

Construction and Practice of a Volunteer Service Team Primarily Composed of Medical Undergraduates: A New Model of Medical Talent Cultivation Integrating “Clinical Practice-Scientific Research-Community Service”

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Research Article

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Abstract

Objective

To establish a medical undergraduate-led volunteer service team integrating clinical practice, scientific research, and community service, and to evaluate its effectiveness in enhancing students' comprehensive competencies.

Methods

Since 2017, Guangzhou Medical University's Third Clinical College recruited medical undergraduates to form a volunteer team with 6 management departments and 4 specialized research groups. Standardized recruitment, training, assessment, and management were implemented. The team engaged in early clinical practice, community epidemiological surveys, targeted health services for vulnerable populations, and health education. This prospective practice study involved participating undergraduates and community beneficiaries, employing mixed-methods (quantitative and qualitative) data collection to evaluate the model's efficacy.

Results

By 2025, 129 undergraduates (39 core members) were recruited. Over 40 community service and research activities directly served > 400 vulnerable individuals and indirectly benefited > 1,000. The team secured 12 research grants, achieved a 100% pass rate on clinical skill assessments, and a 38.8% research participation rate. Three undergraduate-first-authored papers are under review, and 6 CPPCC health proposals were adopted.

Conclusion

The integrated "clinical-research-community service" volunteer model effectively bridges the theory-practice gap for medical undergraduates, achieving synergistic development of clinical competence, research literacy, and social service awareness. This replicable framework provides a transformative reference for practical education reform in undergraduate medical training.

Introduction

Medicine is an applied discipline requiring deep integration of theory and practice, where clinical competence, research innovation, and social service awareness constitute core competencies for modern medical professionals[1]. Current Chinese undergraduate medical education remains predominantly lecture-based, with clinical exposure often delayed until late-stage internships. This results in inadequate early clinical contact, leading to weak application skills and suboptimal mastery of

fundamental clinical techniques like physical examinations and history-taking [2]. Medical education reform requires bridging the gaps in clinical exposure, research training, and community engagement for undergraduates. While China's "Excellence 2.0" and "Double Ten-Thousand" initiatives mandate research innovation competencies for medical undergraduates[3], traditional curricula offer limited research participation channels, resulting in delayed cultivation of scientific thinking and methodology. Additionally, insufficient professional-related social exposure leaves students unaware of primary healthcare needs and vulnerable populations' health conditions, hindering the development of vocationally-aligned social responsibility and medical professionalism[4]. Recent global medical education studies emphasize early clinical contact and comprehensive competency cultivation[5, 6], echoed by China's National Medical Education Development Plan (2021–2025) advocating innovative training models integrating practice with social service[7].

Volunteer service serves as a vital bridge connecting medical education with societal needs. In China, the "improvement of volunteer service systems" has been institutionalized as part of cultural development policies, with university student volunteer teams becoming key forces in grassroots health services and public education[8]. Medical students leverage their professional knowledge and skills to deliver specialized, precise health services in community volunteer work. However, challenges persist including disorganized management, disconnection between service and clinical research, supply-demand imbalance, and poor sustainability[9]. Current research predominantly examines isolated functions of medical student volunteerism (e.g., clinical practice or health education), failing to establish a systematic model that organically integrates clinical-research-community service components, thereby hindering coordinated development of undergraduates' comprehensive competencies[10]. Although preliminary concepts merging volunteer service with research have emerged[11], robust implementation frameworks and empirical studies remain scarce. This study establishes a medical undergraduate volunteer team at Guangzhou Medical University's Third Clinical College, pioneering a trinity model integrating clinical practice as the foundation, scientific research as the core, and community service as the platform. Through standardized organizational structures, systematic practice frameworks, and closed-loop feedback mechanisms, it achieves synergistic advancement across clinical, research, and social service domains. This aligns with WHO's Global Strategy on Human Resources for Health: Workforce 2030, which emphasizes "comprehensive competency development through practice and service"[12]. This study hypothesizes that the proposed model can effectively enhance medical undergraduates' clinical competence, research innovation literacy, and social service capacity, while simultaneously delivering targeted health services to vulnerable populations—achieving a dual-win scenario for medical education and societal needs.

Materials and Methods

1. Study Design and Ethics

This prospective educational intervention study employs a mixed-methods approach, combining quantitative analysis (practice data statistics, skills assessment, scale evaluations) with qualitative

research (volunteer interviews, service recipient feedback) to evaluate the impact of the "clinical-research-community service" model on medical undergraduates' competency development and community health outcomes.

This study was conducted in compliance with the Declaration of Helsinki and approved by the Ethics Committee of Guangzhou Medical University (Approval No.: Lin Lun Shen Yan [2023] No. 082; Date: August 25, 2023); Guangdong Provincial People's Hospital (Approval No: KY2026-018-02). Written informed consent was obtained from all volunteers and community participants, with data strictly confidential and used solely for this research and related scientific work.

2. Research Subjects

2.1 Volunteer Recruitment

The study recruits undergraduate medical students (4-year/5-year programs) from Guangzhou Medical University as core volunteers.

Inclusion Criteria: (1) Full-time undergraduate medical students with foundational medical knowledge. (2) Strong communication skills for effective collaboration with patients, families, and healthcare staff. (3) Voluntary participation with commitment to fixed service hours. (4) Completion of basic training and internal assessments by the volunteer team.

Exclusion Criteria: (1) Severe physical or mental illness that prevents safe participation in volunteer services or completion of assigned tasks. (2) Any other conditions that, in the judgment of the research team, could compromise service quality or data reliability.

2.2 Community Service Recipients

The study focuses on vulnerable populations in Guangzhou's Liwan District and surrounding areas (Foshan, Zhuhai, Zhanjiang), including: Hearing-impaired children and their families; Children with autism spectrum disorder (ASD) and their families; Elderly populations; Pregnant women with periodontitis.

Inclusion Criteria (meeting any one of items 1–4 plus items 5–6):

(1) Children aged 0–14 years diagnosed with hearing impairment according to WHO hearing loss grading criteria (average air conduction threshold > 25 dB HL in the better ear), and their family members.

(2) Children aged 0–14 years diagnosed with ASD according to the Diagnostic and Statistical Manual of Mental Disorders (5th edition, DSM-5) or the Chinese Classification and Diagnostic Criteria for Mental Disorders (3rd edition, CCMD-3), and their family members.

(3) Elderly individuals aged ≥ 60 years.

(4) Pregnant women diagnosed with periodontitis according to the 2018 International Classification of Periodontal Diseases and Conditions (clinical attachment loss ≥ 3 mm with probing depth ≥ 3 mm at ≥ 2 non-adjacent teeth) or the Chinese guidelines for periodontal diagnosis.

(5) Voluntary participation with signed informed consent for research and service activities.

(6) Ability to complete the required assessments (e.g., scales, physical examinations).

Exclusion Criteria: (1) Severe physical/mental comorbidities impairing participation;(2) Any other circumstances deemed by the investigators to make participation inappropriate.

3 Sample Size Calculation

3.1 Volunteer Sample Size

The sample size was determined based on medical education research methodologies, with clinical skills improvement rate as the primary outcome. With $\alpha = 0.05$, $\beta = 0.2$, and an expected improvement rate of 80%, the minimum required sample size was calculated as 102. This study successfully recruited 129 participants, meeting statistical requirements.

3.2 Community Service Recipient Sample Size

The sample size was calculated based on an 80% minimum valid response rate for scale assessments ($\alpha = 0.05$), with each subgroup requiring ≥ 80 participants. This study exceeded requirements by collecting ≥ 120 valid responses per subgroup.

4 Volunteer Service Team Structure and Management

4.1 Organizational Framework

The Volunteer Service Team establishes a Management Committee overseeing six specialized departments: Planning, Practice, General Affairs, Publicity, Personnel, and Technology. Each department operates with defined responsibilities and collaborative workflows. Planning Department: Responsible for activity proposal design and overall coordination. Practice Department: Responsible for on-site execution of clinical practice and community services. General Affairs Department: Responsible for material management, funding allocation, and research data administration. Publicity Department: Responsible for health science communication and service team branding. HR Department: Responsible for volunteer recruitment, training, evaluation, and daily attendance tracking. Technology Department: Responsible for research project applications, literature study, and academic paper writing.

4.2 categorization of scientific research teams

Four specialized research groups were established based on clinical research priorities and community health needs, co-supervised by clinical faculty and research mentors, with a tiered mentorship model integrating undergraduates across academic years. Operational Mechanism: Low-grade students handle data collection, High-grade students lead manuscript writing with faculty co-authorship. Group Composition: Hearing-impaired Children Group; Elderly Care Group; Autism Spectrum Disorder (ASD) Group; Maternal Periodontitis Group.

4.3 Volunteer Standardized Management

4.3.1 Recruitment Process

The standardized volunteer recruitment follows a six-step protocol: (1) Public Announcement (2) Voluntary Registration (3) Preliminary Screening (4) Basic Training (5) Internal Assessment (6) Formal Admission. The assessment certification remains valid for one year, after which volunteers must undergo retraining and reassessment to maintain active status.

4.3.2 Training Content

The training adopts a dual-track “theory+practice” model, covering five core modules essential for clinical and community service volunteers: (1) Clinical Core Skills: Consultation techniques, Physical examinations, Rehabilitation assessment, Therapeutic massage. (2) Research Tools: Standardized scales: Achenbach Child Behavior Checklist (CBCL) [13], Parenting Stress Index (PSI) [14], Mini-Mental State Examination (MMSE) [15], Geriatric Depression Scale (short form) [16], Autism Behavior Checklist (ABC) [17], Strengths and Difficulties Questionnaire (SDQ) [18], Patient Health Questionnaire-9 (PHQ-9) [19]; Analytical methods: Clinical data analysis, Mendelian randomization (MR), and meta-analysis protocols. (3) Communication Strategies: Specialized techniques for vulnerable groups (children/elderly/disabled), 3F Listening Model (Fact-Feeling-Focus) for service scenarios. (4) Research Fundamentals: Literature retrieval (PubMed/CNKI), Data collection and cleaning protocols, Scientific writing frameworks (IMRaD structure). (5) Service Standards: Ethical compliance (Helsinki Declaration applications), Professional etiquette and cultural sensitivity, Safety protocols for field interventions.

4.3.3 Activity Execution

Each event follows a closed-loop workflow coordinated by personnel and operational teams, ensuring structured volunteer deployment and data-driven evaluation. Key Procedures: (1) Team Formation: Personnel Department recruits volunteers and assigns 1 lead member as temporary captain, Operates in small teams (5–8 members/team) for targeted service delivery. (2) Post-Action Protocol: Practice & Technology Departments jointly, Organize field data, Produce activity reports, Implements “Plan → Execute → Analyze → Improve” cycle.

5 Practice Content System

Construct a tridimensional practice content system that integrates "clinical research, community service, and health promotion," and establish a rolling practice mechanism that follows the sequence of "identifying problems through community surveys → analyzing problems via clinical research → resolving problems through community service → preventing problems through health promotion." This approach aims to achieve deep integration and a virtuous cycle among clinical practice, scientific research, and community service.

5.1 Clinical Research Practice

Each research team conducts the following tasks under the full guidance of mentors: (1) Literature Review: Systematic study of research advancements and standardized assessment tools in the specialized field. (2) Clinical Investigation: Collaboration with partner hospitals (e.g., Guangdong Provincial People's Hospital, Third Affiliated Hospital of Guangzhou Medical University) for in-depth clinical case collection and data analysis. (3) Community Epidemiological Survey: Conduct health surveys among vulnerable populations in communities, collecting assessment data and physical examination results to analyze health issues and influencing factors. (4) Research Project Application & Paper Writing: Apply for university/ municipal/provincial/ national research projects based on findings, and draft scientific papers using data outcomes.

5.2 Community Health Services

Targeted and personalized health services are provided for different groups, focusing on psychological care and health support: (1) Children (hearing impairment/autism): Design psychological companionship plans (e.g., sandplay therapy, picture-book reading, puzzle games) based on mental health assessments; Provide professional psychological counseling. (2) Elderly: Standardized physical examinations, rehabilitation assessments, and therapeutic massages; Social integration activities (e.g., sharing sessions, talent competitions); (3) Pregnant women with periodontitis: Professional periodontal health checks; Personalized oral hygiene guidance; Standardized consultation on periodontitis prevention during pregnancy.

5.3 Health Science Communication

A multi-channel "online + offline" model ensures comprehensive and wide-reaching dissemination: (1) Online Outreach: Publish health articles and short videos on WeChat Official Accounts, Bilibili, etc., targeting all age groups. (2) Offline Engagement: Organize health lectures, consultation days, and booth promotions for direct community interaction. (3) Free Screening: Partner with community health centers to provide free screenings (hearing, autism, periodontal health, elderly cognitive function), enhancing early disease detection.

6 Data Collection and Analysis

6.1 Data Collection Indicators

This study evaluates implementation effectiveness through five dimensions: (1) Organizational Development Metrics: Number of volunteers, Core team members, Department operational status, Research groups established; (2) Clinical Practice Metrics: Clinical/community surveys conducted Assessment scales collected Basic clinical skills certification rate; (3) Research Output Metrics: Funded projects (university/municipal/provincial/national levels), Papers drafted/submitted; (3) Community Service Metrics: Service reach (direct/indirect beneficiaries) Activities organized; (4) Social Impact Metrics: Policy proposals submitted, Project approvals, Funding secured.

6.2 Statistical Analysis

Data analysis was performed using SPSS 26.0, with:Continuous variables expressed as mean ± standard deviation ($\bar{x} \pm s$); Categorical variables presented as rates (%); Primary method: Descriptive statistics (aligned with this educational practice study's objectives).

Result

1. Achievements in Volunteer Team Organization

By 2025, the voluntary organization had recruited 129 medical undergraduates from Guangzhou Medical University, including 39 core members, with 6 departments operating efficiently. Recognized as a "Outstanding Voluntary Organization" at the university level, it established 4 specialized research groups supervised by clinical/research mentors, adopting a "mentor-guided + student-led" model. Table 1 lists group composition and establishment duration.

Table 1
Basic Information of Specialized Research Groups in the Volunteer Service Team

Research Group	ears Established	Members	Advisor Specialization	Primary Research Focus
Hearing-impaired Children	3	11	Pediatrics + Rehabilitation	Psychological status & family stress in hearing-impaired children
Elderly Care	2	6	Geriatrics	Cognitive function & depression in elderly populations
Autism Spectrum	2	9	Child Healthcare	Behavioral characteristics of ASD children & parental stress
Maternal Periodontitis	3	≥ 10	Dentistry + Obstetrics	Etiology & prevention of periodontitis during pregnancy

2 Clinical and Research Practice Achievements

2.1 Survey Data Collection

The research teams conducted ≥ 38 clinical/community surveys across Guangzhou and neighboring cities (Foshan, Zhuhai, Zhanjiang). Key outcomes: (1) Participation: Involved > 50 undergraduate volunteers (38.8% of total team); Achieved 100% pass rate in clinical skills assessments (history-taking, physical exams, scale evaluations); (2) Coverage: See Table 2 for detailed data collection metrics by group.

Table 2
Research Data Collection by Teams

Research Group	Total Surveys (Clinical+Community)	Scales/Data Collected	Coverage Areas
Hearing-impaired Children	≥ 20	125	Guangzhou
Elderly Care	≥ 10	323	Guangzhou, Foshan, Zhanjiang
Autism Spectrum	≥ 8	120	Guangzhou, Foshan, Zhuhai
Maternal Periodontitis	--	--	--

2.2 Research Grants and Publications

The team secured 12 research grants (1 national, 3 provincial, 4 municipal, 4 university-level) and produced 3 undergraduate-first-authored papers (2 in English, 1 in Chinese) under review(Table 3). An additional 1 independent database analysis paper was completed.

Table 3
Research Grant Achievements by Teams

Research Group	National Grants	Provincial Grants	Municipal Grants	University Grants	Papers Under Review
Hearing-impaired Children	1	2	1	0	2(English)
Elderly Care	0	0	1	0	0
Autism Spectrum	0	0	1	0	0
Maternal Periodontitis	0	1	1	4	1(Chinese)
Total	1	3	4	4	3

3 Community Service and Science Popularization Achievements

3.1 Community Service Outcomes

The volunteer team conducted 40 + community service events, directly serving 400 + individuals (including hearing-impaired/autistic children, elderly, and pregnant women) and indirectly benefiting 1,000+ (families/residents).

3.2 Science Popularization Outcomes

The initiative achieved dual-channel impact: (1) Digital Platforms: Published 120 + articles/videos on WeChat/Bilibili (5,000 + followers, 100,000 + views);(2)On-site Activities: Conducted 22 health lectures, 15 consultation days, and 8 free screenings, engaging 800 + residents to enhance disease awareness.

4 Social Impact and Government Support Achievements

The team's initiatives gained multi-level institutional recognition: (1) Policy Influence:Submitted 6 health-related proposals to Liwan District CPPCC (all approved); (2) Supported by:Liwan District Political Consultative Conference, Liwan Disabled Persons' Federation, Guangzhou Women's Federation; (3) Funding Support:

Secured ¥50,000 in grants from: Guangzhou Women's Federation's Yangcheng "Her" Public Welfare Program, Guangdong Youth League's Yi Miao Plan.

Discussion

1 Key Findings and Core Advantages

This study successfully established a medical undergraduate-led volunteer service team, pioneering a "clinical-research-community service" tripartite model that achieved significant outcomes in organizational development, clinical research, community engagement, and social impact. Three Core Strengths:

1.1 Synergistic Development of Medical Undergraduates' Comprehensive Competencies

This study establishes a "theoretical learning → practical application → research advancement → social contribution" closed-loop training system through a volunteer service team model, effectively integrating traditionally isolated components of medical education. Undergraduates bridge the gap of insufficient early clinical practice by converting classroom theoretical knowledge into hands-on clinical skills (such

as scale assessments and physical examinations) through early clinical exposure and community research. Under the guidance of research supervisors, students participated in data organization, research project applications, and academic paper writing, which enabled them to develop scientific thinking and master standardized research methodologies in advance, significantly enhancing their research and innovation capabilities. By providing professional health services to vulnerable groups, students gained an in-depth understanding of grassroots medical needs and social realities, cultivating strong social responsibility and medical ethics, ultimately achieving synergistic improvement in clinical competence, research literacy, and professional integrity. The study results demonstrate a 100% pass rate in clinical skills assessment and over 38.8% research participation rate among undergraduate participants, with zero complaints from service recipients, fully validating the talent cultivation efficacy of this model.

1.2 Providing targeted health services for vulnerable groups in the community

This model adopts a community-needs-oriented approach, delivering personalized psychological support and health services to underserved populations such as hearing-impaired children, autistic children, elderly individuals, and pregnant women with periodontitis, effectively addressing gaps in grassroots healthcare regarding mental health counseling and health management. For example, targeted interventions for families with hearing-impaired children include not only audiological assessments but also psychological support for both children and parents, utilizing sandplay therapy and other mental health companion programs to address their psychological distress—effectively complementing existing research findings that "psychological issues in hearing-impaired families are often overlooked" [20]. Simultaneously, the hybrid online-offline science popularization model and free screening initiatives have significantly enhanced community residents' awareness of rare diseases, geriatric conditions, and common pregnancy-related illnesses, facilitating early disease identification and prevention while elevating grassroots healthcare service standards.

1.3 Establishing a replicable medical education practice paradigm

This model has developed a standardized organizational management system and practice framework, featuring: (1) Six functional departments with collaborative workflows; (2) A "mentor-guided + undergraduate-led" research model; (3) A five-phase volunteer management protocol (recruitment-training-assessment- execution-feedback); (4) Integrated practice modules (clinical research, community service, and health education). Providing a replicable reference for medical undergraduate volunteer programs and pedagogical reform in higher education institutions. Moreover, this model has garnered support from government agencies and social organizations, forming a sustainable development mechanism characterized by "university leadership, government backing, and societal participation." By submitting CPPCC proposals to inform grassroots health policymaking with empirical evidence and

securing social funding to address financial constraints, it has significantly enhanced the model's scalability.

2 Comparison with Previous Studies

Existing research on medical student volunteer services primarily focuses on single-function explorations, such as studies limited to evaluating the enhancement of clinical practice skills [21] or solely examining the science popularization value of volunteer activities [22]. These approaches have yet to develop a systematic model integrating clinical training, scientific research, and community service. The innovation of this study lies in the organic integration of three components, establishing a closed-loop feedback mechanism: identifying health issues among vulnerable groups through community research, channeling these findings into targeted clinical studies, and ultimately applying the research outcomes to community services. This creates a virtuous cycle of "problem-research-solution," achieving deep integration between medical education and societal needs.

Traditional medical undergraduate research training models still suffer from low participation rates and disconnection from clinical and social realities [23, 24]. This study innovatively employs volunteer services as a platform to ground scientific research in community needs, enhancing the practical relevance of undergraduate research. Furthermore, a "mentorship cascade" mechanism across different academic years achieves tiered research competency development, lowering the entry barrier for junior students and significantly improving research participation rates.

Regarding community services, this study distinguishes itself from existing community health service research by emphasizing precision and personalization. Tailored service plans were designed for different vulnerable groups—such as psychological companionship for children, and rehabilitation services with social integration activities for the elderly—replacing homogeneous health education campaigns, which significantly improved service efficacy and satisfaction levels [25].

3 Issues and Improvement Directions of the Model

3.1 Current Challenges

While this model has achieved preliminary success, several critical issues require resolution: (1) Professionalism in volunteer management requires further improvement: The management team of the undergraduate volunteer service team consists solely of undergraduates, lacking professional organizational experience, resulting in inefficiencies in activity coordination and execution. (2) Limited service capacity of undergraduates: Medical undergraduates' theoretical knowledge and clinical skills remain at an elementary level, resulting in insufficient ability to handle complex cases, which restricts the depth and breadth of services. (3) Insufficient sustainable funding: The continuity of medical student volunteer services hinges on stable financial and institutional support. Currently, the team's funding

primarily relies on grants from public welfare competitions, lacking sustainable financial channels, which hinders long-term community services and research practices. Studies indicate that establishing diversified fundraising mechanisms is the key solution to this challenge [26]. (4) Low efficiency in research output conversion: Currently, only 3 papers are under review, with slow publication and transformation rates of research outcomes, failing to match the accumulated volume of survey data.

3.2 Future Improvement Directions

While this model has achieved initial success, several critical issues require urgent resolution: (1) Professionalization of volunteer management: The undergraduate-led management team lacks professional organizational knowledge and practical experience, leading to inefficiencies in activity coordination and on-site execution. (2) Limited service capacity of undergraduates: With foundational-level medical knowledge and clinical skills, students struggle to identify and manage complex cases, restricting service depth and breadth. (3) Insufficient sustainable funding: Current reliance on temporary grants from public welfare competitions fails to support long-term community services and research practices. (4) Low research output conversion: Only 3 submitted papers reflect slow publication and transformation rates, mismatching the scale of accumulated survey data and hindering practical application.

4. Limitations of the Study

This single-center educational practice study was conducted exclusively with medical undergraduates from Guangzhou Medical University, focusing on Guangzhou's Liwan District and surrounding areas. The limited sample representativeness necessitates further validation of the results' generalizability. Additionally, the descriptive statistical analysis employed lacks a control group for comparative assessment, hindering precise evaluation of the model's impact on medical education. Future multicenter controlled studies with expanded samples, broader service coverage, and advanced statistical methods are planned to refine the "clinical-research-community service" integration model.

Conclusion

This study pioneers a tripartite "clinical-research-community service" model through undergraduate medical volunteer teams, effectively bridging the theory-practice gap in medical education while delivering precision health services to vulnerable populations. Its standardized framework and multi-stakeholder sustainability mechanism offer replicable solutions for China's medical education reform. Simultaneously, it provides targeted and professional healthcare services for vulnerable community groups, significantly enhancing grassroots health service standards, with its practical outcomes receiving high recognition from both government and society. This model establishes a standardized organizational management and practice content system, forming a sustainable development mechanism of "university-led, government-supported, and society-participated", providing replicable and scalable reference solutions for the reform of practical teaching in China's undergraduate

medical education.Future efforts should focus on refining management systems, establishing stable funding mechanisms, and enhancing the efficiency of research to continuously expand the model's reach, enabling medical education to better serve societal health needs and contribute to the implementation of the "Healthy China" strategy.

Declarations

Ethics approval and consent to participate

This study was conducted in compliance with the Declaration of Helsinki and approved by the Ethics Committee of Guangzhou Medical University (Approval No.: Lin Lun Shen Yan [2023] No. 082; Date: August 25, 2023); Guangdong Provincial People's Hospital (Approval No: KY2026-018-02). Written informed consent was obtained from all volunteers and community participants, with data strictly confidential and used solely for this research and related scientific work.

Consent for publication

Not applicable.

Competing interests

The authors have no conflicts of interest to declare.

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Author Contribution

Chen L, Xie TF, Hong LP, Cao YX, Zhong XQ—Conceptualization
Chen L, Xie TF, Hong LP, Cao YX, Zhong XQ—Data curation
Chen L, Xie TF, Hong LP, Cao YX, Zhong XQ—Formal analysis
Zhong XQ—Funding acquisition
Xie TF, Hong LP, Cao YX, Zhong XQ—Investigation
Chen L, Xie TF, Hong LP, Cao YX, Zhong XQ—Methodology
Chen L, Xie TF, Hong LP, Cao YX, Zhong XQ—Writing-original draft

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Data Availability

The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

References

1. World Federation for Medical Education. Basic Medical Education: WFME Global Standards for Quality Improvement. Copenhagen: WFME Office; 2015.
2. Sun GZ, Zhang Y, Dong YY, et al. Application of standardized patients combined with PBL teaching method in psychiatry teaching [J]. *China Continuing Med Educ*. 2025;17(9):83–6.
3. Zhang GL, Zhang JZ, Li XM, et al. Exploration and practice of the One Body with Two Wings model in research-based classroom teaching [J]. *High Educ Sci*. 2025;44(5):518–23.
4. Xiu SL, Fu JL, Sun LN, et al. Cultivation of scientific research innovation ability in clinical medicine undergraduates [J]. *Med Educ Manage*. 2023;9(1):33–7.
5. Ling T, Shen Y, Zhang Y, et al. Medical Education Reform in China in the 21st Century: A Literature Review. *Adv Med Educ Pract*. 2024;15:1313–24.
6. Simmenroth A, Harding A, Vallersnes OM, et al. Early clinical exposure in undergraduate medical education: A questionnaire survey of 30 European countries. *Med Teach*. 2023;45(4):426–32.
7. 2021.National Health Commission of the PRC. National Medical Education Development Plan (2021–2025) [Z]. 2021.
8. Decision of the Central Committee of the Communist Party of China on Some Major Issues Concerning Upholding. and Improving the System of Socialism with Chinese Characteristics and Advancing the Modernization of China's System and Capacity for Governance [Z]. 2019.
9. Niu D, Zhu XJ, Cai BL. Research status of medical student volunteers participating in community health services [J]. *Chin J Mod Nurs*. 2017;23(16):2077–81.
10. Liu W, Li T, Liu D. Volunteer service and integrated professionalism cultivation practice of medical students under the theory of service learning. *Chin J Med Educ*. 2020;40:8–10.
11. Ishammari SA, Alyousefi NA, Almeneessier A. Shaping tomorrow's professionals: King Saud University's transformative course on medical volunteerism, empowering students to develop proposals for impactful initiatives. *BMC Med Educ*. 2025;25:1397.
12. World Health Organization. Global strategy on human resources for health: workforce 2030 [R]. Geneva: WHO; 2016.
13. Huang Yiming L, Jinzhen, Xu Y, et al. Research on the application of Achenbach Child Behavior Checklist (CBCL) in children with autism spectrum disorder [J]. *Chin J Social Med*. 2022;39(5):571–5.
14. López-Pinar C, Martínez-Sanchis S, Carbonell-Vayá E, et al. Parental Stress Assessment with the Parenting Stress Index (PSI): A Systematic Review of Its Psychometric Properties[J]. *Children*. 2022;9(11):1649.

15. Ala T, Bakir D, Goel S, et al. A Mini-Mental State Examination Formula May Help to Distinguish Alzheimer's Disease from Dementia with Lewy Bodies[J]. *J Alzheimers Dis.* 2022;89(3):1119–29.
16. Zhang C, Wang Y, Fu S, et al. Psychometric Properties and Modification of the 15-item Geriatric Depression Scale Among Chinese Oldest-Old and Centenarians: A Mixed-Methods Study[J]. *BMC Geriatr.* 2022;22(1):144.
17. Cederlund M. Parent Questionnaires in the Evaluation of Pre-School Children Referred for Neuropsychiatric Assessment[J]. *J Autism Dev Disord.* 2022;52(4):1742–51.
18. Murray AL, Speyer LG, Hall HA, et al. A Longitudinal and Gender Invariance Analysis of the Strengths and Difficulties Questionnaire Across Ages 3, 5, 7, 11, 14, and 17 in a Large U.K.-Representative Sample[J]. *Assessment.* 2022;29(6):1248–61.
19. Hellström L, Madeddu F, Jayaram-Lindström N, et al. Psychometric Properties of the Swedish Version of the Patient Health Questionnaire-9: An Investigation Using Rasch Analysis and Confirmatory Factor Analysis[J]. *BMC Psychiatry.* 2025;25:36.
20. Loh DS, et al. Navigating childhood hearing loss: the experiences of parents, grandparents and siblings[J]. *Disabil Rehabil.* 2025;47(11):2846–57.
21. Coster S, et al. Responsibility driven learning in primary care: a qualitative evaluation of a medical student COVID-19 volunteering programme[J]. *BMC Med Educ.* 2022;22(1):740.
22. Gautam D, Sandhu S, Kutzer K, et al. Training student volunteers as community resource navigators to address patients' social needs: A curriculum toolkit[J]. *Front Public Health.* 2022;10:966872.
23. Zeng J, Liu X, Li X, et al. Clinical research capability enhanced for medical undergraduates: an innovative simulation-based clinical research curriculum development[J]. *BMC Med Educ.* 2022;22(1):543.
24. Okabe T, Abe Y, Tomita Y, et al. Effect of community-based social participation intervention for older adults: A randomized controlled trial[J]. *J Am Geriatr Soc.* 2023;71(11):3555–65.
25. Wang Z, Li Y, Zhang H. Precision community health service for vulnerable groups: a case study of Guangzhou [J]. *Chin J Public Health.* 2024;40(3):356–9.
26. Liu WW, Li T, Yang XZ, et al. Innovative exploration of new mechanisms for medical student volunteer services [J]. *Chin J Med Educ.* 2021;41(3):201–4.