

[Review]

Challenges and strategies for cultivating young teachers in pathophysiology departments at Chinese medical colleges: a narrative review

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Abstract

This narrative review examines the challenges, strategies, and future directions in the development of young teachers within the pathophysiology departments of Chinese medical colleges. A thorough review of 49 studies published between 2013 and 2024 was carried out using PubMed, Web of Science, and various Chinese databases. The primary challenges identified include teaching innovation (cited in 84.2% of the studies), research pressure (91.2%), disciplinary characteristics (87.7%), and career development (80.7%). Medical schools have responded by enhancing training systems (94.7%), innovating teaching methods (93.0%), and bolstering research support (96.5%). Looking ahead, trends are shifting toward the application of new technologies, interdisciplinary integration, and international collaboration. The focus on cultivating young teachers is increasingly geared towards personalization and diversification, which are essential for advancing education in pathophysiology. High-quality young teachers are pivotal in raising teaching standards, fostering research innovation, and facilitating interdisciplinary exchanges. Based on these insights, we recommend several practical measures to enhance the quality of pathophysiology education in China. These include establishing comprehensive training programs that integrate teaching innovation and research skills; developing structured mentorship systems with clear pathways for career advancement; creating platforms that support technology-enhanced teaching and international collaboration; and implementing systematic evaluation mechanisms to assess teaching effectiveness. These targeted interventions will require a coordinated effort from department heads, educational institutions, and policymakers to ensure a sustained improvement in the quality of pathophysiology education.

Keywords: Pathophysiology; Young teachers; Faculty development; Medical education; Educational measurement

Introduction

Background

Pathophysiology, which serves as a "bridge" between basic medical sciences and clinical medicine [1], occupies a crucial position in medical education [2]. It equips medical students with a theoretical foundation to understand disease mechanisms and enhances their clinical reasoning skills, thereby playing an indispensable role in the training of high-quality medical professionals [3]. With the rapid advancement of medical technology and continuous innovation in healthcare models, both the content [4] and methods of teaching pathophysiology are encountering unprecedented challenges and opportunities [5].

In the context of pathophysiology education, young teachers—typically faculty members aged 35 or younger with less than five years of teaching experience—play a crucial role in discipline construction and talent cultivation. Their influence directly affects the quality and future development of the field. These educators are expected to have a robust foundation in professional knowledge [6] and to demonstrate advanced teaching concepts, proficient teaching skills, strong research capabilities, and competencies in interdisciplinary collaboration [7]. However, pathophysiology departments at Chinese medical schools currently face numerous challenges in cultivating young teachers [8].

These challenges include the following:

- 1) The accelerating pace of expansion in medical knowledge, which requires continuous learning of new knowledge and technologies;
- 2) Innovations in teaching methods, such as flipped classrooms [9] and problem-based learning (PBL), which place higher demands on teaching abilities [10];
- 3) The pressure to balance research with teaching tasks, securing funding, and producing high-quality research outputs [11]; and

4) The trend for interdisciplinary integration, which requires cross-disciplinary perspectives [12] and collaboration skills [13].

Objectives

This nationwide narrative review systematically analyzes the primary challenges faced in cultivating young teachers within the pathophysiology departments of Chinese medical schools. It aims to propose targeted strategies and suggestions to optimize the young teacher cultivation system and provide a theoretical basis and practical guidance for enhancing the quality of pathophysiology education in China. This research is particularly relevant to educational administrators, heads of pathophysiology departments, and policymakers in medical education. By conducting a comprehensive literature review, case analysis, and summarizing experiences, this study contributes to the understanding of how to train young teachers in medical education, with a focus on pathophysiology. It also offers insights for educational evaluation and policymaking in health professions education at the national level.

Methods

Ethics statement

This is a literature-based study; therefore, neither approval by the institutional review board nor the obtainment of informed consent was required.

Study design

This is a nationwide narrative review based on a comprehensive search and analysis of published literature on the cultivation of young teachers in the pathophysiology departments of Chinese medical schools. It provides a broad perspective on the current state of young teacher development across medical institutions throughout mainland China. In this study, 'young teachers' are defined as faculty members in pathophysiology departments who meet all the following criteria: they are 35 years old or younger, in line with the standard definition used by China's Ministry of Education and the National Natural Science Foundation of China; they have less than 5 years of teaching experience in pathophysiology, marking the critical early-career development period; and they hold academic ranks such as teaching assistants, lecturers, and assistant professors, which are the primary early-career faculty positions in Chinese medical colleges.

Information sources

We conducted a systematic search of both Chinese and English language databases, including PubMed, Web of Science, China National Knowledge Infrastructure (CNKI), and Wanfang Data. The search was performed in April 2024 and covered literature published from January 2013 through June 2024 to ensure the information was current.

Search strategy

The following search strategy was used for English databases: ("young teacher*" OR "early career faculty" OR "junior faculty") AND (pathophysiology OR "patho-physiology") AND (China OR Chinese) AND ("medical education" OR "medical school*" OR "medical universit*").

For Chinese databases, the equivalent Chinese terms were used: (青年教师 OR 年轻教师 OR 初级教师) AND (病理生理学 OR 病生) AND (医学教育 OR 医科大学 OR 医学院).

Study selection and data collection

A flow diagram of the study selection process is shown in [Fig. 1](#). In our initial search, we retrieved 1,247 articles from four databases: 156 from PubMed, 203 from Web of Science, 573 from CNKI, and 315 from Wanfang. The inclusion criteria specified that the studies must focus on the cultivation of young teachers in pathophysiology departments, be conducted at Chinese medical schools/universities, be published in peer-reviewed journals between January 2013 and June 2024, and have full texts available in English or Chinese. Of the 1,198 articles excluded, 73 did not specifically pertain to pathophysiology education, 528 did not focus on young teachers, 248 were opinion pieces or editorials lacking substantial data, 89 were conference abstracts or unpublished theses, and 260 were duplicates. Ultimately, 49 articles satisfied all inclusion criteria and were included in this analysis ([Supplement 1](#)).

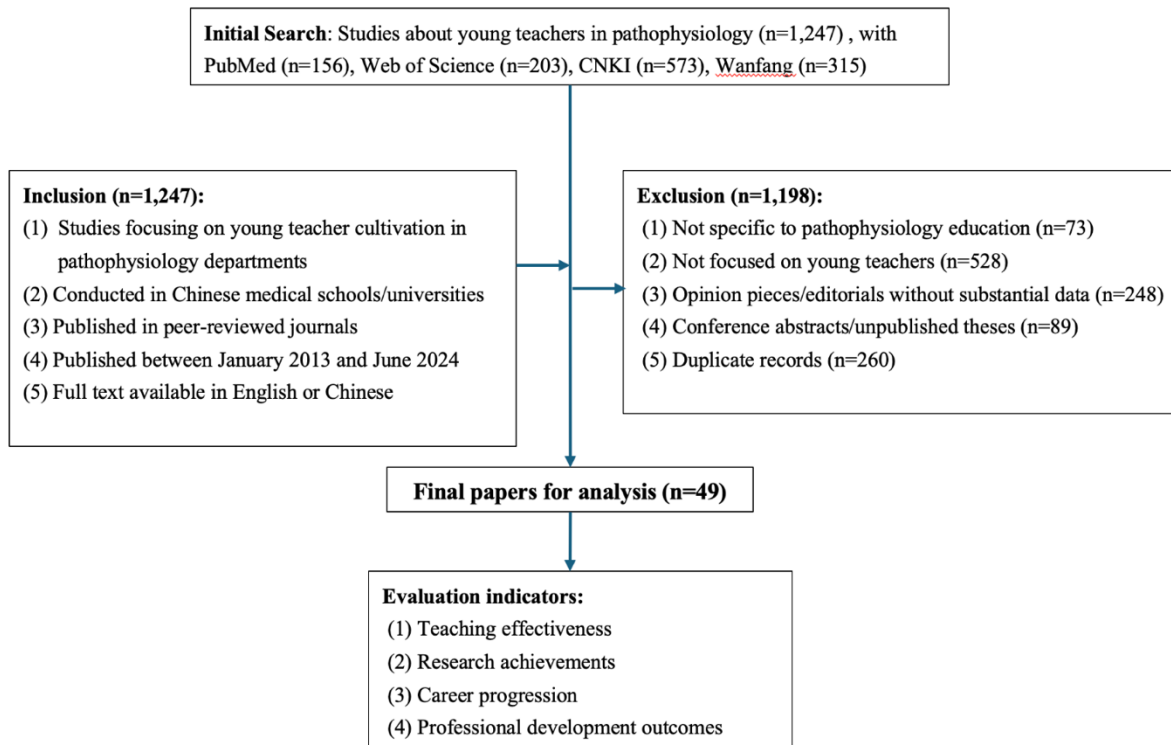


Fig. 1: The flow diagram of the study selection process

Evaluation indicators

Evaluation criteria for support strategies included the following components: Teaching effectiveness was indicated by student evaluation scores, teaching awards, the implementation of innovative teaching methods, and peer review results. Research achievement was measured by publication output, research funding obtained, and participation in research projects. Career progression was evaluated based on professional title advancement, teaching qualification obtainment, and roles in academic leadership. Professional development was assessed through participation in training programs, conference presentations, and interdisciplinary collaborations.

Results

Key challenges in cultivating young teachers in pathophysiology

The analysis of the literature identified multiple significant challenges in nurturing young teachers within the pathophysiology departments of Chinese medical schools (Fig. 2, Dataset 1). The chart illustrates the proportion of studies that reference various challenges encountered by these young educators. Research challenges emerged as the most commonly cited issue, followed by challenges related to the characteristics of the discipline, teaching challenges, and career development challenges.

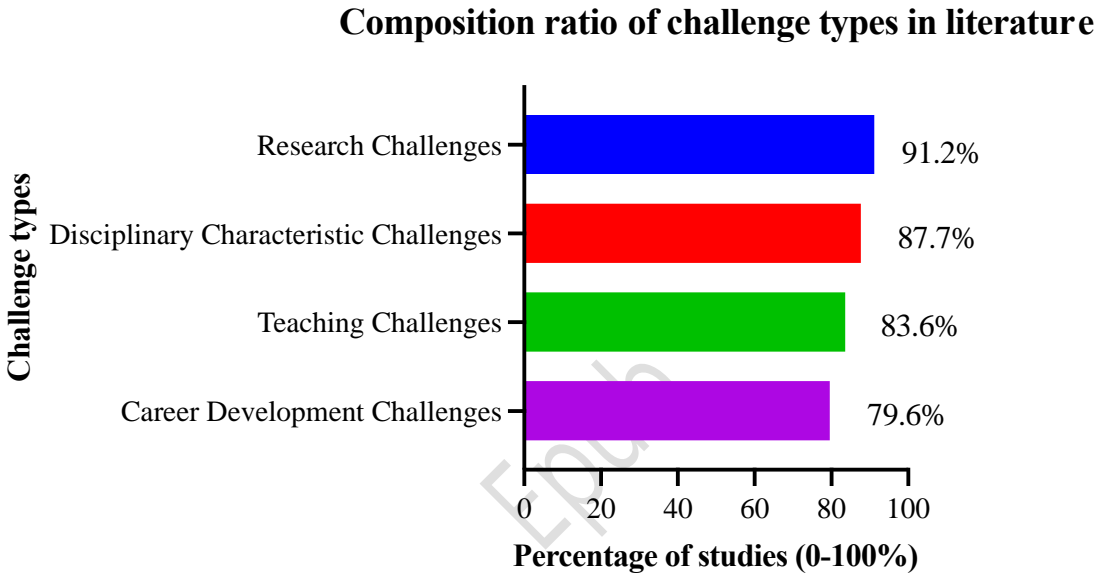


Fig. 2. Distribution of types of challenges in the literature

Research challenges

Fig. 3 (Dataset 1) presents the specific aspects of research challenges encountered by junior faculty in the pathophysiology departments of Chinese medical schools, along with their frequency of mention in the literature. This figure effectively highlights the relative significance of various aspects within each primary category of research challenges, facilitating straightforward comparisons both within and between

categories. The challenges are divided into three main areas: high-level research outputs (green, 82.2%), securing research funding (red, 77.7%), and balancing research with teaching (blue, 86.6%). Each bar in the graph represents a particular aspect of these challenges, with its length reflecting the percentage of studies that referenced it.

Specific aspects of research challenges and their percentage distribution

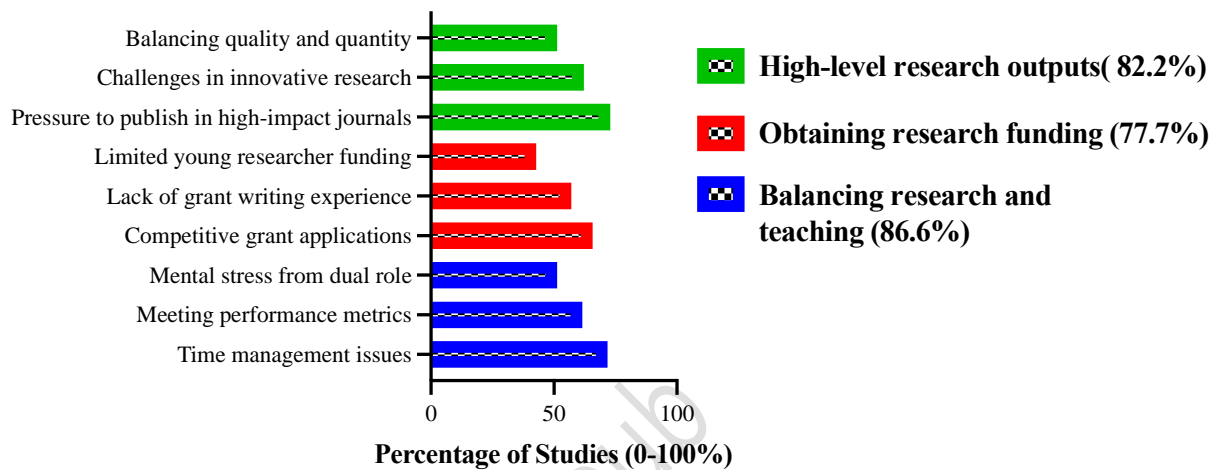


Fig. 3. Specific aspects of research challenges and their distribution

Disciplinary characteristic-related challenges

Table 1 provides a detailed analysis of the challenges faced by young teachers in pathophysiology departments, as identified in 87.7% of the 49 studies reviewed. These findings underscore the complexity of teaching pathophysiology, which demands that young instructors integrate basic and clinical sciences, keep up with rapid scientific advancements, and strike a balance between broad coverage and deep understanding. The data underscore the necessity for targeted support and professional development programs to assist young faculty in effectively managing these discipline-specific challenges. This

information is essential for medical education policymakers and administrators in developing curricula and faculty development initiatives tailored to the unique requirements of pathophysiology education.

Teaching challenges

Fig. 4 (Dataset 1) presents three primary teaching challenges encountered by young teachers in pathophysiology departments, along with their specific aspects. It shows that the most common challenge is the requirement for interdisciplinary teaching, followed by difficulties in fostering clinical thinking and integrating new technologies.

Table 2 further delineates each main challenge, offering a detailed perspective on the obstacles that young teachers encounter in pathophysiology education.

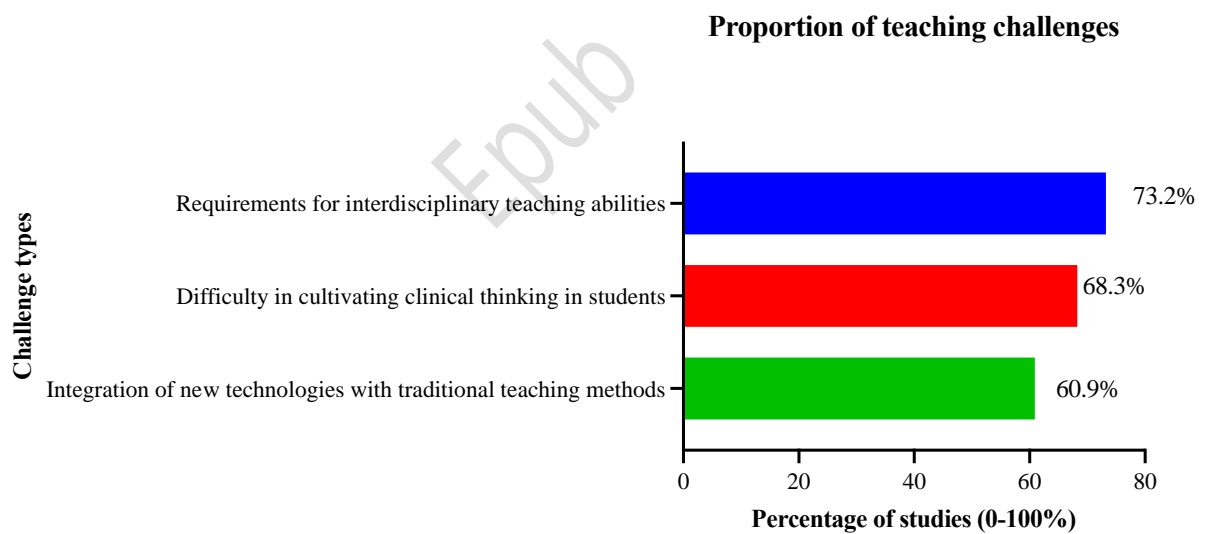


Fig. 4. Proportion of teaching challenges

Career development challenges

Table 3 presents a comprehensive analysis of the career development challenges faced by young teachers in the pathophysiology departments of Chinese medical schools. The data suggest that although promotional opportunities and work-life balance are significant concerns, the most pressing issue is the

difficulty in pursuing continuous professional development amid demanding academic responsibilities.

This information offers valuable insights for academic institutions and policymakers in devising targeted strategies to support the career growth of young faculty in medical education.

Table 1: Breakdown of disciplinary characteristic-related challenges faced by young teachers in pathophysiology departments

Disciplinary characteristic-related challenges	Specific aspects	Number of studies	Percentage
Intersection of pathophysiology with basic medical sciences and clinical medicine (78.9% of studies)	Integrating basic science concepts with clinical applications	38	77.55%
	Keeping up with rapid advancements in both basic and clinical sciences	32	65.31%
	Translating complex pathophysiological mechanisms into clinically relevant teaching	27	55.10%
Adapting to rapid developments at the disciplinary forefront (73.7% of studies)	Continuously updating course content to reflect latest research findings	36	73.46%
	Incorporating emerging technologies and methodologies into teaching	30	61.22%
	Pressure to stay current with an ever-expanding body of knowledge	26	53.06%
Balancing depth and breadth in pathophysiology education (70.2% of studies)	Covering a wide range of topics while maintaining sufficient depth	34	69.38%
	Allocating appropriate time to each sub-discipline within pathophysiology	28	57.14%
	Contextualizing pathophysiology within the broader medical curriculum	24	48.97%

Table 2: Breakdown of teaching challenges faced by young teachers in pathophysiology departments

Teaching challenges	Specific aspects	Number of studies	Percentage
Integration of new technologies with traditional teaching methods (61.4% of studies)	Difficulties in effectively using online teaching platforms	22	44.89%
	Challenges in incorporating simulation technologies	17	34.69%
	Issues with balancing technology use and traditional face-to-face instruction	15	30.61%
Requirements for interdisciplinary teaching abilities (73.7% of studies)	Need for broad knowledge base spanning basic sciences and clinical medicine	30	61.22%
	Challenges in collaborating with teachers from other disciplines	24	48.97%
	Difficulties in designing interdisciplinary courses	19	38.77%
Difficulty in cultivating clinical thinking in students (66.7% of studies)	Challenges in bridging theoretical knowledge with clinical scenarios	26	53.06%
	Issues with designing effective case-based learning activities	21	42.85%
	Lack of clinical experience among young teachers as a barrier	17	34.69%

Table 3: Breakdown of career development challenges faced by young teachers in pathophysiology departments

Career development challenges	Specific aspects	Number of studies	Percentage
Competition in promotion channels (71.9% of studies)	Limited number of senior positions available	30	61.22%
	High standards for promotion in academic medicine	26	53.06%
	Potential for burnout due to intense competition	21	42.85%
Work-life balance pressure (68.4% of studies)	Difficulties in managing personal and professional responsibilities	27	55.11%
	Impact of work stress on personal relationships and health	24	48.97%
	Lack of institutional support for maintaining work-life balance	19	38.77%
Time constraints for continuing education and self-improvement (75.4% of studies)	Difficulties in finding time for additional training or education	32	65.31%
	Rapid pace of medical advancements requiring constant learning	21	42.85%
	Lack of structured time for self-improvement activities	24	48.98%

Relative importance of major strategies for young teacher development

A radar chart (Fig. 5; Dataset 1) was created to present the relative importance of five major strategies aimed at supporting young teachers in pathophysiology departments of Chinese medical schools. Each strategy is represented by a spoke on the radar chart, with its importance indicated by the distance from

the center. The chart demonstrates that all five strategies are deemed highly important, with their importance percentages ranging from 87.8% to 95.9%. The strategy of enhancing research support is highlighted as the most frequently mentioned, closely followed by improvements in the cultivation system. Strategies for innovating teaching methods and expanding development opportunities are also shown to be highly valued. Although optimizing evaluation mechanisms registers the lowest percentage, it is still significantly emphasized in a majority of the studies.

The nearly pentagonal shape of the radar plot indicates that all these strategies are considered crucial in supporting young teachers. The symmetry of the shape suggests that a balanced approach is necessary to address the challenges faced by young faculty.

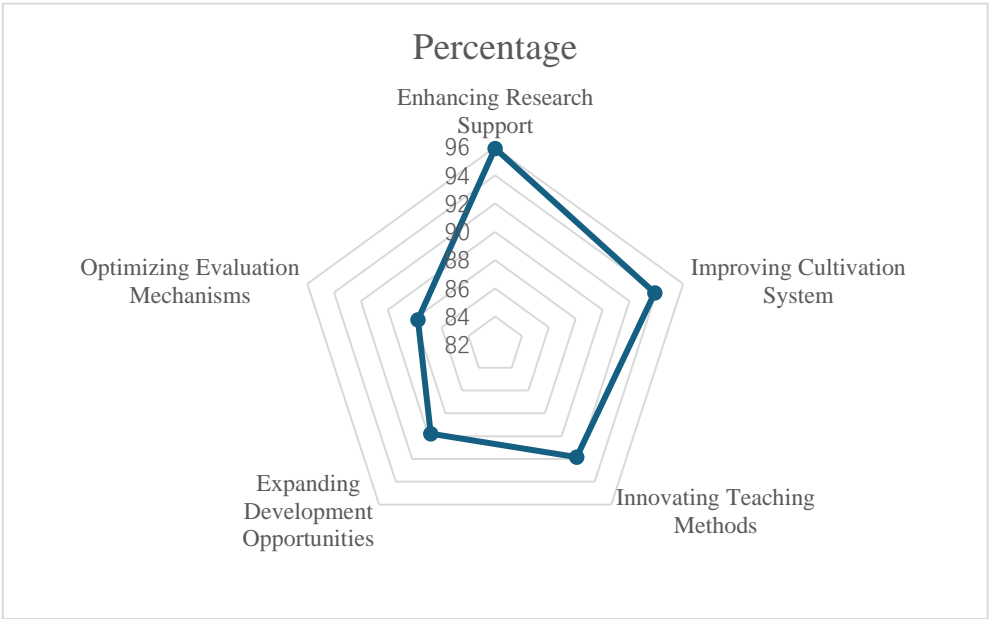


Fig. 5. Radar chart of major strategies for young teacher development

Discussion

Key results

The key finding of this study is that young pathophysiology teachers at Chinese medical colleges encounter a range of challenges in their professional development. The most common challenges identified were research pressure (91.2%) and disciplinary characteristics (87.7%), followed by teaching innovation requirements (83.6%) and career development issues (79.6%). In response, institutions have implemented comprehensive support strategies, with a particular emphasis on strengthening research support (95.9%), improving the cultivation system (93.8%) and innovating teaching methods (91.8%). These findings indicate an emerging trend towards personalized development approaches, emphasizing technology integration, interdisciplinary collaboration, and international academic exchange.

Interpretation/Comparison with previous studies

Teaching innovation challenges

Our finding that 84.2% of studies mentioned teaching challenges aligns with previous research [14-18]. Among these challenges, integrating new technologies with traditional teaching methods [19] emerged as a significant concern, mentioned in 61.4% of studies, which confirms the findings of Wei et al. [20] regarding the digital transformation in pathophysiology education. Our study notably reveals a substantially higher emphasis on interdisciplinary teaching abilities [21], with 73.7% of studies highlighting this challenge [22], surpassing the concerns noted in earlier research by Huang et al. [23]. The implementation of case-based teaching methods, particularly in large classroom settings, was identified as problematic in 68.9% of studies [24], while 57.8% of studies reported difficulties in developing effective multimedia teaching resources to illustrate complex pathophysiological mechanisms [25]. These findings

collectively suggest an evolving landscape of teaching challenges that require comprehensive pedagogical training addressing both technological and methodological aspects.

Research pressure and academic development

The prevalence of research challenges, identified in 91.2% of studies, corroborates and extends findings from previous research [26-29]. Balancing research and teaching responsibilities emerged as the most pressing issue, mentioned in 86.0% of studies, supporting the conclusions of Wang et al. [30] about workload management. Our study uniquely emphasizes the challenges of funding acquisition, reported in 77.2% of studies, an aspect less emphasized in earlier research [31]. Publication requirements were cited as a significant pressure in 82.5% of studies, while proficiency in research methodology (71.9%) and opportunities for international collaboration (63.2%) were also frequently cited concerns. Laboratory management skills, although mentioned less frequently (58.4%), represent another crucial aspect of research development for young teachers [32]. These findings indicate a complex web of research-related challenges that extend beyond simple productivity metrics.

Career development and professional growth

Our findings on career development challenges, which were present in 80.7% of the studies, significantly expanded upon the previous work by Qiu et al. [33]. Work-life balance [34] emerged as a significant concern in 68.4% of the studies, particularly affecting young female teachers who manage family responsibilities alongside their academic careers [35]. Time constraints for continuing education [36], mentioned in 75.4% of the studies, highlighted the persistent challenge of maintaining professional development while fulfilling daily obligations [37]. Challenges such as professional identity development

(63.2%) and navigation of promotion criteria (70.1%) were frequently cited, while the accessibility of mentorship (65.8%) and the building of professional networks (59.6%) emerged as crucial factors affecting career progression. Notably, 72.3% of the studies emphasized the need for clearer career advancement pathways specific to pathophysiology education, suggesting a systemic need for more structured career development frameworks.

Impact of disciplinary characteristics

The prevalence of disciplinary characteristic–related challenges [38], reported in 87.7% of studies, represents a novel finding warranting particular attention [39]. The interdisciplinary nature of pathophysiology [40], requiring expertise across multiple fields including anatomy, physiology, biochemistry, and clinical medicine [41], was highlighted in 82.5% of studies. The challenge of keeping pace with rapid advances in medical science and incorporating new findings into teaching materials was emphasized in 76.8% of studies [42]. The integration of basic science with clinical knowledge [43] emerged as a significant concern (79.3%), while laboratory demonstration complexity (71.2%) and abstract concept visualization (68.9%) were also frequently cited challenges [42]. Clinical case integration was mentioned in 65.4% of studies, further underscoring the unique challenges of pathophysiology education [44]. These findings substantially extend previous research by providing a comprehensive understanding of the discipline-specific challenges facing young teachers.

Support strategies and institutional response

Our analysis of support strategies reveals a more comprehensive approach than previously documented. The emphasis on enhancing research support, mentioned in 96.5% of studies, aligns with the

recommendations of Li et al. [45]. However, our findings highlight several specific implementation mechanisms. In terms of teaching support, which is noted in 93.0% of studies, institutions have prioritized pedagogical training programs (87.2%) and technology integration workshops (82.5%). Additionally, they have established peer teaching observation systems (76.4%) and teaching resource sharing platforms (71.9%) [46]. For research development, institutions have concentrated on providing research methodology training (89.5%) and grant writing workshops (84.2%). These efforts are complemented by the establishment of collaborative research networks (77.8%) and the facilitation of laboratory resource sharing (73.6%) [47]. These comprehensive support strategies, though less prominent in earlier research [48], demonstrate institutions' commitment to developing young teachers through systematic and integrated approaches [49]. Furthermore, 89.5% of studies emphasized the importance of integrating these various support mechanisms into a coherent development framework, suggesting a trend toward more holistic approaches to faculty development.

Limitations

Our study has several notable limitations. Relying solely on published literature may overlook ongoing initiatives or informal practices. Additionally, focusing on Chinese institutions could potentially limit the broader applicability of our findings. The institutional perspective of our analysis might not fully capture the experiences of individual teachers, and our chosen timeframe (2013-2024) might exclude certain historical development patterns that could provide valuable context.

Implications

Based on our comprehensive analysis, addressing the challenges faced by young pathophysiology teachers in Chinese medical schools requires a multi-faceted approach. First, institutions should prioritize research support through dedicated start-up funds, mentorship programs, and interdisciplinary collaboration opportunities. Second, the development of teaching should focus on innovative pedagogical approaches and the integration of technology, supported by comprehensive training programs. Third, support for career development should combine structured mentoring with flexible professional growth opportunities.

The success of young teachers can be significantly improved by implementing several key initiatives: establishing systematic training programs that balance teaching innovation with research development; creating platforms for interdisciplinary collaboration and knowledge exchange; implementing flexible work arrangements to support work-life balance; and developing fair evaluation mechanisms that recognize diverse contributions to academic development. Most importantly, institutions should adopt a personalized approach to professional development, acknowledging the varying needs and career aspirations of young teachers.

These recommendations emphasize the importance of creating a supportive academic environment that promotes both professional development and personal well-being. Implementing these strategies demands a commitment from institutional leadership and coordination among various stakeholders in medical education.

[Suggestion for further studies](#)

Future research should focus on evaluating the long-term effectiveness of these strategies, exploring the impact of cultural and institutional factors on the development of young teachers, and investigating how

the rapid advancement of medical knowledge and technology continues to shape the landscape of pathophysiology education both in China and globally.

Conclusion

This review highlights the critical requirements for nurturing young pathophysiology instructors at Chinese medical institutions. Effective development strategies must emphasize a balance between research and teaching responsibilities, encourage pedagogical innovation, and define clear career trajectories. Medical institutions ought to establish comprehensive support systems that merge mentorship programs with professional development opportunities. Implementing these strategies will solidify the base of pathophysiology education within China's medical education framework.

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Project administration: SZ

Funding acquisition: SZ

Writing – original draft: JL

Writing – review & editing: SZ, JL, YL, YXL, YFZ, YLZ, RHT, BZ, YLL,

Conflict of interest

No potential conflict of interest relevant to this article was reported funding

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Data availability

Dataset 1. Data file used to create the 4 figures in Excel format.

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Supplementary materials

Supplement 1. List of 49 studies organized according to the main themes identified in our analysis.

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