Comparative Analysis of Pathology Case Teaching Models at Home and Abroad: Current Status, Differences, and Insights

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Abstract: This article reviews the current status, differences, and potential impacts of pathology case teaching models both domestically and internationally. Through a comparative analysis of various teaching methods, technological applications, assessment systems, and educational outcomes in pathology case teaching across different countries, the study explores the advantages and shortcomings of each approach. The aim of this review is to provide insights for the reform of domestic pathology education, fostering the optimization and innovation of teaching models. By understanding the diverse methodologies and their implications, educators can enhance the learning experience and outcomes for medical students in the field of pathology.

Keywords: Pathology; Case Teaching; Teaching Models; Domestic and International Comparison; Medical Education

1. Introduction

Pathology is vital in medical education, underpinning clinical reasoning and practical skills. As the field evolves, teaching methods have transformed, with Case-Based Learning (CBL)—emphasizing interactive engagement with real cases—standing out for boosting critical thinking and problem-solving, key for future healthcare professionals. Yet, domestic and international implementation of CBL differs sharply. This review analyzes these differences, focusing on educational philosophies, tech advancements, and policy influences[1].

CBL reflects a shift toward student-centered learning, contrasting traditional lectures by encouraging active engagement, peer collaboration, and application to clinical scenarios—preparing students for real-world patient care complexities. Recent studies note digital tools like Twitter enrich CBL by facilitating global case sharing and collaborative learning, letting students and professionals connect worldwide[2].

Technology, particularly digital pathology and AI, has revolutionized the field: digital slides enable remote access, while AI aids diagnosis training, exposing students to cutting-edge tools. However, integrating these technologies requires

balance—ensuring adequate training and avoiding overshadowing traditional methods.

In summary, comparing domestic and international pathology education highlights major gaps in CBL use and tech integration. Understanding these can identify best practices to reform education, equipping students better for their careers—insights valuable for educators and policymakers aiming to enhance medical education quality and patient care.

2. Main Body

2.1. The development of pathology case teaching at home and abroad

2.1.1. The origin and current situation of pathology case teaching in China

The development of pathology case-based learning (CBL) in China has been relatively recent, primarily relying on traditional lecture-based teaching methods. Historically, medical education in China has emphasized rote memorization and theoretical knowledge, which often leaves students ill-prepared for practical clinical situations. However, in recent years, there has been a gradual shift towards more interactive and student-centered learning approaches, such as CBL and problem-based learning (PBL). These methods encourage active engagement and critical thinking, which are essential for mastering complex subjects like pathology[3]. For instance, some medical schools in China have begun to integrate digital pathology slides with case studies, allowing students to analyze real-life examples and improve their diagnostic skills. Despite these advancements, the adoption of CBL remains limited, with many institutions still predominantly using traditional teaching methods. The widespread implementation of innovative teaching strategies is hindered by a lack of resources, training, and institutional support, which affects the overall quality of pathology education in the country. As a result, while there are promising developments in the integration of CBL, the current state of pathology education in China still requires significant improvement to fully prepare students for the challenges they will face in clinical practice[4].

2.1.2 The Evolution and Maturity of Pathology Case Teaching Abroad

In contrast, Western medical education (notably Europe and North America) has more systematically developed case-based learning (CBL) in pathology since the 1980s. Early adopters recognized CBL's value in boosting critical thinking and clinical reasoning. Institutions like Harvard pioneered initiatives such as the "Virtual Pathology Laboratory," using real clinical cases to let students engage with authentic scenarios—enhancing pathology understanding and preparing them for real diagnostic challenges via simulated clinical decision-making.

Digital pathology tools, advanced imaging, and AI have further improved CBL: students analyze high-res digital slides and get immediate feedback on diagnostic skills. This systematic CBL approach has built a robust framework integrating practical cases, better equipping students to handle pathology complexities. The result is clinicians skilled at applying knowledge in clinical settings[5].

2.2. Teaching Method Comparison Analysis

2.2.1. Domestic Teacher-Dominated Case Teaching Model

In contrast, the domestic case teaching model is teacher-centered, with teachers leading the design and delivery of cases, resulting in students passively receiving information and lacking interactive participation. Most cases are pre-set by teachers, focusing on content that aligns with exam requirements, which is not conducive to students engaging in open discussions and critical thinking to deepen their understanding.

This model emphasizes rote memorization and exam preparation, limiting the breadth of learning. Students struggle to fully explore the complexities and nuances of cases, and it also neglects the cultivation of essential skills in the medical field such as teamwork and collaborative problem-solving. Limited interaction between teachers and students can stifle creativity and hinder students from expressing their views or challenging existing paradigms. Although this model can provide a structured learning environment, it may ultimately impede the development of independent thinking and practical application abilities, which are key competencies for future medical professionals[6].

2.2.2. International Student-Centered Case Teaching Model

In contrast, the international student-centered case teaching model emphasizes students' active participation and collaboration. Students lead case analysis, with educators facilitating discussions and encouraging critical thinking, fostering a dynamic environment where they engage deeply, share insights, and learn from each other. Cases prioritize authenticity, complexity, and interdisciplinary knowledge to reflect real-world challenges, enhancing relevance and preparing students for multifaceted career problems. Teamwork focuses on building key healthcare skills like communication and collaborative decision-making. Research shows such students have higher motivation, better comprehension, and stronger critical thinking than those in traditional lectures[7]. Additionally, the integration of case-based learning with innovative teaching strategies, such as the flipped classroom model, has shown promising results in enhancing educational outcomes in medical education. Overall, the student-centered approach not only enriches the learning experience but also aligns more closely with the competencies required in contemporary medical practice, making it a more effective teaching modality in pathology and other medical disciplines [6].

2.3. Comparison of Assessment Systems

2.3.1. Domestic Examination-Centric Assessment Methods

Domestic medical education's dominant assessment approach is heavily exam-focused, emphasizing rote memorization over applying knowledge in practice. Exams prioritize recalling facts over practical use, with few case analysis questions limiting critical thinking and problem-solving opportunities. Reliance on high-stakes tests narrows learning—students may excel at testing but struggle to apply knowledge clinically[8].

This exam-centric model lacks a dynamic framework to assess comprehensive abilities over time, failing to capture evolving medical competencies like clinical reasoning, teamwork, and communication—vital for patient care[9]. These static assessments don't reflect real-world medical complexities, where adaptability and continuous learning matter[10]. Thus, a more holistic evaluation system is urgently needed, one that assesses knowledge retention while fostering critical thinking and practical skills in medical students[11].

2.3.2. International Diverse Assessment Mechanisms

In contrast, many international medical education systems have adopted more diversified assessment mechanisms that combine formative evaluations with traditional summative assessments. This approach, encompassing group performances, report writing, and oral defenses, enables a more comprehensive evaluation of students' capabilities. The integration of formative assessments provides ongoing feedback, allowing students to identify their strengths and weaknesses during the learning process.

Additionally, the introduction of standardized patients (SPs) and simulated clinical scenarios has transformed assessment, enabling students to demonstrate clinical skills in a controlled environment. These innovative methods not only enhance learning experiences but also better prepare students for complex patient interactions in real clinical settings. Through practical simulations and immediate feedback, students can refine clinical skills and deepen their understanding of patient care dynamics[12].

This multifaceted assessment approach fosters a culture of continuous improvement and lifelong learning—essential qualities for future healthcare professionals. As medical education evolves, drawing insights from these international practices to enhance domestic assessment systems is crucial, ensuring they meet the demands of modern healthcare environments [13].

2.4. An empirical study of teaching effectiveness

2.4.1. Limitations of domestic pedagogical effectiveness

The limitations of domestic teaching effectiveness in pathology education are evident in several key areas. One significant issue is the insufficient improvement in students' clinical thinking and self-directed learning abilities. Research indicates

that while case-based learning (CBL) is intended to enhance these skills, many students report minimal gains in their ability to think critically and learn autonomously when compared to traditional theoretical instruction. For instance, a study found that students expressed lower satisfaction levels with case-based teaching methods than with conventional lectures, indicating a disconnect between the intended educational outcomes of CBL and the actual experiences of students [14]. Furthermore, the lack of engagement and interaction during case discussions often leads to a passive learning environment, which diminishes the potential benefits of CBL. This situation is exacerbated by the limited exposure to real clinical scenarios, as many students are primarily taught through simulated cases rather than through direct patient interactions. Consequently, the overall effectiveness of domestic pathology education is undermined, as students struggle to translate theoretical knowledge into practical skills, ultimately impacting their preparedness for clinical practice.

2.4.2. The superiority of foreign teaching effect

In contrast, international studies have highlighted the superior effectiveness of CBL in enhancing students' clinical reasoning and teamwork skills. Evidence suggests that CBL significantly improves diagnostic accuracy and collaborative abilities among medical students. For instance, a systematic review demonstrated that students engaged in CBL showed marked improvements in their ability to make accurate diagnoses and work effectively within teams compared to those who received traditional instruction [15]. This success can be attributed to the interactive nature of CBL, which fosters active participation and encourages students to engage with complex clinical cases in a supportive environment. Additionally, students reported higher levels of satisfaction and acceptance of the CBL methodology, indicating that they felt more involved and invested in their learning process. The emphasis on collaboration in CBL settings not only enhances individual learning outcomes but also prepares students for the realities of clinical practice, where teamwork is essential for patient care. Overall, the international perspective on CBL underscores its effectiveness as a pedagogical approach that not only improves clinical skills but also enriches the educational experience of students, making it a valuable model for adaptation in domestic settings.

2.5. Analysis of the Causes of Differences between Domestic and International Teaching Models

2.5.1. The Impact of Educational Philosophy and Cultural Background

In pathology education, domestic and international teaching models differ significantly, shaped by varying educational philosophies and cultural backgrounds. Domestically, emphasis lies on knowledge transmission— instructors deliver content-heavy lectures, prioritizing rote memorization and theoretical understanding, which may limit critical thinking and practical skills for real-world use.

In contrast, international frameworks (notably Western) focus on competency-based education, encouraging active learning and practical skill development through collaboration and experiential opportunities. Cultural differences amplify this: Western cultures value student autonomy and critical inquiry, unlike the more hierarchical, teacher-centered domestic approaches.

Moreover, better student-to-faculty ratios in many international medical schools enable smaller classes and personalized instruction, boosting engagement and mentorship. This structural edge helps develop competencies aligned with modern medical practice, underscoring the need for domestic institutions to reassess and reform strategies to achieve similar results[16].

2.5.2. Disparities in Policy and Resource Investment

Differences in pathology education outcomes between domestic and international models also stem from varying policy frameworks and resource allocation. Internationally, governments often provide substantial funding for medical education, supporting faculty development, advanced teaching technologies, and updated resources. This enables innovative methodologies, state-of-the-art facilities, and enhanced learning environments.

In contrast, domestic institutions frequently face budget constraints, limiting investment in faculty training and

modern tools, leading to outdated curricula and practices that fail to meet evolving medical education demands. The rapid pace of technological advancement requires constant curricular and methodological updates— a challenge domestic institutions struggle with due to insufficient funding and support.

Inadequate investment in faculty training and access to contemporary resources hinders their ability to deliver competitive, effective education. This resource gap affects educational quality and graduate preparedness, impacting future clinical performance. To bridge it, domestic policies must prioritize investment in medical education, equipping institutions to deliver high-quality training meeting national and international standards.

3. Conclusion

Exploring pathology case teaching models reveals notable disparities between domestic and international practices in methods, technologies, assessments, and effectiveness. Experts note that international models—featuring student-centered approaches, advanced tech integration, and diverse assessments—hold significant advantages over traditional domestic methods. This conclusion synthesizes findings, emphasizing the need for a balanced approach integrating diverse research perspectives to enhance pathology education.

The international student-centered paradigm promotes active learning and critical thinking—vital for future healthcare professionals—unlike domestic lecture-based methods that may hinder such skills. Adopting a more student-centered approach fosters inquiry and engagement, enriching learning.

Educators' roles are evolving: shifting from "lecturers" to "facilitators" or "guides" is key to creating interactive, supportive environments. Equipped with proper skills, educators can guide complex case discussions, encouraging critical and independent thinking—boosting engagement and preparing students for real-world medical challenges.

Future research should focus on localizing international best practices to fit domestic contexts. Understanding unique challenges and cultural factors in pathology education is crucial for optimizing case teaching models. Collaboration among educators, researchers, and policymakers can share successful strategies, ultimately improving educational outcomes.

In conclusion, the disparities in pathology case teaching models between domestic and international contexts highlight the need for a comprehensive approach that balances various perspectives and findings. By embracing student-centered methodologies, leveraging advanced technologies, reforming assessment practices, and redefining the role of educators, domestic pathology education can be significantly enhanced. The path forward lies in the commitment to continuous improvement and adaptation, ensuring that future healthcare professionals are well-equipped to meet the demands of an ever-evolving medical landscape.

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