

Application of Dialogue-Based Drill Teaching in Clinical Internship Training of Critical Care Medicine

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Research Article

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Abstract

Objective

Traditional clinical internship teaching is limited by one-way knowledge infusion, low student participation, and rapid knowledge forgetting. This study aimed to explore a dialogue-based drill teaching model to improve knowledge internalization and clinical reasoning ability among interns in critical care medicine, and to provide an innovative and replicable strategy for medical education reform.

Methods

A dialogue-based drill teaching model was applied in critical care medicine internship training. Focusing on severe cases such as septic shock and ARDS, student-led clinical reasoning dialogues were organized, and students were guided to conduct active evidence retrieval. Faculty provided real-time targeted feedback and interdisciplinary scenario simulation, introduced guideline evidence at key decision points, and used interleaved teaching to strengthen clinical thinking. A total of 20 medical students who participated in clinical internship in July 2025 were enrolled and randomly divided into a control group (traditional teaching) and an observation group (dialogue-based drill teaching), with 10 students in each group. After a two-week standardized intervention, theoretical examination scores (100-point scale), operational skill scores (100-point scale), and self-designed teaching satisfaction scores (10-point scale) were compared between the two groups.

Results

The observation group achieved significantly higher theoretical scores (88.90 ± 4.18 vs. 78.90 ± 6.71 , $P = 0.001$), operational scores (87.90 ± 3.28 vs. 77.40 ± 8.60 , $P = 0.004$), and teaching satisfaction scores (8.80 ± 0.63 vs. 7.70 ± 1.34 , $P = 0.036$) than the control group. The dialogue-based teaching method effectively improved students' theoretical proficiency and operational skills and reduced knowledge forgetting. Highly simulated clinical scenarios also enhanced the efficiency of knowledge transfer.

Conclusion

The student-centered dialogue-based drill teaching drives cognitive conflict and dynamic knowledge restructuring, which effectively optimizes the internalization of critical care knowledge. This model integrates immersive clinical decision training and has high value for popularization in critical care medicine internship and clinical teaching reform.

Introduction

Critical Care Medicine is a clinical discipline focused on the diagnosis and management of critically ill patients. It has gradually taken shape and gained wide recognition in China over the past 40 years ^[1]. Patients in this field often present with unstable vital signs, multiple organ failure, severe infections, and other life-threatening conditions ^[2]. Critical care practitioners are required to identify, assess, and manage these patients in daily practice, while making high-stakes clinical decisions—tasks that are undoubtedly extremely challenging and add complexity to medical education ^[3].

Medical internship acts as a bridge for the transition from medical students to physicians, whose value far outweighs textbook knowledge and serves as an indispensable pathway to becoming qualified medical practitioners. Although teaching approaches including mini-lectures, case discussions, simulation training and clinical practice are applicable to critical care medicine education [4], these methods remain teacher-dominated traditional teaching modes with poor control over student participation. Furthermore, medical students nowadays face increasingly stringent employment requirements and fierce pressure from postgraduate entrance examinations, resulting in insufficient time and energy devoted to internship. Therefore, educational reform is urgently required to improve teaching efficiency during this crucial stage.

This study proposes a student-centered dialogue-based drill teaching method focused on specific diseases. Students take the lead in the learning process, while instructors act as facilitators and error correctors, ensuring full student participation and enhanced teaching efficiency. The implementation mechanism, operational process, and practical effects of this innovative teaching model are elaborated in the present study.

Traditional Teaching Misconceptions and Limitations

It is widely believed that sustained attention, repetitive reading, rote memorization, and repeated application are efficient learning strategies, and this view dominates current medical education practice. Instructors usually extract core knowledge points, deliver simplified explanations, and emphasize repeated practice to help students master professional knowledge and clinical skills. During clinical internships, preceptors generally arrange students to observe and participate in bedside work, aiming to help students accumulate clinical experience.

Although repetitive teaching and routine clinical training are superior to unstructured learning, they only lead to superficial cognitive engagement rather than effective knowledge internalization. Such passive learning modes easily cause rapid knowledge forgetting. The classic forgetting curve theory indicates that approximately 70% of newly acquired knowledge is forgotten in a short term, while the remaining knowledge gradually fades over time ^[5]. Therefore, blocking the continuous forgetting of professional knowledge has always been a core challenge in clinical medical teaching.

Implementation Process of Dialogue-Based Drill Teaching

All interns were divided into groups of 8–10 students. Instructors assigned core critical care disease topics in advance before each teaching session. In each training unit, one student served as the main presenter and systematically explained the diagnosis, differential diagnosis, and treatment strategies of the designated disease based on personal understanding and textbook frameworks. Throughout the session, instructors conducted real-time interactive dialogues to guide thinking, correct cognitive deviations, and raise in-depth exploratory questions. Other students participated in discussions and supplementary comments to ensure full interactive engagement.

All participating students had completed undergraduate theoretical courses and possessed basic reserve of critical care medicine knowledge before the internship. During the on-site speech and dialogue drills, students were not allowed to refer to any textbooks or electronic materials, and all expressions relied entirely on independent memory and logical combining. This teaching design aimed to trigger active cognitive conflict, deepen students' systematic understanding of critical care diseases, build standardized clinical thinking models, and lay a foundation for future clinical practice.

Full Student Participation Based on Interactive Dialogue

The Pareto Principle suggests that in most scenarios, a small proportion of individuals dominate most learning gains, while the majority of students fail to obtain sufficient learning output in traditional classroom teaching. How to improve the participation and learning efficiency of all interns is an urgent problem in clinical teaching reform.

The dialogue-based drill teaching model effectively solves this problem by ensuring that every student takes turns to serve as the keynote speaker and participate in interactive discussions. No student remains in a passive learning state for a long time. Compared with the traditional student-teacher role-playing teaching mode that requires independent PPT production and brings heavy psychological pressure, the simple speech and interactive dialogue design reduces learning barriers and enables all students to participate efficiently.

The educational concept of dialogue teaching has solid theoretical basis. The 20th-century thinker Mikhail Bakhtin proposed that dialogue is the essential way of human existence, and all ideological cognition obtains practical significance through dialogue. German educator Klinberg also emphasized that the essence of teaching lies in multi-dimensional interaction and dialogue between teachers and students, which fully supports the theoretical rationality of the teaching model adopted in this study.

Active Knowledge Retrieval Driven by On-Site Speech

The core goal of clinical teaching is to help students transform passive knowledge reception into active memory consolidation and form stable clinical thinking and operational reflexes. The knowledge system of critical care medicine is complex and rigorous, and clinical work involves diverse and urgent critical

scenarios. Therefore, resisting knowledge forgetting and maintaining proficient knowledge reserve is the key to improving internship quality.

Cognitive educational studies have confirmed that active retrieval is the most effective strategy to inhibit knowledge forgetting. Compared with repeated reading and passive review, knowledge output through quizzes and on-site detection can produce more stable memory effects ^[6, 7]. A classic educational experiment confirmed that knowledge points detected through irregular quizzes obtained significantly higher long-term retention than those only reviewed repeatedly ^[6]. This retrieval enhancement effect has been fully verified in multiple cognitive studies ^[8, 9].

In this study, the student on-site speech mechanism was designed based on active retrieval theory. Without any reference materials, students actively extracted and sorted out disease-related knowledge from memory, which was equivalent to high-efficiency on-site knowledge detection. This process not only helped students identify their own knowledge gaps and cognitive deficiencies but also continuously consolidated memory traces through repeated active retrieval, realizing solid knowledge reserve and efficient internalization.

Timely Teacher Correction and Interleaved Diversified Guidance

The student-centered teaching model does not reduce teachers' teaching responsibilities but puts forward higher requirements for teachers' professional literacy and on-site control ability. Although interns have completed undergraduate theoretical learning, their clinical cognitive system is not yet perfect, and cognitive deviations and knowledge omissions in the face of complex critical care diseases are inevitable. Timely and accurate teacher correction can immediately correct erroneous cognition, which is more efficient than delayed feedback after written examinations.

In the interactive dialogue process, teachers undertook dual teaching responsibilities. First, they accurately judged the rationality of students' clinical thinking and knowledge expression, corrected erroneous concepts and cognitive deviations in real time, and supplemented missing key clinical points. Second, teachers broke through simple error correction and carried out multi-dimensional interleaved guidance, helping students build a systematic and standardized clinical knowledge framework.

Different from the traditional concentrated repetitive training for weak knowledge points, this study adopted interleaved teaching practice based on cognitive science principles. Relevant studies have confirmed that interleaved training of multiple knowledge points and operational skills is superior to single repeated training, which can effectively avoid mechanical memorization and improve the flexibility and stability of knowledge application ^[10, 11]. In the teaching process, teachers alternately explained different disease types and operational key points, mixed diverse clinical scenario analyses, and disrupted solidified thinking modes, so as to improve students' comprehensive clinical decision-making ability.

Cultivation of Students' Growth Mindset

Clinical speech and interactive drills inevitably bring certain psychological pressure to students, and imperfect expression and cognitive errors are common in the learning process. Based on the growth mindset theory proposed by Stanford University psychologist Carol Dweck, individual abilities and cognitive levels are not innate and fixed but can be continuously improved through learning, trial and error, and experience accumulation [12, 13].

Teachers always adhered to the growth mindset orientation in the whole teaching process, guiding students to view errors and deficiencies in speech expression as valuable learning opportunities rather than ability evaluation criteria. Teachers maintained a friendly and encouraging teaching attitude, actively tolerated students' cognitive errors, and encouraged students to try boldly and summarize experience in interactive dialogues. For students with relatively poor performance, targeted encouragement and guidance were provided to reduce learning anxiety.

Integrating growth mindset education into clinical teaching can effectively improve students' psychological resilience and complex problem-solving ability [14]. For critical care medicine with rapidly updated knowledge and complex clinical scenarios, cultivating interns' growth mindset is of great significance for their long-term clinical career development.

Construction of Modern Clinical Cognitive Mental Models

The ultimate goal of critical care internship teaching is to help students transform textbook theoretical knowledge into practical clinical diagnosis and treatment ability, and build a cognitive model consistent with modern clinical work characteristics. Critical care medicine is characterized by rapid disease progression, high decision-making risks, and complex and changeable conditions, which requires interns to have systematic clinical thinking and accurate operational ability.

Based on student-centered interactive dialogue and scenario simulation, this teaching model closely combined theoretical knowledge with clinical practice. Teachers guided students to complete standardized clinical information collection, medical history sorting, physical examination analysis, and auxiliary examination interpretation around typical critical diseases. In the process of diagnosis and differential diagnosis, students were trained to adhere to the principle of etiological monism, comprehensively consider common diseases, frequently-occurring diseases and critical illnesses, and formulate individualized hierarchical diagnosis and treatment plans.

This teaching mode integrates the concepts of modern precision medicine and whole-cycle health management, helping students abandon rigid textbook thinking and build flexible, standardized and practical clinical mental models, so as to adapt to the actual needs of modern critical care clinical work.

Methods

This study adopted a prospective controlled teaching intervention design. A total of 20 medical students who completed clinical internship in the Department of Critical Care Medicine and Emergency of our hospital in July 2025 were enrolled. All participants were randomly divided into the control group and the observation group, with 10 students in each group. The control group received conventional critical care internship teaching, including routine theoretical lectures, typical case discussions, bedside clinical observation, and daily clinical practice, which adopted a teacher-dominated one-way knowledge transmission mode.

On the basis of conventional teaching content, the observation group received additional 45-minute daily dialogue-based drill teaching for two consecutive weeks. The teaching content covered core critical care diseases including severe pneumonia, septic shock, and craniocerebral injury, as well as key clinical operations such as central venous puncture and thoracentesis. The teaching links included student independent speech, real-time teacher-student dialogue, cognitive error correction, interleaved knowledge guidance, and scenario simulation training.

Unified evaluation indicators were adopted for outcome assessment after the two-week intervention. Theoretical knowledge and clinical operational skills were assessed by unified closed-book examinations, with a full score of 100 points for each indicator. Teaching satisfaction was evaluated by a self-designed anonymous questionnaire with a full score of 10 points, and higher scores represented higher recognition of the teaching mode. The 10-point anonymous teaching satisfaction questionnaire used in this study was independently designed by the research team. The complete assessment paper and questionnaire have been uploaded as Supplementary File 1 to ensure evaluation transparency and reproducibility. The complete self-designed and unpublished examination paper for trainee assessment is provided in Supplementary File 1^[15].

All quantitative data were organized and analyzed using Microsoft Excel. Measurement data were presented as mean $\pm$ standard deviation. Independent samples Welch's t-test was used for inter-group comparison. A two-tailed P value < 0.05 was considered statistically significant.

Results

After the two-week teaching intervention, the theoretical scores, operational scores, and teaching satisfaction scores of the two groups of interns were statistically analyzed. All evaluation indicators of the observation group were significantly higher than those of the control group, and the inter-group differences were statistically significant. The detailed data are shown in Table 1.

Table 1

Comparison of internship assessment outcomes between the two groups. Note: Compared with the control group, * $P < 0.05$; Theoretical score: $P = 0.001$, Operational score: $P = 0.004$, Satisfaction score: $P = 0.036$.

Grou	Sample size	Theoretical score	Operational score	Teaching satisfaction score
Control group	10	78.90 ± 6.71	77.40 ± 8.60	7.70 ± 1.34
Observation group	10	$88.90 \pm 4.18^*$	$87.90 \pm 3.28^*$	$8.80 \pm 0.63^*$

Specific statistical results showed that the observation group obtained significantly better theoretical knowledge mastery (88.90 ± 4.18 vs. 78.90 ± 6.71 , $P = 0.001$), higher clinical operational proficiency (87.90 ± 3.28 vs. 77.40 ± 8.60 , $P = 0.004$), and superior teaching satisfaction (8.80 ± 0.63 vs. 7.70 ± 1.34 , $P = 0.036$). The dialogue-based drill teaching mode effectively improved interns' professional knowledge level, clinical practical ability, and learning experience compared with traditional internship teaching.

Discussion

Traditional critical care internship teaching adopts a teacher-dominated passive indoctrination mode, which is limited by single teaching form, low student participation, and passive learning state. Routine observation and repetitive training can only realize superficial knowledge accumulation, which is prone to rapid forgetting and difficult to form systematic clinical thinking, resulting in low teaching efficiency and difficulty in meeting the high training requirements of critical care medicine for clinical decision-making and operational ability.

Different from traditional teaching modes, the dialogue-based drill teaching constructed in this study takes students as the core of clinical learning, and realizes active knowledge internalization based on cognitive retrieval theory. Through student-led independent speech and material-free knowledge output, this mode forces students to sort out clinical logic independently, effectively inhibits knowledge forgetting, and consolidates long-term memory. Combined with real-time teacher error correction and interleaved multi-dimensional guidance, it makes up for the cognitive deviations and knowledge defects of interns in the early clinical stage, and helps students build standardized and systematic critical care clinical thinking framework.

In addition, this teaching model integrates growth mindset education into clinical teaching practice. By tolerating learning errors, encouraging active attempts, and reducing learning pressure, it helps interns establish positive learning cognition, improve psychological resilience in clinical learning, and form good learning habits of active exploration and summary. The high-simulation clinical scenario and interactive dialogue design also shorten the adaptation cycle of interns from theoretical learning to clinical practice, and improve the efficiency of knowledge transformation.

The results of this controlled trial confirmed that the dialogue-based drill teaching mode significantly improved interns' theoretical examination performance, clinical operational skills, and teaching satisfaction, verifying the practical advantages and application value of this innovative teaching method. Nevertheless, this study has certain limitations. This is a single-center teaching intervention study with a small sample size, which may limit the generalizability of the research conclusions. In addition, this study only evaluated the short-term teaching effect within the internship cycle, and the long-term retention effect of clinical knowledge and skills needs further follow-up observation.

In the future, multi-center and large-sample controlled studies will be carried out to further verify the stability and universality of this teaching model. Combining digital teaching platforms and virtual simulation technology to optimize the dialogue drill process can further build refined and hierarchical critical care internship teaching systems, so as to continuously improve the training quality of clinical medical talents.

Declarations

Ethics approval and consent to participate

This study only involved routine medical education teaching evaluation activities, without enrolling patients, collecting biological samples, or obtaining any identifiable individual personal information. All teaching interventions belong to daily educational quality monitoring and reform practice, which does not involve human biomedical research. This study was reviewed and ethical exemption was officially approved by the Medical Ethics Committee of Shanghai Chest Hospital. Therefore, ethical approval and informed consent were exempted in accordance with the Expert Consensus on the Practice of Exemption from Ethical Review in Medical Institutions (Medicine and Philosophy, 2024) and the principles of the Declaration of Helsinki.

Consent for publication

Not applicable. No identifiable individual participant data, clinical images, or personal details are included in this manuscript, so specific consent for publication is not required.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

Y.Z. conceived the study design, completed teaching implementation, performed data collection and statistical analysis, and drafted the full manuscript. H.W. contributed equally to this work, participated in study design, literature collation, manuscript revision and result interpretation. B.H. is the corresponding author, who supervised the entire research process, provided academic guidance, critically revised the manuscript, and finalized the submission

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Data Availability

All datasets generated and analysed during this study are available from the corresponding author on reasonable request.

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Figures

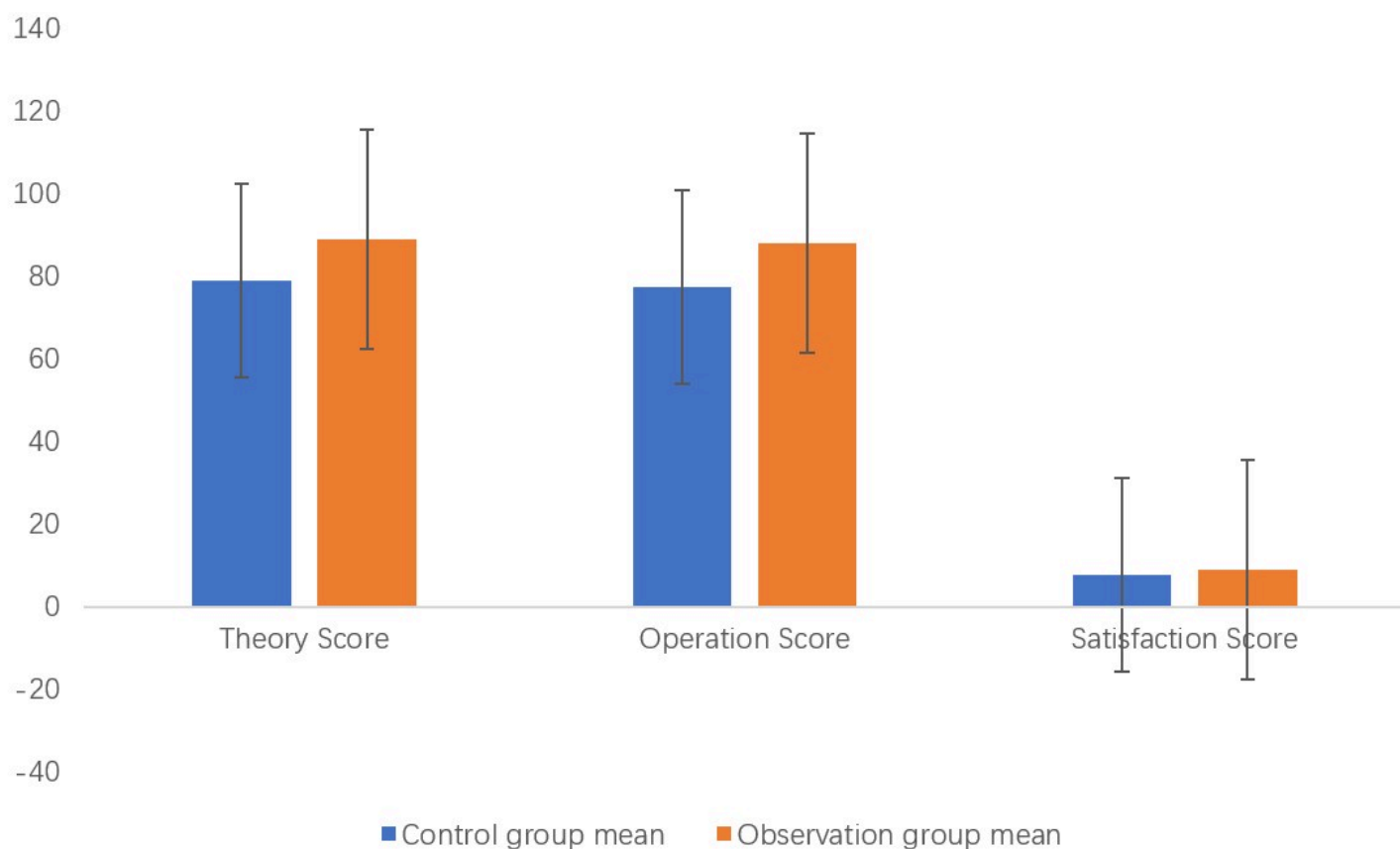


Figure 1

Comparison of teaching outcomes between the two groups. The bar chart illustrates the average theoretical scores, operational scores, and satisfaction scores of interns in the control group and observation group. Error bars represent standard deviation. *P < 0.05 vs control group.

Supplementary Files

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- [SupplementaryFile1.CriticalCareMedicineInternshipTheoreticalAssessmentExaminationPaper.docx](#)