

Application of Problem-based Teaching Combined with Case Simulation Teaching and Film Reading Mode in the Training of Geriatric Residents

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Abstract: *Objective:* To explore the practical application effect of problem-based learning (PBL) combined with case simulation in the standardized training of geriatric residents and its impact on the trainees' clinical comprehensive ability. *Methods:* From January 2020 to December 2024, 80 trainees who completed their training in the Department of Geriatrics of our hospital were enrolled and randomly divided into two groups, with 40 cases in each. The control group received conventional film-reading teaching, while the observation group received PBL combined with case-simulation film-reading teaching; both groups underwent an 18-month training period. *Results:* Compared with the control group, the observation group had significantly higher scores in theoretical assessment, practical skills, film-reading ability, and case analysis ($p < 0.05$), as well as better performance in clinical reasoning ability, overall coordination, information processing, and interpersonal communication ($p < 0.05$), and also reported higher teaching satisfaction ($p < 0.05$). *Conclusion:* The teaching model of PBL combined with case simulation can effectively improve the theoretical knowledge, clinical thinking ability, and post competence of geriatric residents, and thus deserves wider promotion.

Keywords: Problem-based teaching; Case simulation; Department of geriatrics; Standardized resident training; Clinical competence

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1. Introduction

The aging wave is sweeping across the world with an irreversible trend, and China is the country with the largest elderly population base in the world, so the training of geriatric medical talents has become one of the most prominent and urgent issues in China's medical and health undertakings^[1]. As an important bridge for the transition from medical students to clinicians, the teaching quality of standardized resident training

directly affects the overall quality of the future physician team ^[2]. However, the traditional teaching mode of film reading has many disadvantages, such as weak teaching consciousness, single method, and general evaluation. In the complex subject of geriatrics, which is characterized by multiple system diseases, multiple organ dysfunction, and multiple medications, the traditional way of relying solely on teachers' teaching and students' passive acceptance can not meet the teaching needs ^[3]. Studies have shown that misreading in the traditional mode can lead to a misdiagnosis rate of about 5% to 10%, while the risk of misdiagnosis in elderly patients is high due to complications and atypical clinical signs ^[4]. In recent years, the innovative mode of problem-based teaching combined with case simulation has shown significant advantages in radiology and other disciplines, which can effectively improve students' image thinking ability and humanistic quality, but its systematic application research in geriatric teaching film reading is still blank. In this study, PBL combined with case simulation was introduced into geriatric teaching to explore a set of teaching programs that fit the characteristics of geriatrics and stimulate students' active thinking, so as to provide an empirical basis for the reform of regular training teaching.

2. Data and methods

2.1. General information

The study was carried out from January 2020 to December 2024. A total of 80 postgraduates and trainees who were receiving standardized resident training in the Department of Geriatrics of our hospital were included. The subjects were divided into a control group and an observation group by a random number table method, and each group contained 40 trainees. There were 15 males and 25 females in the control group, ranging from 19 to 23 years old, with an average of (22.05 ± 1.17) years old; there were 17 males and 23 females in the observation group, ranging from 19 to 23 years old, with an average of (21.72 ± 1.35) years old, and the general data of the two groups were balanced and comparable ($p > 0.05$).

2.1.1. Inclusion criteria

Bachelor's degree or above in full-time clinical medicine; having obtained the qualification certificate of a licensed physician or being in the second year of training or above; voluntarily participating in the study and signing the informed consent; The attendance rate during the training period is not less than 90%.

2.1.2. Exclusion criteria

Those who have been interrupted for more than 3 months during the training period; those who have participated in similar teaching reform projects; those who are absent from the examination for some reason during the examination period; Those who have serious violations of discipline and have been disqualified from training.

2.2. Method

Control group: The traditional teaching mode was adopted. The image data of common cases in the geriatrics department were selected by the instructor and displayed in the form of PPT. The instructor gave a systematic explanation, and the students listened passively and recorded the key points. Each film reading lasts about 40 minutes, once every two weeks, and about 36 times during the training period. Regular homework is assigned after class, and students review by themselves.

Observation group: The teaching reading mode of PBL combined with case simulation was adopted, and the specific implementation steps were as follows:

(1) Pre-class preparation stage

The guiding physician selected typical elderly cases one week before each teaching film reading, and had clear and standardized case selection principles: selecting cases of common diseases, frequently occurring diseases, and typical syndromes in the elderly, such as community-acquired pneumonia, chronic obstructive pulmonary disease, acute coronary syndrome, senile degenerative heart valvular disease, Alzheimer's disease, senile multiple organ failure, and the like. Five to seven progressive questions were set up according to the grade of the trainees. The trainees were arranged to consult evidence-based medical literature through the network or library. The resident physicians were required to complete the written preparation of the medical history report, image sign description, and preliminary diagnostic opinions.

(2) Classroom implementation stage

Each teaching film reading takes about 40 minutes, so it is divided into four links: the first link is the opening introduction and task assignment (3 to 5 minutes), the instructor clarifies the purpose and basic process of this film reading, and the second link is the clinical diagnostic thinking training based on case imaging (25 to 30 minutes). The medical history report, sign description, analysis and induction, and diagnosis and differential diagnosis statement were first made by the chief resident, and other students supplemented and discussed to guide the doctor to make standard comments on the key signs in time. The third part is group discussion and case simulation (5 to 8 minutes). Students are divided into groups to play different roles in clinical decision-making simulation. The fourth part is the summary of film reading (3 to 5 minutes), which guides doctors to summarize the main points of knowledge and arrange the thinking questions after class.

(3) After-class consolidation stage

The training teacher collects similar clinical cases and arranges the trainees to carry out clinical simulation training to consolidate the theoretical knowledge they have learned, at least once every two weeks, with a total of 36 times during the training period.

2.3. Observation index

(1) Examination results

The hundred-mark system is adopted for both the theoretical examination and the practical skill examination, in which the theoretical examination involves the theoretical examination (the full score is 100, covering the basic knowledge of geriatrics and imaging knowledge) and the practical skill examination (the full score is 100, including the ability to read films and case analysis), which is scored by unified proposition, unified marking and blind method.

(2) Clinical competence

The evaluation was conducted with the help of the clinical competence scale, which included four dimensions: clinical reasoning ability, overall coordination ability, information processing ability, and interpersonal communication ability. Each dimension was scored 25 points, totaling 100 points. The higher the score, the stronger the competence.

(3) Teaching satisfaction

Self-made satisfaction questionnaire was used to evaluate, the total score of the questionnaire was 100

points, involving four aspects of teaching content, teaching methods, teaching effect and learning interest, according to the score, it was divided into three grades, ≥ 85 points were judged as very satisfied, 70–84 points were satisfied, less than 70 points were not satisfied.

2.4. Statistical analysis

The data involved in this study were processed by SPSS 23.0 software. The data of χ^2 and t tests were count and measurement data, and the count and measurement data were also processed by (%) and ($\bar{x} \pm s$) means. When the difference meets the statistical condition, $p < 0.05$.

3. Results

3.1. Comparison of assessment results

Table 1 shows that the scores of theoretical examination, practical skills, film reading ability, and case analysis in the observation group were higher ($p < 0.05$).

Table 1. Comparison of the examination results of the two groups ($\bar{x} \pm s$, minutes)

Group	Number of cases	Theoretical assessment	Practical skills	Ability to read films	Case analysis
Observation group	40	89.17 ± 5.25	88.64 ± 4.84	90.26 ± 4.51	89.85 ± 5.14
Control group	40	78.41 ± 6.15	76.92 ± 5.94	79.35 ± 5.72	78.17 ± 6.03
t	-	8.351	8.725	8.972	8.561
p	-	< 0.05	< 0.05	< 0.05	< 0.05

3.2. Comparison of clinical competence

Table 2 shows that the scores and total scores of the observation group in the four dimensions of clinical reasoning ability, overall coordination ability, information processing ability, and interpersonal communication ability were higher than those of the control group ($p < 0.05$).

Table 2. Comparison of two clinical competence scores ($\bar{x} \pm s$, minutes)

Group	Number of cases	Clinical reasoning ability	Overall coordination ability	Information processing capability	Interpersonal communication skills	Total score
Observation group	40	22.35 ± 1.83	21.54 ± 2.03	22.01 ± 1.95	21.83 ± 2.15	87.80 ± 5.72
Control group	40	18.73 ± 2.31	17.92 ± 2.41	18.45 ± 2.28	18.15 ± 2.53	73.26 ± 7.38
t	-	7.493	7.054	7.276	7.018	10.241
p	-	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

3.3. Comparison of teaching satisfaction between the two groups

Table 3 shows that the teaching satisfaction of the observation group is higher ($p < 0.05$).

Table 3. Comparison of teaching satisfaction between the two groups (examples,%)

Group	Number of cases	Very satisfied	Satisfied	Not satisfied	Satisfaction
Observation group	40	28 (70.00)	10 (25.00)	2 (5.00)	38 (95.00)
Control group	40	12 (30.00)	18 (45.00)	10 (25.00)	30 (75.00)
χ^2	-				4.527
<i>p</i>	-				< 0.05

4. Discussion

Geriatrics is an interdisciplinary subject based on the concepts of senility, aging and age-related disability, so its clinical teaching is bound to face various special problems different from other specialties: elderly patients often have a variety of chronic diseases, many kinds of medication, and atypical clinical signs, so the diagnosis and treatment thinking of a single disease obviously can not be directly used for such patients [5,6]. The traditional teaching mode of film reading is teacher-centered and takes knowledge inculcation as the main line. Although students can remember some knowledge points, it is difficult to establish a clinical thinking framework that integrates image information with multi-system clinical signs [7]. This is the fundamental shortcoming of the traditional model in gerontology teaching, and also the starting point of introducing the PBL joint case simulation model in this study.

From the point of view of the underlying logic of teaching design, the PBL model is driven by problems and returns the initiative of learning to the students, so the students should actively retrieve knowledge, integrate information, and construct reasoning chains in the process of solving problems, on the basis of which case simulation increases the sense of reality of the situation and the urgency of decision-making. Instead, the judgment is made in a simulated clinical scenario with consequences [8]. Therefore, the combination of the two can complement each other: PBL provides the skeleton of thinking training, and case simulation gives it flesh and blood and temperature [9]. The cases selected by geriatric instructors cover a complete spectrum from community-acquired pneumonia to multiple organ failure in the elderly. Each film reading is a complete clinical decision-making exercise. In repeated training, the trainees imperceptibly form a “patient-centered, evidence-based” diagnosis and treatment habit.

The results of this study showed that the observation group was better in theoretical examination, practical skills, film reading ability, and case analysis ($p < 0.05$). It is worth noting that the improvement of the film reading ability dimension was the most prominent, which may be related to the complexity of geriatric imaging diagnosis itself. Under the PBL mode, the students observed the imaging signs more carefully and thought more deeply about the differential diagnosis. In terms of clinical competence, the scores of the four dimensions of the observation group were in the lead, especially the clinical reasoning ability was close to the full score level, which indicated that the model had a significant effect on the shaping of students' high-level thinking ability. In terms of teaching satisfaction, the satisfaction rate of 95.00% fully reflects the students' high recognition of this participatory and interactive learning method.

5. Conclusion

To sum up, the teaching mode of PBL combined with case simulation can systematically improve the theoretical level, clinical thinking ability, and post competence of geriatric residents, which is an innovative

teaching scheme worthy of vigorous promotion in the standardized training of residents.

Disclosure statement

The authors declare no conflict of interest.

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