An Exploratory Study on the Application of Mind Mapping Combined with Scenario Simulation in CPR Emergency Skills Training for Nursing Interns

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Abstract

Objective To explore the application of mind mapping combined with scenario simulation in first aid skills training for nursing students. Methods Mind mapping combined with scenario simulation was adopted to train nursing students in first aid skills. Participants were divided into a traditional group and an innovative group using random sampling method. A comprehensive evaluation was then conducted on both groups regarding their theoretical knowledge, practical operation skills, and clinical thinking ability in cardiopulmonary resuscitation training. Results The theoretical scores and practical operation assessment scores of nursing students in the innovative group were both higher than those in the traditional group ($P<0.05$). Simultaneously, the critical thinking ability scores of nursing students showed improvement, with all differences being statistically significant ($P<0.05$). Conclusion The integration of mind mapping and scenario simulation in cardiopulmonary resuscitation skills training for nursing students can significantly enhance their technical and communication skills, thereby achieving superior educational training outcomes. This approach not only stimulates students' learning interest and initiative, but also promotes the development of their comprehensive abilities in health education, verbal communication, and other aspects. Furthermore, this integrated teaching strategy helps bridge the gap between traditional classroom teaching and actual work scenarios, thereby strengthening the practical effectiveness of learning.

Full Text

Title and Authors

Exploring the Application of Mind Mapping Combined with Scenario Simulation in CPR Emergency Skills Training for Intern Nursing Students

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Abstract

Objective: To investigate the effectiveness of combining mind mapping with scenario simulation in training intern nursing students in cardiopulmonary resuscitation (CPR) emergency skills. **Methods:** Nursing students were trained using a combination of mind mapping and scenario simulation, with participants randomly assigned to either a traditional teaching group or an innovative teaching group. A comprehensive evaluation was conducted comparing the two groups' performance in CPR-related theoretical knowledge, practical skills, and clinical thinking ability. **Results:** The innovative group achieved significantly higher scores in both theoretical examination and practical skills assessment compared to the traditional group ($P<0.05$). Additionally, the innovative group demonstrated significant improvements in critical thinking ability scores ($P<0.05$). **Conclusion:** Integrating mind mapping with scenario simulation in CPR skills training for nursing students can significantly enhance their technical competencies and communication skills, thereby achieving superior educational outcomes. This approach not only stimulates students' interest and initiative in learning but also promotes the development of their comprehensive abilities in health education and verbal communication. Furthermore, this integrated teaching strategy helps bridge the gap between traditional classroom instruction and real-world clinical practice, thereby strengthening the practical effectiveness of learning.

Keywords: Nursing students; Mind mapping; Scenario simulation; CPR emergency training

Introduction

Mastering emergency skills represents a fundamental requirement for intern nursing students during clinical practice and constitutes an essential condition for becoming qualified healthcare professionals in the future. Clinical internships help nursing students acquire basic nursing competencies and develop professional attitudes, preparing them to become competent nurses [1-2]. Cardiopulmonary resuscitation operational skills constitute a critical component of emergency care, and emergency department nursing personnel must possess in-depth understanding of CPR theoretical knowledge and demonstrate proficiency in clinical CPR techniques [3]. With societal development, new pedagogical approaches have been proposed and applied in medical education. Mind mapping and scenario-based teaching methods have gradually found application across various industries. Introducing these methods into nursing intern training can significantly enhance thinking efficiency, assist students in understanding knowledge [4], and promote the development of core competencies such as assessment and communication [5]. However, cases combining these two methods in CPR emergency skills training remain scarce. Currently, research on the application of mind mapping combined with scenario simulation in CPR training for nursing students is still in its infancy and requires further exploration and validation. Based on this context, this study aims to investigate the application effects of combining mind mapping with scenario simulation in CPR emergency skills training for nursing students. We hope this method will enhance students' learning interest, deepen their understanding of CPR procedures, strengthen their practical operational capabilities, and adequately prepare them for future clinical work.

1. Methods

1.1 Study Subjects

Twenty-four intern nursing students from our hospital between July 2022 and April 2023 were selected as study subjects. Using random sampling, they were divided into a traditional group and an innovative group, with 15 students in each group. Prior to training, a unified closed-book examination was administered, showing no statistically significant difference in scores, and no significant differences were found in other baseline data ($P>0.05$). **Inclusion criteria:** Emergency department intern nursing students; Voluntary participation in this study. **Exclusion criteria:** Absence during training; Withdrawal due to any reason.

1.2 Intervention Methods

1.2.1 Traditional Group Based on *Emergency Nursing* and the *2015 American Heart Association CPR Basic Life Support* guidelines, and incorporating specific issues encountered in past emergency nursing practice, instructors employed "brainstorming methods" to maximize students' subjective initiative and

tap into their potential. Simultaneously, training objectives were clearly defined, training plans and evaluation criteria were established, and these were reviewed and approved by quality control team leaders and specialized nurses.

The traditional training model was adopted, wherein instructors delivered CPR theoretical knowledge lectures using multimedia and PowerPoint presentations, supplemented with actual case studies to inspire independent thinking. After instruction, students completed in-class quizzes by scanning QR codes through questionnaires. CPR standards were explained by instructors according to corresponding operational criteria, with students observing on-site demonstrations, practicing in groups, and receiving detailed guidance from instructors for any questions arising during practice.

1.2.2 Innovation Group The innovation group received training through the combination of mind mapping and scenario simulation, with specific implementation as follows:

1.2.2.1 Development of Emergency Skills Mind Map
A mind map with "cardiopulmonary resuscitation" as the central theme was developed (as shown in [Figure 1: see original paper]), with knowledge points expanding outward in hierarchical levels covering diagnosis, timing, initial resuscitation, secondary resuscitation, cerebral resuscitation, and post-resuscitation treatment and nursing care. Different colors, patterns, numbers, and keywords were used to annotate knowledge points, enabling learners to more clearly understand logical relationships and key points while better capturing attention and improving memory retention and learning efficiency. Additionally, initial PowerPoint presentations were used to enhance memory and help students understand the knowledge and operations involved throughout the resuscitation process.

1.2.2.2 Scenario Design
The emergency scenario encompassed seven core emergency technical designs, including cardiac arrest identification, emergency medical service system (EMSS) activation, chest compression implementation, electrocardiographic monitoring application, defibrillation technique utilization, ventilation management execution, and rational emergency medication use. Beginning with patient cardiac and respiratory arrest and culminating in the restoration of spontaneous circulation, life support measures were subsequently implemented. Following the emergency procedure, summary analysis was conducted to deepen the intern nurses' memory.

1.2.2.3 Training Video Production
A professional team comprising eight nurses (including emergency specialized nurses, 120 emergency center specialized nurses, and senior instructors) and one associate chief physician collaboratively performed emergency operations according to the pre-designed scenario model. The team meticulously filmed the entire emergency operation as a 30-minute training video for learning reference

and skills improvement.

1.2.2.4 Assessment Case Design

Based on the scientific principles of pathophysiological evolution during CPR, assessment cases were meticulously designed addressing various sudden conditions and management processes involving respiratory, circulatory, and nervous system diseases, encompassing at least seven key emergency techniques to ensure comprehensive knowledge mastery.

1.2.2.5 Supervision

During implementation, the head nurse strengthened supervisory functions, adhering to people-centered principles, maintaining timely and effective communication, coordinating overall arrangements, identifying problems, and providing targeted assistance and guidance to ensure rapid and effective problem resolution.

1.2.3 Training Implementation 1.2.3.1 Training Phase

Instructors conducted decomposed teaching and explanation of emergency knowledge, operational skills, and procedures involved in the drill process, then recorded training videos. Students were organized into groups for role-playing and practical exercises, rotating roles for continuous practice. Improvement suggestions could be proposed when problems were identified.

1.2.3.2 Drill Phase

Drills were implemented based on the high-performance team resuscitation model from the American Heart Association Advanced Cardiovascular Life Support training curriculum. Each group consisted of six nurses assuming six roles: team leader, circulation, airway, intravenous access, recorder, and logistics. Each drill was supported by one associate chief physician and three training team members responsible for guiding and correcting non-standard, uncoordinated, and unsafe practices.

1.2.3.3 Discussion Phase

Following each drill, immediate debriefing was required to reflect on existing problems before continuing training. For unsafe factors or identified issues, root causes were thoroughly explored and corrective measures were formulated. Due to students' differential characteristics, individualized teaching was implemented: detailed suggestions were provided for underperforming students while excellent students received full recognition, thereby ensuring learning efficiency and maintaining enthusiasm.

1.2.3.4 Recording and Summary

During scenario-based teaching, the entire process could be recorded via video for post-class instructor evaluation of each student's performance. Instructors focused their assessment on students' practical performance and attitudes. Corrections and recommendations were provided for problems encountered during practice, with instructors explaining and expanding on questions raised by students. This also presented new requirements for clinical teaching: as instructors,

they should focus on imparting nursing knowledge and professional skills, keep abreast of cutting-edge nursing information domestically and internationally, and fully utilize creative thinking to guide intern nurses.

1.3 Evaluation Metrics

1.3.1 CPR Theory and Operation Unified standards were applied for theoretical and operational assessment content, with a maximum score of 100 points. The examination scores of both groups were compared, with both theoretical and skills operation exams scored out of 100 points.

1.3.2 Critical Thinking The Chinese version of the Critical Thinking Disposition Inventory (CTDI-CV) was used to evaluate nursing students' critical thinking abilities, primarily involving seven dimensions and 70 items, with total scores ranging from 70 to 420 points.

1.4 Statistical Methods

Data were processed using SPSS 22.0 software. Measurement data were expressed as mean ± standard deviation (±s), and count data were expressed as percentages (%). t-tests and ^{2} tests were employed, with P<0.05 considered statistically significant.

2. Results

2.1 CPR Knowledge and Skills

The innovation group demonstrated superior performance in both theoretical assessment and operational skills compared to the traditional group (as shown in) (P<0.01).

Table 1 Comparison of CPR Knowledge and Skills Scores Between Groups

Group	Theory Score	Operation Score
Traditional	92.48$±1.69|91.36±2.37||*Innovation*|95.19±1.43|96.81±$2.69	

2.2 Critical Thinking

Following training, the innovation group showed significant improvement in all abilities except analytical skills (P<0.01), while the traditional group demonstrated improvement only in systematic ability (as shown in) (P<0.05).

Table 2 Critical Thinking Abilities Before and After Training

Note: The original table data contained formatting errors and incomplete information. The statistical analysis confirmed significant improvements in the innovation group across multiple dimensions.

3. Discussion

3.1 Enhanced Knowledge and Skills Through Combined Training

Mind mapping serves as a graphical information organization tool that promotes structured understanding and memory of knowledge [6], while scenario simulation provides an educational approach using authentic clinical scenarios that enables nursing students to practice clinical decision-making and skills in a safe environment, enhancing their ability to address real-world work challenges [7] and improving student satisfaction [8]. The combined training method of mind mapping and scenario simulation can significantly improve nursing students' knowledge mastery and skill performance in emergency care. Currently, most hospital training methods rely primarily on instructor lectures, resulting in students' inadequate mastery of relevant knowledge and lack of continuous emergency scenario drills, leading to superficial knowledge acquisition. In CPR emergency skills training, traditional teaching methods predominantly depend on theoretical lectures and simple practical operations, which can transmit basic knowledge but possess inherent limitations in cultivating students' practical operational abilities and emergency response capabilities.

Our study demonstrates that under the combined training method of mind mapping and scenario simulation, the innovation group achieved significantly higher scores in both theoretical assessment and operational skills compared to the traditional group ($P<0.01$). This indicates that the combination can substantially enhance nursing students' knowledge and skills in emergency care, consistent with the findings of Xu Yongjuan et al. [9]. The core of mind mapping lies in using combined text and graphics to simplify and summarize complex information into intuitive, colorful diagrams that help students systematically organize and integrate theoretical knowledge related to emergency care, making concepts clear and comprehensible. Scenario simulation, conversely, enhances emergency response capabilities by allowing students to perform practical operations in simulated emergency environments. Through this combined approach, students develop comprehensive and systematic understanding of CPR and other emergency knowledge. Students can perform actual operations such as CPR, electrocardiographic monitoring, and defibrillation in simulated emergency scenarios, thereby translating theoretical knowledge into practical skills. This integrated training method not only improves students' knowledge and skill levels but also enhances their confidence and ability to handle emergencies. Knowledge becomes consolidated and integrated through concrete practice; students grasp the internal logic of knowledge through mind mapping, achieving deeper memory, while scenario simulation helps them rapidly identify key information and clarify thinking when facing various nursing problems, thereby improving emergency success rates and clinical competence.

3.2 Enhanced Critical Thinking Through Combined Training

Critical thinking refers to the ability to analyze and make judgments about matters. As the healthcare environment continues to evolve, nurses with strong critical thinking abilities are better equipped to flexibly address challenges posed by external uncertainties. This is particularly crucial in emergency departments, where intern nurses require sufficient critical thinking to make reasonable decisions rapidly based on evidence—essential for improving patient survival rates and constructing a modern medical care model.

This study reveals that in the combined mind mapping and scenario simulation training, no significant differences existed between the innovation and traditional groups in critical thinking ability scores before training. However, after training, the innovation group demonstrated superior critical thinking scores compared to the traditional group ($P<0.01$), indicating that the combined approach can enhance nursing students' critical thinking abilities. Mind mapping combined with scenario simulation helps students visually clarify connections between different concepts, strengthen memory points, and encourage exploration of multiple possibilities. Furthermore, scenario-based teaching involves designing targeted teaching scenes according to educational objectives and content, utilizing video viewing, demonstrations, role-playing, 启发 (heuristic guidance), and discussions to guide student learning and skill mastery. By simulating real scenarios, students can practice CPR and other emergency techniques in a safe, controlled environment, thereby improving emergency response capabilities. During scenario simulation, students subjectively experience tension and responsibility, which enhances learning impressions. When facing complex and variable scenarios, students must make rapid judgments, which promotes critical thinking development and helps them better engage clinically, improving healthcare efficiency and quality.

4. Innovations and Limitations

This study explored the application of mind mapping combined with scenario simulation in CPR emergency skills training for nursing students. The results demonstrate that this integrated teaching method can improve students' theoretical knowledge and operational skills in emergency care while enhancing communication abilities. The fusion of mind mapping and scenario simulation not only deepens students' understanding of theoretical knowledge but also strengthens their practical skills and clinical judgment in authentic contexts, significantly improving learning outcomes and self-directed learning capabilities. Additionally, scenario simulation provides a safe practice environment where students can consolidate knowledge in simulated real situations, thereby improving practical operational abilities. Research has also shown that scenario simulation can shorten the maturation cycle of clinical nurses [10]. In recent years, these two methods have been gradually applied in medical education, primarily in nursing, neurology, anesthesiology, and imaging fields [10].

Domestic applications of combined mind mapping and scenario simulation have focused primarily on basic nursing skills training, emergency skills training, and special populations. Zhou Hongdan [11] explored the application of this combined approach in infection prevention and control knowledge and skills training for community healthcare workers, finding significant improvements in knowledge and skills scores ($P<0.05$). Li Xiaoqin et al. [12] further confirmed the effectiveness of this method in improving nursing staff protection levels and humanistic care abilities. Internationally, Li N et al. [13] investigated the application of evidence-based mind mapping combined with scenario simulation training for junior nurses' hospital transfer capabilities for severely burned and trauma patients, finding significant improvements in nursing skills and emergency response capabilities. Yanping Du [14] studied the application of mind mapping in neurosurgery nursing teaching with prominent clinical results. Leisa L Marshall [15] evaluated the impact of self-care scenario simulations on first-year pharmacy doctoral students' performance and self-perceived confidence in applying the Pharmacists' Patient Care Process, finding increased confidence and knowledge.

The findings of this study provide a new perspective for nursing education, offering not only improved learning outcomes for nursing students but also an effective teaching strategy for nursing educators. This approach helps cultivate nursing professionals with solid theoretical foundations and strong practical abilities and warrants clinical promotion. However, despite these positive outcomes, future research should consider longer-term follow-up observations of trainees to evaluate the impact of this teaching method on long-term skill retention. Additionally, given individual differences, future studies could further explore the effectiveness of this teaching approach for students with different backgrounds and characteristics.

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Note: Figure translations are in progress. See original paper for figures.