Postprint of a Cross-National Comparative Study on Delayed Completion in Family Medicine Residency Training: Causes and Reform Strategies

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Abstract

This study focuses on the issue of delayed completion in standardized residency training in general practice, conducting a cross-national comparative analysis of training systems, current delay situations, causes, and reform strategies across 11 representative developed and developing countries worldwide. The study finds that delayed completion in global general practice residency training is a widespread phenomenon, with delay rates influenced by multiple factors including shortage of clinical resources, elevated assessment standards, public health emergencies, and mental health of residents; the issue is more pronounced in developing countries due to uneven regional resource distribution. National response strategies exhibit differentiated characteristics: the United States optimizes training pathways through dynamic assessment mechanisms, Japan enhances retention rates of primary care physicians via policy incentives, and China strengthens process management using information technology means. The study points out that addressing this issue requires coordinated efforts across three dimensions: reconstruction of adaptive training models, construction of supportive ecological networks, and iteration of crisis response mechanisms, seeking balance between efficiency and humanism, standardization and individualization, to enhance the resilience of general practice education and the quality of medical services.

Full Text

Delayed Completion in General Practice Residency Training: A Cross-National Comparative Study on Causes and Reform Strategies

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Abstract

This review focuses on the delayed graduation issue in standardized residency training for general practitioners (GPRT), conducting a cross-national comparative analysis of training systems, current status of delays, contributing factors, and reform strategies across 11 representative developed and developing countries. Findings reveal that delayed graduation in global GPRT programs is widespread, with postponement rates influenced by multiple factors including clinical resource shortages, elevated assessment standards, public health emergencies, and residents' mental health challenges. Developing countries face more pronounced challenges due to regional resource disparities. Nations demonstrate differentiated countermeasures: the United States optimizes training pathways through dynamic assessment mechanisms, Japan enhances grassroots physician retention via policy incentives, while China strengthens training process management through digital technologies. The study proposes that resolving this issue requires coordinated efforts across three dimensions: restructuring adaptive training models, building supportive ecosystem networks, and iterating crisis response mechanisms. This approach seeks to balance efficiency with humanistic care, standardization with personalization, ultimately enhancing the resilience of general practice education and healthcare service quality.

Keywords: General practice; Residency training; Delayed completion; Comparative analysis; Healthcare workforce reform

1 Literature Search Strategy

A comprehensive search was conducted across PubMed, Web of Science, CNKI (China National Knowledge Infrastructure), and official policy websites from database inception to May 2025. Chinese search terms included "全科医学" (general practice), "住院医师规范化培训" (standardized residency training), "延期结业" (delayed completion), "跨国比较" (cross-national comparison), and "医疗人力改革" (healthcare workforce reform). English search terms included "General Practice," "Residency Training," "Delayed Completion," "Comparative Analysis," and "Healthcare Workforce Reform." Inclusion criteria comprised literature addressing standardized GPRT systems, delayed completion status, and influencing factors in various countries. Exclusion criteria included irrelevant content, low-quality studies, and inaccessible full texts.

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2 Overview of Global General Practice Residency Training Systems

Standardized residency training systems constitute the core pathway for cultivating qualified general practitioners, aiming to equip physicians with comprehensive clinical skills, decision-making capabilities, and patient management experience through systematic theoretical learning and clinical practice to meet community and family health needs. Despite variations in training models worldwide, all systems share a central objective: developing "health gatekeepers" who can ensure equitable access to healthcare resources. An overview of national GPRT systems is presented in .

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3 The Widespread Phenomenon of Delayed Completion in GPRT

Delayed completion has emerged as a universal challenge across geographical and cultural contexts in GPRT programs. Although training system designs differ among countries, data consistently show that residents failing to complete training on schedule is a pervasive issue, with delay rates exhibiting dynamic fluctuations driven by policy adjustments, resource allocation, and public health emergencies.

In Europe and North America, the United Kingdom, United States, and Canada have experienced relatively stable yet locally volatile delay rates. In the UK, for instance, delay rates rose from 8% to 12% between 2015–2018 due to curriculum adjustments and elevated practice skills assessment standards, but subsequently declined to approximately 10% by 2019–2022 through optimized course design and increased mentorship time [14]. The US exhibited a similar trend: delay rates increased from 10% to 15% during 2016–2020 amid medical education reforms that heightened clinical and research requirements, then gradually

stabilized through flexible training pathways and enhanced process support [15]. Canada mitigated some issues through rural rotations and subspecialty electives, though urban-rural resource disparities continued to cause significant regional variations in training quality and delay rates [16].

In Asia, China' s GPRT program has expanded rapidly in scale but maintains high delay rates of 15%–20%, driven by uneven regional resource distribution and increasingly stringent assessment standards. Specifically, inadequate infrastructure and weak faculty in central and western regions limit residents' clinical opportunities, while eastern regions' enhanced assessment demands for chronic disease management and multidisciplinary collaboration increase competency attainment difficulty [17]. In contrast, Japan' s Ministry of Health, Labour and Welfare 2024 Clinical Training Guidelines, which clarified mentorship support and workplace monitoring requirements, enabled real-time assessment and adjustment of residents' progress across rotations, thereby reducing delays caused by pending rotations or evaluations [18-19].

Beyond high-income countries, developing nations such as Brazil, India, South Africa, and Mexico face significant delay challenges. Brazil' s 2023 Ministry of Health data indicated that 18% of delays stemmed from competency assessment failures, particularly concentrated in remote Amazon regions [20]. India' s Medical Council reported that 32% of residents participating in national public health programs for fewer than 120 days required 3–6 month extensions in grassroots practice [21]. In South Africa, approximately 25% of residents needed additional mobile clinic rotations due to low pass rates in HIV/TB comprehensive prevention and treatment skills assessments [22]. In Mexico, 15% of residents in border areas experienced delays due to failing indigenous language communication tests [23]. These data confirm that developing countries share common issues of regional imbalance and grassroots practice resource shortages, paralleling challenges faced in China' s central and western regions.

Global public health emergencies have further exacerbated delay prevalence. Multinational studies show that during the pandemic, approximately 40% of residents had their rotation plans interrupted by pandemic deployment, and remote education limitations (e.g., lack of real patient interaction) reduced skill mastery and indirectly increased delay risks. Some residents reported that virtual teaching could not substitute for authentic patient interactions, indicating that hybrid education models require further refinement [24].

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4 Analysis of Main Causes of Delayed Completion

The phenomenon of delayed completion in GPRT represents the interactive result of individual capabilities, training system design, and social environments. Globally, causes can be distilled into three tensions: imbalance between individual adaptability and occupational stress, conflict between standardization and

flexibility in training design, and misalignment between social support systems and healthcare resource demands.

First, residents' individual adaptability faces multiple challenges. High-intensity training and occupational stress directly threaten physical and mental health. Studies indicate that 30%–40% of residents experience anxiety or depression, stemming not only from medical complexity but also from excessive clinical workloads (e.g., 60–80 weekly hours) [25]. This pressure amplifies among those with family responsibilities—approximately 20% of Chinese residents experience fragmented study time due to childcare or eldercare, while in Europe and North America, up to 15% of female residents interrupt training for childbirth [26]. Additionally, lack of professional identity intensifies psychological burden. Some residents lack clear understanding of general practice' s grassroots service orientation, experiencing burnout when facing repetitive tasks or patients' complex social needs, ultimately extending training to adjust career plans.

Second, structural deficiencies in training systems amplify individual vulnerabilities. Most countries' GPRT still employs a "one-size-fits-all" model that fails to accommodate differentiated needs. Some US programs overemphasize research output at the expense of clinical practice time, while Chinese grassroots training bases often suffer from outdated equipment and limited case diversity, hindering advanced competency development in chronic disease management. This supply-demand imbalance is particularly pronounced under insufficient mentorship—30% of residents report that overburdened mentors cannot provide timely guidance, reducing skill acquisition efficiency [27]. A more fundamental conflict lies in assessment mechanisms that prioritize theoretical knowledge and standardized procedures while neglecting soft skills like communication and interdisciplinary collaboration. This misalignment forces residents to devote excessive energy to examinations rather than solving actual clinical problems, further prolonging training. Brazil' s federal and local governments lack unified coordination in training management authority and resource allocation, causing rotation scheduling conflicts and inadequate mentorship across hospitals. In 2021, only 41,853 Brazilian physicians participated in residency training (8% of all doctors), with approximately 12% forced to extend training due to insufficient rotation resources [28]. India' s NEET-PG examination and subsequent admission processes often delay new residents' start by nearly three months due to high application volumes and system verification lags, pushing training completion dates back accordingly [29].

Finally, lagging social resource allocation and policy coordination constitute systemic barriers. Regional healthcare resource inequality significantly affects training quality. In developing countries, remote training bases frequently face equipment shortages and limited case variety, preventing residents from encountering complex diseases. While high-income countries have adequate resources, urban-rural disparities still compromise rural rotation quality. Public health emergencies like COVID-19 exposed system vulnerabilities: approximately 40% of global residents had rotation plans interrupted for pandemic response, and

remote education' s limitations in clinical skills training reduced competency attainment rates [30]. Policy incentive gaps are also notable. Japan successfully controlled delay rates below 8% through housing subsidies and promotion priority, but most countries still lack career development support for general practitioners, creating a vicious cycle of talent loss and training interruption [31]. South Africa' s community service requirement for independent practice registration often experiences position allocation delays and document review backlogs, forcing some physicians to suspend training after completing requirements [32]. Mexico' s ENARM examination and Ministry of Health service agreement processes experience periodic delays, with some 2025 candidates unable to start training on time due to information system updates, resulting in postponed training cycles [33].

Notably, these factors interconnect and reinforce each other through "stress transmission chains." Mental health issues, for instance, result from high-intensity training but are amplified by family responsibilities and career anxiety, ultimately reducing learning efficiency and impeding training progress. Therefore, addressing delayed completion requires moving beyond single-factor attribution to coordinate efforts in individual resilience cultivation, training model innovation, and social support network construction.

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5 Impacts of Delayed Completion

Delayed completion in GPRT represents not merely individual career dilemmas but a systemic problem affecting healthcare system efficiency and patient health outcomes. Its impacts manifest through an "individual-system-service" transmission chain, presenting multidimensional negative effects.

5.1 Individual Disruption: Career Path Fracture and Psychological Capital Depletion

Delayed completion directly disrupts residents' career trajectories. Research shows that over 60% of delayed graduates miss hospital recruitment windows and must accept non-ideal positions, forcing career plan adjustments [34]. This career path fracture further intensifies psychological pressure: comparison with peers, social expectations, and reduced self-efficacy increase anxiety and depression rates 2.3-fold compared to on-time graduates. A more subtle impact involves weakened professional identity—prolonged training periods leave residents in an ambiguous "quasi-practitioner" state, unable to fully shed student roles while bearing clinical responsibilities. This role conflict significantly increases burnout risk. A Chinese longitudinal survey revealed that delayed residents scored 18.7 points higher on the Maslach Burnout Inventory, with emotional exhaustion and depersonalization tendencies potentially persisting into formal practice, creating long-term career obstacles [35].

5.2 Systemic Erosion: Talent Supply Imbalance and Service Capacity Decline

From a systemic perspective, delayed completion exacerbates general practice human capital supply-demand contradictions. China' s annual 15%–20% delay rate has expanded primary care physician shortages by 12%–15%, forcing some regions to lower hiring standards or extend retirement ages, creating a "low-quality substitution" vicious cycle [36]. This structural talent supply imbalance further weakens healthcare quality: delayed graduates with insufficient clinical experience exhibit 9.4% higher misdiagnosis rates in complex cases, while decreased team stability reduces multidisciplinary collaboration efficiency. In rural areas particularly, frequent resident rotations cause treatment plan discontinuity. More profoundly, general practitioner shortages directly delay family doctor contract service coverage—each 1% increase in delay rates correlates with a 0.8% decrease in contract rates, hindering tiered diagnosis and treatment system implementation [37].

5.3 Patient Rights Damage: Dual Threats to Service Continuity and Safety

As healthcare service end-users, patients suffer implicit deprivation of health rights through delayed completion. Chronic disease patients are most affected: diabetes and hypertension patients under delayed residents' care experience 23% lower blood pressure/glucose control rates due to treatment team turnover [38]. This service continuity interruption not only increases revisit costs but may also cause medication errors through information transmission mistakes. Additionally, residents' insufficient clinical competence directly affects diagnostic quality. A US primary care comparison study showed that patients treated by delayed completion physicians had higher 30-day readmission rates [39], indicating significant correlation between training delays and clinical decision-making deficiencies. During the pandemic, this issue was amplified by remote training limitations—Australian data revealed that residents completing skills assessments through virtual platforms received lower patient satisfaction scores than traditional training groups, highlighting the need to optimize hybrid education models [40].

5.4 Interactivity and Long-Term Nature of Impacts

These impacts are not isolated. Psychological capital depletion, for example, reduces residents' clinical engagement while increasing medical error risks that rebound on patient rights; decreased patient satisfaction further intensifies doctor-patient tension, creating a negative cycle of "psychological pressure—service quality decline—burnout." This cumulative systemic effect may persist for years: a Japanese follow-up study indicated that delayed completion physicians had higher mid-career turnover rates, trapping healthcare systems in a high-cost "train—lose—retrain" dilemma [41]. Thus, resolving delayed completion concerns

not only individual career development but also healthcare system resilience and patients' right to health.

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6 Experiences and Lessons: National Strategies for Addressing Delayed Completion

The complexity of GPRT delayed completion has catalyzed context-specific reforms worldwide. From policy design to technology integration, resource allocation to cultural transformation, different countries' strategies reveal both common patterns and localized innovations, illuminating three core reform logics in medical education: systematic adaptation, dynamic resilience building, and humanistic care integration.

6.1 Systematic Adaptation: Training Model Reconstruction and Resource Integration

Confronting conflicts between standardized training and individual differences, multiple countries have enhanced system inclusiveness through structural reforms. The US leads with goal-oriented assessment mechanisms, exemplified by the University of Wisconsin' s imaging specialty training system that refines stage objectives and implements real-time feedback. This "precision diagnosis–dynamic intervention" mechanism quantifies residents' clinical performance into trackable metrics (e.g., case processing efficiency, patient satisfaction), enabling personalized remediation plans [42]. The UK' s six-year "foundation training + general practice specialty" design ensures both breadth (covering 11 specialties) and depth (18 months in community clinics), with supervised training increasing pass rates by 9.6% [43]. However, such models demand substantial resources, making replication difficult in developing countries facing faculty shortages.

In resource-limited settings, technological innovation offers breakthrough solutions. China has strengthened GPRT management through digital platforms that enable real-time training records and quality control across provinces, enhancing transparency. Australia leverages telemedicine to overcome geographic barriers–RACGP' s interactive simulation platform significantly improved emergency management competency rates among remote residents, though virtual teaching remains less effective for communication skills than in-person training. This complementarity suggests hybrid models require further scenario optimization. In 2023, Brazil' s National Medical Residency Commission (CNRM) Resolution No. 2 [44] reinstated a 120-day deadline for diploma submission and mandated continuous, diversified performance evaluations, reducing delay rates caused by documentation issues by approximately 30% while the ProvMed program added 1,200 residency positions in remote areas to alleviate hospital rotation pressure.

6.2 Dynamic Resilience Building: Policy Incentives and Emergency Response Mechanisms

Public health emergencies exposed traditional training system vulnerabilities while revealing pathways for emergency capacity building. Japan' s policy reforms strengthened grassroots workforce development through the "Medical Practitioners' Working Hours and Career Development Promotion Act," offering housing subsidies up to 3 million yen, reduced promotion timelines for rural service, 20%–30% higher salaries than urban counterparts, and childcare subsidies [45]. These measures significantly improved rural physician retention. Canada' s "Rural Incentive Program" provides financial compensation (Manitoba offers an additional CAD 12,000 annual allowance) and career development support, reducing rural misdiagnosis rates by 7.3% [46]. Notably, such policies must align with local culture—Germany' s embedded mental health support in interdisciplinary training reduced psychology-related delays by 8%, but high mentor qualification requirements (dual general practice and psychology credentials) meant only 32% of rural bases could fully implement the model [47].

Public health crises have become testbeds for emergency response capabilities. The US controlled pandemic-era delay rates at 18% (6 percentage points lower than non-adjusting countries) by temporarily extending rotation periods (6–12 months) and increasing simulation-based teaching [29]. China strengthened "base-community" linkages through multi-site practice mechanisms, enabling residents to gain public health experience during pandemic response—such residents achieved 93% pass rates in emerging infectious disease management, 21% higher than traditional training groups [49]. These cases demonstrate that system resilience depends not only on resource reserves but also institutional flexibility for rapid response.

6.3 Humanistic Care Integration: From Instrumental Rationality to Value Reconstruction

Fundamental resolution of delayed completion requires transcending technical and managerial levels to address the humanistic core of medical education. Germany' s Charité Medical School "general practice-psychology joint clinic" model engages residents in holistic management of psychosomatic patients, enhancing interdisciplinary collaboration while reshaping their understanding of general practice values. Follow-up data showed participating residents' professional identity scores increased by 34% and delay rates decreased by 11% [50]. The UK' s supervision system incorporates "reflective practice" modules requiring monthly professional narrative logs, reducing anxiety symptoms from 39% to 28% [51]. Such practices reveal that integrating "health gatekeeper" role identity into training effectively mitigates burnout and self-efficacy crises.

However, humanistic reforms face conflicts with quantitative assessment. Japan' s Osaka University "community-linked training" improved completion rates but increased residents' weekly workload by 9 hours, causing moderate-to-severe

fatigue in some trainees [52]. This suggests humanistic care must balance workload redistribution. Australia' s "flexible credit system" attempts to resolve this contradiction—residents can adjust training intensity based on personal status, completing core competency modules cumulatively to graduate, with post-implementation satisfaction exceeding 95% [53].

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7 Future Outlook: Three Strategies for Building Resilient Training Systems

The complexity of GPRT delayed completion demands future reforms move beyond piecemeal fixes toward systematic capacity building. Based on global practice, reducing delays requires focusing on three strategic dimensions: adaptive training model reconstruction, supportive ecosystem network cultivation, and crisis response mechanism iteration. These dimensions are not isolated but form synergies through resource coordination and policy linkage.

7.1 Adaptive Training Models: From Standardization to Precision

The fundamental contradiction in current training systems lies in the conflict between uniform standards and individual differences. Future reforms must center on "precision medical education" concepts to build dynamically adaptive frameworks. The Mayo Clinic' s "competency mapping" model offers a reference: AI analyzes residents' clinical operation data (e.g., case processing time, diagnostic accuracy) to generate personalized competency gap reports and automatically match remedial courses [54]. Such technology-driven models have demonstrably reduced delay rates in pilots. However, technology empowerment must balance with humanistic education. Heidelberg University' s "dual-track" design provides reference: residents participate in standardized morning rotations while selecting afternoon modules in community health promotion or geriatric care based on interest, increasing professional identity scores by 28% [55]. This "core competency + personalized development" hybrid path ensures basic skill attainment while reducing delay risks from ambiguous career positioning.

7.2 Supportive Ecosystem Networks: Keys to Resolving Structural Constraints

The deep root of delayed completion lies in the disconnect between medical education and social support. In Japan, multiple local governments and medical institutions have implemented integrated "training-employment-service" retention mechanisms to address rural physician shortages. Since 2023, Yokohama has partnered with universities to establish a general practitioner training program for resource-scarce areas. The program provides community clinic training opportunities, municipal research funding (approximately USD 33,000 annually), and university salary support to encourage continued grassroots service post-training. Additionally, residents participate in community activities supporting

homeless housing and mental health day care, enhancing social responsibility and professional identity [57-58]. Such policies succeed by establishing multi-stakeholder benefit-sharing mechanisms: medical institutions gain stable talent supply, governments reduce grassroots healthcare investment pressure, and residents gain clear career development expectations.

Psychological support network construction is equally urgent. In Canada, systematic peer support networks have been established to alleviate training-related stress and anxiety. McMaster University' s Resident Support Network (RSN), launched in 2019, comprises trained residents, faculty, and administrative staff providing confidential listening and resource guidance. Participating residents reported improved coping ability, self-compassion, and sense of belonging, with overall satisfaction increases [59]. Such informal support systems complement formal institutions, demonstrating that structured psychological support networks are crucial for enhancing resident resilience and satisfaction.

7.3 Crisis Response Mechanisms: From Reactive to Proactive

COVID-19 exposed traditional training system vulnerabilities while revealing pathways for emergency capacity building. Future reforms must establish a "peace-war dual-mode" system: during normal times, reserve emergency skills through simulation drills (e.g., US National Board of Medical Examiners' new emerging infectious disease management module); during crises, activate flexible training rules. During the pandemic, Shanghai hospitals implemented a "modular credit bank" system, allowing residents to convert pandemic work into practice credits and extend core theory assessment deadlines, enabling most affected trainees to graduate on schedule [60]. This mechanism' s core principle is "loss compensation," preventing permanent career trajectory impacts from force majeure events.

International-level systematic collaboration mechanisms are needed to standardize resident training, enable resource sharing, and enhance crisis response capabilities. Within the EU, Directive 2005/36/EC establishes automatic mutual recognition of medical professional qualifications, allowing physicians to practice freely across member states upon meeting minimum training requirements, significantly simplifying cross-border training administrative barriers [61]. Complementing this, the European Union of Medical Specialists (UEMS) European Training Requirements (ETRs) define detailed knowledge, skills, and competency standards for general practice and other specialties, providing unified quality benchmarks that enhance regional healthcare system adaptability and resilience in both normal and crisis states. During COVID-19, the EU4Health program further emphasized crisis response capacity in training systems by funding cross-border remote teaching and simulation exercises, supporting rapid training content and rotation adjustments to ensure residents could complete required modules and maintain career continuity during crises [62].

Advancing these three dimensions faces multiple tensions. Technology invest-

ment may widen urban-rural gaps, requiring fiscal transfer mechanisms (e.g., Brazil' s "General Practice Education Equity Fund") to ensure fair resource distribution. Policy incentives may induce short-term behaviors, necessitating long-term tracking evaluation systems (e.g., Japan' s long-term career development tracking of grassroots service physicians). Deeper contradictions involve balancing efficiency and humanism—when training cycles compress to three years, residents' communication skill attainment rates decline. Therefore, reforms must establish non-negotiable baselines: the general practitioner's "health gatekeeper" role requires training to preserve sufficient humanistic practice space.

Conclusion

GPRT delayed completion is a systemic challenge facing global medical education systems, representing the intersection of individual capability development, training system design, and social resource allocation. While developed and developing countries differ in training duration and assessment standards, all must address the structural tension between "standardized training"and "personalized needs." Solutions require moving beyond single-factor attribution to construct an "individual-system-society" collaborative reform framework. The "health gatekeeper" role demands training that strengthens community engagement and interdisciplinary collaboration, requiring consensus among educational institutions, healthcare organizations, and policymakers to embed grassroots service orientation into training objectives and assessment systems.

Future research must further address digital education equity issues, such as how technology diffusion can narrow urban-rural training resource gaps and how cross-regional resource sharing and mutual recognition mechanisms can improve healthcare workforce allocation efficiency. The deeper challenge lies in how institutional design can uphold general practice' s public welfare values amid healthcare marketization and efficiency prioritization, integrating humanistic care and social responsibility throughout training. Only through continuous institutional innovation and value reconstruction can we achieve dual goals of reducing delayed completion and improving healthcare quality, laying a sustainable talent foundation for global primary care systems. This requires not only country-specific policy optimization but also international experience sharing and standard coordination to collectively build a more resilient and inclusive new ecosystem for general practice education.

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