Current Status and Prospects of General Practitioners in Community Infectious Disease Prevention and Control in China: Postprint

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Abstract

Infectious disease prevention and control is crucial to national welfare and people' s livelihood. General practitioners, as one of the main providers of primary healthcare, play an irreplaceable role in community infectious disease prevention and control. Based on the current status of community infectious disease prevention and control by general practitioners in China, this study reviews relevant domestic and international literature to discuss the existing deficiencies and the roles that should be fulfilled. It is proposed that we should further improve the legal and regulatory framework for infectious disease prevention and control, implement the tiered diagnosis and treatment system, establish a robust information platform for the prevention and control system, create effective incentive and development mechanisms, increase financial and material investment in primary healthcare, and strengthen continuing medical education and regular drills, so as to enhance the job attractiveness of general practitioners in China and their comprehensive capacity for community infectious disease prevention and control, enabling them to be competent in community infectious disease prevention and control work in the future.

Full Text

Current Status and Prospects of General Practitioners in Community-Based Prevention and Control of Communicable Diseases

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Abstract: The prevention and control of communicable diseases is a major concern for public welfare. General practitioners (GPs), as one of the primary providers of primary healthcare, play an irreplaceable role in community-based prevention and control of communicable diseases. Based on the current situation of GPs in community communicable disease prevention and control in China, this study reviews relevant domestic and foreign literature to discuss their shortcomings and the roles they should play. We propose that China should further improve the legal and regulatory system for communicable disease prevention and control, implement the hierarchical medical system, establish a robust information platform for the prevention and control system, create effective incentive and development mechanisms, increase financial and material investment in primary healthcare, and strengthen continuing medical education and regular drills. These measures aim to enhance the job attractiveness of GPs and their capacity for comprehensive community-based prevention and control of communicable diseases, so that they will be competent in community communicable disease prevention and control in the future.

Keywords: Communicable diseases; Communicable disease control; General practitioners; Community health services; Prevention and control of communicable diseases; Review

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Communicable diseases refer to illnesses caused by pathogenic microorganisms that are infectious and can potentially cause epidemics under certain conditions [**?**]. Currently, the global prevalence of communicable diseases is severe, with emerging and re-emerging infectious diseases posing alternating threats to health [**?**]. As the world' s most populous developing country, China faces a grave situation regarding the health hazards of communicable diseases, which represent one of the leading causes of morbidity and mortality. Therefore, improving the communicable disease prevention and control system is particularly important [**?**]. Communities, as the fundamental units of social governance, serve as the frontline and critical gateway for communicable disease prevention and control, playing a foundational role in reducing or preventing the spread of communicable diseases [**?**]. The 2022 National Health Conference and the Government Work Report emphasized that "focusing on the grassroots level, we must improve strategies for major disease prevention and control, prioritize community-based prevention and control capacity building, strengthen the development of community prevention and control talent teams, and enhance health education and management" [**?**, **?**]. This indicates that community-based communicable disease prevention and control will remain a priority for disease prevention and control efforts for a considerable period.

General practitioners are the main providers of community-based primary medical services and the first line of defense for early detection and prevention of communicable diseases in communities, playing an irreplaceable role in communicable disease prevention and control [?, ?]. However, multiple studies have shown that GPs in China are not adequately competent for community-based communicable disease prevention and control [?, ?]. This article reviews relevant domestic and foreign literature, examines the current status of GPs in community communicable disease prevention and control in China, discusses their deficiencies and the roles they should play, and provides references for improving GPs' capacity in community communicable disease prevention and control.

1. Current Status of General Practitioners in Community Communicable Disease Prevention and Control in China

Currently, GPs are primarily responsible for providing high-quality, comprehensive, continuous, and individualized health management services to community residents, as well as daily communicable disease monitoring, detection, reporting, classification management, referral, and health education. However, multiple studies suggest that GPs in China are not adequately competent in communicable disease prevention and control [?, ?].

1.1 Shortage of GP Human Resources

By the end of 2021, China had 435,000 registered GPs, accounting for less than 13.9% of the total number of clinical physicians, with 3.08 GPs per 10,000 population [?]. This falls short of the target proposed by the State Council that "by 2030, there will be 5 qualified GPs per 10,000 residents in urban and rural areas, and the GP workforce will basically meet the needs of Healthy China construction" [?]. In developed countries, the number of GPs generally approaches 30% of the total clinical physicians, even reaching 50% or more, with an average GP-to-resident ratio of 1:2,000-2,500 [?]. Overall, there remains a significant gap between the number of GPs in China and both developed country levels and China's own targets, which greatly limits the role GPs can play in community communicable disease prevention and control.

1.2 Insufficient Mastery of Communicable Disease Theory and Response Skills

American medical educator Miller proposed that the learning process from knowledge accumulation to clinical practice capability development involves four hierarchical levels that are progressive and cannot be skipped [?]. Therefore, mastering communicable disease-related theoretical knowledge is the cornerstone for GPs to effectively prevent and control communicable diseases in communities. However, three studies investigating GPs' knowledge of communicable disease surveillance, reporting, occupational protection, environmental

disinfection, and epidemiological investigation methods have identified deficiencies in their knowledge accumulation [?, ?, ?].

Regarding communicable disease prevention and control skills, multiple studies have also examined GPs' diagnostic capabilities for communicable diseases, emergency response capabilities, coordination abilities with institutions such as the Centers for Disease Control and Prevention (CDC) and higher-level hospitals as well as government departments including public security, transportation, agriculture and commerce, and street offices, and their ability to apply relevant laws and regulations, concluding that GPs are also deficient in these areas [?, ?, ?].

1.3 Inadequate Community Health Management During Communicable Disease Prevention and Control

During communicable disease prevention and control periods, GPs must not only provide communicable disease prevention and control-related public health services but also serve as "gatekeepers" for residents' health, undertaking multiple health management tasks including health education for community residents, health care for key populations, and psychosocial interventions. Multiple studies examining GPs' delivery of communicable disease-related health education services have found that GPs are not effectively providing these services [?, ?, ?]. During the COVID-19 pandemic, phenomena such as some residents not wearing masks, participating in gathering activities, and panic-buying "Shuanghuanglian" and "ibuprofen" not only reflected insufficient self-protection awareness, inadequate psychological preparedness for large-scale epidemics, and low health literacy among some residents but also indirectly indicated inadequate intensity and effectiveness of community health education by GPs.

In addition to health education, two studies found that during the COVID-19 pandemic, GPs demonstrated insufficient proactivity in providing medical assistance to home-quarantined individuals, inadequate standardization of home guidance operations, and incomplete mastery of information regarding residents' health status in their jurisdictions [?, ?]. These situations all reflect that while preventing and controlling community communicable diseases, GPs have not truly fulfilled their role as health "gatekeepers" for residents.

2. Experience of General Practitioners in Community Communicable Disease Prevention and Control in China

Although China' s GPs face problems including shortage of human resources, insufficient mastery of communicable disease theory and response skills, and inadequate community health management, they have accumulated rich experience in prevention and control work after undertaking successive communicable disease prevention and control tasks and learning from international GP experiences.

2.1 "Early Detection, Early Reporting, Early Isolation" of Communicable Diseases

Early detection, early reporting, and early isolation are key measures for community communicable disease prevention and control [**?**]. The Healthy China Action (2019-2030) released by the Healthy China Action Promotion Committee proposed strengthening screening of key populations for communicable diseases such as hepatitis B, tuberculosis, AIDS, and influenza, and encouraging medical institutions to guide medical personnel to perform early detection work to reduce the infection and fatality rates of common communicable diseases [**?**]. Therefore, as patients' first-contact doctors, GPs should detect and isolate confirmed cases, suspected cases, and asymptomatic carriers as early as possible to reduce communicable disease transmission [**?**]. Early reporting of suspected communicable diseases is an important means of overall early warning for communicable diseases and provides the data foundation for analyzing possible epidemiological characteristics, activating community communicable disease prevention and control contingency plans, and timely formulating prevention and control measures [**?**]. A post-hoc analysis of the causes of the COVID-19 outbreak in Wuhan suggested that in the early stage of the COVID-19 epidemic, first-contact doctors (primarily GPs) failed to timely identify and report suspected cases after discovering cases of "pneumonia of unknown cause" similar to Severe Acute Respiratory Syndrome (SARS), which was one of the reasons for its occurrence [**?**]. Therefore, first-contact doctors should report suspected cases early in communicable disease prevention and control. Early isolation is an important measure for cutting off transmission routes and is easily implemented in communities. When GPs first see patients with communicable diseases, they must infer the type of communicable disease and possible transmission routes based on medical history, initial symptoms, and signs. On this basis, they should immediately select appropriate blocking methods and collaborate with government departments and the CDC to safely isolate suspected infected individuals at temporary isolation points to prevent cross-infection [**?**, **?**].

2.2 Community Health Management During Communicable Disease Prevention and Control

Professor Li Guodong, President of the World Organization of Family Doctors (WONCA), stated that "general practitioners, especially family doctors, shoulder the responsibility of 'first-contact and continuous intervention' " [**?**]. This shows that in addition to undertaking communicable disease prevention and control work, GPs should also undertake community health management tasks during communicable disease epidemics, particularly for isolated suspected and confirmed populations as well as key groups such as children, pregnant women, and patients with chronic diseases.

Regarding health education, multiple studies have reported insufficient comprehensive quality among China' s population in terms of health literacy and legal concepts, which also reflects inadequate intensity and effectiveness of health

education provided by GPs to the public [**?**, **?**]. However, a study on the role of GPs in SARS prevention and control found that compared with government propaganda, educational content from GPs was more easily accepted by the public, more operable, and more likely to achieve prevention goals [**?**]. Therefore, GPs should improve their health education capabilities. Multiple studies suggest that improving health education effectiveness can be achieved through two approaches: first, expanding health education methods such as bulletin boards, WeChat, Weibo, public accounts, radio, television, and online clinics; second, providing correct personalized guidance for different audiences, periods, and issues. For isolated populations, GPs should educate patients and their families about isolation precautions, self-monitoring, and how to use materials such as thermometers and disinfectants [**?**, **?**, **?**, **?**], thereby improving health literacy and protection awareness among patients and those around them, helping them treat diseases correctly, eliminating panic, and reducing communicable disease spread.

Regarding psychosocial interventions, mental health issues caused by communicable diseases, such as post-traumatic stress disorder and depression, are as harmful as physical health problems. GPs should provide psychological crisis intervention services such as psychological hotlines and online counseling to avoid large-scale social panic and maintain normal social order [**?**].

Regarding health care, three studies suggest that during communicable disease epidemics, GPs should proactively provide continuous and comprehensive services to community residents through WeChat, text messages, telephone, and other possible information platforms, such as providing long prescriptions for patients with chronic diseases with follow-up guidance and medication intervention, providing home visit services for disabled and mobility-impaired vulnerable individuals living alone, and providing health care and home management services for the elderly, infants, and pregnant women [**?**, **?**, **?**]. These services help reduce the risk of exacerbation of other diseases such as chronic diseases due to loss of contact or interrupted management, and reduce hospital traffic seeking non-emergency medical services, thereby lowering cross-infection risk. Two studies also suggest that in communicable disease prevention, GPs can screen high-risk populations by managing patients' health records and reviewing or inquiring about their health examination information, and reduce infection rates among high-risk populations through long-term follow-up management and intervention of unhealthy behaviors [**?**, **?**]. In treatment, GPs can formulate personalized treatment plans and conduct regular follow-ups to supervise patients' completion of full-course regular medication and regular re-examination at designated medical institutions [**?**, **?**]. When patients' conditions change, GPs should coordinate medical resources to provide referral services after assessing patients' conditions and follow up on their condition progression and post-discharge management [**?**].

3.1 Emphasize Infrastructure Development for GP Communicable Disease Prevention and Control Systems

The United Kingdom, United States, Japan, and other countries emphasize the development and utilization of communicable disease legal and regulatory systems, GP first-contact and referral systems, and communicable disease prevention and control system information platforms, as well as financial investment in grassroots communicable disease prevention and control. Regarding legal and regulatory systems, developed countries such as the United States, Japan, and the United Kingdom have successively issued laws and regulations with clear division of labor, coordinated order, strong operability, and mutual complementarity in the process of preventing and controlling communicable diseases, gradually forming a relatively complete legal and regulatory system that provides action guidelines for frontline communicable disease prevention and control personnel such as GPs [**?**, **?**].

Regarding the GP system, the United Kingdom, Australia, and other countries emphasize the GP first-contact system and strict referral system, which facilitates GPs' implementation of communicable disease monitoring, detection, diagnosis, reporting, isolation, and continuous intervention [**?**, **?**]. In terms of information platform construction for prevention and control systems, the United Kingdom, United States, Canada, and other countries have achieved multi-party information integration, sharing, and fusion utilization by building and using network platforms with functions such as network monitoring, data analysis, and communicable disease notification [**?**, **?**]. This enables frontline prevention and control personnel such as GPs to detect communicable diseases early and take timely measures to reduce communicable disease transmission and alleviate the medical burden on higher-level hospitals. Regarding financial support, Europe, the United States, Japan, Australia, and other countries have prioritized medical investment to the grassroots level since implementing the GP system. One study showed that the strong primary healthcare service capacity in European countries (such as Belgium, Denmark, and the Netherlands) is closely related to good financial investment [**?**]. This demonstrates that adequate financial investment facilitates GP community communicable disease prevention and control.

3.2 Strengthen Training and Drills for GP Communicable Disease Prevention and Control

To enhance communicable disease prevention and control capabilities, Australia, Japan, and other countries regularly conduct training and emergency drills for GPs on communicable disease-related knowledge and skills to strengthen their abilities in early warning, prediction, reporting, and coordination with the CDC and government departments [**?**, **?**, **?**]. For example, the Royal Australian College of General Practitioners (RACGP) holds annual conferences to provide GPs with the latest clinical research and education [**?**]. After SARS, Germany' s 7

national-level communicable disease treatment centers organized practical drills for severe virulent viruses every 2-3 months [**?**]. Therefore, regular operational practice and emergency technical drills for routine communicable diseases and major public health events should be conducted [**?**]. To improve training effectiveness for GPs, flexible and effective training methods should be adopted, such as self-directed learning, interactive learning, problem-based learning, and online teaching, with appropriate increases in training frequency. After training, written examinations and clinical practical operation skills assessments should be used to evaluate training effectiveness and adjust training content, format, and frequency through negative feedback [**?**, **?**, **?**].

3.3 Focus on Daily Monitoring and Prevention of Communicable Diseases

In Singapore, Canada, the United States, and other countries, GPs emphasize the integration of "medical treatment" and "prevention" in their daily work. Primary healthcare institutions led by GPs focus on monitoring and preventing communicable diseases and related symptoms in normal times. For example, Singapore established community-wide acute respiratory infection surveillance to effectively implement routine prevention and monitoring, which promoted early detection of epidemics at the grassroots level [**?**].

4 Future Prospects for Community Communicable Disease Prevention and Control by General Practitioners in China

Although China's GPs have improved their community communicable disease prevention and control capabilities to a certain extent through repeated practice and learning from valuable international experiences, further improvements are needed to become competent in community communicable disease prevention and control.

4.1 Strengthen Top-Level Design and Improve Legal and Policy Guarantee Systems

China's legal and regulatory system for communicable disease prevention and control is imperfect and cannot provide action guidelines for GPs when responding to community communicable diseases. The legislative purposes of various laws should be clarified, relationships between relevant laws and regulations should be sorted out, and the epidemic information reporting and release procedures and legal responsibility attribution and definition of relevant concepts should be improved to construct a scientific, complete, and effective legal and regulatory system for communicable diseases.

Regarding the hierarchical medical system, China's GP first-contact and two-way referral systems are not well-established, which limits GPs' role in early detection of infected individuals. The foundation of grassroots first-contact sys-

tems such as family doctor contract services and telemedicine systems should be gradually improved, and policies related to two-way referral, vertical integration between medical institutions at all levels, and other hierarchical medical system-related policies should be perfected to promote the establishment of a hierarchical medical pattern featuring "grassroots first-contact, two-way referral, acute-chronic separation, and vertical integration."

Regarding financial investment, given the shortage of GP human resources and inadequate grassroots software and hardware facilities in China, effective incentive and development mechanisms should be established to attract and retain talent, stimulate the enthusiasm of community GPs, and increase financial and material investment at the grassroots level to enhance job attractiveness and improve GPs' service capabilities.

4.2 Strengthen Continuing Medical Education and Emergency Drills

Multiple studies have shown that GPs' comprehensive capabilities in responding to community communicable diseases are insufficient and training needs are high [**?**, **?**]. This may be related to the relatively late start of GP medical talent training in Chinese universities, where communicable disease-related education and training are often marginalized. Moreover, China' s current GP workforce is primarily composed of rural doctors or community doctors who mostly obtained their qualifications through GP transfer training, with persistent problems such as relatively older age, lower professional titles and education levels, and relatively weaker professional capabilities, resulting in slightly inadequate disease diagnosis, treatment, and prevention and control capabilities [**?**]. Therefore, the systems for undergraduate education, postgraduate education, and continuing education should be further improved. For example, during the continuing education stage, a complete training system for communicable disease specialists among GPs should be established to promote GPs' mastery of multidisciplinary knowledge and skills such as epidemiology, communicable disease science, and computer networks, and enhance communicable disease prevention and control capabilities [**?**, **?**]. Additionally, since multiple studies have reported that GPs lack experience in responding to major public health events or even common communicable diseases and have difficulty assuming their roles early in prevention and control [**?**, **?**], regular operational practice for routine communicable diseases and major public health events, including monitoring, reporting, and management, as well as emergency technical drills, should be conducted [**?**].

4.3 Strengthen Epidemic Prevention Health Education and Establish the "Medical-Prevention Integration" Concept

General practitioners are both providers of basic medical services and implementers of public health services. However, multiple studies have found that GPs exhibit a phenomenon of "emphasizing treatment over prevention" [**?**, **?**, **?**]. Therefore, GPs should first adhere to the prevention-first principle in health work, establish the "medical-prevention integration" concept, and focus on daily

monitoring of communicable diseases and related symptoms. Second, health education and health promotion are basic functions of public health services and play important roles in preventing and controlling communicable diseases and chronic non-communicable diseases and responding to public health emergencies. Therefore, GPs should proactively learn the latest guidelines or consensus statements, expand health education methods, and improve their initiative in providing health education services to residents. This will help the public correctly master personal home protection knowledge, outdoor protection knowledge, and medical care knowledge during epidemics, improve self-protection awareness and capabilities, enhance legal awareness, establish correct health concepts, and reduce fear of communicable diseases and active cooperation with medical institutions and the CDC [**?**]. Additionally, misinformation can lead to discrimination, panic, and other negative emotions among the public. Therefore, GPs should also improve their psychological intervention capabilities and provide psychological crisis intervention services such as psychological hotlines, online consultations, and counseling services to avoid large-scale social panic [**?**].

Communicable diseases are among the major diseases harming community residents' health. General practitioners should fulfill dual functions in community communicable disease prevention and control and resident health management. At present, China' s GPs still face problems including shortage of human resources, insufficient mastery of communicable disease theory and response skills, and inadequate resident health management. Therefore, we recommend improving the legal and regulatory system for communicable diseases, implementing the hierarchical medical system, establishing effective incentive and development mechanisms, increasing financial and material investment in primary healthcare, and strengthening continuing medical education and regular drills to enhance job attractiveness and improve GPs'comprehensive capabilities, thereby meeting grassroots needs in communicable disease prevention and control.

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