

# Observation on the Application Effect of Clinical Thinking-Oriented Case Discussion Teaching in the Standardized Residency Training of Internal Medicine

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**Abstract:** *Objective:* To observe the application value of a clinical thinking-oriented case discussion teaching model in the standardized residency training of internal medicine, and to provide practical evidence for optimizing the teaching program and enhancing residents' comprehensive clinical competency. *Methods:* A total of 106 residents who rotated through the internal medicine department in a tertiary hospital from July 2023 to June 2025 were selected and randomly divided into an observation group ( $n = 53$ ) and a control group ( $n = 53$ ) using a random number table. The control group received conventional teaching, consisting mainly of theoretical lectures and routine teaching ward rounds; the observation group additionally received clinical thinking-oriented case discussion teaching over a 6-month period. The two groups were compared in terms of multidimensional clinical thinking scores (evidence-based retrieval ability, differential diagnosis construction, treatment plan weighing, risk prediction and adverse event identification, and total clinical thinking score), post-competency assessment scores (subscores for clinical practice, doctor-patient communication, multidisciplinary collaborative management, and quality of medical documentation, as well as total competency score), self-directed learning behaviors (proactive guideline and literature searching, proactive case thinking note-taking, and proactive diagnostic questioning), and teaching satisfaction. *Results:* All scores in the observation group were significantly higher than those in the control group (all  $P < 0.05$ ), including overall teaching satisfaction. *Conclusion:* The implementation of clinical thinking-oriented case discussion teaching in internal medicine residency training can strengthen residents' evidence-based reasoning and risk prediction abilities, enhance comprehensive post-competency, and improve self-directed learning status, with positive teaching feedback. This approach is suitable for broader application in internal medicine residency training bases.

**Keywords:** Standardized residency training; Internal medicine; Case discussion; Clinical thinking; Post-competency

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# 1. Introduction

Standardized residency training is a critical transition phase from medical graduates to licensed clinicians. As a core rotation department in residency training, internal medicine bears the fundamental task of consolidating basic medical knowledge and shaping clinical diagnostic thinking <sup>[1]</sup>. Clinical thinking refers to a physician's comprehensive reasoning ability that integrates medical history, physical signs, ancillary tests, and evidencebased data to conduct differential diagnosis, weigh pros and cons, and anticipate risks. It also represents a weak link in current internal medicine residency training <sup>[2]</sup>. Traditional teaching models tend to emphasize knowledge delivery and skill demonstrations, with residents accustomed to passively receiving diagnostic conclusions, while receiving insufficient training in the logic of disease differentiation, the rationale behind treatment choices, and the identification of potential risks. Some residents exhibit a tendency to "prioritize tests over reasoning, and conclusions over inference," resulting in limited approaches when facing complex or atypical cases, which fails to meet the competency requirements of modern internal medicine practice <sup>[3]</sup>. Teaching case discussions are an important component of residency training activities; however, conventional case discussions often devolve into case reporting and knowledge recitation, lacking the dissection of clinical reasoning chains and failing to fully realize the training value of thinking. Clinical thinkingoriented case discussion teaching, using authentic clinical cases as carriers, shifts the teaching focus from "disease knowledge explanation" to "reconstruction of the diagnostic reasoning process," guiding residents to fully replicate the entire clinical reasoning chain—including information collection, hypothesis building, differential exclusion, treatment weighing, and risk assessment—thereby achieving simultaneous enhancement of knowledge internalization and competency <sup>[4]</sup>. This study enrolled 106 internal medicine residents for a comparative observation, aiming to provide empirical references for the reform of internal medicine residency teaching.

## 2. General information and methods

### 2.1. General information

A total of 106 residents who received standardized training in the Department of Internal Medicine of our hospital from July 2023 to June 2025 were selected and divided into an observation group and a control group using a random number table, with 53 residents in each group. In the control group, there were 28 males and 25 females, aged 23–28 years, with a mean age of  $25.14 \pm 1.72$  years; 44 held a bachelor's degree, and 9 held a master's degree. In the observation group, there were 26 males and 27 females, aged 22–29 years, with a mean age of  $24.96 \pm 1.85$  years; 42 held a bachelor's degree, and 11 held a master's degree. There were no statistically significant differences between the two groups in terms of gender, age, or educational background ( $P > 0.05$ ), indicating comparability.

Inclusion criteria: (1) met the national admission standards for standardized residency training and passed the entry assessment for the internal medicine rotation; (2) rotation duration in internal medicine  $\geq 6$  months; (3) participated in all teaching activities of this study with complete records; (4) provided informed consent and voluntarily participated in this teaching research. Exclusion criteria: (1) prolonged leave or interruption of rotation during the rotation period; (2) rotation extended due to failing the assessment; (3) withdrawal from the residency program. This teaching research was approved by the Teaching Ethics Committee of our hospital.

## 2.2. Teaching methods

Residents in both groups followed the national internal medicine residency training syllabus requirements, with consistent rotation departments, chief supervising faculty, assessment question banks, and rotation duration. The total intervention period was 6 months.

### 2.2.1. Control group

The control group received the traditional internal medicine teaching model, which included lectures, teaching ward rounds, and case reporting. Teaching ward rounds were led by supervising physicians, who conducted history confirmation, physical examination demonstrations, knowledge delivery, and formulation of diagnosis and treatment plans. Case reporting involved residents briefly presenting the key points of medical records, with supervising physicians supplementing the main points, without a dedicated clinical reasoning deconstruction session. Residents completed routine clinical work and participated in monthly endofrotation assessments.

### 2.2.2. Observation group

The observation group retained the traditional teaching and additionally received clinical thinking-oriented case discussions, held once every two weeks, each lasting 90–120 minutes, chaired by an internal medicine physician of associate chief physician rank or above. The discussions followed the procedure of “case prepresentation–staged information disclosure–hypothesis deduction–differential analysis–evidencebased balancing–risk prediction–debriefing and reflection.”

- (1) Case selection: Complex, atypical, and real clinical cases with diagnostic conflicts were selected, involving difficult differentials, multiple comorbidities, treatment contradictions, and potential risks, while avoiding simple textbook cases. Deidentified cases were distributed 3 days in advance with preparatory assignments, requiring residents to preliminarily outline diagnostic hypotheses, necessary examinations, and clinical questions.
- (2) Staged information disclosure: Simulating real patient consultations, examination data were presented in stages, guiding residents to propose diagnostic hypotheses based on the available information and to specify supporting evidence and exclusion criteria, thereby enhancing iterative reasoning ability.
- (3) Thinking seminar: The instructor did not directly provide conclusions but instead used progressive questioning to guide residents through information assessment, differential diagnosis construction, weighing of treatment options, analysis of comorbidities and drug effects, and risk prediction, encouraging the exchange of diverse diagnostic perspectives.
- (4) Evidencebased training: Residents were guided to consult guidelines and authoritative literature, make decisions based on evidence, and strengthen their skills in literature retrieval and evidence application.
- (5) Debriefing and summary: The complete reasoning logic was reviewed, reasoning deficiencies were pointed out, thinking patterns for similar diseases were summarized, and postclass reflective tasks were assigned.

## 2.3. Observation indicators

The observation indicators in this study differed from conventional single theoretical or practical scores and were set in four dimensions: (1) Multidimensional clinical thinking scores, including four subitems: evidencebased retrieval ability, differential diagnosis construction, treatment plan weighing, and risk

prediction and adverse event identification, each scored 0–25 points, with a total score of 0–100 points; (2) Post competency assessment scores: a comprehensive endofrotation examination was conducted, comprising four subitems: clinical practice, doctorpatient communication, multidisciplinary collaborative management, and quality of medical documentation, each scored 0–25 points, with a total score of 0–100 points; (3) Selfdirected learning behavior evaluation: the proportions of residents who proactively searched guidelines and literature, proactively organized case thinking notes, and proactively raised diagnostic questions were recorded; (4) Teaching satisfaction questionnaire: using a 5point Likert scale, categorized as very satisfied, satisfied, neutral, dissatisfied, and very dissatisfied; overall satisfaction = (number of very satisfied + satisfied) / total number  $\times$  100%.

## 2.4. Statistical analysis

Data analysis was performed using SPSS 27.0 statistical software. Continuous data were expressed as mean  $\pm$  standard deviation (SD), and comparisons between groups were conducted using the independent samples *t* test. Categorical data were expressed as counts (%), and comparisons were made using the  $\chi^2$  test. A *P* value of  $<0.05$  was considered statistically significant.

## 3. Results

### 3.1. Comparison of multidimensional clinical thinking scores between the two groups

After 6 months of intervention, the observation group showed significantly higher scores than the control group in evidencebased retrieval ability, differential diagnosis construction, treatment plan weighing, risk prediction, and adverse event identification, and total clinical thinking score (all  $P < 0.001$ ), as shown in Table 1.

**Table 1.** Comparison of multidimensional clinical thinking scores between the two groups of residents (mean  $\pm$  SD, points)

| Group                          | Evidencebased retrieval ability | Differential diagnosis formulation | Treatment plan weighing | Risk prediction and adverse event identification | Total clinical reasoning score |
|--------------------------------|---------------------------------|------------------------------------|-------------------------|--------------------------------------------------|--------------------------------|
| Control group ( $n = 53$ )     | 16.27 $\pm$ 2.41                | 15.81 $\pm$ 2.33                   | 15.42 $\pm$ 2.26        | 14.93 $\pm$ 2.18                                 | 62.43 $\pm$ 7.36               |
| Observation group ( $n = 53$ ) | 20.15 $\pm$ 2.06                | 19.74 $\pm$ 2.12                   | 19.28 $\pm$ 2.04        | 18.86 $\pm$ 2.21                                 | 78.03 $\pm$ 6.82               |
| <i>t</i> value                 | 8.911                           | 9.178                              | 9.251                   | 9.260                                            | 11.304                         |
| <i>P</i> value                 | $<0.001$                        | $<0.001$                           | $<0.001$                | $<0.001$                                         | $<0.001$                       |

### 3.2. Comparison of post competency assessment scores between the two groups of residents

The observation group scored significantly higher than the control group in all subitems, including clinical practice, doctorpatient communication, multidisciplinary collaborative management, quality of medical documentation, and the total post competency score (all  $P < 0.001$ ), as shown in Table 2.

**Table 2.** Comparison of post competency assessment scores between the two groups of residents  
(mean  $\pm$  SD, points)

| Group                          | Clinical practice | Doctor-patient communication | Multidisciplinary collaborative management | Quality of medical records | Overall competency score |
|--------------------------------|-------------------|------------------------------|--------------------------------------------|----------------------------|--------------------------|
| Control group ( $n = 53$ )     | 17.14 $\pm$ 2.35  | 16.62 $\pm$ 2.27             | 15.79 $\pm$ 2.14                           | 16.05 $\pm$ 2.22           | 65.60 $\pm$ 7.48         |
| Observation group ( $n = 53$ ) | 20.46 $\pm$ 2.17  | 19.83 $\pm$ 2.09             | 19.31 $\pm$ 2.03                           | 19.57 $\pm$ 2.11           | 79.17 $\pm$ 7.05         |
| $t$ value                      | 7.573             | 7.551                        | 8.684                                      | 8.343                      | 9.987                    |
| $P$ value                      | <0.001            | <0.001                       | <0.001                                     | <0.001                     | <0.001                   |

### 3.3. Comparison of selfdirected learning behaviors between the two groups of residents

The proportions of residents in the observation group who actively searched for guidelines and literature, actively organized casethinking notes, and actively raised diagnostic questions were all higher than those in the control group (all  $P < 0.001$ ), as shown in **Table 3**.

**Table 3.** Comparison of selfdirected learning behaviors between the two groups of residents [ $n$  (%)]

| Group                          | Actively consulted guideline literature | Actively organized case thinking notes | Actively raised clinical questions |
|--------------------------------|-----------------------------------------|----------------------------------------|------------------------------------|
| Control group ( $n = 53$ )     | 22 (41.51)                              | 18 (33.96)                             | 20 (37.74)                         |
| Observation group ( $n = 53$ ) | 38 (71.70)                              | 34 (64.15)                             | 36 (67.92)                         |
| $\chi^2$                       | 9.832                                   | 9.664                                  | 9.691                              |
| $P$                            | 0.002                                   | 0.002                                  | 0.002                              |

### 3.4. Comparison of teaching satisfaction between the two groups of residents

The overall teaching satisfaction in the observation group was higher than that in the control group ( $P < 0.05$ ), as shown in **Table 4**.

**Table 4.** Comparison of teaching satisfaction between the two groups of residents [ $n$  (%)]

| Group                          | Very satisfied | Satisfied  | Neutral    | Dissatisfied | Very dissatisfied | Overall satisfaction |
|--------------------------------|----------------|------------|------------|--------------|-------------------|----------------------|
| Control group ( $n = 53$ )     | 14 (26.42)     | 21 (39.62) | 12 (22.64) | 4 (7.55)     | 2 (3.77)          | 35 (66.04)           |
| Observation group ( $n = 53$ ) | 24 (45.28)     | 23 (43.40) | 5 (9.43)   | 1 (1.89)     | 0 (0.00)          | 47 (88.68)           |
| $\chi^2$                       |                |            |            |              |                   | 7.756                |
| $P$                            |                |            |            |              |                   | 0.005                |

## 4. Discussion

The core objective of standardized residency training in internal medicine is to cultivate physicians capable of independently undertaking clinical duties. Clinical thinking ability directly determines the level of competence in handling real clinical problems and represents a key focus of the residency completion assessment<sup>[5]</sup>. In traditional teaching models, case discussions often remain at the level of case reporting and knowledge review, lacking indepth deconstruction of the clinical reasoning process. Residents passively receive established diagnostic and treatment plans, without deep reflection on “why this diagnosis,” “why this plan,” or “where the risks lie.” When faced with complex comorbidities or atypical cases, they tend to

develop rigid thinking patterns, and their competency enhancement becomes limited.

The present study established a clinical thinking-oriented case discussion teaching approach. The core of this approach is not to teach disease knowledge *per se*, but to reconstruct the entire real-world clinical decision-making process. Through a closed-loop teaching sequence involving phased release of case information, hypothesis generation, differential analysis, evidence-based weighing, risk prediction, and debriefing reflection, the training focus was placed on cognitive steps such as information filtering, diagnostic hypothesis construction, evidence selection, benefit/risk balancing, and adverse event anticipation, thereby guiding residents to shift from “memorizing diseases” to “learning how to approach clinical practice”<sup>[6]</sup>. The results of this study showed that residents in the observation group achieved significantly improved scores in the four clinical thinking subdomains: evidence-based retrieval ability, differential diagnosis construction, treatment plan weighing, and risk prediction with adverse event identification. In contrast to the traditional evaluation system that focuses solely on theoretical written examinations, the present assessment emphasized reasoning ability and risk awareness in the clinical decision-making process, rather than mere memorization of disease knowledge.

The post-competency assessment results indicated that the observation group demonstrated simultaneous improvements in clinical practice, doctor-patient communication, multidisciplinary collaborative management, and quality of medical documentation. Clinical thinking training is not simply logical deduction; it drives overall clinical competency enhancement: comprehensive diagnostic reasoning helps residents obtain histories more precisely and grasp communication priorities<sup>[7]</sup>; discussion of multisystem comorbid cases promotes the development of a multidisciplinary perspective; and thorough organization of diagnostic logic directly improves the analytical and judgmental sections of medical records, thereby enabling thinking training to boost overall clinical competence. At the same time, the observation group showed significantly higher proportions of positive self-directed learning behaviors, including active guideline and literature searching, case thinking note-taking, and active questioning, indicating that this teaching model can stimulate residents’ initiative in inquiry, transform them from passive knowledge recipients to active constructors of clinical knowledge systems, and form a positive learning cycle<sup>[8,9]</sup>. The teaching satisfaction survey also reflected higher acceptance of this model among residents.

In actual implementation, several key points warrant attention. First, case selection should balance typicality and complexity, avoiding overly simplistic textbook examples, and preferentially using real deidentified cases that involve differential diagnostic challenges, multiple comorbidities, or therapeutic conflicts. Second, instructors should refrain from directly providing standard answers, and instead use guided questioning to facilitate trainees’ reasoning, protecting residents’ enthusiasm for critical thinking. Third, the pace of discussion should be controlled to ensure that every resident participates and expresses opinions, avoiding domination by a few trainees. Fourth, post-session debriefing and reflection should be emphasized, summarizing the thinking gaps identified during the discussion and consolidating thinking paradigms<sup>[10]</sup>.

The present study has certain limitations. It is a single-center study with a limited sample size and a follow-up period of only six months; the long-term effects need further validation through multicenter, large-sample studies. Future work may further stratify cases, design gradient case discussion tasks for junior versus senior residents, refine clinical thinking assessment tools, and continuously optimize the teaching program for internal medicine residency.

## 5. Conclusion

In summary, clinical thinking-oriented case discussion teaching shifts the teaching focus from knowledge transmission to clinical reasoning chain training. It can significantly enhance residents' abilities in evidence-based retrieval, differential diagnosis, treatment weighing, and risk prediction in internal medicine training, improve overall post competency, and promote self-directed learning awareness. The teaching feedback from trainees has been positive, and this approach is suitable for broader promotion and application in internal medicine residency training bases.

## Disclosure statement

The authors declare no conflict of interest.

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