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ORIGINAL RESEARCH

Application of the Cognitive Apprenticeship Teaching Model in the Standardized Training of Critical Care Medicine Resident Physicians: A Randomized Clinical Trial

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Objective: This study explores the effectiveness of the cognitive apprenticeship teaching model in fostering critical thinking and clinical reasoning and decision-making skills among medical residents during their rotations in the critical care medicine department.
Methods: We selected medical residents undergoing standardized training during their rotations in the critical care medicine department at the First Affiliated Hospital of Chengdu Medical College as the study participants. We conducted a two-month clinical practice course using the cognitive apprenticeship teaching model and evaluated its outcomes.
Results: Prior to the teaching intervention, there were no significant statistical differences ($P > 0.05$) in the general information and pre-teaching assessment scores related to critical thinking and clinical reasoning and decision-making skills between the two groups of students. However, after the training, the experimental group demonstrated significant improvements in four dimensions: truth-seeking, systematic skills, confidence in critical thinking, and curiosity, compared to the control group. Furthermore, in the Mini-CEX assessment, the experimental group scored higher in six dimensions: medical history inquiry, humane care, communication skills, clinical judgment, organizational efficiency, and overall clinical competency, with statistically significant differences ($P < 0.05$) compared to the control group.
Conclusion: The cognitive apprenticeship teaching model enhances the critical thinking and clinical reasoning and decision-making skills of resident physicians, thereby improving the effectiveness of medical education.

Plain Language Summary:
Objective: This study tested a teaching method called "cognitive apprenticeship" to see if it helps medical residents improve their critical thinking and decision-making skills during their training in the intensive care unit.
Methods: We worked with medical residents training in the critical care department of a teaching hospital. Half of the residents took part in a two-month program using the cognitive apprenticeship model, while the other half continued with regular training. We compared the two groups before and after the program.
Results: Before the training, both groups had similar skills. After the program, the residents who received the cognitive apprenticeship training showed greater improvement in key areas such as truth-seeking, systematic thinking, confidence, and curiosity. They also scored higher in practical skills like taking patient histories, showing empathy, communicating, making clinical judgments, working efficiently, and overall competence.
Conclusion: The cognitive apprenticeship model helps medical residents develop stronger critical thinking and clinical decision-making skills, making their training more effective.

Keywords: cognitive apprenticeship, critical care medicine, critical thinking, clinical reasoning and decision-making skills

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In 1980, the Chinese government recognized critical care medicine as an independent specialty, officially designating it as a clinical medical discipline in 2009.[1] From a disciplinary perspective, critical care medicine encompasses systemic tissues and organs, involving multidisciplinary theories and techniques. It is a comprehensive and highly integrated discipline. Over the past decade, significant progress has been made in the development of critical care medicine, with the wide adoption of various new treatment technologies and monitoring methods in clinical practice. These aim to provide advanced life support and standardized monitoring and treatment for critically ill patients. Physicians in the field of critical care medicine not only require a solid theoretical foundation but also need strong clinical thinking skills and operational abilities, which are particularly crucial in the treatment of acutely and critically ill patients.[2] Furthermore, the teaching of critical care medicine is highly challenging. This is because it features a fast-paced environment and demands a deeper and broader knowledge base compared to other disciplines. Traditional teaching methods are less suitable for critical care medicine, which involves a wide scope and complex pathophysiological conditions.[3] Clinical teaching is at the core of medical education, and over the past thirty years, it has received widespread attention in the field of medical education. Considerable effort has been invested in training and providing feedback to clinical teachers to help them optimize their teaching. Therefore, the key issue to address urgently is determining which teaching model should be adopted for the cultivation of clinical practice capabilities in standardized medical resident training in the field of critical care medicine.[4,5]

For a long time, apprenticeship has been considered a natural way of learning. Traditional apprenticeship is an ancient teaching model in which apprentices observe experts performing tasks, assist in completing them, and gradually assume more responsibilities until they can independently carry out the tasks. Experienced doctors possess a wealth of information and expertise in close proximity to patients, which is difficult to express in words, and learners cannot directly observe it. This is known as tacit knowledge. In traditional apprenticeship, little attention is paid to making tacit knowledge explicit, leaving learners lacking the skills needed to solve complex real-life clinical problems.[6] However, the best clinical physicians require not only a strong theoretical knowledge base but also excellent clinical thinking and decision-making abilities.

Brown and Collins, among others, introduced the concept of cognitive apprenticeship, which is a "teaching model that makes thinking visible." Its aim is to make expert thinking "visible" to learners, shifting educational objectives from task-oriented practices to developing cognitive skills, cultivating advanced thinking in students, and enhancing their ability to solve complex tasks.[7] The underlying theory is Vygotsky's constructivist theory, which emphasizes that individual knowledge is constructed by people themselves. Based on their previous knowledge and experience, individuals construct their own interpretations and understanding of the real world. When teaching in accordance with constructivist principles, teachers provide learners with opportunities to discover and apply knowledge themselves. Through interactions with teachers, peers, and the material environment, students gain confidence, grasp the complexity of concepts, and flexibly apply them to specific situations.[8] Cognitive apprenticeship integrates the core techniques of traditional apprenticeship with formal schooling, nurturing learners' advanced cognitive skills. It encourages learners to combine theory with practice, mimic the expert problem-solving thought process, gradually develop the ability to handle complex tasks, and defines six core strategies of cognitive apprenticeship: modeling, coaching, scaffolding, articulation, reflection, and exploration.[9] Cognitive apprenticeship has been explored in various medical fields, but its implementation in critical care medicine clinical training has been limited. In this study, guided by cognitive apprenticeship theory, we conducted clinical teaching practices for medical residents undergoing standardized training during their rotations in the critical care medicine department. We report the results below.

Participants and Methods

Participants

We selected medical residents undergoing standardized training from the 2021 and 2022 classes who completed rotations in the critical care medicine department at the First Affiliated Hospital of Chengdu Medical College in 2024. They were randomly divided into a control group comprising 59 individuals and an experimental group comprising 56 individuals. This study was conducted in the Intensive Care Unit (ICU) of The First Affiliated Hospital of Chengdu Medical College,

but exclusively enrolled awake, non-intubated patients who met the following criteria: a. Glasgow Coma Scale (GCS) ≥14; b. No mechanical ventilation or non-invasive ventilation during assessment; c. Hemodynamically stable (eg, norepinephrine dose <0.1 μg/kg/min); d. Able to communicate effectively.

Research Methods

In accordance with the requirements of the standardized training program for medical residents in the critical care medicine department, students were expected to systematically grasp the basic and clinical theories related to critical care medicine, possess significant clinical experience in critical care medicine, and have strong clinical thinking skills. They were also expected to master the diagnosis and treatment of common and prevalent diseases in critical care medicine and acquire basic clinical skills. All resident physicians underwent traditional teaching methods during their rotation in the Intensive Care Unit (ICU), in accordance with the national standards for resident standardized training. This traditional teaching model encompassed various components, including bedside teaching rounds, skill training, small group lectures, teaching rounds, and case discussions. During the routine teaching process, each resident physician was assigned to a specific supervising physician for daily shadowing and learning. For the experimental group, the supervising physicians had received systematic training in the cognitive apprenticeship teaching model prior to the rotation, while control group instructors received standard faculty development. Both groups taught the same curriculum with identical contact hours. This training covered specific clinical teaching strategies, implementation steps, teaching techniques, and key considerations during the teaching process. After a period of two months, students' critical thinking abilities were assessed through a questionnaire survey (Critical Thinking Disposition Inventory-Chinese Version, CTDI-CV), and their clinical thinking and decision-making abilities were evaluated using the Mini-Clinical Evaluation Exercise (mini-CEX) by clinical instructors.[10–12]

Teaching Process

Initially, we conducted an analysis of the specialized knowledge and clinical skills relevant to critical care medicine. A patient's case from the department was developed into a teaching case, a task undertaken by a team of clinical instructors. Subsequently, using the case as a foundation, we implemented teaching practices based on the six key elements of the cognitive apprenticeship teaching method.

Modeling

Clinical instructors explain the case while elucidating the etiology, pathogenesis, diagnosis, differential diagnosis, and treatment principles. They construct a cognitive model of the disease's understanding process, making the instructor's internal cognitive processes and activities explicit. This allows students to observe and establish conceptual models of the clinical thinking and decision-making processes required for this disease.

Guiding

During students' independent practice, instructors observe their practical processes and provide hints, suggestions, and evaluative feedback. Guidance is provided through observational means, directing students' attention to overlooked steps in their practice. Instructors offer real-time feedback and make adjustments based on the current situation, enabling students to approach the practice more closely to the instructor's methods.[7] For example, instructors observe trainees in specific aspects of history-taking and physical examinations while providing real-time feedback during daily rounds.

Scaffolding

Scaffolding refers to the gradual shift from instructor-guided student practice to students taking on primary responsibilities for patients. When students encounter difficulties in clinical practice, instructors provide critical guidance and prompts, and when necessary, work alongside students to complete clinical tasks. During this process, the level of instructor support gradually diminishes, imparting more responsibility to the students. Scaffolding can be dismantled when students are capable of independently completing clinical practice tasks.[7] Early scaffolding strategies can involve simulation-based training, widely employed in medical education programs, such as training for procedures like

endotracheal intubation and central venous catheterization. Simulation-based training lays a solid foundation for students to gain increasing autonomy in more complex clinical work.

Expression

Expression encourages students to explicitly articulate their thought processes on how they arrive at solutions to complex problems during clinical practice. This is achieved through collective discussions and can foster critical thinking in students. It involves instructors asking questions to students, often using the Socratic method, which involves progressively posing more challenging questions until the limitations of students' knowledge are revealed. This not only helps gauge students' current knowledge levels to lay the foundation for subsequent teaching but also allows students to express their existing knowledge and integrate new knowledge gained, facilitating the demonstration of their thought processes. In turn, instructors can provide targeted instruction.[4,13,14]

Reflection

Similar to expression, reflection is a unique method aimed at deepening students' understanding of their cognitive processes. Students and teachers review the process of clinical practice, enabling students to compare their thinking and problem-solving processes with those of experts, leading to self-correction and insight into their learning and practice processes. The process involves recording and reflecting on acquired knowledge and experiences through reflection journals. Students share their journal entries weekly, allowing classmates to assess and analyze the content, discuss and identify issues, and find solutions. Finally, teachers summarize and distill the reflections.[15] Teachers can also use reflection journals to revisit teaching situations, engage in self-reflection, summarize teaching practices, and address problems encountered during teaching. This facilitates self-reflection and has been employed by clinical mentors in intern education, proving effective in bridging the gap between classroom knowledge and practical clinical application, as well as reinforcing professional skills.[16,17]

Exploration

Exploration aims to empower students to autonomously set their own learning objectives and problem-solving strategies, delving into clinical issues and research hotspots related to the case study for more in-depth investigation and research.

Evaluation Methods

Before and after the teaching intervention, the critical thinking abilities of students undergoing rotations in the critical care medicine department were assessed using a Critical Thinking Ability Measurement Scale. This scale measures seven aspects of critical thinking: truth-seeking, open-mindedness, analytical ability, systematic skills, confidence in critical thinking, curiosity, and cognitive maturity. Each item is rated on a 6-point Likert scale, with a total score ranging from 70 to 420 points. Negative critical thinking ability (<210 points), moderate critical thinking ability (210–279 points), positive critical thinking ability (280–349 points), and strong critical thinking ability (350–420 points) are categorized based on the total score. The clinical thinking and decision-making abilities of both groups of students were evaluated by clinical instructors using the Mini-Clinical Evaluation Exercise (mini-CEX) scale. This comprehensive assessment measures seven aspects of clinical thinking and decision-making: history taking, physical examination, humane care, communication skills, clinical judgment, organizational efficiency, and overall clinical competency. The assessment results are assigned a rating (1–9 points), and statistical analysis is conducted based on the performance and assessment method, with 1–3 points indicating areas for improvement, 4–6 points meeting the standard, and 7–9 points representing excellent performance.

Statistical Analysis

The difference before and after teaching was compared between groups by covariance analysis with the score before teaching as a covariate. The other quantitative data were expressed as $\bar{x} \pm s$, and the comparison between groups was performed by t test. The quantitative indicators that did not meet the normal distribution were represented as $M\ (Q_1,Q_3)$, and the rank sum test was used for comparison between groups. Count data were expressed as frequency (%), and comparison between groups was analyzed by chi-square test. $P < 0.05$ was considered statistically significant.

Research Results

Comparison of General Data Between Two Student Groups

As shown in Table 1, a total of 115 resident physicians meeting the inclusion and exclusion criteria were randomly assigned to the control group and experimental group. Their general data and comprehensive abilities before teaching were evaluated and analyzed. In the control group and experimental group, the male-to-female ratio was 54.2% and 53.6%, respectively, with no significant difference between the two groups, indicating a relatively balanced gender distribution. The age of the control group was 23 (IQR 22–24) years, with a pre-teaching critical thinking ability score of 277.24±36.91, and pre-teaching clinical thinking and decision-making ability of 4.48 ±0.80. The age of the experimental group was 23 (IQR 23–24) years, with a pre-teaching critical thinking ability score of 277.14±37.55, and pre-teaching clinical thinking and decision-making ability of 4.29±0.72. There were no statistically significant differences between the two groups in terms of age, gender, pre-teaching critical thinking ability, and pre-teaching clinical thinking and decision-making ability assessments ($P > 0.05$).

Comparison of Critical Thinking Ability Between Two Student Groups

Before teaching, there were no statistically significant differences in the CTDI-CV scores across dimensions between the two student groups. After teaching, regardless of whether traditional teaching methods or cognitive apprenticeship teaching methods were used for clinical training, both groups showed a significant increase in CTDI-CV scores in all dimensions. Comparing the critical thinking abilities of the two student groups before and after teaching, we found that resident physicians in the experimental group showed significant improvements in four dimensions: truth-seeking, systematic skills, confidence in critical thinking, and curiosity, as well as a significant improvement in overall critical thinking ability compared to the control group. However, there were no significant advantages in the dimensions of open-mindedness, analytical ability, and cognitive maturity, with no statistically significant differences observed, as shown in Table 2.

Table 1 General Information, Pre-Teaching Critical Thinking Ability, Clinical Thinking and Decision-Making Ability Evaluation of Intensive Care Medicine Resident Physicians

	Control Group (n=59)	Experimental Group (n=56)	P value
Gender Male (frequency, proportion)	32, 54.2%	30, 53.6%	0.862
Age (years)	23 (22, 24)	23 (23, 24)	0.310
Total score of critical Thinking ability before teaching (score)	277.24±36.91	277.14±37.55	0.989
Average score of clinical thinking and decision making ability before teaching (score)	4.48±0.80	4.29±0.72	0.076

Table 2 Comparison of Critical Thinking Ability Between the Two Groups of Resident Physicians Before and After Teaching

Dimensionality	Control Group		P value	Experimental Group		P value	Difference Value		t/F	P value
	Before Teaching	After Teaching		Before Teaching	After Teaching		Control Group	Experimental Group		
Search for the truth	39.41±6.89	47.17±7.09	0.001	39.31±6.38	48.85±6.33	0.001	5.73±5.57	10.00±3.76	24.09	<0.001
Open mind	39.88±6.46	41.68±6.56	0.003	38.71±6.06	40.17±5.87	0.034	1.28±4.74	2.57±6.46	4.96	<0.001
Analytical ability	39.43±5.50	47.90±5.71	0.001	39.56±4.85	49.41±4.84	0.001	6.05±6.06	6.68±5.83	0.30	0.028
Systematic ability	39.63±7.22	46.80±7.21	0.001	39.29±6.84	48.63±6.33	0.001	8.20±7.06	9.34±4.73	5.20	<0.001
Confidence in critical thinking	39.20±6.70	46.22±6.92	0.001	39.08±6.94	48.78±6.60	0.001	4.27±5.07	9.57±5.13	38.62	<0.001
Thirst for knowledge	40.15±6.03	47.58±6.40	0.001	39.83±5.92	49.58±6.01	0.001	5.23±5.41	9.26±4.92	16.31	<0.001
Cognitive maturity	39.50±6.22	48.02±6.24	0.001	40.22±5.92	49.86±5.27	0.001	6.05±6.06	6.68±5.83	0.30	0.583
Total points	277.24±36.91	314.54±34.81	0.001	277.14±37.55	336.75±35.22	0.001	37.82±13.13	59.91±13.99	79.26	0.025

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Table 3 Comparison of Clinical Thinking and Decision-Making Ability Between the Two Groups of Resident Physicians Before and After Teaching

Dimensionality	Control Group		P value	Experimental Group		P value	Difference Value		t/F	P value
	Before Teaching	After Teaching		Before Teaching	After Teaching		Control Group	Experimental Group		
History inquiry	4.08±1.83	6.17±1.22	0.001	3.79±1.61	7.02±1.24	0.001	2.14±1.57	3.26±1.60	23.24	<0.001
Physical examination	4.58±1.51	6.44±1.04	0.001	4.38±1.21	7.02±1.04	0.001	2.04±1.88	2.58±1.66	2.85	0.094
Humanistic care	4.49±1.57	6.25±1.06	0.007	4.42±1.43	7.13±0.99	0.001	1.68±1.54	2.62±1.44	22.23	<0.001
Communication skill	4.69±1.63	6.69±0.99	0.005	4.36±1.14	7.05±1.05	0.001	1.64±1.98	2.70±1.66	10.83	0.001
Clinical judgment	4.42±1.49	6.24±1.28	0.001	4.32±1.40	6.92±1.12	0.001	1.84±1.50	2.72±1.68	13.19	<0.001
Organizational effectiveness	4.64±1.69	6.64±1.13	0.003	4.46±1.41	7.27±1.09	0.001	2.00±1.64	2.81±1.58	10.14	0.002
Overall clinical competence	4.46±1.49	6.32±1.07	0.001	4.28±1.40	7.00±1.01	0.001	1.82±1.25	2.74±1.47	16.86	<0.001
Average score	4.48±0.61	6.39±0.48	0.001	4.29±0.54	7.07±0.45	0.001	1.88±0.48	2.78±0.44	129.67	<0.001

Comparison of Clinical Thinking and Decision-Making Abilities Between Two Student Groups

After two months of training in the critical care medicine department, both student groups showed significant improvements in clinical thinking and decision-making abilities compared to before the teaching intervention. Among these, resident physicians who received clinical training using the cognitive apprenticeship teaching method demonstrated significant improvements in six dimensions of the Mini-CEX: history taking, humane care, communication skills, clinical judgment, organizational efficiency, and overall clinical competency, compared to the control group. These differences were statistically significant. However, there were no significant differences observed in the dimension of relatively procedural physical examinations under both teaching methods, with no statistically significant differences, as shown in Table 3.

Discussion

This study, based on the cognitive apprenticeship clinical teaching model, provided practical guidance for clinical instructors, improved the quality of clinical teaching, and explored the applicability of the cognitive apprenticeship model in clinical education. Surveys and follow-ups were conducted with students, and their views also supported the application of the cognitive apprenticeship model in clinical teaching. Our research results show that after this training, all resident physicians were able to grasp the methods and techniques of patient communication, as well as the procedures and precautions for conducting physical examinations and clinical procedures. However, resident physicians in the experimental group demonstrated higher levels of critical thinking and clinical thinking and decision-making abilities compared to the control group, indicating that the implementation of the cognitive apprenticeship teaching model had a positive impact on students' learning outcomes and the development of clinical thinking. Similar conclusions were drawn in the course of clinical radiology skills teaching, where the cognitive apprenticeship-based approach resulted in resident physicians gaining confidence and transferring conceptual knowledge effectively.[18] Beyond skill transfer, our findings suggest that instructor training induces motivational changes that independently enhance teaching effectiveness - a phenomenon warranting further study in faculty development programs.

The cognitive apprenticeship teaching model uses case-based learning scenarios, allowing students to get closer to the real-life clinical situations, which stimulates their interest in learning. In traditional teaching models, students often struggle to gain a tangible understanding of clinical work through theoretical knowledge acquired in the classroom. However, the cognitive apprenticeship teaching model provides training where students observe teachers' language expression, physical examination procedures, and clinical operations during live interactions with patients. During independent practice, teachers observe students' practical processes and provide timely advice and feedback, increasing interaction between teachers and students. This approach encourages resident physicians to express their thoughts and questions clearly, promotes learning through collective discussions, and enhances classroom participation. Finally, resident physicians engage in reflection, revising their own cognitive and practical processes, linking theoretical

knowledge and skills with clinical work, and continuously improving their overall clinical competence.[19,20] Cognitive apprenticeship helps learners emulate the thinking processes of experts in problem-solving during practice, enhancing their advanced thinking and the ability to handle complex tasks.

Critical thinking is an active and rational way of continuously regulating self-awareness towards people, events, and things. It not only reflects comprehensive thinking skills but also embodies humanistic values. In the field of intensive care medicine, where all patients are critically ill, dealing with complex cases involving multiple organ systems and rapid changes in patient conditions, it is essential for intensive care physicians to possess strong critical thinking skills. These skills enable them to calmly analyze and manage evolving patient conditions.[21] Having robust critical thinking skills is particularly vital in the fast-paced and high-pressure environment of intensive care medicine, where medical errors can have severe consequences for patients. Margaret et al research in ICU clinical education also emphasizes the importance of enhancing resident physicians' thinking skills, making thought processes explicit, addressing and eliminating cognitive biases, modeling and inductive reasoning, and evaluating resident physicians' critical thinking abilities.[22] Our study findings further validate the effectiveness of the cognitive apprenticeship teaching model in improving resident physicians' critical thinking abilities. However, the experimental group did not show obvious advantages in the three dimensions of open-mindedness, analytical ability and cognitive maturity, which may be affected by multiple factors such as personal background, educational environment, learning style and practical experience. Although the resident physicians in the experimental group were improved in some aspects, their thinking may still be limited by existing ideas or educational models. Analytical ability is closely related to individual thinking habits and learning methods, and the improvement often requires a systematic learning process and the accumulation of practical experience. The improvement of cognitive maturity is a relatively complex and long-term process, which involves many aspects such as the individual's knowledge level, thinking ability, life experience and so on. It needs more time and experience to gradually improve.[21] To further enhance these competencies, we can consider providing resident physicians with more diverse educational resources and practical opportunities, while encouraging them to actively think and explore new knowledge and ideas.

Scientific clinical thinking and decision-making in medicine involve a process where physicians, centered on the patient, engage in extensive communication, gather detailed medical history, perform physical examinations, and conduct necessary laboratory tests. This process aims to collect the best diagnostic and differential diagnostic evidence. It incorporates critical comprehensive analysis, analogies, diagnosis, and differential diagnosis while considering the patient's family and cultural background. Physicians then formulate personalized plans for diagnosis, treatment, recovery, and prevention and proceed with their execution and adjustment. This thinking process and mental activity require physicians to make preliminary diagnoses and treatment decisions as quickly as possible. Errors in decision-making can lead to severe consequences.[10] Croskerry's research has demonstrated the impact of cognitive and emotional biases on diagnostic reasoning, clinical decision-making, and nursing quality in emergency and general medical settings. Particularly in time-sensitive clinical scenarios, the cultivation of metacognitive awareness - specifically the capacity to recognize and mitigate these inherent cognitive phenomena - represents a critical competency for healthcare providers. This cognitive debiasing not only enhances diagnostic precision but also serves as a fundamental mechanism for optimizing clinical judgments and reducing medical errors.[23,24] Clinical thinking and decision-making are fundamental skills that run throughout clinical practice. Traditional teaching methods primarily focus on knowledge transmission, often neglecting the cultivation of resident physicians' scientific thinking and decision-making abilities. In our research findings, the experimental group, through the cognitive apprenticeship teaching model, made the inner clinical thinking and decision-making processes of the teacher explicit. This allowed students to learn the teacher's scientific thinking methods, enabling them to construct and internalize their clinical abilities based on acquired knowledge. This approach enhanced resident physicians' higher-order thinking skills, knowledge transfer, and integration abilities. It further underscored the advantages of the cognitive apprenticeship teaching model in improving resident physicians' clinical thinking and decision-making.

In summary, this study implemented the cognitive apprenticeship teaching model in the clinical education of standardized training for resident physicians in the intensive care medicine department. It aimed to enhance their clinical comprehensive abilities. The cognitive apprenticeship teaching model significantly improved the residents' self-directed

learning abilities, enhanced their critical thinking, clinical thinking, and decision-making skills. This, in turn, improved the effectiveness of education. It has implications for developing a professional and standardized training system for teaching staff and establishing a scientific training system for clinical thinking and decision-making.

Data Sharing Statement

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of Chengdu medical college (approval number: JG201943), Patients were consented by an informed consent process that was reviewed by the Ethics Committee of Chengdu medical college and certify that the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki. All participants were fully informed about the purpose, methods, possible risks and benefits of the study before participating in the questionnaire, and participated voluntarily on the basis of clear understanding. Participants have the right to withdraw from the study at any time without providing any reason.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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