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ORIGINAL RESEARCH

Analysis of CME Participation and Credit Compliance Among Healthcare Professionals: A Five-Year Study (2019–2023) From a Hospital in Guangdong, China

Dongxue Yang[1–3,*], Jiansong Chen[1–3,*], Jiaying Li[1,3], Xicheng Pu[1–3], Siyu Wu[1–3], Zeyu Jiang[1–3], Zhuoli Li[1–3], Yinglian Cai[1–3], Biyu Ye[1–3], Chanjuan Yang[1–3]

[1]The Affiliated Brain Hospital, Guangzhou Medical University, Guangzhou, Guangdong, People's Republic of China; [2]School of Mental Health, Guangzhou Medical University, Guangzhou, Guangdong, People's Republic of China; [3]Key Laboratory of Neurogenetics and Channelopathies of Guangdong Province and the Ministry of Education of China, Guangzhou Medical University, Guangzhou, Guangdong, People's Republic of China

*These authors contributed equally to this work

Correspondence: Biyu Ye; Chanjuan Yang, Email wendyye788@sohu.com; yangwang2004@126.com

Objective: Continuing Medical Education (CME) is vital for maintaining and improving the competencies of healthcare professionals. Despite the recognized importance of CME, disparities in CME engagement across professional roles remain underexplored in China. This study aims to addresses this gap by analyzing the participation and credit compliance of healthcare professionals in CME programs at a hospital in Guangdong Province over a five-year period (2019–2023) and to explore the differences across different professional titles and specializations.

Methods: We conducted a retrospective analysis of 5,156 records from the hospital's proprietary electronic CME management system. All full-time clinical staff were included. Descriptive statistics quantified annual average participation and credit compliance rates. Chi-square tests (χ^2) assessed differences by title and specialty.

Results: The results indicate that over the past five years, both CME participation and credit compliance steadily increased. Significant differences were observed in participation among healthcare professionals with different professional titles (χ^2=38.02, p<0.001), with intermediate-title staff exhibiting the highest participation (98.8%) and junior-title staff the lowest (95.4%). Credit compliance rates also differed significantly among professional titles (χ^2=43.88, p<0.001), with intermediate-title group reaching the highest credit compliance rate (97.1%) and senior consultant-title group the lowest (89.1%). Additionally, there were significant variations in credit compliance rates across different specialties (χ^2=233.10, p<0.001), with nursing professionals at the top (99.3%) and technicians at the bottom (90.6%).

Conclusion: Significant disparities in CME participation and credit compliance were observed across professional titles and clinical specialties. The findings suggest that CME programs should be tailored to the specific needs of different professional groups. These insights provide valuable recommendations for policymakers and hospital administrators seeking to optimizing CME program design, enhancing participation, and improving healthcare quality through continued professional development.

Keywords: continuing medical education, healthcare professionals, participation, credit compliance, professional development

Introduction

Background

Continuing Medical Education (CME) is widely regarded as the cornerstone of professional development in healthcare systems worldwide. It refers to educational activities that healthcare professionals engage in to maintain and improve their competence after completing formal training.[1] These activities are vital for ensuring that practitioners remain

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informed about the latest advancements in medicine, updated treatment guidelines, and emerging best practices, all of which have a direct impact on patient care quality.[2] CME encompasses a variety of activities, including seminars, workshops, online courses, conferences, and peer discussions.[3] These programs aim to enhance clinical skills and broaden professional capabilities of healthcare workers. Globally, CME has been recognized for decades as an indispensable lifelong learning process that enables healthcare professionals to address the changing burden of disease and drive technological innovation in medical practice.[4] In China, healthcare professionals have been explicitly required to complete a certain number of CME credits annually, integrating it into the assessment systems for professional titles and licensure.[5] Specifically, Guangdong Provincial Health Commission mandates 25 CME credits per year for all clinical professionals. In the contemporary context of rapidly evolving medical technologies and the diversification of patient needs, CME has become not only a necessary condition for individual professional development but also a key pathway for healthcare institutions to enhance their core competitiveness—such as improved clinical performance, higher staff retention, greater patient satisfaction, and stronger accreditation outcomes.[6]

As one of China's most economically and medically resource-rich provinces, Guangdong Province, located in southern China, has been actively promoting medical reform and the development of the health industry in recent years, further strengthening the organization and implementation of CME. Although Guangdong has established a relatively comprehensive CME system, with the growing demand for healthcare and rapid changes in the medical environment, challenges remain in improving the participation rate and effectiveness of CME programs. Participation in CME may vary by professional title, specialization, and individual circumstances. Understanding these differences is crucial for optimizing the effectiveness of CME programs, especially within the rapidly evolving healthcare sector.[3]

Importance of Continuing Medical Education

Ongoing medical education plays a critical role in maintaining clinical competence and healthcare quality. With the unprecedented speed at which medical knowledge and technology are advancing, CME ensures that healthcare professionals stay current. Continuously updating skills and knowledge through CME helps reduce medical errors, improve patient outcomes, and enhance the overall quality of healthcare.[7] Specifically, CME is essential for addressing the increasingly complex challenges of modern medical practice, as healthcare professionals must navigate an expanding body of medical knowledge and integrate new technologies into clinical settings.[8]

In addition to improving technical and clinical skills, CME also contributes to enhancing healthcare workers' professional identity and job satisfaction.[9] By continually learning, healthcare professionals can maintain motivation, retain competence, and better meet the needs of patients. Research has shown that regular participation in CME can improve work performance, clinical decision-making, and lead to more positive patient experiences.[10]

The rapid evolution of medical practice presents both opportunities and challenges. On the one hand, new diagnostic tools, treatment modalities, and clinical guidelines enable more effective patient care.[11] On the other hand, the volume of emerging information can be overwhelming, so it is essential that medical professionals have structured mechanisms like CME to help them keep up with the changes.[12] CME is an important bridge between theoretical advances and practical applications, ensuring that research innovations are effectively translated into daily clinical practice.[13]

Moreover, CME plays a key role in addressing public health challenges. For example, during the COVID-19 pandemic, healthcare professionals worldwide turned to CME programs to stay up-to-date with rapidly changing guidelines and clinical practices.[14] In regions like Guangdong, where healthcare systems face increasing demands, CME is crucial for ensuring that professionals are prepared to meet these challenges. The capacity to quickly update clinical practices in response to emergent public health crises is invaluable. Through timely and relevant educational updates, CME ensures that healthcare professionals can adapt to new challenges swiftly and efficiently, thereby safeguarding public health and enhancing the resilience of healthcare systems.[15]

In essence, CME is not simply about acquiring new knowledge, it is about ensuring that healthcare professionals are continuously equipped to face the evolving demands of clinical practice. This dual focus on immediate clinical application and long-term professional development underscores the fundamental importance of CME in maintaining and enhancing the quality of healthcare.

The System and Current Status of Continuing Medical Education in Guangdong Province

Guangdong Province, as the economic and healthcare hub of South China, provides a unique environment for CME. Guangdong has established a comprehensive CME system that encompasses multiple levels, including national, provincial, and municipal. This multi-level approach facilitates the provision of diverse CME programs to meet the different needs of medical professionals working in various settings.[16]

The CME system in Guangdong is characterized by collaborative efforts among hospitals, medical associations, and educational institutions. These entities work together to offer a wide range of educational activities that cover both general clinical knowledge and specialized medical fields such as surgery, oncology, and public health.[16] This collaborative model not only enhances the breadth of available CME content but also ensures that the educational programs are aligned with the latest clinical and technological advancements.

In recent years, the government has vigorously promoted the digital transformation of the healthcare industry, including the adoption of online CME courses. Major platforms include "Guangdong CME Network" and "Huayi Online", which provide accredited modules across specialties. These courses enable healthcare professionals to continue their education flexibly, regardless of time and geographical constraints.[17] Compliance is verified through the provincial electronic CME management system, which synchronizes data with the National Health Commission for licensure audits. The wide range of continuing education courses, coupled with an increasing number of digital options, fosters a robust educational environment for medical professionals across Guangdong.

However, despite these advancements, challenges remain. For example, participation and credit compliance in CME programs often vary significantly across different professional titles (eg, junior, intermediate, senior) and specializations (eg, physicians, nurses, pharmacists, technicians). These variations underscore a critical issue: while the CME system in Guangdong has achieved considerable progress in enhancing accessibility and digital integration, its effectiveness is not uniform across all segments of the healthcare workforce.[18] The existence of these disparities may be attributed to a number of factors, including individual career development needs, time management, and workload. To optimize the implementation of CME programs, further research and exploration of these differences and their underlying causes are necessary, along with the development of more targeted educational programs for different groups.

Overview of the Current Study

Although there are several studies on CME, especially regarding its impact on improving healthcare quality and professional competence, most focus on the overall effects of CME, with limited attention given to participation and credit compliance and differences among various professional titles and specialization groups. Therefore, understanding these differences and providing empirical evidence to optimize CME programs is an urgent issue.

The aim of this study is to analyze the participation and credit compliance of healthcare professionals with different titles (eg, junior, intermediate, senior, senior consultant) and specializations (eg, physicians, nurses, pharmacists, technicians) in CME programs at a hospital in Guangdong Province based on data from 2019 to 2023. By comparing participation rates and credit compliance across different titles and specialization groups, the study seeks to reveal the differences and explore the factors influencing these differences, providing theoretical and practical suggestions for further optimizing the design and implementation of CME programs in Guangdong. On the one hand, it offers a new perspective on understanding the participation patterns and challenges of healthcare professionals in Guangdong's CME programs. On the other hand, the findings can help healthcare institutions and policymakers provide targeted suggestions to improve the relevance and participation of CME programs, ultimately enhancing the quality of healthcare services and the competence of professionals. The study contributes to the improvement of the CME system and the enhancement of healthcare quality in Guangdong and other regions.

Method

Materials

We conducted a retrospective study at The Affiliated Brain Hospital, Guangzhou Medical University, a tertiary-care institution with 1,920 beds, located in Guangdong Province, southern China. The study protocol was submitted to the

Ethics Committee of The Affiliated Brain Hospital of Guangzhou Medical University and was approved with ethical review exemption.

CME records for all full-time clinical staff from 2019 to 2023 were extracted from the hospital's proprietary electronic CME management system (not linked to external regulatory platforms). Inclusion criteria: All physicians, nurses, pharmacists, and technicians with at least one CME activity recorded during the study period. Exclusion criteria: Administrative staff and trainees without clinical CME records; records missing both professional-title and credit fields (<1% of total) were excluded listwise. A total of 5,156 records met these criteria and were included in the analysis.

Professional titles were categorized into four credentialing levels—junior, intermediate, senior, and senior consultant—according to hospital credentialing standards. Specializations were grouped as physicians, nurses, pharmacists, and technicians. The participation rate was defined as the proportion of staff in each group with at least one CME activity per year. Credit compliance rate referred to the proportion of staff meeting or exceeding the minimum annual CME credit requirement (≥25 credits).

Statistical Analysis

All statistical analyses were performed using SPSS (version 26). Descriptive statistics—specifically frequencies and percentages—were calculated for annual and overall participation and credit compliance rates. The Chi-square tests (χ^2) were applied separately to compare participation rates and credit compliance rates across four professional-title groups and four specialization groups. Each χ^2 test involved four categories, and a two-tailed $p < 0.05$ was considered statistically significant. Missing data were handled by listwise deletion of records missing both title and credit fields.

Results

Differences in Participation Between Professional Title Groups

The participation of healthcare professionals with different titles in CME programs from 2019 to 2023 is shown in Figure 1. Overall, the number of participants from various professional titles showed a consistent annual increase.

The average participation rates by professional titles over the past five years, from highest to lowest, were as follows: intermediate title 98.8%, senior title 96.5%, senior consultant title 96.0%, and junior title 95.4%. Statistical analysis revealed significant differences in participation rates among healthcare professionals of different titles (χ^2=38.02, p<0.001). The results are shown in Table 1. Further pairwise comparisons indicated that healthcare professionals with intermediate titles had significantly higher participation rates than those with junior titles, and intermediate title holders

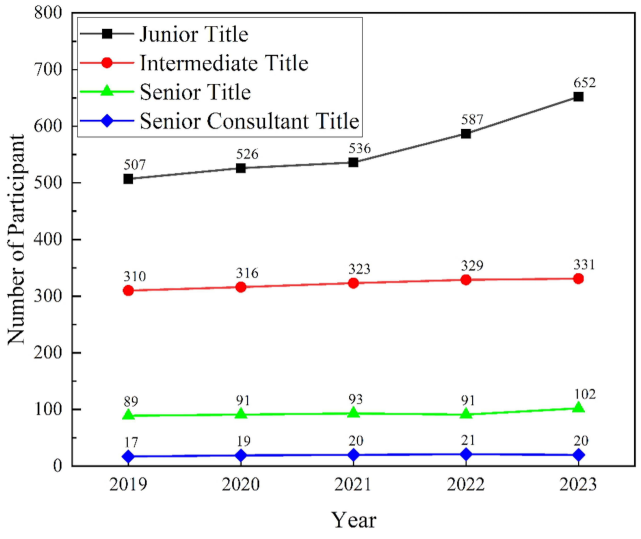

Figure 1 Participation in CME Programs by Healthcare Professionals of Different Titles Over the Past Five Years. This figure illustrates the annual number of healthcare professionals, categorized by their professional titles, who participated in CME programs at a hospital in Guangdong Province from 2019 to 2023. It highlights a consistent year-over-year increase in participation across all titles.

Table 1 Comparison of Participation Rates Among Healthcare Professionals with Different Titles

Group	Number of Participant	Number of Non-Participant	Total Number	Participation Rate (%)	χ^2	*p*
Junior Titles	2808	136	2944	95.4		
Intermediate Titles	1609	19	1628	98.8		
Senior Titles	466	17	483	96.5		
Senior Consultant Titles	97	4	101	96.0		
Total	4980	176	5156	96.6	38.02	<0.001

also had significantly higher participation rates than senior title holders. The markedly higher engagement of intermediate-title professionals likely reflects mid-career promotion pressures: accruing CME credits is a prerequisite for advancing to senior status, thereby incentivizing this group more strongly than both junior staff, who are earlier in their learning curves, and senior consultants, who have already secured top credentials.

Differences in Credit Compliance Between Professional Title Groups

The credit compliance of healthcare professionals with different titles in CME programs from 2019 to 2023 is shown in Figure 2. In general, the number of professionals meeting the credit requirements showed a steady increase over the years.

The average credit compliance rates by professional titles over the past five years, from highest to lowest, were as follows: intermediate title 97.1%, junior title 92.7%, senior title 92.1%, and senior consultant title 89.1%. Statistical analysis showed significant differences in credit compliance rates among healthcare professionals of different titles (χ^2=43.88, p<0.001). The results are shown in Table 2. Further pairwise comparisons revealed that the intermediate title group had significantly higher compliance rates than the junior, senior, and senior consultant title groups.

Differences in Credit Compliance Between Professional Specializations Groups

The credit compliance of healthcare professionals with different specializations in CME programs from 2019 to 2023 is shown in Figure 3. In general, the number of professionals of different specialties who have reached the standard has been increasing steadily.

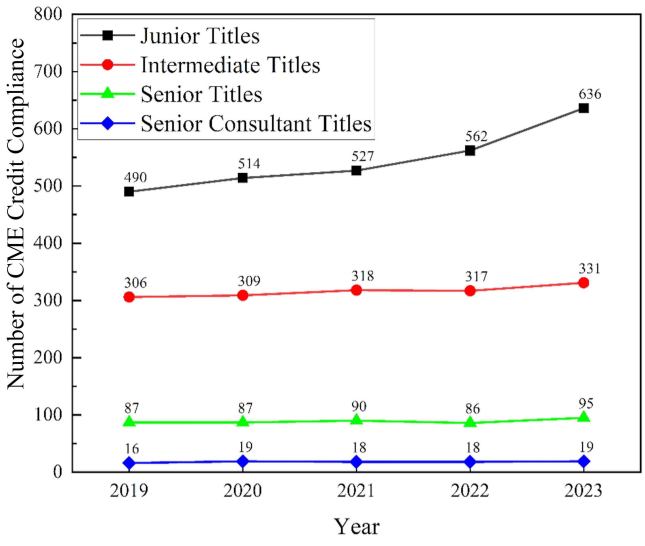

Figure 2 Credit Compliance in CME Programs by Healthcare Professionals of Different Titles Over the Past Five Years. This figure shows the number of healthcare professionals in four title categories—junior, intermediate, senior, and senior Consultant—who met the CME credit requirements from 2019 to 2023. The figure indicates a steady increase in credit compliance across all groups over the five-year period.

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Table 2 Comparison of Credit Compliance Rates Among Healthcare Professionals with Different Titles

Group	Number of Compliance	Number of Non-Compliance	Total Number	Credit Compliance Rate (%)	χ^2	*p*
Junior Titles	2729	215	2944	92.7		
Intermediate Titles	1581	47	1628	97.1		
Senior Titles	445	38	483	92.1		
Senior Consultant Titles	90	11	101	89.1		
Total	4845	311	5156	94.0	43.88	<0.001

The average compliance rates by specialization over the past five years, from highest to lowest, were as follows: nurses 99.3%, pharmacists 94.9%, physicians 93.0%, and technicians 90.6%. Statistical analysis revealed significant differences in credit compliance rates among healthcare professionals of different specializations (χ^2=233.10, p<0.001). The results are shown in Table 3. Further pairwise comparisons indicated that nurses had significantly higher compliance rates than physicians, pharmacists, and technicians.

Organization and Participation in CME Programs Over the Past Five Years

A summary of the number of sessions organized and the number of participants in national, provincial, and municipal CME programs organized by the hospital over the past five years is shown in Table 4. In total, 29 national-level programs were held, with 3,125 participants, 67 provincial-level programs with 11,169 participants, and 21 municipal-level programs with 7,370 participants. On average, municipal events drew 351 attendees per session, provincial 167, and national 108. Although municipal sessions had the highest per-session turnout, provincial programs exhibited the most rapid expansion—participant numbers grew from 568 in 2019 to 3,067 in 2023 (+440.5%), compared to +111.9% for municipal programs (991→2,100) and a –22.6% decline for national events (1,160→898). This suggests that provincially tailored CME offerings have been most effective at scaling engagement across our staff.

Discussion

Our analysis of 5,156 CME records from 2019–2023 at the Brain Hospital Affiliated of Guangzhou Medical University revealed three key findings. First, overall CME participation showed a consistent annual increase. Second, significant

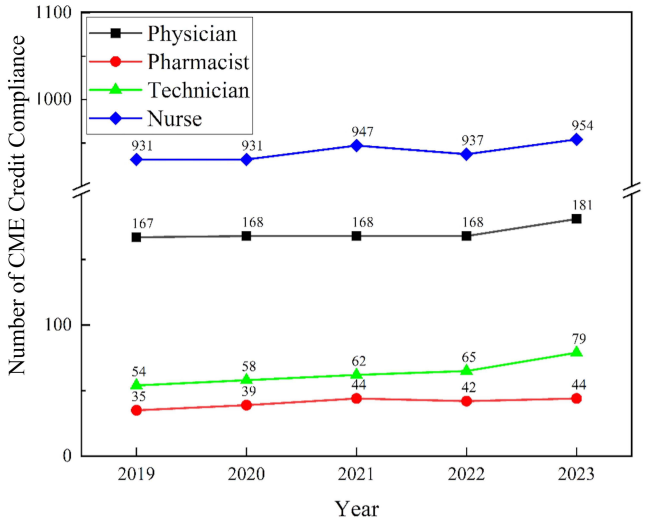

Figure 3 Credit Compliance in CME Programs by Healthcare Professionals of Different Specializations Over the Past Five Years. This figure illustrates the number of healthcare professionals in four specialties—physician, pharmacist, technician, and nurse—who met the CME credit requirements each year from 2019 to 2023. The results show a steady increase in credit compliance across all specialties over the five-year period.

Table 3 Comparison of Credit Compliance Rates Among Healthcare Professionals with Different Specializations

Group	Number of Compliance	Number of Non-Compliance	Total Number	Credit Compliance Rate (%)	χ^2	*p*
Physician	852	64	916	93.0		
Pharmacist	204	11	215	94.9		
Technician	318	33	351	90.6		
Nurse	4700	33	4733	99.3		
Total	6074	141	6215	97.7	233.10	<0.001

Table 4 Summary of the Number of Sessions Organized and the Number of Participants in CME Programs

Year	National CME Programs		Provincial CME Programs		Municipal CME Programs	
	Number of Sessions	Number of Participants	Number of Sessions	Number of Participants	Number of Sessions	Number of Participants
2019	4	1160	8	568	3	991
2020	2	200	17	2346	4	1380
2021	7	462	14	3007	4	1557
2022	7	405	11	2181	4	1342
2023	9	898	17	3067	6	2100
Total	29	3125	67	11,169	21	7370

disparities emerged across professional titles and specialty groups: intermediate-title group demonstrated the highest participation and compliance rates, while among specialties nurses achieved the highest credit compliance. Third, when comparing program accreditation tiers, provincial-level CME offerings not only accounted for the greatest number of sessions and participants but also exhibited the fastest growth, outpacing both municipal and national programs.

Differences Between Professional Title Groups

Our analysis revealed that the number of participants in CME programs increased across all professional titles over the five-year period. This consistent growth in participation suggests that the hospital's CME programs have successfully attracted medical staff to engage in continuous education. However, significant differences in CME participation rates were observed between professional titles. Specifically, intermediate title holders demonstrated the highest participation rates across all groups, likely due to their need for career advancement and motivation for continued learning.[19] This pattern aligns with self-determination theory, which posits that professionals driven by competence and career advancement seek learning opportunities that satisfy intrinsic needs.[20] Empirical studies in medical education have similarly shown that clinicians with moderate experience levels demonstrate higher CME uptake when learning is perceived as directly relevant to clinical decision-making and promotion criteria.[21]

Similarly, significant differences were found in credit compliance rates across different title groups. Intermediate title holders had the highest compliance rates, while senior consultant title holders had the lowest. This indicates that although senior-level professionals have extensive clinical experience, they may face barriers in meeting CME credit requirements, which could be attributed to factors such as workload, time constraints, or a lower perceived need for further education.[22] Senior-level professionals often have a more stable career, which may diminish their motivation to actively engage in CME programs.[23] This phenomenon has been observed in similar studies, where healthcare professionals at higher titles exhibit reduced motivation for CME participation due to their established career positions.[24]

Beyond individual motivation and role-specific needs, structural and institutional supports may play a pivotal role in shaping CME credit compliance rates. Structural factors—including greater administrative responsibilities and complex

clinical roles—constrain senior consultants' time for CME, while intermediate staff often have institutional support (eg, protected learning time) targeted at career advancement.[25]

These title differences suggest that CME program design should take into account the specific needs of professionals at different levels, particularly providing more flexibility and targeted programs for senior-level professionals to ensure their continued participation.

Differences Between Specialization Groups

In addition to professional titles, this study also found significant differences in credit compliance rates between different specialization groups. Among the healthcare professionals studied, nurses exhibited the highest credit compliance rates, followed by pharmacists, physicians, and finally technicians.

The high compliance rate among nursing professionals can be understood within the context of their critical role in patient care. On one hand, nursing professionals are directly involved in patient care, and their professional knowledge and skills have a direct impact on the quality of patient care.[26] As a result, they are highly motivated to engage in CME. On the other hand, due to the nature of their work, nurses tend to have more opportunities and motivation to participate in CME compared to physicians and technicians, especially as clinical nursing work becomes increasingly complex and requires ongoing learning to meet the challenges of modern healthcare.[27] Consequently, nursing professionals are more likely to view CME as an essential tool for both personal development and improved patient care, resulting in higher credit compliance rates.

In contrast, the lower compliance rates among technicians may reflect some barriers to CME engagement. Technicians often face busy work schedules and have fewer learning demands, which may limit their involvement in CME.[28] Therefore, CME programs for technicians should be more aligned with their practical needs and offer flexible learning options to accommodate their schedules. To address these challenges, CME programs for technicians should be more closely aligned with their practical needs and delivered through flexible, role-specific models. Evidence suggests that microlearning modules—short, focused units delivered via mobile platforms—can increase completion rates compared to traditional formats, as they allow learners to engage in 5~10-minute segments during downtime.[29] Additionally, implementing a blended learning model—combining asynchronous e-learning with periodic in-person skill labs—enables technicians to balance self-paced study with collaborative problem-solving sessions, fostering peer support and accountability.[30] By adopting these role-specific formats and delivery models, institutions can reduce access barriers and enhance CME engagement among technical staff.

The disparities among specialization groups underscore the importance of customizing CME content to the specific roles and responsibilities of different healthcare professionals. By designing specialty-specific modules that take into account the unique challenges and learning needs of each group, healthcare institutions can improve both participation and credit compliance.[31] For example, for nurses, CME programs might focus on patient safety, clinical skills enhancement, and interprofessional communication. For physicians, advanced clinical updates, emerging research findings, and case-based learning could be prioritized. Similarly, for pharmacists and technicians, the development of content that directly relates to their daily functions and technological requirements could help bridge the gap in CME engagement.

Organization and Participation in CME Programs

This study also explored the organization and participation in CME programs at various levels. Over the past five years, the number of national, provincial, and municipal CME programs organized by the hospital has shown an overall increasing trend. This reflects the growing emphasis placed on CME by healthcare institutions and the increasing demand for educational opportunities among healthcare workers.

Participation in CME programs varied across the different organizational levels. Our findings suggest that provincial-level programs had the highest participation rates, followed by municipal and national-level programs. Provincial-level programs consistently attracted the highest engagement—likely because they strike an optimal balance between accessibility (fewer travel requirements, lower fees) and content relevance, as modules are tailored to regional clinical guidelines and patient populations.[5] Municipal-level offerings, though highly practical and focused on local protocols, suffer from limited scope and lower perceived prestige, dampening their appeal beyond immediate service areas.[24]

National-level courses, while academically rigorous and backed by leading experts, often emphasize theoretical frameworks over hands-on skills and require travel and higher registration costs, reducing participation among staff with tighter schedules.[28] To address these disparities, national-level programs could adopt a hybrid delivery model—livestreaming keynote lectures and making on-demand recordings available—to reduce travel and scheduling barriers, while closer collaboration between provincial and municipal bodies could yield case-based workshops that marry national standards with local clinical scenarios, enhancing both relevance and rigor. At the same time, targeted subsidies for municipal-level course development could support the introduction of simulation laboratories and peer-reviewed assessments, elevating the instructional quality and institutional recognition of these programs.[32]

The quality and accreditation processes also vary by tier. National CME providers undergo stringent external audits, ensuring high content rigor but slower curriculum updates. Provincial boards offer more agile curriculum revision cycles—facilitating timely incorporation of emerging regional health priorities—but their accreditation criteria are less uniform across provinces.[33] Municipal programs are governed by local health bureaus with minimal external oversight, which can lead to variable instructional quality and inconsistent assessment standards. By standardizing core competencies across levels—such as adopting a unified assessment rubric and joint accreditation committees—institutions can both preserve the academic excellence of national offerings and enhance the practical impact of provincial and municipal programs, leading to a more coherent, high-quality CME ecosystem.[34]

Given these findings, it is essential to continue promoting provincial-level CME programs while ensuring that national-level programs remain relevant and accessible to healthcare professionals across the region. Providing hybrid or online options for national-level programs may further increase participation rates and offer greater flexibility in learning.[35] Furthermore, promoting cooperation among national, provincial, and municipal organizations can ensure a more coordinated CME delivery, thereby enhancing the overall impact of these programs.[5]

Implications

The findings of this study have important implications for the development of CME programs in Guangdong Province. The significant differences in participation and credit compliance across professional titles and specializations suggest that CME programs should be tailored to meet the specific needs of different groups. For example, intermediate-level professionals may benefit from more advanced, career-oriented CME courses, while junior-level professionals may need more foundational courses.[36] Similarly, senior-level professionals may benefit from CME programs focused on modern medical practices, patient safety, and advanced technologies.[4]

Additionally, the observed differences in credit compliance rates among specialization groups highlight the importance of designing CME programs that are closely aligned with the roles of healthcare professionals in various specialties. For instance, nurses could benefit from more practical learning opportunities that directly enhance their patient care skills,[37] while physicians and technicians may require CME focused on the latest medical treatments, updated clinical guidelines, and research developments.[38] Tailoring CME content to the specific needs of different healthcare professions will ensure that the programs are relevant and engaging for all participants.[3] Furthermore, offering flexible and convenient learning options, such as online courses or evening seminars, can accommodate the busy schedules of professionals.[39]

Limitations

Despite the valuable insights provided by this study, several limitations need to be acknowledged. First, the data were collected from a single 1,920-bed tertiary hospital in Guangdong Province. While this institution operates under the same provincial CME regulations as other major centers and serves a diverse mix of clinical departments and specialties—characteristics that make its CME practices to some extent representative of tertiary-care settings in the region—its unique administrative policies, resource allocation models, and organizational culture may nonetheless influence program delivery and staff engagement in ways that differ elsewhere. The characteristics of healthcare professionals, including their participation in CME programs, may vary across different hospitals, regions, and even countries due to differences in healthcare policies, institutional support, and the educational environment.[40] Therefore, future research could benefit from a more extensive dataset that includes multiple hospitals or healthcare institutions from different regions, which

would provide a more comprehensive and representative understanding of the trends and factors influencing CME participation and credit compliance.

Second, this study relied on quantitative methods, specifically descriptive statistics and Chi-square tests, to analyze participation and compliance. While these methods effectively identify broad patterns and significant differences among groups, they are limited in their ability to uncover the underlying reasons or motivations behind healthcare professionals' engagement (or lack thereof) in CME programs. Incorporating qualitative research methods, such as interviews or focus groups, could offer a deeper insight into barriers to participation, including time constraints, perceived relevance of CME programs, and personal or professional factors influencing decision-making.[41] Furthermore, exploring healthcare professionals' motivations for participating in CME could provide valuable insights for improving program design and tailoring it to meet the needs of different professional groups.[22]

Third, our analysis did not account for potential confounders such as age, gender, department size, job tenure, or shift work—all of which may influence both CME participation and credit-compliance rates. These factors could interact with professional title or specialty to affect engagement, and their omission limits our ability to isolate the independent effects of role and accreditation tier. Future research should prospectively collect these variables and employ multivariable or multilevel modeling to disentangle the independent effects of professional role, personal characteristics, and work environment on CME engagement.

Fourth, we did not assess whether higher CME participation or compliance translates into improved clinical outcomes, job performance metrics, or patient satisfaction scores, which constrains the practical interpretation of our findings. Without linkage to performance or outcome data, it remains unclear whether increased engagement yields tangible benefits for patient care or organizational efficiency. Future studies could address this gap by establishing data linkages—under appropriate governance—to examine correlations between CME engagement and metrics such as procedure success rates, error incidence, staff turnover, or patient-reported experience measures. Additionally, quantitative efficiency-evaluation methods—such as data envelopment analysis (DEA) and multi-criteria decision-making (MCDM), which were recently used to benchmark OECD countries' health-system efficiency during the COVID-19 pandemic[42]—could be adapted to evaluate CME program performance, offering data-driven insights into resource utilization and educational impact.

Moreover, grouping all healthcare professionals into four broad categories (physicians, nurses, pharmacists, technicians) may oversimplify the diversity of roles and CME requirements. Our classification was driven by the hospital's internal reporting system, which aggregated individuals into these groups for administrative efficiency. However, we recognize that sub-groups—such as physiotherapists, dietitians, radiologic technologists, laboratory scientists, clinical psychologists, and infection control practitioners—have distinct licensure mandates and educational needs. Future multicenter research should implement a more granular taxonomy of professional roles and specialties, enabling role-specific analyses that can guide tailored CME program development and policy recommendations.

Finally, the study focused on a limited timeframe (2019–2023). Given the rapid evolution of the healthcare system, CME delivery methods, and professional attitudes toward continuing education, the dynamics observed during this period may not fully capture longer-term trends or the impact of recent developments. For example, the increasing adoption of online CME courses and virtual learning environments—accelerated by the COVID-19 pandemic—could significantly alter participation patterns and engagement levels in ways not reflected in our data.[14] Future studies should consider a longitudinal design to assess how technological advancements, policy changes, and external shocks such as pandemics influence CME engagement over time.

Conclusion

In conclusion, this study underscores the growing importance of CME in Guangdong Province. The research explores the participation and credit compliance of healthcare professionals of different titles and specializations in CME programs at a hospital in Guangdong, revealing significant differences across these groups. Notably, significant disparities persisted across professional titles—with intermediate-level clinicians achieving the highest engagement—and among specialties, with nurses leading in compliance. Provincially accredited programs accounted for the greatest volume and fastest growth of CME offerings. To translate these gains into sustained improvements, hospitals could allocate protected CME

hours and introduce flexible, role-specific learning modules, such as brief micro-learning segments and on-site simulations. In addition, they could harmonize accreditation standards while adopting hybrid delivery models that combine streamed core lectures with locally facilitated discussion groups. These measures can further enhance CME uptake, ensure equitable professional development, and ultimately improve patient care quality.

Ethics Approval and Informed Consent

This study is a retrospective data collection study based on anonymized hospital records. The data involved in the study were low-risk, non-interventional, and all data were anonymized. The study protocol was submitted to the Ethics Committee of The Affiliated Brain Hospital of Guangzhou Medical University and was approved with ethical review exemption.

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Disclosure

The authors declare no competing interests in this work.

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