which cannot meet the needs of operating room nursing work [2].

Under the concept of hierarchical nursing management, implementing stratified training according to the differences in nurses' abilities have become the key to improving training efficiency. There are significant gaps in knowledge reserve, operational skills and emergency experience among nurses at different levels: junior nurses need to consolidate basic emergency skills, middle nurses need to strengthen their ability to handle complex situations, and senior nurses need to improve their team command and guidance capabilities [3]. The one-size-fits-all training model is prone to resource waste and poor effect, and it is difficult to adapt to stratified needs.

Scenario simulation teaching constructs and restores real critical scenarios with the help of real nursing cases, realizing the combination of theoretical explanation and practical operation, and making up for the lack of practical operation opportunities in traditional training [4]. At present, the OSCE model and standardized patient simulation have shown good application effects in operating room training, but the scenarios selected in current research are relatively single, and different types of critical cases have not been transformed into training resources [5,6]. Based on this, this study follows the concept of hierarchical management, constructs a hierarchical scenario simulation training system, and further promotes the scientific and standardized development of the training model for operating room nurses.

2. Relevant theoretical basis

2.1. Stratified training theory

Stratified training theory originates from the concept of teaching students in accordance with their aptitude, which requires following the principle of differentiation, and formulating hierarchical training content, implementation methods and assessment standards according to personnel's job responsibilities, basic levels and improvement goals, so as to promote the improvement of personnel's overall work ability and level. Stratification based on the professional age of operating room nurses: N0–N1 grade nurses (working ≤ 3 years) are in the adaptation period and need to master basic emergency procedures and skills; N2 grade nurses (working 3–7 years) are in the growth period and need to improve their ability of independent disposal and cooperation in complex situations; N3–N4 grade nurses (working ≥ 8 years) are in the mature period and must have the abilities of emergency command, teaching guidance and decision-making [3]. Stratified training can avoid the problem of unbalanced difficulty of content and improve the pertinence and effectiveness of training.

2.2. Situated learning theory

Situated learning theory emphasizes carrying out learning activities in combination with reality-close scenarios, and using situational interaction to help learners construct knowledge and skill systems and realize the improvement of knowledge and skill levels. Typical critical cases are selected for operating room scenarios, and immersive and experiential scenarios are created by using real operating room environments, equipment, instruments and standardized patients, allowing nurses to experience the whole process of

emergency treatment [7]. Compared with lecture-based training methods, this model can give play to nurses' subjective initiative, promote them to apply knowledge in practice, and improve their psychological quality and team cooperation ability [8,9].

2.3. Ebbinghaus forgetting curve theory

This theory points out that memory decreases with time, forgetting rapidly at first and then slowing down gradually, and reviewing according to a certain cycle can improve memory effect. This study integrates it into training design: junior nurses focus on repeated practical operation of basic skills, middle nurses strengthen interval review of complex situations, and senior nurses deepen knowledge transfer through case discussion, consolidating training effects with scientific review planning and ensuring the long-term retention of skills [3].

3. Research objects and methods

3.1. Research objects

A total of 50 operating room nurses in a tertiary hospital from July to December 2025 were selected. Inclusion criteria: holding a nurse practitioner certificate, working in the operating room for ≥ 1 year, voluntarily participating and cooperating with the assessment. Exclusion criteria: further study/internship nurses, those with training absence ≥ 10%, and those who have participated in similar training in the past. According to the Guidelines for Hierarchical Management of Operating Room Nurses, the nurses were divided into groups combined with professional titles, working years and ability assessment: 17 nurses in the junior group (N0–N1 grade), aged 22–29 years (25.7 ± 3.5) years, with working years of 1–2 years (2.0 ± 0.2) years; 26 nurses in the middle group (N2 grade), aged 23–34 years (28.6 ± 5.4) years, with working years of 3–7 years (5.6 ± 2.4) years; 7 nurses in the senior group (N3–N4 grade), aged 30–40 years (35.2 ± 4.8) years, with working years of 8–14 years (12.1 ± 2.4) years. There was no statistically significant difference in general data among the three groups ($p > 0.05$), with comparability.

3.2. Research methods

3.2.1. Training preparation

(1) Setting up a training team

Composed of operating room head nurses, quality control specialists of the nursing department, attending anesthesiologists and senior specialist nurses. The head nurse overall plans the implementation of the plan, the anesthesiologist explains the pathological mechanism and key points of anesthetic cooperation, and the specialist nurses are responsible for drill guidance and assessment. The team clarifies goals and standards after unified training to ensure training standardization.

(2) Constructing a gradient case database

Six types of typical critical situations were sorted out: massive intraoperative hemorrhage, anesthetic accidents, instrument-related events, sudden changes in vital signs, intraoperative infection and emergency treatment for special populations [4,10]. Each case includes case data, trigger points, disposal procedures and division of labor, and the difficulty is designed according to stratified needs: the junior group is for basic scenarios with a single trigger point, the middle group for comprehensive scenarios with multiple trigger points, and the senior group for complex command scenarios with unknown trigger points.

(3) Preparing simulation resources

A simulated operating room was created relying on the nursing simulation training center, equipped with operating tables, defibrillators, first-aid drugs, simulated instruments, standardized patients (SP) and other resources. SPs were professionally trained to simulate critical symptoms and emotions, and video recording equipment was prepared to record drills for review and analysis simultaneously.

3.2.2. Training implementation

The training cycle was 6 months, adopting the mode of "theoretical teaching + scenario simulation + review and summary + reinforcement and consolidation", 4 times a month, 2.5 hours each time (0.5 hours for theory, 1.5 hours for drill, 0.5 hours for review), and hierarchical differentiated training was implemented.

(1) Junior group

The core goal is to master basic emergency procedures and the use of first-aid resources, and improve initial response ability. Theories explain scenario identification, disposal principles and drug usage; basic scenarios such as massive hemorrhage in a single part and mild anaphylaxis to anesthesia are selected for division of labor drills in groups of 4–5 people, with on-site error correction by the team; the review focuses on operational standardization and process integrity, and deficiencies are clarified through video recording; basic skill operation is conducted once a week and scenario re-performance once a month, combining the Ebbinghaus curve to consolidate memory [3,11].

(2) Middle group

The core goal is to train the ability to respond to and cooperate in handling complex situational problems. The theoretical part analyzes and evaluates comprehensive scenarios and shares team communication skills. Comprehensive scenarios such as massive hemorrhage in multiple parts and instrument failure combined with infection are selected, and surgical operation teams are formed with 5–6 people invited, requiring rapid scenario assessment and decision-making, with team members giving prompts at key links; the review analyzes deficiencies in scenario decision-making and cooperation level, and summarizes optimization plans; case variant drills are adopted to improve flexible response ability.

(3) Senior group

The core goal is to strengthen command, decision-making and teaching guidance capabilities. Theories explain emergency decision-making thinking and team management skills; complex scenarios such as multiple organ failure and anesthetic accidents combined with instrument failure are selected, with senior nurses serving as chief commanders in groups of 6–7 people to overall plan division of labor and decision-making; two-way evaluation is adopted for the review, and senior nurses share experience simultaneously; they are arranged to serve as instructors for the junior group to deepen abilities through teaching.

3.2.3. Evaluation indicators and methods

(1) Theoretical assessment

A self-made test paper with good reliability and validity (Cronbach's $\alpha = 0.86$) was used for assessment before and after training, covering scenario identification, disposal principles and other contents, with a full score of 100 points and an assessment time of 60 minutes.

(2) Operational skill assessment

Defibrillation, preparation and infusion of first-aid drugs were assessed before and after training, scored according to unified standards (50 points for each item, 100 points in total), covering operational standardization, process integrity and other dimensions.

(3) Emergency response capacity

A self-made scale (Cronbach's α = 0.89) was used for scoring, including 5 dimensions and 20 items of scenario identification, decision-making, operation, cooperation and psychological quality, with Likert 5-level scoring (full score of 100 points).

(4) Professional identity

The Nurse Professional Identity Scale (Cronbach's α = 0.83) was used, with 20 items and Likert 5-level scoring (20–100 points), and the higher the score, the stronger the identity.

(5) Training satisfaction

A self-made questionnaire was used to investigate from 4 dimensions of content, method, teaching staff and effect (10 items with Likert 5-level scoring), and open suggestions were collected simultaneously. Total satisfaction = (number of very satisfied + satisfied cases) / total number of cases × 100%.

3.2.4. Statistical methods

SPSS 26.0 was used to process the data. Measurement data were expressed as ($\overline{x} \pm s$), with paired *t*-test within groups and one-way analysis of variance between groups; count data were expressed as rate (%), with χ^2 test. $p < 0.05$ indicated a statistically significant difference.

4. Research results

4.1. Comparison of ability scores of the three groups before and after training

There was no statistically significant difference in the scores of theoretical knowledge, operational skills and emergency response capacity among the three groups before training ($p > 0.05$); after training, all scores of the three groups increased significantly ($p < 0.05$), and the scores of emergency cooperation and command dimensions in the senior group were higher than those in the middle group, and those in the middle group were higher than those in the junior group, with statistically significant differences among groups ($p < 0.05$).

4.2. Comparison of professional identity scores of the three groups before and after training

There was no statistically significant difference in the total score of professional identity among the three groups before training ($p > 0.05$); after training, all scores of the three groups increased significantly ($p < 0.05$), with no statistically significant difference among groups ($p > 0.05$). Specific data: junior group (62.3 ± 5.8) points vs (78.6 ± 6.2) points ($t = 12.35$, $p < 0.001$); middle group (65.7 ± 5.2) points vs (81.2 ± 5.9) points ($t = 13.17$, $p < 0.001$); senior group (68.9 ± 4.7) points vs (83.5 ± 5.3) points ($t = 12.89$, $p < 0.001$).

4.3. Training satisfaction results

Among the 50 nurses, 33 were very satisfied (66.0%), 15 were satisfied (30.0%), and 2 were general (4.0%), with a total satisfaction of 96.0%. The top four recognized advantages were: scenario simulation close to clinical practice (90.0%), strong pertinence of stratified training (86.0%), improved emergency confidence

(82.0%), and review helping improvement (78.0%). Suggestions were concentrated on increasing drill frequency (8 nurses), enriching case types (5 nurses), and extending the command drill time for the senior group (3 nurses).

5. Discussion

After the application and effect test of the training model, it was found that the typical critical situation simulation teaching in the operating room makes up for the lack of practical training in the traditional training system and has a significant promoting effect on improving nurses' abilities. Under the traditional theoretical training system, nurses can only passively learn knowledge and skills, lacking real operation opportunities and difficult to accumulate practical experience [12]. By constructing and restoring typical critical scenarios and setting assessment content combining theory with practice, nurses' enthusiasm for analyzing and solving problems is mobilized. After basic skill training, junior nurses have a further understanding of skill standards and accumulate practical experience; middle nurses have trained their team cooperation and problem-solving abilities through comprehensive situational problem disposal training; senior nurses have improved their coordination and decision-making abilities and deepened their understanding of professional norms [10]. The introduction of standardized patients enhances the authenticity of scenario simulation, provides nurses with repeated training opportunities, and gradually strengthens their psychological quality. This is consistent with the research conclusion of Cui Haiwei, whose training with the OSCE model confirmed that scenario simulation can improve nurses' professional and emergency abilities and reduce the probability of untimely clinical cooperation [5,6].

At the same time, the stratified training model follows the principle of differentiated design, and formulates targeted training goals and content according to the differences in basic abilities and experience of junior, middle and senior nurses, promoting mutual help among nurses of different seniorities, creating a training atmosphere of "seniors guiding juniors, middle nurses promoting excellence", and mobilizing the overall enthusiasm for learning and development. This is consistent with the research results of Zhang Yin et al, that modular stratified training can improve both individual ability and overall team level simultaneously [13].

According to the satisfaction feedback, the training model needs to be improved in four aspects: first, junior nurses have rapid short-term forgetting, so it is necessary to increase the opportunities for basic skill drills and optimize the review cycle combined with the Ebbinghaus curve; second, the case scenarios need to be enriched, and it is necessary to link with multidisciplinary clinical scenarios and continuously develop critical scenarios to improve nurses' ability to deal with complex situations; third, extend the command drill time for the senior group and add special training for teaching guidance; fourth, introduce a virtual simulated surgery system to improve the authenticity of scenario simulation relying on 3D visualization and real-time feedback [3,14]. In addition, it is necessary to establish a long-term evaluation mechanism to track the transformation of training effects through clinical follow-up and emergency event review ; combine the Kirkpatrick evaluation model to construct a comprehensive evaluation system from four dimensions of reaction, learning, behavior and results, providing a scientific basis for model optimization [15].

6. Conclusion

In conclusion, stratified teaching combined with typical critical situation simulation in the operating room

significantly enhances professional competence and professional identity among nurses at all levels. This approach effectively meets the demands of standardized training and is therefore worthy of widespread application.

Disclosure statement

The author declares no conflict of interest.

References

[1] Su Y, Wang S, Gong M, et al., 2024, Application of Interactive Teaching Based on Problem-Solving Model Combined with Scenario Simulation Training in the Training of Operating Room Specialist Nurses. Nursing of Integrated Traditional Chinese and Western Medicine, 10(12): 193–195.

[2] Fang Z, Zhao W, Miao X, et al., 2024, Investigation and Analysis of Training Needs of Nurses in Interventional Operating Room. Chinese Journal of Nursing Education, 21(12): 1482–1489.

[3] Bi C, Tang J, 2024, Effect of Teaching Model Based on Ebbinghaus Forgetting Curve Theory in the Training of N0–N1 Grade Obstetric Nurses. China Continuing Medical Education, 16(22): 141–145.

[4] Zhang Y, Li Y, Wu X, et al., 2024, Construction of a Team Training Case Database for Operating Room Nurses Based on Clinical Crises. Journal of Nursing, 31(21): 22–26.

[5] Cui H, 2024, Application of OSCE Model Based on Scenario Cases in the Training and Assessment of Operating Room Nurses. Famous Doctors, 2024(16): 183–185.

[6] Fan R, Wang Q, Huang P, et al., 2024, Application of Standardized Patient Scenario Simulation in Skill Training of Junior Operating Room Nurses. Medicine and Pharmacy of Yunnan, 45(03): 101–103.

[7] Li Y, Wang Y, 2022, Application Effect of Combined Teaching Method of Standardized Cases and Scenario Simulation in Nursing Staff Participating in Standardized Training in the Operating Room. China Standardization, 2022(22): 255–257.

[8] Ruan X, Feng Y, Chen J, et al., 2023, Design and Application of a Comprehensive Training Program for Pain Management with High-Fidelity Scenario Simulation. Chinese Journal of Nursing Education, 20(02): 158–163.

[9] Xu L, Guo Y, Sun T, 2020, Application Effect of Scenario Simulation Case Teaching Method in the Standardized Training of Nurses. China Continuing Medical Education, 12(13): 34–37.

[10] Wang Y, Zhang Z, Li S, et al., 2024, Application of Scenario Simulation Teaching Based on OSCE in the Training of Operating Room Specialist Nurses. Chinese Clinical Nursing, 16(01): 37–40.

[11] Zheng J, Hu Y, Luo P, et al., 2024, Application of Three-Step Teaching Method in Skill Training of Operating Room Intern Nurses. Journal of Traditional Chinese Medicine Management, 32(15): 76–78.

[12] Fei L, Gao B, Li Q, et al., 2024, Comparison of Application Effects of Different Teaching Models in the Standardized Training of Operating Room Nurses. Nursing of Integrated Traditional Chinese and Western Medicine, 10(08): 190–192.

[13] Zhang Y, Chen H, 2024, Application Effect of Modular Training in the Training of New Operating Room Nurses. Chinese Journal of Health Preservation and Health Care, 42(09): 160–162 + 166.

[14] Pan Y, Zhang Y, Luo X, et al., 2024, Application of Work Record Micro-Videos in the Training of Operating Room Nurses. Continuing Medical Education, 38(07): 74–77.

[15] Huang S, Liu F, 2023, Application Research of Scenario Simulation Teaching Method Combined with Kirkpatrick

Model Evaluation Method in CLABSI Prevention and Control Training. Modern Medicine and Health, 39(13): 2318–2321 + 2340.

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