The primary health-care system in China

Xi, Li; Cheng, Kar

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Primary Health Care System in China: Rising to the Challenges of Increasing Chronic Non-Communicable Diseases

Xi Li*, PhD, Jiapeng Lu*, PhD, Shuang Hu, PhD, KK Cheng†‡, PhD, Jan De Maeseneer†‡, PhD, Qingyue Meng†‡, PhD, Elias Mossialos†‡, PhD, Dong Roman Xu†‡, MPP, Winnie Yip†‡, PhD, Hongzhao Zhang, MPH, Harlan M Krumholz#†, MD, Lixin Jiang#†, MD, Shengshou Hu#†, MD

(* Joint first authors)

(# Joint senior authors)

(† Full professors)

(‡ Listed alphabetically)

National Clinical Research Center of Cardiovascular Diseases, State Key Laboratory of Cardiovascular Disease, Fuwai Hospital, National Center for Cardiovascular Diseases, Chinese Academy of Medical Sciences and Peking Union Medical College (XL, JL, Shuang Hu, HZ, LJ, Shengshou Hu), Beijing, People's Republic of China;

Institute of Applied Health Research, University of Birmingham, Birmingham, United Kingdom; General Practice Development and Research Center, Peking University Health Science Center, Beijing, People's Republic of China (KKC)

Department of Family Medicine and Primary Health Care, Ghent University (JDM), Gent, Belgium.

School of Public Health, Peking University Health Science Center (QM), Beijing, People's Republic of China;

Department of Health Policy, London School of Economics and Political Science (EM), London, United Kingdom;

Sun Yat-sen Global Health Institute, Sun Yat-sen University School of Public Health (DRX), Guangzhou, Guangdong, People's Republic of China;

Department of Global Health and Population, Harvard T.H. Chan School of Public Health (WY), Boston, Massachusetts, United States;

Section of Cardiovascular Medicine and the Robert Wood Johnson Foundation Clinical Scholars Program, Department of Internal Medicine, Yale University School of Medicine; Department of Health Policy and Management, Yale School of Public Health; Center for Outcomes Research and Evaluation, Yale-New Haven Hospital (HMK), New Haven, Connecticut, United States;

Correspondence: Professor Shengshou Hu, National Clinical Research Center of Cardiovascular Diseases, Fuwai Hospital, 167 Beilishi Road, Beijing 100037, People’s Republic of China; Tel: +86 10 8839 8359; Fax: +86 10 6833 2500; Email: huss@fuwaihospital.org

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Summary

China has made remarkable progress in strengthening its primary health care system. Nevertheless, the system still faces challenges in structural characteristics, incentives and policies, and quality of care, which diminish its preparedness to care for one fifth of the world's population with an aging issue and a growing prevalence of chronic non-communicable disease. These challenges include: inadequate education and qualifications in its workforce, aging and turnover among village doctors; fragmented health information technology systems and a paucity of digital data on everyday clinical practice; financial subsidies and incentives that fail to encourage cost savings and good performance; insurance policies that hamper the efficiency of care delivery; and a lack of a quality measurement and improvement system and poor control of risk factors, such as hypertension and diabetes. As China is deepening its health care reform, it has the opportunity to build an integrated, cooperative primary health care system using sound evidence and comprehensive action plans, bolstered by evidence-based performance indicators and incentives.

Panel 1: Key messages

1. The primary health care system in China had contributed substantially to a reduction in the burden of diseases and helped to advance the global primary health care movement. Since the launch of the health care reform in 2009, access to and affordability of primary health care have been significantly improved through a series of national efforts, including increased government funding, universal health insurance coverage, and implementation of the basic public health service program and an essential drug system. There remain, however, many challenges.

2. Primary health care doctors in China have low levels of training, commonly lack certification, and experience high rates of burnout. Primary health care professionals are paid low wages and not provided with many job-related social benefits. Moreover, the payment policies do not reward the delivery of high-quality care. Many younger doctors are considering leaving the profession, and a large proportion of doctors in village clinics are past retirement age.

3. Application of information technology (IT) is fragmented, with IT systems for clinical care often unavailable and for those that are available, it is not interoperable. In addition, IT systems for public health service are rarely leveraged in clinical practice. The resulting lack of linked digital data impedes the implementation of decision support and the accurate and timely generation of evidence from everyday primary health care practice.

4. In China's new health care reform, government subsidies are not enough to offset the decline in revenue from drug prescriptions at primary health care institutions, since the institutions are no longer allowed to charge mark-ups above cost of drugs, which might have diminished the incentive to deliver appropriate clinical care.

5. Many health insurance policies provide more generous reimbursement for inpatient care relative to primary health care or outpatient care, which incentivize patients to use the hospital for even minor health conditions and inhibit primary health care providers from

being gatekeepers.

6. The quality of primary health care in China has, in general, been poorly characterized. In the management of hypertension and diabetes in primary health care settings, there is evidence that only a minority of patients in China are being diagnosed, and among the diagnosed patients, a small number achieve the risk control targets. In addition, inappropriate prescribing is commonly practised in primary health care institutions.

7. The wide range of challenges for primary health care in China requires comprehensive strategies. "The Healthy China 2030 Plan", a government blueprint, highlighted the important role of primary health care and could provide opportunities to strengthen the primary health care system. Nevertheless, recommendations linked to resources and evidence-based indicators are needed for the implementation.

Introduction

The primary health care system in China, which provides basic clinical care and public health services to a fifth of the world's population, has a notable history. Since its establishment in the early 1950s, it has contributed substantially to a reduction in the burden of communicable, maternal, and neonatal diseases through the 1960s and 1970s,[1, 2] and helped to advance the global primary health care movement enshrined in the Declaration of Alma-Ata in 1978.[3] In subsequent decades, this system experienced significant challenges after the market-based reforms in healthcare sector,[4, 5] including inadequate government funding[6] and weakening of the support of public healthcare providers.[7] These policy changes led to unintended consequences such as surging costs,[8] diminished access to care,[8] widening inequities,[9] and an erosion of the healthcare workforce.[10, 11]

As part of China's new health care reform, initiated in 2009,[12] the government increased its subsidies to primary health care institutions from 19 billion RMB (2·8 billion USD) in 2008 to 140 billion RMB (20·3 billion USD) in 2015.[1, 13] In addition, the government instituted universal health insurance coverage,[10] a basic public health service program,[14] and a

national essential drug system,[15, 16] which improved access to and affordability of primary health care.[17] Acknowledging the increasing pressure exerted by an aging population, behavioural changes,[18] and rapid urbanization,[19] the recent government blueprint "The Healthy China 2030 Plan"[20] envisions the primary health care system as a means of addressing the emerging dual burden of growing chronic non-communicable diseases (NCDs)[21-23] and rising health expenditures.[1] Despite the importance of primary health care in China and its recent reforms, there is a lack of knowledge on both the current system and the impact of recent policy changes.

The aim of this review is to evaluate the primary health care system and provide a foundation for policy and practice improvements to ensure efficient delivery of high-quality primary health care, particularly to tackle chronic NCDs. We sought to assess the current state of evidence related to the primary health care system in China, with specific attention towards identifying the challenges in structural characteristics, incentives and policy, and quality of care, according to an assessment framework designed for primary health care system assessment.[24] We employed the following methods: narrative literature review of both published and grey literature (Panel 2); a quantitative data analysis of results from a recent national survey of primary health care administrators, providers and patients (Appendix 2); and interviews with national experts to interpret themes that emerged from the literature review and the survey.

Panel 2: Search strategies

We searched the PubMed/Medline (1966-2017) and CNKI (China National Knowledge Infrastructure) database in July 2016 to identify relevant studies on seven domains of primary health care (structural, human resources, electronic health record system, financial, insurance, medications, and quality of care) in China. In PubMed/Medline (1966-2017), we used MeSH and free text terms in conjunction to increase sensitivity to potentially appropriate literature. The MeSH terms include "Primary Health Care", "General Practice", "General Practitioners", "Physicians, Family ",

"Community Health Services", "Delivery of Health Care", and terms for each specific domain. Search terms and all their possible synonyms and spellings were identified and used in the search strategy (Appendix 1). Our reference list was modified according to the length limitation.

Structural Characteristics

Infrastructures, Professionals and Services

According to the Declaration of Alma-Ata,[25] the primary health care system is designed to provide universally accessible essential health care to individuals and families in the community, as the first level of contact with the national health system. In China, the primary health care system provides generalist clinical care and basic public health services.

Primary health care institutions provided 55·1% of outpatient care (4.4 billion visits) and 18·3% of inpatient care (41.7 million hospitalizations) in China in 2016,[26] mainly for common clinical conditions (Appendix 4). Clinical care capabilities vary substantially across primary health care institutions. Among the 3602 institutions in our survey, 51·9% (109/210) of community health centres and 84·6% (248/293) of township health centres provided inpatient care, and among these, the median number of beds was 40 [interquartile range (IQR): 27-59] and 35·5 (IQR: 19·5-60), respectively. Overall, 46·7% (98/210) of community health centres and 69·6% (204/293) of township health centres had an internal medicine department, 38·1% (80/210) and 63·8% (187/293) had a surgery department, and 21·9% (46/210) and 47·1% (138/293) had an emergency department. In addition, traditional Chinese medicine (TCM) is widely provided (Panel 3): 76·2% (160/210) of community health centres and 68·6% (201/293) township health centres have a specific TCM department. There were 4·8% (10/210) of community health centres and 9·6% (28/293) of township health centres that could not provide routine blood tests, urine tests, or electrocardiography. Additionally, about two thirds of community health centres and township health centres could not provide chest X-rays. Village clinics demonstrated an even lower coverage of basic clinical tests, where 96·0%

(2535/2642) and 90·5% (2391/2642) were not capable of routine blood and urine testing, respectively, and 31·0% (819/2642) and 95·8% (2532/2642) could not provide blood glucose and lipid tests.

With respect to government-sponsored basic public health services (Panel 3), community health centres and township health centres take more responsibilities than the institutions one level below them. Meanwhile between community health stations and village clinics, the latter were more commonly involved in these programs (Appendix 5).

Panel 3: Definitions and background

Hierarchy of primary health care institutions

The primary health care system in China is divided into urban and rural components, which are organized differently. In 2016, urban components include approximately 9000 community health centres (93% are publicly owned) and, one level below them, 25,000 community health stations (71% are publicly owned); rural components include approximately 37,000 township health centres (99% are publicly owned) and, one level below them, 639,000 village clinics (63% are publicly owned).[1, 26] In urban areas, the community health stations function as satellite sites of the community health centres. In contrast, in rural areas, village clinics are more independent and have a less formal relationship with the township health centres above them, even though village clinics function as for-profit entities with revenue generated primarily from government subsidies, mainly through the health insurance programs and basic public health service program.

Training and qualification of primary health care doctors

Formal medical training for primary health care doctors has 3 levels: (a) medical college (5 years of medical education after 12 years of primary and secondary education to get a bachelor's degree of medicine); (b) junior medical college (3 years of medical education after 12 years of primary and secondary education); and (c) technical school (3 years of medical education after 9 years of primary and secondary education). Medical

college or junior medical college training is required to become a licensed doctor or a licensed assistant doctor, respectively, both of whom also need to pass the National Practicing Doctor (or Assistant Doctor) Examination and periodic government assessments. Meanwhile, village doctors, with technical school education or continuous practicing experience for more than 20 years in village clinics, are permitted by local health authorities to work only in village clinics with a "village doctor certificate", rather than a regular license. In 2015, there were about 360,000 licensed doctors or licensed assistant doctors in urban areas, as well as 740,000 licensed doctors or licensed assistant doctors, and 960,000 village doctors in rural areas.[1] There are still unlicensed individuals practicing in urban and rural primary health care institutions.

National basic public health service program

A principal function of the primary health care system in China is to implement basic public health service that aims for equity in access. These services funded by the government and provided all residents for free, regardless of their Hukou. In 2014, Chinese government issued official guidance emphasizing that PHC institutions have the responsibility to provide basic health services to the migrants. For the migrants, they can receive all basic public health services from the PHC institutions in the locations where they work (not just where they are from). The services include vaccination, health education, child health management, maternal health care, elderly health management, TCM health management, reporting of infectious diseases and public health emergencies, and management for hypertension, type 2 diabetes, psychosis and tuberculosis (Appendix 3). However, allied health services that play an important role in wide range of health maintenance have not been fully integrated into the primary health care in China – there is very little information about their use besides the health management and education within the basic public health service program.[27] The disease control and prevention agencies, who are in charge of capacity building and performance evaluation for the basic public health service, also provide technical support to primary health care institutions involved in the program.

Traditional Chinese medicine in primary health care system

In China's primary health care system, there are consistent national policies emphasizing equal attention to and the complementary advantages of the traditional Chinese medicine (TCM) and western medicine.[28] TCM care is widely provided in primary health care institutions (i.e. 97·5% of community health centres and 94·3% of township health centres in 2016),[26] often jointly with western medicine care. On the other hand, TCM health management was specified by the government as one of the national basic public health services. It includes TCM health check and education for residents aged over 65 years or below 3 years.

Financing policies for primary health care

The national policy of "separation between revenue and expenses" in primary health care institutions requires that all government-owned institutions turn in their revenue to the government, while in return, the government provides full subsidies for all of their expenses.[29, 30] This policy created incentives similar to those of the "iron rice bowl" policy (occupation with guaranteed job security and benefits) and has contributed to low productivity in primary health care institutions. Since 2015, some provinces have gradually eliminated the policy. In addition, in an effort to reduce primary health care institutions' incentives to prescribe unnecessary drugs, the government introduced the "zero drug mark-up" policy as part of the national essential drug system.[31] Under this system, primary health care providers have to sell drugs at cost without including a mark-up.

Social health insurance programs

Social health insurance programs have successfully covered more than 97% of residents in China.[17, 32] There are three social health insurance programs. They are the Urban Employee-Based Medical Insurance (UEBMI), the New Cooperative Medical Scheme (NCMS), and the Urban Resident-Based Medical Insurance (URBMI), established in 1998, 2003, and 2007 respectively. While funds for the two urban programs are pooled at the municipality level, those for NCMS are pooled at the county level. According to

recent national policies, NCMS and URBMI are in the process of merging.[33, 34] Insurance policies, including reimbursement rates, deductibles, and annual caps, vary across regions. Deductibles are the amount paid out-of-pocket for covered health care services before the insurer (i.e. specific government agencies for these programs) starts to reimburse expenses. Annual caps are the maximum amount that the insurer can reimburse per insured individual (or household) each year. Reimbursement rates are the proportion of expenditures the insurer reimburses until the cap is reached.

Workforce

Primary health care requires multidisciplinary professional teams, which consist of doctors, nurses, pharmacists, and other health workers. Despite being the backbone of the primary health care workforce, primary health care doctors in China are unevenly distributed across the country, and often inadequately trained. Moreover, these doctors are substantially underpaid, often have no legally mandated social benefits, and are commonly burned out. Village doctors are an older group and commonly report intentions to quit practice.

While the number of primary health care professionals is increasing, the regional distribution of primary health care doctors is uneven. Since the new health care reform in 2009, the number of primary health care doctors (about 1,730,000) in the four types of institutions has been increasing by 3·3% annually. The annual increases are larger for nurses (9·9%, approximately 472,000 in 2015), but smaller for pharmacists (3·1%, about 109,000 in 2015).[1, 13] However, similarly with the substantial disparities in the distribution of doctors in the entire health care system,[35] in the primary health care system, there was a two-fold difference across provinces in the number of licensed doctors or licensed assistant doctors per 1000 population (from 0·52 to 1·13), and a sixteen-fold difference for village doctors in rural settings (from 0·24 to 3·90) (Figure 1).[1]

Significant gaps exist in the licensure and education of primary health care doctors, with variation across regions. Similar to results from prior studies,[36] our survey revealed that 20·9% (1510/7241) of “doctors” practicing in community health centres, township health

centres, or community health stations were neither a licensed doctor nor licensed assistant doctor, with a larger proportion in less developed regions [32·7% (773/2361) in Western regions] and an even greater figure for community health stations [37·4% (328/876), P<0·001], even though unlicensed individuals are prohibited to practice by law. *The China Health and Family Planning Statistical Yearbook*, from the National Health and Family Planning Commission, reported that in village clinics, 24·4% of doctors held a regular license in 2015,[1] compared with 14·4% in 2010.[37] However, in community health centres, township health centres, or community health stations, 30·8% of the doctors' educational levels were below the requirement for licensed assistant doctor (junior medical college), while in village clinics, 12·3% of doctors' educational levels were below the requirement for village doctors (3 years of technical school education after 9 years of primary and secondary education). Continuing education for primary health care doctors is also insufficient. Although annual training is required by authorities, 35·5% (3775/10626) of the primary health care doctors in our survey had received no continuing training courses during the past year, with an even higher rate in Western regions [44·4% (1518/3418)]. Moreover, more than a third of primary health care professionals who received continuing training found that the courses were too short and provided insufficient practice.

The pay for primary health care professionals is low, and they often do not receive legally mandated social benefits. In community health centres, community health stations, or township health centres, for doctors with junior professional title, who typically have 2 to 10 years of clinical practice experience after graduating from medical college, our survey found a median annual income of 48,000 (IQR: 35,000-65,000) RMB [6969 (IQR: 5081-9437) USD], ranging from 35,000 (IQR: 29,000-45,000) RMB [5081 (IQR: 4210-6533) USD] in the Central regions to 60,000 (IQR: 49,342-83,291) RMB [8711 (IQR: 7163-12,029) USD] in Eastern regions. In village clinics, the figure was much lower: 25,000 (20,000-37,000) RMB [3630 (IQR: 2904-5372) USD]. These figures, consistent with those from prior studies,[38-40] are much lower than the income of average employees (62,029 RMB, 9000 USD) in China.[41] Compared with general practitioners in the Organization for Economic Cooperation and Development member countries, whose average income is two times higher than that of

average employees,[42] financial incentives are limited for primary health care doctors in China. A prior study noted that 37·5% of 121 doctors in community health centres or community health stations and 62·8% of 180 doctors in township health centres had no pensions,[43] although the level varied significantly across regions.[39] Among community health centres, community health stations, and township health centres in our survey, 22·5% (216/960) do not provide their employees any of the five social benefits mandated by the Chinese government, including pension, health insurance, unemployment insurance, occupational injury insurance, and housing funds. Even in the more affluent Eastern regions, the percentage of employees lacking legally mandated social benefits remained considerable [7·8% (30/386)]. Among village clinics, 74·9% (1978/2642) offered no legally mandated social benefit for employees (Figure 2).

Low job satisfaction and high occupational burnout also are widespread. The 2011 China Primary Care Workforce Survey showed overall job satisfaction of 47·6% among 823 primary health care professionals.[44] As noted in previous studies,[45-48] income, social benefits, and career development paths were the areas of lowest satisfaction among this workforce.[49] A recent systematic review of 13 studies showed a decline in job satisfaction among urban primary health care professionals after the new health care reform starting in 2009.[50] In addition, as a few previous studies have shown,[43] our survey revealed that 40·5% (4307/10626), 37·4% (3974/10626), and 34·0% (3616/10626) of primary health care doctors felt highly exhausted, highly depersonalized, and a high lack of personal accomplishment, respectively. Village doctors, particularly young and middle-age ones, were more likely to report “high lack of personal accomplishment” than their counterparts in other primary health care institutions (45·7% (1546/3385) vs. 28·6% (2070/7241), P<0·001).

A significant threat to the workforce is the high rate of turnover intention among primary health care doctors, particularly in village clinics. Specifically, according to prior studies identified in our literature review, 56·3% (139/247) of doctors in community health centres,[51] 38·8% (31/80) in community health stations,[51] 34·0% (137/403) in township health centres,[43] and 36·8% (695/1889) in village clinics,[52] were thinking about quitting their jobs. This is also found to be more common among those of younger age or with higher

education.[43, 51] Not surprisingly, the underlying reasons included insufficient remuneration, low job security, and an unclear career development path.[52] Our survey showed a similar finding that 29·5% (1000/3385) of village doctors reported the intention to quit their jobs. The rate was much higher for young or middle-age doctors (31·3% (636/2035) among those aged <50 years vs. 27·0% (364/1350) among those aged ≥50 years, P=0·007) and among those with a higher level of education (31·2% (814/2607) for technical school or above vs. 23·9% (186/778) for high school or below, P<0·001).

Aging of doctors in village clinics could also threaten the primary health care workforce. The *China Health and Family Planning Statistical Yearbook* reported that more than one fifth of village doctors were older than 60 years. Older doctors in village clinics are present in a much higher percentage than for doctors in community health centres (9%) or township health centres (6%).[1] In our survey, the median age was 47 years (IQR: 41-57) for village doctors and 39 years (IQR: 32-46) for doctors in community health centres or township health centres (P<0·001). Overall, 20·7% (700/3385) of village doctors have already exceeded the officially predefined retirement age in China (60 for male and 55 for female), compared with 3·6% (231/6365) of the doctors in community health centres or township health centres (P<0·001).

Information Technology Systems and Digital Data

Health information technology (IT) systems for clinical care and basic public health services in China are essential for continuity and coordination of primary health care. Currently, the two systems are separated. IT systems for clinical care are commonly unavailable or are functionally fragmented, whereas the systems for basic public health services are centrally deployed and widely available in primary health care settings. As such, the two systems are rarely linked or interoperable. The resulting paucity of digital data impedes the generation of evidence from everyday primary health care practice.

Fragmentation in IT availability and support has constrained the efficient delivery of clinical care within China's primary health care system. Our literature review identified two

studies on IT support for clinical care in community health centres or township health centres; findings from both demonstrated that interoperability of the systems was poor.[53, 54] We found no published studies on IT systems in village clinics in China. Our survey data identified a much wider range of challenges. First, IT systems are not commonly used in primary health care institutions: 54·5% (114/209) of community health centres and 51·0% (146/286) of township health centres had no electronic medical record (EMR) system, and the lack of IT penetration was much worse in village clinics [92·2% (2381/2582)]. Moreover, among village clinics with EMR systems, 39·0% (119/305) of village doctors did not routinely use the system, either because they did not know how to use it or they found it inconvenient to use. In addition, development and deployment of clinical IT systems in primary health care institutions were highly decentralized, without standardized data structures or definitions, or protocols to ensure integration and interoperability. In primary health care institutions with EMR systems, the systems were provided by more than 80 different IT vendors. However, only 40·0% (38/95) of the community health centres and 21·4% (30/140) of the township health centres can link their systems with hospitals in order to facilitate patient referrals.

IT systems are often used in rural and urban primary health care institutions for the purpose of collecting public health data in a standardized digital format. Since the launch of the basic public health service program in 2009, the Chinese national Center for Disease Prevention and Control developed and deployed a series of IT systems that cover all community health centres and township health centres, including systems for the Infectious Diseases and Public Health Emergencies Report, and Health Management for Psychosis. In addition, 96·5% (985/1021) of community health centres and 94·6% (1588/1679) of township health centres in prior surveys,[55] and 94·3% (197/209) of community health centres and 86·0% (246/286) of township health centres in our survey, were using the Resident Health Records System. This is another national basic public health service that documents the history of common chronic NCDs and the relevant treatment of individuals in each local household. An important role of the system is health data management, including tracking individuals' health status and treatment. However, the systems were rarely integrated with delivery of clinical care, and these health data were rarely leveraged in clinical practice.

We found no studies on the use of decision support and telemedicine in primary health care institutions in China, with the exception of one ongoing trial.[56] This demonstrates that China is still at a very early stage in leveraging innovative IT strategies, expanding expertise, and improving performance.

Incentives and Financing Policies

Financing Policies and Incentives for Care Providers

Despite increased government subsidies for primary health care institutions since China's 2009 reform, their income associated with clinical care has sharply declined, which created challenges to the clinical care delivery in primary health care system. Moreover, incentive policies for primary health care professionals do not reward high-quality clinical care.

Since China's market-oriented health care reform in the 1980's, primary health care providers have relied heavily on drug revenue as source of income. Providers were allowed to charge a 15% mark-up on drug sales, leading to incentives to over-prescribe drugs. To reduce primary health care providers' reliance on drug income and incentives on prescribing unnecessary drugs, the government has been increasing its total subsidy for primary health care institutions by 30% every year since 2009.[57] It also instituted the policies of "zero drug mark-up" and "separation between revenue and expenses" (Panel 3).[58] These policies have substantially affected primary health care institutions' financial incomes. From 2008 to 2015, the share of government subsidies in total income increased from 18·3% to 34·6% in community health centres and from 17·3% to 44·0% in township health centres, accompanied by dramatic declines in the share of clinical care income, from 77·4% to 59·4% in community health centres and from 81·6% to 52·6% in township health centres.[1, 13]

Prior studies have suggested that, because mark-ups in drug sales are now prohibited, community health centres and township health centres have experienced declines in drug income of about 40% through 2011.[59, 60] To compensate for these income losses, the

government has introduced other funding mechanisms, mainly by subsidizing the use of essential drugs.[61] However, these steps appear insufficient for two major reasons. First, the subsidies are trivial compared with prior drug profits.[62] Second, the amount of the essential drug subsidy is usually not linked to the quantity or quality of clinical care provided by the institutions.[61]

Changes in financing policies have also caused unintended consequences. Prior studies showed that some primary health care institutions tried to offset reductions in drug revenue with earnings from other channels, such as unnecessary intravenous infusion therapy or inpatient care.[59, 63] Other institutions were inclined to provide basic public health services, rather than clinical care, since they can get more subsidies from the basic public health service program. Some of them seek to minimize the amount of clinical care they do, resulting in patients going to hospitals without clinical need.[63, 64]

Prior studies suggest that performance appraisal mechanisms for individual primary health care professionals have failed to encourage delivery of high-quality clinical care .[65-70] Our survey demonstrated that payments for primary health care doctors do not reward quality. The bonuses for primary health care doctors that constitute 30% (IQR: 20·0-50·0%) of their income could have played a key role in incentivizing quality of care. However, across institutions, these bonuses were most often determined by the quantity of care delivered rather than the quality (Figure 3).

Insurance Policies for Care Consumers

Current social health insurance policies, which still largely provide limited coverage for primary health care or outpatient care, through setting low annual caps for total reimbursement, lead to over-use of hospital services even for minor health conditions and have inhibited primary health care providers from effectively playing the role of gatekeeping. This makes it difficult to achieve China's goals of system integration and cost savings.

In the social health insurance programs (Panel 3), benefit package (i.e. what services

are covered), reimbursement rates and caps affect patients' care-seeking behavior. Prior studies suggest that primary health care–oriented health insurance programs may encourage patients to go to primary health care institutions for their outpatient care.[71, 72] This goal is particularly important because the cost per outpatient visit at primary health care institutions is only two-fifths of the cost at secondary hospitals and one-quarter of the cost at tertiary hospitals.[1] A study suggested that an increase of 1 USD in outpatient expenditures could lead to a decrease of 6 USD in inpatient expenditures.[73]

In our survey, among the 67 rural sites in our survey, the New Cooperative Medical Scheme (NCMS) on average have higher reimbursement rates for outpatient care than for secondary or tertiary hospitals in 2016 [85% (IQR: 75%-90%) vs. 70% (IQR: 65%-80%) or 55% (IQR: 50%-62%), both P<0·001]. However, the effects on patients' financial risk and demand for services have largely been limited by the low reimbursement caps. On average in 2016, one patient can get no more than 39 (IQR: 15-58) USD reimbursed annually by NCMS for outpatient care in primary health care institutions, which can cover only 3 to 5 typical outpatient visits [60-98 RMB (9–14 USD) per visit].[1] After the limited annual caps were reached, patients with minor health conditions may choose to go to secondary and tertiary hospitals for outpatient care, particularly when there were specific reimbursement caps for outpatient care in hospitals that were higher than in primary health care institutions (Table 1). On the other hand, the limited reimbursement caps for outpatient care in primary health care institutions could also lead to inappropriate hospital utilization for inpatient and outpatient services,[74] particularly when the reimbursement rate for inpatient care was relatively high (Table 1). In essence, the government subsidizes hospital care, inpatient and outpatient, instead of favoring the delivery of care in primary health care institutions.

Quality of Care

The quality of primary health care in China, in general, is poorly characterized. Some

evidence, however, points to significant quality gaps in processes and outcomes.

There were few studies on the quality of primary health care with respect to outcome measures. Our survey revealed substantial gaps in the management of hypertension and diabetes, two conditions heavily prioritized in the national basic public health service programs. For example, among participants with hypertension who received care from primary health care institutions in a community-based population cohort,[75] only 69·6% (8539/12,264) knew they had hypertension and only 5·8% (707/12,264) had their blood pressure controlled (<140/90 mm Hg). The conditions were equally bad or even worse in comparison with the hypertensive patients who sought care only from hospitals (67·6% (6435/9517) diagnosed and 7·3% (699/9517) achieved <140/90 mm Hg). These results were but much lower than what has been found in the US (84·3% diagnosed, and 51·8% controlled)[76]. Findings were similar among people with diabetes: only 46·4% (2095/4515) of those usually seeking care from primary health care institutions were diagnosed, and 3·0% (134/4515) had their blood glucose controlled (fasting glucose <7·0 mmol/L), while 53·9% (1889/3502) diagnosed and 5·3% (184/3502) controlled among patients seeking care only from hospitals. This performance is much poorer than in the US (86·8% and 58·8%, respectively).

Our literature review revealed consistent gaps in the quality of care according to process measures. A prior incognito standardized patient study in 36 village clinics in the Western regions of China found that 41% of diagnoses were wrong, and 64% of the treatments were unnecessary or harmful.[77] In addition, a systematic review summarizing 24 studies published from 2000 through 2012, showed that the overall weighted average proportion of antibiotic use was 53% among 326,486 outpatient prescriptions from community health centres and township health centres in China, and that more than 15% of prescriptions included more than one antibiotic.[78] The proportion of antibiotic use was much higher than the performance standard recommended by the World Health Organization (WHO) (30%).[79] In 14 more recently published studies, involving 2,038,872 outpatient prescriptions, the proportions of antibiotic use ranged from 30% to 85%, with an overall weighted average of 45%.[80-93] The proportions of prescriptions with more than one antibiotic ranged from 10%

to 25% (Appendix 6).[81, 82, 87, 93, 94] In addition, we searched for and reviewed 16 studies on the use of intravenous or intramuscular injections published after 2009, involving 1,051,136 prescriptions in primary health care institutions. The proportions of prescriptions that included injections ranged from 23% to 64%, with an overall weighted average of 45%,[80-90, 94-98] which also exceeded the WHO recommended standard (20%).[79]

Prior studies in primary health care settings indicated improved patient satisfaction since the new reform,[99-101] and higher satisfaction compared with hospitals.[102] However in our survey, among the patients who had been to primary health care institutions for clinical care, 84·3% (1912/2269) felt "not satisfied at all" or "mostly dissatisfied". Among the patients who had chosen to bypass primary health care institutions and went to hospitals, the most common reasons include "do not know primary health care institutions well" [13·6% (523/3837)], "do not trust primary health care institutions" [12·8% (493/3837)], "be not satisfied with the quality of care in primary health care institutions" [12·5% (478/3837)].

Moreover, there are significant knowledge gaps in the quality of primary health care in China, particularly its changing patterns during the national reform effort. This reality could be due to the fact that no system routinely collects clinical information on quality or officially reports quality measures.

Challenges and Opportunities

Even though China has made remarkable efforts and achievements since 2009, the primary health care system still needs to be substantially strengthened to manage both the rising chronic NCD burden and increasing health expenditures.[103] Despite increasing government financial investments, universal health insurance coverage, basic public health service programs, and the essential drug system,[104, 105] current policies and technology systems have marked limitations.[106, 107] These limitations impede the integration of clinical care and public health services within the primary health care system, negate the collaboration between primary health care and other healthcare sectors (e.g., hospitals),[108] and make it

difficult to ensure that a sufficient number of professionals have appropriate training, remuneration, and performance.[107] Moreover, the system is not configured to learn from everyday practice and, thereby, promote continuous improvement. As a result, on the supply side, doctors lack adequate technical support and appropriate financial incentives to deliver integrated and high-quality care. On the demand side, patients tend to bypass the primary health care system (i.e. the "gatekeepers") to go to hospitals for more specialized consultations and higher insurance reimbursements. Moreover in the short term, the possible forthcoming shortage of village doctors could undermine the entire system, as they have provided a quarter of the outpatient care in China,[1] and are expected to act as a first point of consultation for more than 600 million rural residents.

The national roadmap "The Healthy China 2030 Plan" highlighted the important role of primary health care,[20] which ensured strong political commitments to strengthen the primary health care system. In this critical juncture in the development of primary health care, a forthcoming *Lancet* Commission on primary health care in China will propose recommendations and indicators by pooling global expertise.[109] Further studies will helpfully provide comprehensive insight into root causes to the current challenges by exploring the evolution and socio-economic environment of the primary health care system in China. These actions by the government and academic communities are notable steps for China, as it aims to build an integrated, cooperative primary health care system – one that fully supports its professionals and is accountable for its performance. These strategies and measures are also essential for the entire healthcare sector in China as they would improve the delivery of high-quality care and control rising costs. These experiences may also be helpful for other developing countries facing similar challenges.

Conflicts of Interest

The authors declared no relevant conflict of interest.

Contributors' Statement

Shengshou Hu, LJ and HMK conceived the review and take responsibility for all aspects of it. XL, JL, LJ and HMK initially designed the survey, with the support from KKC, JDM, QM, EM, DRX and WY. XL and JL wrote the first draft. Shuang Hu and HZ provided data management and statistical expertise. Shengshou Hu, LJ, HMK, KKC, JDM, QM, EM, DRX and WY provided comments and suggestions in critical revision of the article. All authors approved the final version of the article.

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Figure legends

Figure 1. Number of primary health care doctors per 1000 population in urban and rural China in 2015

Figure 2. Social benefits for employees in primary health care institutions

* Including township health centres, community health centres, and community health stations

Including pension, health insurance, unemployment insurance, occupational injury insurance, and housing fund

PHC indicates primary health care

The three economic-geographic regions of China, including Eastern (13 provinces), Central (6 provinces), and Western (12 provinces), are categorized according to the official definition.[1]

Figure 3. Percentage of institutions reporting each factor that influences doctors' bonuses

MR indicates medical record; ED essential drug; HTN hypertension; DM diabetes mellitus

Tables

Table 1. Reimbursement deductibles, rates and annual caps of New Cooperative Medical Scheme in 67 rural sites in 2016

	For outpatient care	For inpatient care
Deductible, USD		
PHC institution	0 (0-0)	22 (7-29)
Secondary hospital	0 (0-44)	58 (44-73)
Tertiary hospital	0 (0-73)	116 (87-145)
Rate, %*		
PHC institution	85 (75-90)	85 (75-90)
Secondary hospital	70 (65-80)	70 (65-80)
Tertiary hospital	55 (50-62)	55 (50-62)
Annual cap, USD		
PHC institution	39 (15-58)	21777 (14518-29036)
Secondary hospital	48 (22-218)	21777 (14518-29036)
Tertiary hospital	58 (48-218)	21777 (14518-29036)

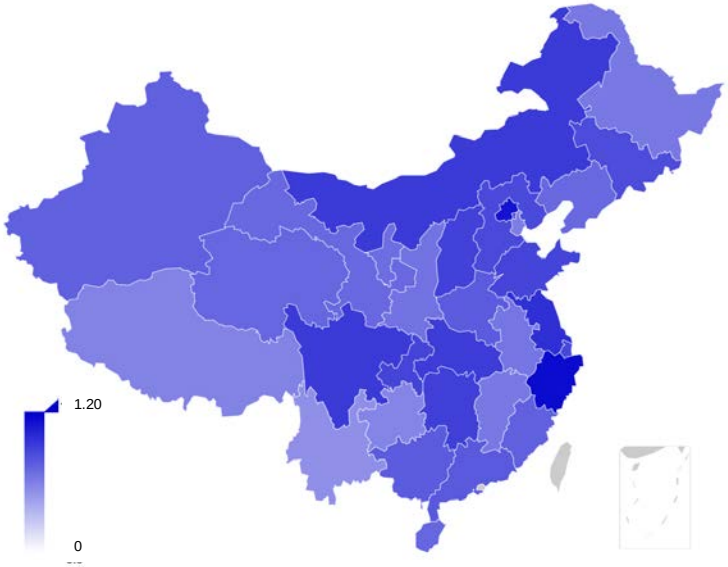
Median (interquartile range)

PHC indicates primary health care; USD United States Dollar

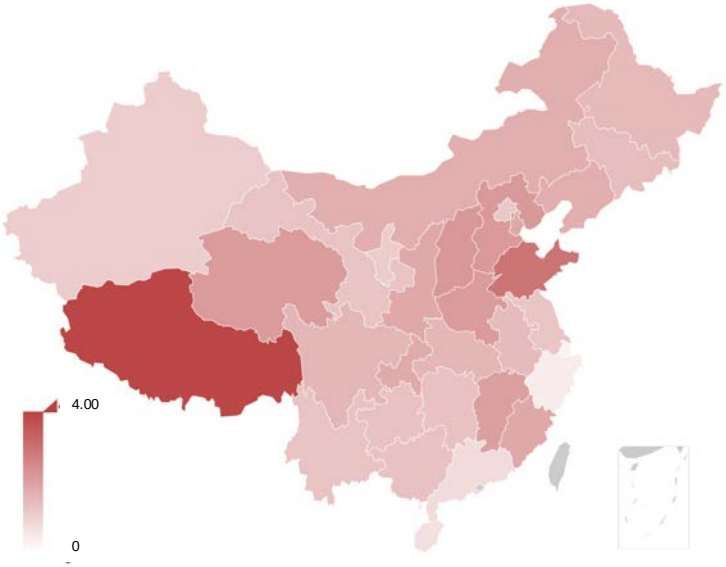
* This is the “official” reimbursement rates. The percentages of total expenditure that are reimbursed by insurance (i.e. “actual” reimbursement rates) are typically lower because of the annual caps and that not all services are covered by insurance.[110]

Figures

Figure 1.



A. Number of licensed or assistant licensed doctors per 1000 population

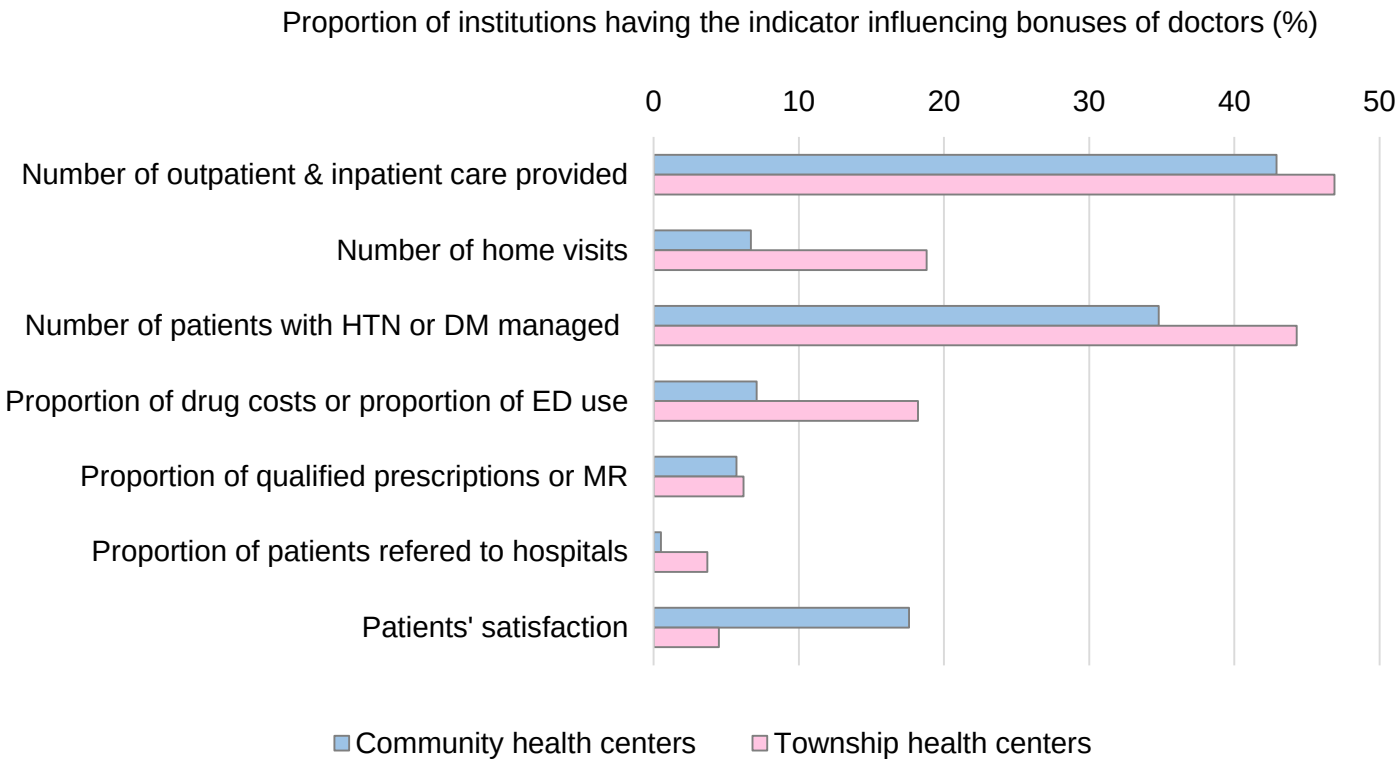


B. Number of village doctors per 1000 rural population

Figure 2.


No social benefits for employees
All five social benefits for employees #
Proportion of primary health care institutions, %
100%
80%
60%
40%
20%
0%
9
69
24
76
38
79
Other PHC institutions *
Village clinics
Other PHC institutions *
Village clinics
Other PHC institutions *
Village clinics
Eastern
Central
Western

Figure 3.


Proportion of institutions having the indicator influencing bonuses of doctors (%)
0
10
20
30
40
50
Number of outpatient & inpatient care provided
Number of home visits
Number of patients with HTN or DM managed
Proportion of drug costs or proportion of ED use
Proportion of qualified prescriptions or MR
Proportion of patients refered to hospitals
Patients' satisfaction
Community health centers
Township health centers