

Postprint: Current Status and Improvement Strategies of Healthcare Service Capacity of Village Doctors in China

Authors: Li Siqing, Wang Xuanxuan, Xie Kun, Gao Shuhong, Chen Jiaying, Zhang Chaoyang, Wang Xuanxuan, Zhang Chaoyang

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Abstract

Background With the comprehensive advancement of the Healthy China strategy, health disparities between urban and rural residents have gradually narrowed. However, as the first point of contact for rural residents' health issues, village doctors' medical service capacity still shows a gap compared with residents' medical service demands. **Objective** To investigate the current status of medical service capacity of village doctors in the eastern, central, and western regions of China, analyze their capacity characteristics and main deficiencies, explore strategies for improving village doctors' medical service capacity, and provide references for capacity building of rural primary health workforce. **Methods** In August 2020, the research team used a combination of multi-stage sampling and typical sampling to select a total of 3,916 village doctors from five provinces in the eastern, central, and western regions. Through distributing questionnaires on the "Wenjuanxing" platform, an online survey was conducted on the current status of medical service capacity among the selected village doctors across seven dimensions: diagnosis and treatment of common diseases, emergency response to critical conditions, standardized medical device usage, community rehabilitation guidance, medical service collaboration, medical documentation, and traditional Chinese medicine services. **Results** Among the 3,916 village doctors included in the analysis, 2,925 (74.7%) demonstrated competency in diagnosis and treatment of common and frequent diseases, with central region doctors showing the highest competency rate (81.2%), followed by the eastern region (79.6%), and the western region the lowest (59.1%); 2,098 (53.6%) demonstrated competency in emergency response to critical conditions, with central region doctors showing the highest competency rate (61.6%), followed by the eastern region (52.3%), and the western region the lowest (40.1%); 2,081 (53.1%) demonstrated competency in standardized medical device usage,

with central region doctors showing the highest competency rate (62.3%), followed by the eastern region (53.8%), and the western region the lowest (36.3%); 2,073 (52.9%) demonstrated competency in community rehabilitation services, with central region doctors showing the highest competency rate (59.7%), followed by the eastern region (53.6%), and the western region the lowest (40.3%); 3,120 (79.7%) demonstrated competency in medical documentation, with central region doctors showing a higher competency proportion (82.6%), followed by the eastern region (82.0%), and the western region the lowest (72.7%); 2,190 (55.9%) demonstrated competency in medical service collaboration, with central region doctors showing a higher competency proportion (61.0%), followed by the eastern region (57.9%), and the western region the lowest (45.3%); 2,443 (62.4%) demonstrated competency in traditional Chinese medicine services, with western region doctors showing the highest competency rate (64.8%), followed by the central region (62.7%), and the eastern region the lowest (58.7%). Conclusion Village doctors possess relatively good medical service skills, basically meeting the general medical service needs of rural residents; however, their comprehensive management capacity needs improvement, with significant regional disparities in capacity. It is necessary to strengthen training for village doctors' capacity, improve the overall quality of the workforce, perfect the construction of hardware facilities and information systems for village-level medical services, and promote the effective implementation of the primary care first-visit system.

Full Text

Preamble

Research on the Current Status and Improvement Strategies of Medical Service Capacities of Village Doctors in China

Li Siqing¹, Wang Xuanxuan², Xie Kun³, Gao Shuhong⁴, Chen Jiaying^{3, 4}, Zhang Chaoyang⁴

¹School of Continuing Education, Nanjing Medical University, Nanjing 211166, China

²School of Health Policy & Management, Nanjing Medical University, Nanjing 211166, China

³Kangda College of Nanjing Medical University, Lianyungang 222000, China

⁴China Rural Health Association, Beijing 100061, China

Corresponding authors: Wang Xuanxuan, Associate Professor; E-mail: an-nawang@njmu.edu.cn; Zhang Chaoyang, Professor/Doctoral Supervisor; E-mail: zzyang001@sohu.com

Abstract

Background: With the nationwide implementation of the “Healthy China” strategy, health disparities between urban and rural populations have gradually narrowed. However, as the first point of contact for rural residents' health

concerns, village doctors' medical service capacities still lag behind the actual needs of the population they serve.

Objective: This study investigates the current medical service capacities of village doctors in eastern, central, and western China, analyzes their competency characteristics and primary deficiencies, and explores strategies for capacity improvement to inform the development of rural primary health workforce capabilities.

Methods: In August 2020, the research team employed a combination of multi-stage stratified sampling and typical sampling to select 3,916 village doctors across five provinces in eastern, central, and western China. An online questionnaire survey was administered via the “Wenjuanxing” platform, assessing seven dimensions of medical service capacity: diagnosis and treatment of common diseases, emergency response to critical conditions, standardized medical device usage, community rehabilitation guidance, medical service coordination, medical documentation, and traditional Chinese medicine services.

Results: Among the 3,916 village doctors analyzed, 2,925 (74.7%) demonstrated competence in diagnosing and treating common and frequent diseases, with the highest rate in central China (81.2%), followed by eastern China (79.6%), and lowest in western China (59.1%). For emergency response to critical conditions, 2,098 (53.6%) were competent, again highest in central China (61.6%), followed by eastern China (52.3%), and lowest in western China (40.1%). Standardized medical device usage was reported by 2,081 (53.1%), with central China leading (62.3%), followed by eastern China (53.8%), and western China trailing (36.3%). Community rehabilitation services competence was found in 2,073 (52.9%) village doctors, with central China at 59.7%, eastern China at 53.6%, and western China at 40.3%. Medical documentation skills were present in 3,120 (79.7%), with central China at 82.6%, eastern China at 82.0%, and western China at 72.7%. Medical service coordination capability was reported by 2,190 (55.9%), with central China at 61.0%, eastern China at 57.9%, and western China at 45.3%. Traditional Chinese medicine service capacity was found in 2,443 (62.4%), interestingly highest in western China (64.8%), followed by central China (62.7%), and lowest in eastern China (58.7%).

Conclusions: Village doctors generally possess adequate medical service skills that essentially meet rural residents' basic healthcare needs. However, their comprehensive management capabilities require enhancement, and significant regional disparities exist. Strengthening training programs, improving overall workforce quality, upgrading village-level medical facilities and information systems, and promoting effective implementation of the primary care first-visit system are urgently needed.

[Key words] Rural doctors; Medical services; Service capacity; Cross-sectional studies

Introduction

In December 2019, the Standing Committee of the National People's Congress passed the *Basic Medical and Health Care and Health Promotion Law*, which explicitly emphasizes the importance of strengthening primary-level medical institutions and workforce development. The law establishes a career development mechanism for rural medical personnel that integrates county, township, and village levels, further promoting rational allocation of medical resources to ensure equitable access to basic medical and health services for urban and rural residents, thereby consolidating the “safety net” of basic medical and health care. Village doctors constitute a crucial component of China's health professional workforce, serving as primary providers of basic health services in rural areas and bearing the heavy responsibility of safeguarding the health of vast rural populations. As the “first point of contact” for rural residents' health issues, their duties include providing basic medical care and public health services. In family doctor contract services, they are not only essential members of the family doctor team but also important service providers and contacts for rural households. Research consistently shows that although family doctor services are comprehensive, medical services represent their most fundamental and important function, forming both the core content of family doctor services and an important guarantee for comprehensive health services. Possessing adequate medical service capacity is the foundation for village doctors' practice and a critical basis for establishing a tiered diagnosis and treatment system. Therefore, building a high-quality village doctor workforce with strong medical service capabilities is significant for realizing the “Healthy China” strategy and narrowing health service gaps between urban and rural residents.

Currently, China's village doctor workforce still faces problems including insufficient numbers, aging personnel, and limited service capacities, which affect the delivery of rural primary health services. This study investigates the current status of medical service capacities among village doctors nationwide, analyzes regional differences and capacity distribution characteristics, explores measures to strengthen village doctor workforce development and enhance service capacities, and provides policy foundations and decision-making support for implementing tiered diagnosis and treatment systems.

1. Materials and Methods

1.1 Survey Subjects and Sampling Design

In August 2020, the research team employed multi-stage stratified cluster sampling to select four provinces and one municipality across China's eastern, central, and western regions: Jiangsu, Anhui, and Henan provinces, Gansu province, and Chongqing municipality. Within each sample province, two prefecture-level cities with medium to high and medium to low population and economic status were selected as sample cities. Based on economic development level and popula-

tion size, one urban district and one county (or county-level city) in the medium range were selected from each sample city, resulting in a total of 24 districts and counties across the five provinces/municipalities. The analysis included village doctors working in village clinics and those working in township health centers or community health service stations but holding village doctor qualifications. Public health physicians, nurses, and other personnel who worked in village clinics but did not directly provide medical services and health management were excluded. This study was approved by the Ethics Committee of Nanjing Medical University [Approval No.: NMU Ethics Review (2020)].

1.2 Survey Content and Methods

The questionnaire was developed based on the “Family Doctor Health Service Capacity Indicator System” previously developed by the research team. It included two parts: general information survey and self-assessment of job capabilities.

1.2.1 General Information The general information survey collected data on age, education level, and practice qualifications. Practice qualifications were categorized into five types: licensed physicians, licensed assistant physicians, general practitioners, rural doctors, and other or no qualifications (multiple selections allowed). For analysis, licensed physicians and licensed assistant physicians were combined into “licensed (assistant) physicians,” resulting in four categories. If respondents selected both “licensed (assistant) physician” and “rural doctor,” they were classified as “licensed (assistant) physician”; if they selected both “licensed (assistant) physician” and “general practitioner” (possibly indicating additional general practice certification or completion of general practice transition training), they were classified as general practitioners; if they selected both “rural doctor” and “general practitioner,” they remained classified as “rural doctor.”

1.2.2 Self-Assessment of Job Capabilities Self-assessment covered four aspects: medical service capacity, public health service capacity, organizational management and service coordination, and professional competence. This study focused on medical service capacity, encompassing seven dimensions: diagnosis and treatment of common diseases, emergency response to critical conditions, standardized medical device usage, community rehabilitation guidance, medical collaboration, medical documentation, and traditional Chinese medicine services. The survey evaluated competency in relevant skills required for these services. Using a self-assessment format, questions typically asked “Do you possess this capability?” with “yes” or “no” options. A “yes” response indicated possession of that capability.

Based on the “Family Doctor Health Service Capacity Indicator System” developed by the research team, the competency assessment framework included seven medical service content areas and 15 specific service skills. Each specific skill was evaluated through targeted questions. When a village doctor possessed

at least two-thirds of the evaluation items for a skill, they were deemed to have basic competency in that skill. Table 1 shows the specific criteria for assessing competency in each medical service area. For the seven medical service capabilities, competency was determined when all required skills for a service area were possessed. For example, for common disease diagnosis and treatment capability, a village doctor was deemed competent only when they possessed all three skill components: identification and diagnosis of common diseases, interpretation of common auxiliary examination results, and standardized medication use.

1.3 Data Collection and Quality Control

- (1) The survey team comprised faculty and students majoring in health administration. All investigators underwent rigorous, standardized training before fieldwork to ensure thorough understanding of questionnaire content, survey procedures, and data quality control measures. One investigator was assigned to each sample district/county.
- (2) Surveys were conducted with assistance from local health administrative departments in each sample district/county, with the local health commission sending Wenjuanxing QR codes to local primary care doctor work groups.
- (3) Multi-channel publicity and mobilization were conducted before the survey, with detailed explanations provided to participants about the survey purpose, questionnaire scope, completion methods, and data confidentiality measures.
- (4) The questionnaire was completed anonymously online via the Wenjuanxing platform. Participants had to sign an informed consent form before completing the survey and provide a contact phone number for quality verification purposes only.
- (5) Participants completed the questionnaire independently. If questions arose during completion, they could communicate with investigators online in real time. Investigators recorded common issues during the online survey period to optimize subsequent survey processes.
- (6) After submission, investigators promptly reviewed collected questionnaires, focusing on missing items, logical contradictions, or obvious errors (such as unanswered questions or illogical responses). For problematic questionnaires, investigators contacted participants through the reserved phone number to assist with supplementation or corrections.
- (7) Invalid questionnaires were defined as those lacking signed informed consent, having missing key questions (e.g., incorrect job type that was verified by phone to be a non-physician position and therefore deleted), serious logical errors, obviously perfunctory answers, or abnormal completion times. All invalid questionnaires had the reason for exclusion recorded and underwent further review and confirmation during data processing to ensure final data quality and reliability.

1.4 Statistical Methods

Data collected via Wenjuanxing were imported into SPSS 22.0 for statistical analysis. Normally distributed data were expressed as $(\bar{x}\pm s)$. Count data were

expressed as percentages, and inter-group comparisons were performed using ² tests, with $P < 0.05$ considered statistically significant.

2. Results

2.1 Basic Characteristics of Village Doctors

The 3,916 participants had a mean age of (47.9 ± 7.8) years, ranging from 22 to 78 years. Age distribution showed that the 45-60 age group accounted for the majority (60.4%), while only three village doctors (0.1%) were under 25. Educational attainment was predominantly high school/technical secondary school or below (71.8%), followed by junior college (25.3%), and bachelor's degree or above (2.9%). Among the 3,916 village doctors, 1,512 (38.6%) held licensed (assistant) physician qualifications, 2,067 (52.8%) held rural doctor qualifications, 302 (7.7%) held general practitioner qualifications, and 35 (0.9%) had other or no qualifications. Statistically significant differences were found in age, education level, and practice qualifications among village doctors in eastern, central, and western regions ($P < 0.05$), as shown in Table 2.

2.2 Analysis of Medical Service Capabilities

2.2.1 Common and Frequent Disease Diagnosis and Treatment Capability The survey assessed common disease diagnosis and treatment capability through two aspects: diagnostic identification of common diseases and interpretation of common auxiliary examination results. Among the 3,916 village doctors surveyed, 3,816 (97.4%) possessed diagnostic identification skills for common diseases, 3,035 (77.5%) could interpret common auxiliary examination results, and 3,698 (94.4%) could use medications appropriately. The competency rates for disease identification and standardized medication use exceeded 90% across all regions, while the ability to interpret auxiliary examination results was notably lower in western China at only 61.7%. Overall, 2,925 village doctors (74.7%) possessed comprehensive common disease diagnosis and treatment capability, with the highest rate in central China (81.2%), followed by eastern China (79.6%), and lowest in western China (59.1%). Statistically significant differences were found among eastern, central, and western regions in comprehensive competency for auxiliary examination interpretation, standardized medication use, and overall common disease diagnosis and treatment capability ($P < 0.05$), as shown in Table 3.

2.2.2 Emergency Response to Critical Conditions The survey evaluated emergency response capability through two components: cardiovascular and cerebrovascular accident management, and emergency first aid. Among the 3,916 village doctors, 2,203 (56.3%) possessed cardiovascular and cerebrovascular accident management skills, while 3,325 (84.9%) had emergency first aid capabilities. Cardiovascular and cerebrovascular accident management skills

were generally low across regions, highest in central China (64.7%) and lowest in western China (42.4%). Emergency first aid capability was also lower in western China at only 77.7%. Overall, 2,098 village doctors (53.6%) possessed comprehensive emergency response capability, with the highest rate in central China (61.6%), followed by eastern China (52.3%), and lowest in western China (40.1%). Statistically significant differences were found among regions in cardiovascular and cerebrovascular accident management, emergency first aid, and overall emergency response capability ($P < 0.05$), as shown in Table 4 .

2.2.3 Standardized Medical Device Usage The survey examined village doctors' competency in using ten medical devices: oxygen delivery devices, ventilators, suction apparatus, ultrasonic nebulizers, electrocardiogram machines, cardiac monitors, portable ultrasound, glucometers, electronic blood pressure monitors, and oxygen generators. Based on the *Village Clinic Service Capacity Standards (2022 Edition)* jointly issued by the National Health Commission and National Administration of Traditional Chinese Medicine, this study focused on four essential devices: oxygen delivery devices, electrocardiogram machines, glucometers, and electronic blood pressure monitors. Among the 3,916 village doctors, 2,773 (70.8%) could properly use oxygen delivery devices, 2,471 (63.1%) could use electrocardiogram machines, 3,737 (95.4%) could use glucometers, and 3,776 (96.4%) could use electronic blood pressure monitors. Overall, 2,081 village doctors (53.1%) possessed comprehensive standardized device usage capability, with the highest rate in central China (62.3%), followed by eastern China (53.8%), and lowest in western China (36.3%). Statistically significant differences were found among regions in the use of all four devices and overall competency ($P < 0.05$), as shown in Table 5 .

2.2.4 Community Rehabilitation Services The survey assessed community rehabilitation service capability through two aspects: rehabilitation assessment and rehabilitation guidance. Among the 3,916 village doctors, 2,157 (55.1%) possessed rehabilitation assessment skills, and 3,268 (83.5%) could provide rehabilitation medical services. Overall, 2,073 village doctors (52.9%) possessed comprehensive community rehabilitation service capability, with the highest rate in central China (59.7%), followed by eastern China (53.6%), and lowest in western China (40.3%). Statistically significant differences were found among regions in rehabilitation assessment, rehabilitation medical services, and overall community rehabilitation capability ($P < 0.05$), as shown in Table 6 .

2.2.5 Medical Documentation Skills The survey evaluated medical documentation capability through prescription writing and medical record writing. Overall competency was relatively high, with 3,724 village doctors (95.1%) able to write prescriptions and 3,166 (80.8%) able to write medical records. In total, 3,120 village doctors (79.7%) possessed comprehensive medical documentation skills, with the highest rate in central China (82.6%), followed by eastern China (82.0%), and lowest in western China (72.7%). Statistically significant differ-

ences were found among regions in prescription writing, medical record writing, and overall documentation capability ($P < 0.05$), as shown in Table 7 .

2.2.6 Medical Service Coordination Capability The survey assessed medical service coordination through referral services and telemedicine services. Among the 3,916 village doctors, 3,381 (86.3%) possessed referral service capability, and 2,311 (59.0%) could provide telemedicine services. Overall, 2,190 village doctors (55.9%) possessed comprehensive medical service coordination capability, with the highest rate in central China (61.0%), followed by eastern China (57.9%), and lowest in western China (45.3%). Statistically significant differences were found among regions in referral services, telemedicine services, and overall coordination capability ($P < 0.05$), as shown in Table 8 .

2.2.7 Traditional Chinese Medicine Services Traditional Chinese medicine service capability included three aspects: traditional Chinese medicine constitution identification, traditional Chinese medicine health guidance, and traditional Chinese medicine physiotherapy techniques. Among the 3,916 village doctors, 3,264 (83.4%) possessed constitution identification capability, 3,224 (82.3%) could provide health guidance, and 2,781 (71.0%) could perform physiotherapy techniques. Overall, 2,443 village doctors (62.4%) possessed comprehensive traditional Chinese medicine service capability, interestingly with the highest rate in western China (64.8%), followed by central China (62.7%), and lowest in eastern China (58.7%). Statistically significant differences were found among regions in all three aspects and overall traditional Chinese medicine service capability ($P < 0.05$), as shown in Table 9 .

3. Discussion

3.1 Village Doctors Possess Adequate Medical Skills, Essentially Meeting General Medical Service Needs

The survey results indicate that, based on current job requirements, most village doctors can fulfill their basic medical responsibilities, with nine of the 15 service skill evaluation indicators showing self-reported competency rates above 80%. This is partly due to explicit policy requirements and partly because these services represent the most essential demands of residents for primary medical care, giving village doctors ample experience. Regarding common disease diagnosis and treatment, 97.4% could accurately diagnose and identify common diseases, 77.5% could interpret common examination results, and 94.4% could appropriately use common medications. Capabilities in emergency response to critical conditions, rehabilitation guidance, and traditional Chinese medicine services also reached certain levels. Research suggests that in most cases, village doctors can conduct preliminary assessments of rural residents' common health problems and take correct management measures. Although there re-

mains room for improvement in service quality, overall village doctors' service capacities essentially meet rural residents' health needs and can shoulder the responsibility of first-contact medical services in rural areas.

3.2 Comprehensive Management Capabilities Require Strengthening

In emergency response to critical conditions, village doctors have limited experience and relatively insufficient handling capabilities. When encountering serious conditions, they tend to provide simple treatment before directly referring patients to higher-level institutions, resulting in lower demand and competency rates for emergency response capabilities, which stood at only 53.6%. While 84.9% could handle relatively simple trauma first aid, their ability to manage more severe cardiovascular and cerebrovascular accidents was notably inadequate at 56.3%.

Regarding standardized medical device usage, according to the *Village Clinic Service Capacity Standards (2022 Edition)*, village clinics should be equipped with oxygen delivery devices, electrocardiogram machines, glucometers, and electronic blood pressure monitors, with corresponding graded standards. Electronic blood pressure monitors and glucometers belong to Grade C (equipment that qualified village clinics should have); oxygen delivery devices belong to Grade B (equipment that good village clinics should have); and electrocardiogram machines belong to Grade A (equipment that excellent village clinics should have). The survey found competency rates above 95% for glucometer and blood pressure monitor usage, indicating that most village doctors can properly use the most basic medical devices. However, competency in using electrocardiogram machines and oxygen delivery devices was lower, possibly because some village clinics had not reached the corresponding grade and lacked the equipment, preventing doctors from using and learning about these devices in daily practice. Additionally, rural residents generally seek relevant medical examinations at township health centers, limiting village doctors' opportunities to use such equipment and develop their skills, which in turn restricts their ability to interpret common auxiliary examination results.

Competency rates were also relatively low in community rehabilitation, medical service coordination, and traditional Chinese medicine services, particularly in rehabilitation assessment within community rehabilitation skills, telemedicine services within medical coordination skills, and traditional Chinese medicine physiotherapy techniques within traditional Chinese medicine services. These skills are highly specialized and technically demanding. Village doctors are not yet proficient in operating telemedicine information systems and remain accustomed to traditional service models, with insufficient mastery of modern technologies, leading to lower competency rates.

3.3 Significant Regional Disparities Exist in Village Doctors' Medical Service Capacities

Except for traditional Chinese medicine services, the other six medical service capabilities showed the lowest competency rates among western China village doctors. Interestingly, western China had the highest proportion of village doctors with college education or above, likely reflecting some achievements in primary health workforce development since deepening healthcare reforms, with increased personnel numbers and improved qualifications. However, service capacities remain at relatively low levels, with licensed (assistant) physicians and general practitioners accounting for only 35.2%, both below the national average. This suggests that training and capacity-building efforts for village doctors in western China need further strengthening. Western China has many mountainous areas with harsh working conditions, where many administrative villages have only 1-2 village doctors responsible for prevention, health care, and treatment of common diseases for large rural populations. Meanwhile, medical school graduates prefer to work in economically developed areas with more promotion opportunities and faster self-improvement. The relatively poor working environment, limited promotion opportunities, and lower compensation in western rural areas lead to serious brain drain and difficulties in recruitment. These factors may contribute to the insufficient health service capacities of village doctors in western China.

4. Improvement Strategies

4.1 Strengthen Village Doctor Training and Improve Educational Attainment

Village-level health personnel serve as the “first point of contact” for rural residents' health and act as health gatekeepers, requiring good general practice knowledge and skills. However, the survey found that few village doctors hold general practitioner qualifications, and most lack systematic general practice thinking. As “general practitioners” for rural residents, their competency levels fall far short of general practitioner requirements, necessitating greater emphasis on training rural primary health professionals. The government should increase continuing education and training opportunities for village doctors, regularly conduct training sessions, encourage participation in learning activities, and help them develop general practice thinking through ongoing education and work experience. For areas with weak village doctor resources, particularly in western China, the “University Student Village Doctor Program” should be vigorously promoted to prevent workforce shortages. Collaborations with medical schools should be established through various approaches to guide and provide channels for grassroots practice and training. Targeted enrollment, 定向培养 (targeted training), and 定向就业 (targeted employment) models should be adopted, prioritizing recruitment of students from rural areas for free gen-

eral practitioner training to cultivate village doctors rooted in rural areas and serving rural populations. After obtaining relevant qualifications and passing assessments, graduates should be assigned to corresponding village clinics, with clear provisions on breach of contract liabilities and minimum service periods to ensure effective implementation of rural health workforce reserve measures.

4.2 Improve the Village Doctor Training System and Enhance Comprehensive Quality

Although various regions have formulated village doctor training plans, the actual training effect is minimal because most village clinics lack replacement staff, making training schedules inflexible. Therefore, a scientifically sound and rational training system must be developed based on village doctors' actual circumstances, targeting weaknesses to consolidate the foundation of medical services. According to survey findings, training should be strengthened in standardized medical device usage, community rehabilitation, medical service coordination, traditional Chinese medicine physiotherapy techniques, and other skills, as well as in foundational theoretical knowledge such as cardiovascular and cerebrovascular disease scoring standards, rehabilitation assessment, and examination result interpretation. While building systematic theoretical knowledge, greater emphasis should be placed on practical skills training. For example, county-level medical institutions or township health centers could provide training in appropriate traditional Chinese medicine techniques for village clinic staff, combining theoretical knowledge with practical skills to enhance village doctors' professional capabilities in traditional Chinese medicine services and meet rural residents' diverse health service needs. Flexible training methods should be adopted, with senior hospital physicians providing one-on-one guidance based on village doctors' actual competency levels. For village doctors with higher professional competence, short-term full-time training could be conducted to strengthen clinical practice and community rehabilitation skills. Additionally, internet resources should be utilized to provide remote guidance, effectively improving village doctors' theoretical knowledge levels. On this foundation, village doctors should be encouraged to participate in degree programs and licensing examinations to facilitate their professional evolution from rural doctors to licensed (assistant) general practitioners, gradually establishing a high-quality village doctor workforce that meets service demands.

4.3 Improve Medical Facility Infrastructure and Information Technology

Adequate medical equipment is essential for enhancing village doctors' service capacities. The survey revealed uneven distribution of standardized medical device usage competencies among village doctors, partly related to shortages of equipment in institutions. Particularly in western rural areas, village clinics lack examination equipment, with insufficient and outdated medical devices, resulting in incomplete diagnostic and treatment functions, where some village doctors

can only perform simple blood pressure and glucose measurements. Therefore, health resource investment should promote upgrading of rural primary-level medical institutions, with particular attention to implementing equipment configuration in western regions and providing operational guidance for specialized devices. While optimizing hardware conditions, medical service information technology should be improved to increase service accessibility and convenience, enhancing service quality and efficiency. Telemedicine should be fully utilized to promote sharing of high-quality medical resources, as remote education represents an important means for training village doctors in remote areas, helping to alleviate problems of insufficient capacity and personnel shortages. Combining online and offline training can timely update village doctors' service technologies and concepts, promoting effective implementation of primary care first-visit systems in rural areas.

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ORCID IDs:

Li Siqing: <https://orcid.org/0009-0003-8623-8772>

Wang Xuanxuan: <https://orcid.org/0000-0002-8678-4066>

Note: Figure translations are in progress. See original paper for figures.

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