

Analysis of the Role of Problem-Based Independent Learning Model in Teaching Cerebral Ischemic Stroke First Aid in Emergency Medicine

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Abstract: *Objective:* To analyze the effect of using a problem-based (PBL) independent learning model in teaching cerebral ischemic stroke (CIS) first aid in emergency medicine. *Methods:* 90 interns in the emergency department of our hospital from May 2022 to May 2023 were selected for the study. They were divided into Group A (45, conventional teaching method) and Group B (45 cases, PBL independent learning model) by randomized numerical table method to compare the effects of the two groups. *Results:* The teaching effect indicators and student satisfaction scores in Group B were higher than those in Group A ($P < 0.05$). *Conclusion:* The use of the PBL independent learning model in the teaching of CIS first aid can significantly improve the teaching effect and student satisfaction.

Keywords: Problem-based independent learning model; Emergency medicine; Ischemic stroke; First aid teaching; Satisfaction

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1. Introduction

Cerebral ischemic stroke (CIS) is characterized by sudden onset and rapid progression to life-threatening conditions, which can significantly increase the mortality rate of patients in the event of untimely resuscitation or resuscitation errors^[1]. For patients with CIS, standardized emergency care is the key to reducing disability and mortality. Medical students are the main personnel involved in emergency care in the future emergency department, and their professional quality directly determines the quality and efficiency of emergency care in the future emergency department^[2]. Therefore, transforming the theoretical medical knowledge learned in school into practical operation skills during the clinical internship of medical students is one of the main teaching purposes of clinical instructors^[3]. In the conventional teacher-oriented teaching method used by emergency department teachers in the past, students can only passively accept the knowledge and experience taught by the teacher and observe the teacher's simulation operation, and students seldom participate in the interaction during the whole teaching process, which leads to students' low interest in learning the relevant

content, and most of the students do not have the consciousness of independent learning, which leads to the difficulty in improving the effect of clinical teaching^[4]. Problem-based learning (PBL) is a new type of student-oriented teaching method, the instructor carefully selects typical case design and syllabus requirements in line with the problem, so that students search for relevant literature and carry out discussions, analysis, and problem-solving. This teaching method is conducive to stimulating students' enthusiasm to take the initiative to learn and can improve students' independent thinking, and analytical and problem-solving skills^[5]. Clinicians must have the ability to independent learning and thinking, so it is crucial to cultivate the independent learning and thinking skills of medical students in the process of teaching. In view of this, this study analyzes the effect of using the PBL independent learning model in the teaching of CIS first aid, as described below.

2. General information and methods

2.1. General information

90 interns in the emergency department of our hospital from May 2022 to May 2023 were selected for the study. They were grouped by randomized numerical table method into Group A and Group B. Group A had 16 males and 29 females, aged 21–28 (24.51 ± 2.89) years, with 28 specialists, 15 undergraduates, and two master's degree students; Group B had 18 males and 27 females, aged 22–27 (24.23 ± 2.75) years, with 26 specialists, 16 undergraduates, and three master's degree students. General information was comparable between the two groups ($P > 0.05$). Inclusion criteria included completion of the school teaching content, taking and cooperating with the arrangements of the emergency department, and completing the post-teaching assessment and evaluation. Exclusion criteria were those who dropped out in the middle of the study.

2.2. Methods

Group A adopted the conventional teaching method. CIS cases in the emergency department of our hospital were selected for teaching, and the instructor explained the relevant knowledge (CIS diagnosis and treatment process, first aid content, first aid operation skills, matters requiring attention in the process of first aid, etc.) to the students, demonstrated the relevant content, and instructed the students to observe and learn in the field in real time, so as to promote their familiarity with and mastery of the relevant knowledge of first aid for patients with CIS.

Group B adopted the PBL independent learning model. Teachers in the emergency department combined their own experience, the actual situation of the emergency department of the hospital, and the syllabus of emergency CIS, and chose a typical CIS case for teaching. Firstly, the teacher introduced the case information to the students and then put forward common diagnostic and therapeutic problems in the emergency department according to the actual situation of this case. The students were divided into groups and asked to search for relevant literature (definition of CIS, clinical signs and symptoms, examination and diagnostic techniques, common treatment modalities, effects and complications, etc.) to find the answers to the questions. On the second day, the teacher organized a focused discussion for the students, each group explained their views on the case and how to solve the problem, the teacher corrected the errors in the students' presentation and answered questions that arose in the discussion, and according to the changes in the case, students were encouraged to independently search for literature to solve the problem and conduct independent learning. On the third day, the teaching staff organized another discussion, and each student talked about his/her understanding of the problems and solutions. The teaching staff synthesized and evaluated the students' independent learning, pointed out the problems in the students' learning, supplemented the students' missing knowledge of CIS diagnosis and treatment and shared their own work experience and lessons with the students to encourage them to think about

and analyze the cases independently, which prompted the students to take the initiative to learn the process of emergency treatment and rescue of CIS patients.

2.3. Observation indicators

2.3.1. Teaching effect

At the end of the internship, the teaching effect was evaluated in terms of skills in clinical thinking, language expression, self-study, knowledge correlation, and other aspects using the teaching effect assessment questionnaire that was reviewed and revised by experts from the Emergency Department and Department of Neurology of our hospital. The total score for each item is 100 points, and the score is positively correlated with the teaching effect.

2.3.2. Student satisfaction score

At the end of the internship, students' satisfaction with the teaching was investigated using the college students' learning satisfaction scale jointly improved by experts from the Department of Emergency Medicine and Department of Neurology of our hospital. The evaluation content includes teachers' teaching attitude, teaching effect, learning efficiency, learning ability enhancement, etc., the total score of each item is 100 points, and the scores are positively correlated with the degree of satisfaction.

2.4. Statistical analysis

SPSS25.0 was used in data processing, mean \pm standard deviation (SD) and % indicate the measurement and count data, respectively, with t value and χ^2 test, $P < 0.05$ indicating a statistical significance.

3. Results

3.1. Comparison of teaching effect

The teaching effect indicators of Group B were higher than those of Group A, and the difference between the groups was significant ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of teaching effect indicators [mean \pm SD (points)]

Group	Number of cases	Clinical thinking skills	Expressive language skills	Self-learning skills	Knowledge correlation skills
Group B	45	90.68 \pm 3.52	89.53 \pm 3.41	90.45 \pm 3.34	89.76 \pm 3.56
Group A	45	83.14 \pm 4.67	82.67 \pm 4.58	83.59 \pm 4.42	82.58 \pm 4.35
t	-	8.649	8.059	8.306	8.568
P	-	0.000	0.000	0.000	0.000

3.2. Comparison of student satisfaction

Student satisfaction scores in Group B were higher than those in Group A. The difference between the groups was significant ($P < 0.05$), as presented in **Table 2**.

Table 2. Comparison of student satisfaction scores [mean \pm SD (points)]

Group	Number of cases	Teaching attitude	Teaching effectiveness	Learning efficiency	Improvement of learning ability
Group B	45	87.52 \pm 5.47	86.18 \pm 5.32	87.45 \pm 5.58	86.69 \pm 5.43
Group A	45	80.47 \pm 6.23	80.12 \pm 6.54	80.38 \pm 6.45	80.03 \pm 6.32
<i>t</i>	-	5.704	4.790	5.560	5.361
<i>P</i>	-	0.000	0.000	0.000	0.000

4. Discussion

CIS patients not only have a high incidence but also have more disability and death cases, which has become one of the major diseases threatening human health [6]. For CIS patients, the quality and efficiency of emergency medical care directly affect the prognosis. Emergency medical personnel with high professional quality and strong processing ability should be able to carry out emergency treatment in a timely manner, to reduce the mortality rate of CIS patients and improve the prognosis. The teaching and training effect of the clinical internship stage of medical students directly determines their future clinical work capability and affects the sustainable development of health care, so there is an urgent need to solve the problem of clinical teaching and training. We should optimize the teaching method, in order to improve the quality and efficiency of the emergency department teaching, so as to cultivate a large number of medical personnel with rich theoretical knowledge and strong clinical practical skills for the healthcare industry [7].

Compared with the conventional teaching method, the advantages of the PBL teaching method are as follows:

- (1) Stimulating students' interest in actively exploring knowledge: Teachers use conventional teaching methods to instill relevant knowledge in students. However, students often follow the teacher's ideas without engaging in exploration and independent thinking. The PBL teaching method shifts the primary focus of the learning process to the students. In this approach, students take the initiative to actively seek out literature and explore solutions to the problems posed by their teachers. Through discussions with others, they deepen their understanding of the relevant knowledge, thereby stimulating their interest in actively exploring new information [8].
- (2) Improving students' motivation to participate in learning: The teaching method requires students to learn based on the problem, students gradually improve their independent thinking and the ability to link theory to practice in the process of exploring, analyzing, and solving problems, while cultivating clinical thinking [9].
- (3) Enhancing students' independent thinking and problem-solving skills: Before the class, the problem is given by the teacher, and the students look for relevant information about the problem and actively search for ways to solve the problem. In the process, the students question, judge, compare, select and analyze, synthesize and generalize the knowledge they have learned in the past, and finally gain a deeper understanding of the theoretical knowledge, so as to gradually improve their comprehensive thinking and problem-solving skills [10].

The results of this paper showed that the teaching effect indicators and student satisfaction scores of Group B were higher than those of Group A ($P < 0.05$), confirming that good results can be achieved by using the PBL self-directed learning model in the teaching of CIS first aid in the emergency department. In the past, the

teacher-oriented spoon-fed teaching method in the emergency department had single, dull teaching methods and forms, resulting in many students lacking positive initiative in learning and only passively accepting the knowledge and experience inculcated by the teacher. In addition, in conventional teaching methods, teachers do not provide students with opportunities for discussion, which leads to many students not having independent thinking and learning consciousness, which in turn results in students' difficulties in combining the theoretical knowledge they learn in school with clinical practice. The PBL independent learning mode emphasizes the cultivation of students' independent learning ability while implementing the PBL teaching method. Teachers carefully select real and typical clinical cases and encourage students to learn independently about related problems. In this study, the teaching staff selected typical cases in the emergency department of the hospital, and based on the problems encountered in the process of dealing with the cases, they designed a series of questions in line with the requirements of the syllabus, which involved the diagnosis, clinical signs, and treatment of CIS; teachers allowed the students to independently consult the relevant information around the questions and divided the students into small groups to analyze and discuss the problems, and each student shared his/her views and insights on the problems as well as their solutions in the process of the discussion. In this process, students gradually improve their independent learning, language expression skills, team consciousness, etc. ^[11]. The first time when the teaching staff guides students to discuss the problems collectively, the teaching staff puts forward new problems according to the change in the patient's condition, so that the students can think, discuss, and solve the new problems after class; in next day's lesson, the teaching staff summarizes and evaluates the learning effect of students, corrects the students' wrong ideas and methods, and answers the students' unsolved problems, so as to make sure that the students can interpret the theoretical knowledge correctly and systematically, thus gradually cultivating students' ability of knowledge correlation, insights, and solutions. Thus, students can gradually cultivate their knowledge correlation, clinical thinking, and practical skills ^[12]. The PBL independent learning model is used in the teaching of CIS first aid, in which students can learn CIS-related knowledge by solving CIS first aid problems, solve new problems in deepening CIS-related knowledge, and stimulate a stronger learning interest in the discussion with other students and the teaching staff. In addition, the teaching method is based on actual clinical cases, and the clinical problems encountered in the cases are raised, so that the students can improve their comprehensive ability in the process of independent learning, which is conducive to improving the quality of teaching.

5. Conclusion

In conclusion, the use of the PBL independent learning model in the teaching of CIS first aid can significantly improve teaching effectiveness and student satisfaction.

Disclosure statement

The author declares no conflict of interest.

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