

The Impact of Real-Case Scenario Simulation Teaching on Nursing Students' Pediatric Emergency Response Competence

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Abstract: *Objective:* To investigate the actual results of applying real-life scenario simulation teaching in nurturing nursing students' pediatric emergency response ability. *Methods:* A total of 96 nursing interns from the pediatric department of a hospital were selected and randomly divided into a control group and an observation group, with 48 students in each group. The control group was taught by the traditional lecture method, and the observation group was taught using real-life case scenario simulations based on this method. Compare the scores of emergencies theoretical knowledge, operational skills and all-around emergency response ability for the two groups. *Results:* The observation group performed significantly better than the control group in emergency theoretical knowledge, operational skills and overall emergency response ability ($p < 0.05$). *Conclusion:* Real-life scenario simulation teaching can help nursing students develop their skills for responding to emergencies among children more effectively and is thus recommended.

Keywords: Scenario simulation; Real cases; Nursing students; Pediatrics; Emergency response

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1. Introduction

Pediatric emergencies are sudden-onset, rapidly progressing, and have a high mortality rate; therefore, they place very high demands on the emergency response ability of nursing staff. As the reserve force of the clinical nursing team, the cultivation of nursing students' pediatric emergency skills will directly affect the quality of future pediatric nursing care and the safety of children. Traditional teaching models focus on knowledge transmission, and nursing students may feel anxious, confused, disorganized in their work, and unable to cooperate effectively during a real emergency situation; thus, they cannot effectively apply what they have learned in class to practice. Real-case scenario simulation teaching takes actual clinical cases as its foundation, recreates the emergency process through high-fidelity scenarios, enables nursing students to practice multiple times and receive immediate feedback in a near-real-stressful environment, and helps

them bridge the gap between classroom learning and clinical application. Systematically assess the effect of this teaching model on nursing students' abilities in pediatric emergency response through a controlled experiment, and provide empirical support for nursing education reform ^[1].

2. Subjects and methods

2.1. Study subjects and grouping

From March 2024 to January 2025, 96 nursing students who had been rotated in the pediatric department of a tertiary Grade A hospital served as the study subjects. The inclusion criteria were: full-time undergraduate or associate degree students in nursing who had completed the theoretical course on pediatrics, provided informed consent, and volunteered to participate in this study. Exclusion criteria were: those with previous experience in pediatric emergency training and those who dropped out during the internship. Using a random number table, the nursing students were randomly assigned to a control group and an observation group, and there were 48 students in each group. There were no statistically significant differences in the baseline data of the two groups for age, gender, education level and pre-rotation theoretical examination scores ($p > 0.05$), so they could be compared; see **Table 1**. The study has been approved by the hospital's ethics committee, and all nursing students have signed informed consent forms.

Table 1. Comparison of general information between the two groups of nursing students

Item	Observation group (n = 48)	Control group (n = 48)	Statistical value	p value
Age (years, $\bar{x} \pm s$)	21.35 $\pm$ 1.42	21.48 $\pm$ 1.37	$t = 0.456$	0.649
Gender (male/female, n)	8/40	7/41	$\chi^2 = 0.079$	0.779
Education (undergraduate/associate, n)	19/29	21/27	$\chi^2 = 0.171$	0.679
Pre-rotation theoretical score (points, $\bar{x} \pm s$)	76.82 $\pm$ 6.54	77.15 $\pm$ 6.28	$t = 0.252$	0.801

2.2. Teaching methods and implementation

The control group used the old way of teaching; clinical instructors gave centralized theoretical lectures based on the pediatric internship syllabus, explained the rescue procedures and nursing key points for common pediatric emergencies, and then demonstrated operations in the demonstration room. Nursing students worked in groups, and the teachers moved around to guide them. The observation group received real-case scenario simulation teaching in addition to the traditional teaching method, and this was carried out in three steps. First, select a case and write a script. Four representative cases were selected from actual pediatric emergency situations for the teaching team's four typical scenarios: febrile convulsion, acute laryngeal obstruction, anaphylactic shock, and cardiac respiratory arrest. De-identify the data, standardize the scenario scripts, and specify when the condition changes and how it is assessed. Second, set up a scenario. A high-fidelity simulator and emergency equipment were employed to build a simulated scene. Nursing students formed groups of six and, under changing circumstances, carried out emergency operations such as assessment, judgment, calling for help, cardiopulmonary resuscitation (CPR), medication administration, and airway management, all of which were recorded on video. Thirdly, lead the debriefing. After the simulation, the instructor played back the recording and led the nursing students in a multi-dimensional reflective discussion about technical operation, clinical decision-making, teamwork and communication, etc., and then

provided item-by-item comments and summaries ^[2].

2.3. Evaluation indicators and tools

The three types of teaching effectiveness in this study are shown below. A self-developed test paper was used to assess the students' emergency theoretical knowledge, covering basic theory for children's emergencies, emergency medication dosage calculation, and key points of emergency procedures; a total of 100 points were available, and this test was given uniformly after the teaching period. Standardized operating assessment scales were used to evaluate emergency operational skills, and three main operations were selected: cardiopulmonary resuscitation (CPR), airway management, and intravenous access establishment. Each operation was graded out of 100 points, and then the mean of the three grades was taken as the operational skill score; independently, two uniformly trained graders rated these scores, and their average values were recorded. Five items were included in the self-developed rating scale for comprehensive emergency response ability: condition assessment and judgment, execution of emergency procedures, teamwork and coordination, nurse-patient communication, and emergency psychological quality. Each item was scored out of 20 points, and the total score of 100 points was obtained by combining the ratings from clinical instructors based on recordings of the simulation process and daily behavior. All three evaluation tools were validated by five nursing education and pediatric emergency experts, and all had content validity indices exceeding 0.85; they also passed pilot tests for good reliability.

3. Results

3.1. Comparison of emergency theoretical knowledge scores between the two groups

At the end of the teaching period, both groups of nursing students took the test for pediatric emergency theory. As shown in **Table 2**, the mean scores of the observation group and the control group were 88.42 ± 5.36 and 81.27 ± 6.18 , respectively; the difference between them was statistically significant ($p < 0.001$), and thus the observation group performed better than the control group. Based on the further analysis of the scores by question type, it was found that the advantage of the observation group was relatively greater for case analysis questions and emergency procedure sequencing questions. Case analysis questions asked nursing students to determine whether there was a problem and suggest a solution based on the given situation for a child in an emergency; the average score of the observation group was 86.3%, and that of the control group was only 74.8%. Sequencing questions on emergency procedures tested how well nursing students could organize the steps of rescue logically, and the scoring rate for the observation group was also relatively high. Therefore, it can be seen that real-case scenario simulation teaching has strengthened the connection between theoretical knowledge and clinical practice by enabling nursing students to repeatedly experience the entire thought process of "assessment-judgment-management" in simulated environments, thus promoting the transition from rote memorization to the construction of an organized system of emergency thinking, and demonstrating a clear advantage in theoretical tests requiring all-around application^[3].

3.2. Comparison of emergency operating skill scores for the two groups

Based on the results of the emergency operating skill assessment, the mean operation skill scores for the observation group were (90.15 ± 4.82) points, and those for the control group were (83.76 ± 5.94) points; the observation group had a higher score than the control group and was statistically significantly different ($p <$

0.001), as shown in **Table 2**. In item-by-item comparisons, for cardiopulmonary resuscitation, the observation group had significantly better standardization than the control group in all key indicators, including compression depth, rate and adequate recoil. In the operations of airway management, the observation group showed superior proficiency and fluency in bag-valve-mask ventilation techniques, timing of oropharyngeal airway insertion, and suctioning procedures. For intravenous access construction, the observation group had a shorter operation time, showed good asepsis awareness, and achieved a high first-attempt success rate. Based on the above results, it can be seen that real-life scenario simulations gave nursing students multiple chances to practice emergency operations under stress. Each simulation exercise was a full-featured and well-coordinated practical training session, requiring nursing students to quickly and accurately perform various emergency techniques under dynamic circumstances, rather than practicing isolated individual operations. This way of training for “operating in context” helped the nursing students learn how to apply their knowledge in practice and thus improve the quality and efficiency of their work during exams.

Table 2. Comparison of emergency theoretical knowledge and operational skill scores between the two groups (points, $\bar{x} \pm s$)

Item	Observation group (n = 48)	Control group (n = 48)	t value	p value
Emergency theoretical knowledge	88.42 ± 5.36	81.27 ± 6.18	6.055	< 0.001
Operational skill total score	90.15 ± 4.82	83.76 ± 5.94	5.786	< 0.001
Cardiopulmonary resuscitation	91.23 ± 5.14	84.38 ± 6.27	5.854	< 0.001
Airway management	89.76 ± 5.42	83.52 ± 6.15	5.274	< 0.001
Intravenous access establishment	89.46 ± 5.08	83.38 ± 5.86	5.431	< 0.001

3.3. Comparison of comprehensive emergency response competence scores between the two groups

The overall scores of the comprehensive emergency response competence tests for both groups are shown in **Table 3**; the observation group achieved a higher total score of (86.73 ± 5.21) points compared to the control group at (78.64 ± 6.35) points, and this difference was statistically significant ($p < 0.001$). Among the sub-item scores, the observation group showed the largest improvement in the three areas: condition assessment and judgment, teamwork and coordination, and emergency psychological quality. In the course of the scenario simulation, the nursing students in the observation group could promptly recognize signs of danger based on changes in vital signs and other clinical manifestations of the simulated children, and thus made reasonable prioritization judgments. In a group emergency response, the members had clearly divided labor and worked together well, carrying out their own responsibilities conscientiously. In the face of unexpected circumstances, the observation group had better self-regulation ability and was able to handle problems more proactively. On the other hand, although the control group of nursing students had learned some basic emergency knowledge and operation skills, they were still relatively disorganized, lacked coordination in teamwork, and were not emotionally ready to deal with complex emergencies. Therefore, it can be concluded that real-life case study simulation teaching promotes all-around and multi-faceted development of nursing students' general emergency response abilities ^[4].

Table 3. Comparison of comprehensive emergency response competence scores between the two groups (points, $\bar{x} \pm s$)

Evaluation item	Observation group (n = 48)	Control group (n = 48)	t value	p value
Condition assessment and judgment	17.86 ± 1.42	15.32 ± 1.78	7.729	< 0.001
Emergency procedure execution	17.42 ± 1.36	16.18 ± 1.52	4.212	< 0.001
Teamwork and coordination	17.65 ± 1.28	15.08 ± 1.86	7.885	< 0.001
Nurse-patient communication	16.92 ± 1.45	15.74 ± 1.63	3.747	< 0.001
Emergency psychological quality	16.88 ± 1.53	15.32 ± 1.72	4.694	< 0.001
Total score	86.73 ± 5.21	78.64 ± 6.35	6.782	< 0.001

4. Discussion

4.1. Impact of scenario simulation teaching on nursing students' emergency theoretical level

Real-case scenario simulation teaching can help nursing students learn more about the theoretical knowledge of pediatric emergency care better. Traditional theoretical teaching presents knowledge in an isolated and abstract manner; therefore, nursing students need to rely on rote memorization for exams and cannot apply what they have learned to actual clinical situations effectively. Scenario simulation teaching can address this problem by placing emergency theoretical knowledge in a real-life situation under time pressure and changing circumstances, prompting nursing students to actively recall, organize and apply what they have learned in the process of solving specific problems. This “learning by doing” method is in line with the first idea of constructivist learning theory; that is, people do not acquire knowledge passively but create it themselves in real life. A leader of the simulation will also conduct a group discussion later. Teachers guide the nursing students to reflect on their own judgments and decisions during the simulation, compare their actual performance with theoretical knowledge, identify deficiencies in their studies, and correct misunderstandings to deepen their understanding of the theory. Therefore, the increase in the theoretical level achieved by scenario simulation teaching is not merely the repetition of knowledge but also deep processing and meaning construction of that knowledge.

4.2. Effects of scenario simulation teaching on nursing students' emergency operating skills

The promotion effect of real-case scenario simulation teaching for emergency operation skills is also relatively strong. Given the high degree of proceduralism and time pressure in emergency operating skills, they cannot be taught by gradual decomposition; rather, all-encompassing training under near-real-life stress needs to be employed. In scenario simulation teaching, nursing students do not perform isolated single-operation tasks but a whole emergency process with continuously changing circumstances. A sequence of operations needs to be completed within a short period of time, such as assessment, calling for help, chest compressions, airway opening and intravenous access establishment; these operations have strict logical sequences and mutual constraints. Thus, this way of training can repeatedly activate and strengthen the operating skills of nursing students in real-world task chains, forming stable motor programs. At the same time, the repeatability of the simulation environment can be used to repeat practice safely several times before taking care of actual patients in a real emergency. Promptly correct errors and provide feedback during

the simulation to help nursing students learn about the standardized operation details more intuitively and improve the quality of their test results.

4.3. Impact of scenario simulation teaching on the all-round clinical competence of nursing students

Essentially, emergency response ability refers to all-around clinical practice skills that include both knowledge and operational skills, as well as other types of competencies such as clinical judgment, teamwork, communication, and stress management. The overall emergency response capability score of the observation group increased significantly in this study; thus, it can be concluded that the special value of real-case scenario simulation teaching lies in its all-encompassing cultivation of nursing students' all-round abilities. Nursing students need to work together to handle sudden changes in health during high-fidelity emergency training. Collaborative learning activities require students to learn how to divide roles, share information and cooperate mutually; these skills cannot be taught effectively in a traditional classroom setting. At the same time, the relatively mild psychological stress caused by the simulated scenarios can also serve as a form of "stress inoculation" for nursing students; through repeated exposure to tense simulated emergency situations, their emotional regulation and stress response abilities will gradually improve, and anxiety and panic in the face of actual emergencies will be reduced. Real-life cases can help nursing students feel the urgency of paediatric emergencies and understand why good cooperation among medical staff is necessary; thus, they will be motivated to learn systematically and develop a sense of professional responsibility.

5. Conclusions and recommendations

5.1. Research conclusions

Based on the results of a controlled experiment, this study found that simulated case scenario-based teaching can help nursing students improve their theoretical knowledge of pediatrics and emergency care, as well as enhance their practical skills and all-around emergency response ability. Scenario simulation teaching is better than the old lecture-demonstration method in terms of helping students learn how to apply their knowledge in practice and develop all-round clinical literacy; thus, it is a good way to teach pediatric emergency nursing ^[5].

5.2. Teaching recommendations

According to the research results, it is proposed that nursing colleges and clinical teaching bases proactively adopt real-case scenario simulation teaching in pediatric internship education. First, a well-organized library of typical cases for children's emergencies should be built to cover all kinds and difficulties of emergency situations and meet the requirements for tiered teaching. Secondly, strengthen the training of simulation teaching faculty to improve the clinical instructors' abilities in script writing, scenario leading and feedback analysis. In addition, the ratio of simulation teaching, theoretical instruction and skill training should be reasonably set up to form a closed-loop teaching process of "theory-simulation-reflection-re-practice", and a scientific and standardized evaluation system needs to be established to comprehensively and objectively assess the emergency response ability of nursing students.

5.3. Research limitations and prospects

The Study has the following defects. First, the sample was obtained from a single center and had a small size; therefore, the results of this study need to be verified by multiple centers and large-scale samples before being applied externally. Second, the assessment indicators focused on the short-term teaching effect and did not include a follow-up evaluation of how well nursing students retained their emergency skills after leaving school. Thirdly, the overall emergency response capability scores were subjectively evaluated by clinical instructors, and although reliability and validity tests have been conducted, there may still be some bias. In the future, one can extend the follow-up time, add objective behavioral observation indicators and clinical performance assessments, and further explore the ideal implementation plan for scenario simulation teaching and its application across all levels of nursing students.

6. Conclusion

The training of children's emergency response ability is a relatively urgent and complex problem in nursing education. Real-case scenario simulation teaching has many strengths, such as context creation, interaction and reflection, which can help nursing students connect their classroom learning with actual practice. Based on the above analysis, it can be concluded that this way will help nursing students improve their emergency theory knowledge, operating skills and all-around response ability. With the continuous progress of simulation teaching technology and changes in teaching ideas over time, this teaching model will likely be applied more widely to nurture outstanding nursing talents who possess strong emergency skills and can protect the lives of young patients.

Disclosure statement

The authors declare no conflict of interest.

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