



The primary health-care system in China

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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, all of which diminish its preparedness to care for a fifth of the world's population, which is ageing and which has a growing prevalence of chronic non-communicable disease. These challenges include inadequate education and qualifications of its workforce, ageing and turnover of village doctors, fragmented health information technology systems, a paucity of digital data on everyday clinical practice, financial subsidies and incentives that do not encourage cost savings and good performance, insurance policies that hamper the efficiency of care delivery, an insufficient quality measurement and improvement system, and poor performance in the control of risk factors (such as hypertension and diabetes). As China deepens its health-care reform, it has the opportunity to build an integrated, cooperative primary health-care system, generating knowledge from practice that can support improvements, and bolstered by evidence-based performance indicators and incentives.

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 contributed substantially to a reduction in the burden of communicable, maternal, and neonatal diseases through the 1960s and 1970s,^{1,2} and helped advance the global primary health-care movement enshrined in the Declaration of Alma-Ata in 1978.³ In subsequent decades, the system faced substantial challenges after market-based reforms in the health-care sector,^{4,5} including inadequate government funding⁶ and weakening of the support of public health-care 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 health-care 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 (US\$2.8 billion) in 2008 to ¥140 billion (\$20.3 billion) in

2015.¹³ Additionally, the government instituted universal health insurance coverage,¹⁰ a basic public health service programme,¹⁴ and a national essential drug system,^{15,16} all of which improved access to and affordability of primary health care.¹⁷ Acknowledging the increasing pressure exerted by an ageing population, behavioural changes,¹⁸ and rapid urbanisation,¹⁹ the government's Healthy China 2030 plan²⁰ envisions the primary health-care system as a means of addressing the emerging dual burden of chronic non-communicable diseases^{21–23} and increasing health expenditures.¹ Despite the importance of primary health care in China and its recent reforms, there is insufficient knowledge about both the current system and the effect of recent policy changes.

In this Review, we aim to assess 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 non-communicable diseases. We sought to assess the state of evidence related to the primary health-care system in China, with specific attention towards identifying the challenges in structural characteristics, incentives and financing policies, and quality of care, according to a framework designed for the assessment of primary health-care systems.²⁴ We employed the following methods: a narrative literature review of both published and grey literature; a quantitative data analysis of results from a recent national survey of primary health-care administrators, providers, and patients; and interviews with national experts to interpret themes that emerged from the literature review and the survey (appendix).

Structural characteristics Infrastructure, professionals, and services

According to the Declaration of Alma-Ata,²⁵ a 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.

Search strategy and selection criteria

We searched the PubMed, MEDLINE, and China National Knowledge Infrastructure databases (CNKI) on July 28, 2016, to identify relevant studies on seven domains of primary health care in China—structure, human resources, electronic health record system, finance, insurance, medications, and quality of care. In PubMed and MEDLINE, we used MeSH and free-text terms in conjunction to increase sensitivity to potentially appropriate literature published, in English or Chinese, between 1966 and 2016. MeSH terms included “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 are identified in the full search strategy (appendix). We used a similar strategy in CNKI to include literature published in Chinese journals.

Primary health-care institutions provided 55% of outpatient care (4.4 billion visits) and 18% of inpatient care (41.7 million hospital admissions) in China in 2016,²⁶ mainly for common clinical conditions (appendix). Clinical care capabilities vary substantially across primary health-care institutions. Of the 3602 institutions in our national survey, 109 (52%) of 210 community health centres and 248 (85%) of 293 township health centres provided inpatient care. The median number of beds was 40 (IQR 27–59) for community health centres, and 36 (IQR 20–60) for township health centres. Overall, 98 (47%) of 210 community health centres and 204 (70%) of 293 township health centres had an internal medicine department, 80 (38%) versus 187 (64%) had a surgery department, and 46 (22%) versus 138 (47%) had an emergency department. Additionally, traditional Chinese medicine is widely provided: 160 (76%) community health centres and 201 (69%) township health centres have a specific department of traditional Chinese medicine (panel). Ten (5%) community health centres and 28 (10%) of township health centres 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 (n=2642) showed an even lower coverage of basic clinical tests: 2535 (96%) were not capable of routine blood testing, 2391 (90%) were not capable of routine urine testing, 819 (31%) could not provide blood glucose tests, and 2532 (96%) could not provide lipid tests.

With respect to government-sponsored basic public health services, community health centres and township health centres take more responsibilities than do the community health stations and village clinics one level below them (panel). Village clinics were more commonly involved in this programme than were community health stations (appendix).

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 are 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 than other primary health-care doctors and commonly report intentions to quit practice.

Although the number of primary health-care professionals is increasing, the regional distribution of primary health-care doctors is uneven. Since the health-care reform in 2009, the number of primary health-care doctors (about 1730 000 in 2015) in the four types of institutions has been increasing by 3.3% annually. The annual increases are larger for nurses (9.9%,

Key messages

- The primary health-care system in China has contributed substantially to reductions in the burden of diseases. With the 2009 health-care reform, access to and affordability of primary health care has substantially improved through increased government funding, universal health insurance coverage, the basic public health service programme, and an essential drug system. However, challenges remain.
- Primary health-care doctors in China have low levels of training, commonly do not have certifications, and experience high rates of burnout. Primary health-care professionals are paid low wages and minimal benefits. Moreover, payment policies do not reward high-quality care. Many younger doctors are considering leaving the profession, and a large proportion of doctors in village clinics are past retirement age.
- Application of information technology (IT) is fragmented. IT systems for clinical care are often unavailable; when available, they are not interoperable. IT systems for public health services are more widespread, but they are not integrated with clinical practice. The resulting lack of linked digital data impedes the implementation of decision support as well as the timely generation of evidence from everyday primary health-care practice.
- 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 charging mark-ups above the cost of drugs is no longer allowed, which might have diminished the incentive to deliver appropriate clinical care.
- Many health insurance policies provide more generous reimbursement for inpatient care, which incentivises patients to use the hospital for even minor health conditions and inhibits primary health-care providers from being gatekeepers.
- The quality of primary health care in China is not well characterised. However, available data suggest that only a minority of primary care patients with hypertension and diabetes in China are diagnosed, and few among them achieve optimal control. Furthermore, inappropriate prescribing is common.
- The wide range of challenges for primary health care in China requires a strategy. The Healthy China 2030 plan, a government blueprint, highlights the important role of primary health care and is committed to strengthening the primary health-care system. Nevertheless, recommendations linked to resources and evidence-based indicators are needed for the implementation.

approximately 472 000 in 2015), but smaller for pharmacists (3.1%, about 109 000 in 2015).¹¹³ However, similar to 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-times difference across provinces in the number of licensed doctors or licensed assistant doctors per 1000 population (from 0.52 to 1.13), and a 16-times difference for village doctors in rural settings (from 0.24 to 3.90; figure 1).¹

Substantial gaps exist in the licensure and education of primary health-care doctors, with variation across regions. Similar to results from previous studies,³⁶ our national survey revealed that 1510 (21%) of 7241 doctors practicing in community health centres, township health centres, or community health stations were neither licensed doctors nor licensed assistant doctors, with a larger proportion in less developed regions (773 [33%] of 2361 practitioners in western regions), and an even greater proportion in community health stations (328 [37%] of 876 practitioners;

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See Online for appendix

Panel: 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 organised differently. In 2016, urban components included approximately 9000 community health centres (93% publicly owned) and, one level below them, 25 000 community health stations (71% publicly owned). Rural components include approximately 37 000 township health centres (99% publicly owned) and, one level below them, 639 000 village clinics (63% publicly owned).^{1,26} In urban areas, the community health stations function as satellite sites of the community health centres. By 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 programmes and basic public health service programme.

Training and qualification of primary health-care doctors

Formal medical training for primary health-care doctors has three levels: medical college (5 years of medical education after 12 years of primary and secondary education to get a bachelor's degree of medicine); junior medical college (3 years of medical education after 12 years of primary and secondary education); and technical school (3 years of medical education after 9 years of primary and secondary education). Completion of medical college is required to become a licensed doctor and junior medical college training is required to become a licensed assistant doctor, both of whom also need to pass the National Practising Doctor (or Assistant Doctor) Examination and periodic government assessments. Meanwhile, village doctors, with technical school education or continuous practising experience for more than 20 years in village clinics, are permitted by local health authorities to work only in village clinics with a so-called village doctor certificate, rather than a regular licence. 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 practising in urban and rural primary health-care institutions.

National basic public health service programme

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 are funded by the government and provided to all residents for free, regardless of their hukou (a record that officially identifies area residents). In 2014, the Chinese Government issued official guidance emphasising that primary health-care institutions have the responsibility to provide basic health services to migrants within China. Migrants can receive all basic public health services from the primary health-care institutions in the locations where they work, not just where they are from. These services include vaccination;

health education; child health management; maternal health care; elderly health management; traditional Chinese medicine; reporting of infectious diseases and public health emergencies; and management for hypertension, type 2 diabetes, psychosis, and tuberculosis (appendix). However, allied health services that play an important part in health maintenance have not been fully integrated into the primary health-care system in China—there is very little information about their use besides health management and education within the basic public health service programme.²⁷ The disease control and prevention agencies, who are in charge of capacity building and performance assessment for the basic public health service, also provide technical support to primary health-care institutions involved in the programme.

Traditional Chinese medicine in the primary health-care system

In China's primary health-care system, there are consistent national policies emphasising equal attention to and the complementary advantages of traditional Chinese medicine with allopathic approaches.²⁸ Traditional Chinese medicine care is widely provided in primary health-care institutions (ie, 98% of community health centres and 94% of township health centres in 2016),²⁶ often jointly with allopathic medical care. On the other hand, traditional Chinese medicine health management was specified by the government as one of the national basic public health services. It includes a traditional Chinese medicine health check and education for residents aged older than 65 years or younger than 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, and, in return the government provides full subsidies for all of their expenses.^{29,30} This policy created incentives similar to those of the so-called iron rice bowl policy (occupation with guaranteed job security and benefits) and might have contributed to low productivity in primary health-care institutions. Since 2015, some provinces have gradually eliminated the policy. Additionally, 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 programmes

Social health insurance programmes have successfully covered more than 97% of residents in China.^{17,32} There are three social health insurance programmes: Urban Employee-Based Medical Insurance (established in 1998), New Cooperative Medical Scheme (NCMS; established in 2003), and Urban

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Resident-Based Medical Insurance (URBMI; established in 2007). Although funds for the two urban programmes 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 (ie, specific government agencies for these programmes) 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.

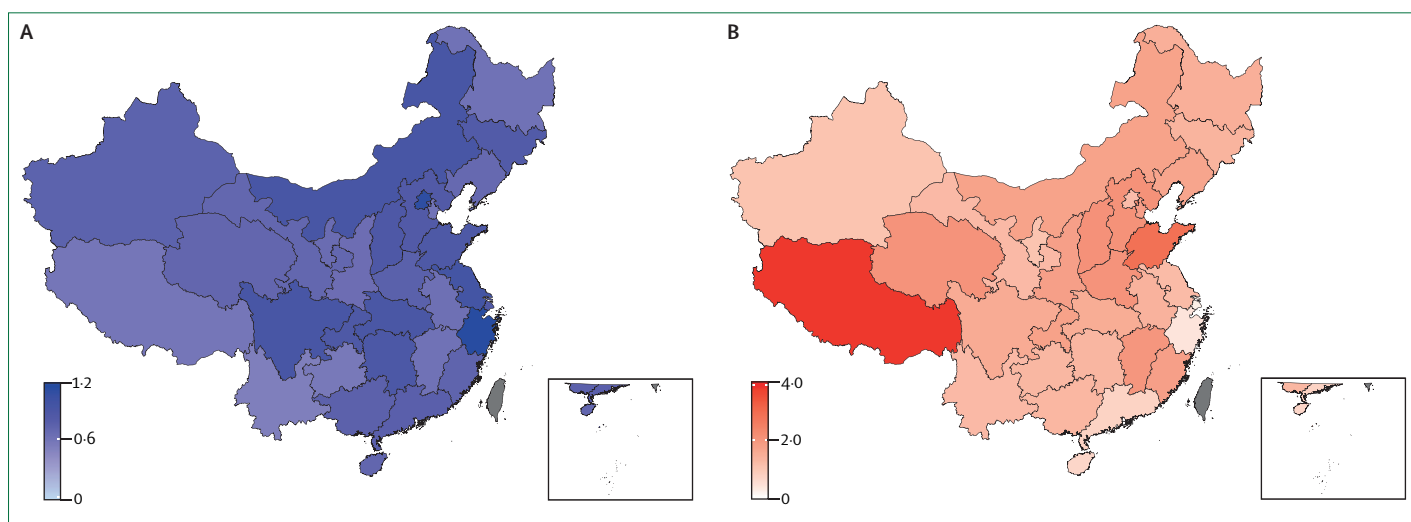


Figure 1: Number of primary health-care doctors in China in 2015

(A) Number of licensed or assistant licensed doctors per 1000 population. (B) Number of village doctors per 1000 rural population.

$p < 0.0001$), even though unlicensed individuals are prohibited to practise by law. The China Health and Family Planning Statistical Yearbook, from the National Health and Family Planning Commission, reported that in village clinics, 24% of doctors held a regular licence in 2015,¹ compared with 14% in 2010.³⁷ However, in community health centres, township health centres, or community health stations, 31% of doctors' educational levels were below the requirement for a licensed assistant doctor (junior medical college), whereas in village clinics, 12% 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; panel). Continuing education for primary health-care doctors is also insufficient. Although annual training is required by authorities, 3775 (36%) of 10 626 primary health-care doctors in our national survey had received no continuing training courses during the past year, with an even higher rate in western regions (1518 [44%] of 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 a junior professional title (who typically have 2 to 10 years of clinical practice experience after graduating from medical college), our national survey found a median annual income of ¥48 000 (IQR 35 000–65 000; \$6969 [IQR 5081–9437]), ranging from ¥35 000 (29 000–45 000; \$5081 [4210–6533]) in the central regions to ¥60 000 (49 342–83 291; \$8711 [7163–12 029]) in eastern regions. In village clinics, the figure was much lower, at ¥25 000 (20 000–37 000; \$3630 [2904–5372]). These figures, which are consistent with those from previous studies,^{38–40} are lower than the average income in China (¥62 029 [\$9000]).⁴¹ Compared with general practitioners in member countries of the Organization for Economic Cooperation and Development, whose average income is two times higher,⁴² financial incentives are scarce for primary health-care doctors in China. A previous study⁴³ noted that 46 (38%) of 121 doctors in community health centres or community health stations and 113 (63%) of 180 doctors in township health centres had no pensions, although the level of pension coverage varied substantially across regions.³⁹ Among community health centres, community health stations, and township health centres in our national survey ($n=960$), 216 (23%) do not provide their employees with any of the five social benefits mandated by the Chinese Government, including

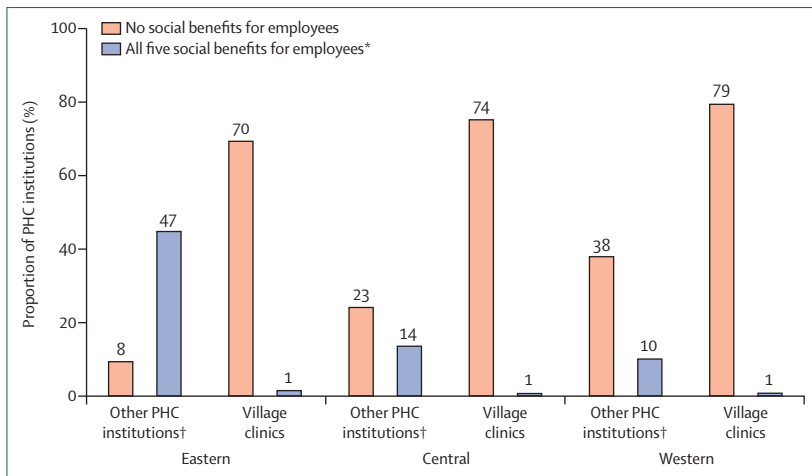


Figure 2: Social benefits for employees in PHC institutions

The three economic–geographical regions of China—eastern (13 provinces), central (six provinces), and western (12 provinces)—are categorised according to the official definition.[‡] PHC=primary health-care. *Including pension, health insurance, unemployment insurance, occupational injury insurance, and housing fund. †Including township health centres, community health centres, and community health stations.

pension, health insurance, unemployment insurance, occupational injury insurance, and housing funds. Even in the more affluent eastern regions, there was a considerable proportion of institutions that do not provide any legally mandated social benefits (30 [8%] of 386; figure 2). Among village clinics, 1978 (75%) of 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 of 823 primary health-care professionals showed overall job satisfaction of 48%.⁴⁴ As noted in previous studies,^{45–48} income, social benefits, and career development paths were the areas of lowest satisfaction among this workforce.⁴⁴ A recent systematic review of 13 studies⁴⁹ showed a decline in job satisfaction among urban primary health-care professionals after the 2009 health-care reform.⁴⁹ Additionally, as results from previous studies have also shown,⁴³ our national survey revealed that, of 10 626 primary health-care doctors, 4307 (41%) felt highly exhausted, 3974 (37%) felt highly depersonalised, and 3616 (34%) felt that they highly lacked personal accomplishment. Village doctors, particularly young and middle-aged ones, were more likely to report high lack of personal accomplishment than were their counterparts in other primary health-care institutions (1546 [46%] of 3385 vs 2070 [29%] of 7241; $p<0\cdot0001$).

A noteworthy threat to the workforce is the high prevalence of intention to quit among primary health-care doctors, particularly in village clinics. Specifically, according to previous studies identified in our literature review, 139 (56%) of 247 doctors in community health centres,⁵⁰ 31 (39%) of 80 in community health stations,⁵⁰ 137 (34%) of 403 in township health centres,⁴³ and 695 (37%) of 1889 in village clinics⁵¹ were thinking about

quitting their jobs. This threat is also more common in those of younger age or with higher education.^{43,50} Unsurprisingly, the underlying reasons included insufficient remuneration, low job security, and an unclear career development path.⁵¹ Our national survey showed a similar finding, in that 1000 (30%) of 3385 village doctors reported the intention to quit their jobs. The rate was higher for young or middle-aged doctors (<50 years; 636 [31%] of 2035) than in doctors aged 50 years or older (364 [27%] of 1350; $p=0\cdot0074$). The rate of turnover intention was also higher in participants with a higher level of education (ie, technical school or above; 814 [31%] of 2607) compared with 186 (24%) of 778 with a high school education or lower ($p<0\cdot0001$).

Ageing 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 a fifth (24%) of village doctors were older than 60 years. These older doctors are present in village clinics in a much higher percentage than are doctors in community health centres (9%) or township health centres (6%).¹ In our national 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 ($p<0\cdot0001$). Overall, 700 (21%) of 3385 village doctors have already exceeded the officially predefined retirement age in China (age 60 years for men and age 55 years for women), compared with 231 (4%) of 6365 doctors in community health centres or township health centres ($p<0\cdot0001$).

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 separate. 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 integrated, interoperable, longitudinal 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 showed that interoperability of the systems was poor.^{52,53} We found no published studies on IT systems in village clinics in China. Our national survey data identified a much wider range of challenges. First, IT systems are not commonly used in primary health-care institutions: 114 (55%) of 209 community health centres and 146 (51%) of 286 township health centres had no electronic medical record system, and the insufficiency

of IT penetration was much worse in village clinics, of which 2381 (92%) of 2582 had no electronic medical records. Moreover, among village clinics with electronic medical record systems, 119 (39%) of 305 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 decentralised, without standardised data structures, definitions, or protocols to ensure integration and interoperability. In primary health-care institutions with electronic medical record systems, the systems were provided by more than 80 different IT vendors, and are largely not interoperable. However, only 38 (40%) of 95 community health centres and 30 (21%) of 140 township health centres can link their systems with hospitals 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 standardised digital format. Since the launch of the basic public health service programme 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, 985 (96%) of 1021 community health centres and 1588 (95%) of 1679 township health centres in previous surveys,⁵⁴ and 197 (94%) of 209 community health centres and 246 (86%) of 286 township health centres in our national survey were using the Resident Health Records System. This system is another national basic public health service that documents the history of common chronic non-communicable diseases 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.⁵⁵ This finding shows 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 reform in 2009, the income associated with clinical care has sharply declined, which has created challenges to the clinical care delivery in the 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 1980s, primary health-care providers have relied heavily on drug revenue as a source of income. Providers were allowed to charge a 15% mark-up on drug sales, leading to incentives to over-prescribe drugs. To reduce the reliance of primary health-care providers on drug income and incentives to prescribe unnecessary drugs, the government has been increasing its total subsidy for primary health-care institutions by 30% every year since 2009.⁵⁶ The government also instituted the policies of zero drug mark-up and separation between revenue and expenses (panel).⁵⁷ These policies have substantially affected the financial incomes of primary health-care institutions. From 2008 to 2015, the share of government subsidies in total income increased from 18% to 35% in community health centres and from 17% to 44% in township health centres, accompanied by noteworthy declines in the share of clinical care income, from 77% to 59% in community health centres and from 82% to 53% in township health centres.^{1,13}

Results from previous 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% until the end of 2011.^{58,59} To compensate for these income losses, the government has introduced other funding mechanisms, mainly by subsidising the use of essential drugs.⁶⁰ However, these steps appear insufficient for two major reasons. First, the subsidies are trivial compared with previous drug profits.⁶¹ Second, the amount of the essential drug subsidy is usually not linked to the quantity or quality of clinical care provided by the institutions.⁶⁰

Changes in financing policies have also caused unintended consequences. Results from previous 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.^{58,62} 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 programme. Some of them seek to minimise the amount of clinical care they provide, resulting in patients going to hospitals without clinical need.^{62,63}

Results from previous studies also suggest that performance appraisal mechanisms for individual primary health-care professionals have failed to encourage delivery of high-quality clinical care.⁶⁴⁻⁶⁹ Our national survey showed that payments for primary health-care doctors do not reward quality. The bonuses for primary health-care doctors that constitute 30% (IQR 20-50) of their income could have played a key part in incentivising quality of care. However, across institutions, these bonuses were most often determined by the quantity of care delivered rather than the quality (figure 3).

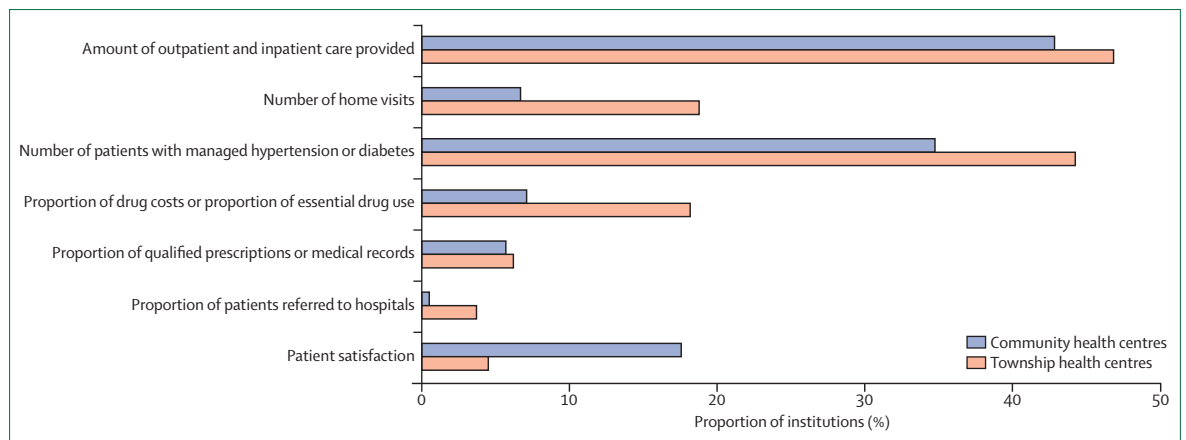


Figure 3: Proportion of institutions reporting each factor that influences doctors' bonuses

Insurance policies for care consumers

Social health insurance policies 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 part of gatekeeping (providing first-contact care). This approach makes it difficult to achieve China's goals of system integration and cost savings.

In the social health insurance programmes, benefit packages (ie, what services are covered), reimbursement rates, and caps affect patients' care-seeking behaviour (panel). Results from previous studies suggest that primary health-care-oriented health insurance programmes might encourage patients to go to primary health-care institutions for their outpatient care.^{70,71} 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 a quarter of the cost at tertiary hospitals.¹ The investigators of one study⁷² suggested that an increase of \$1 in outpatient expenditures could lead to a decrease of \$6 in inpatient expenditures.

Among the 67 rural sites in our national survey, the New Cooperative Medical Scheme (NCMS) had higher reimbursement rates for outpatient care, on average, than for secondary or tertiary hospitals in 2016 (85% [IQR 75–90] vs 70% [IQR 65–80%] vs 55% [IQR 50–62]; both $p < 0.0001$). 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 could get no more than \$39 (IQR 15–58) reimbursed annually by NCMS for outpatient care in primary health-care institutions, which can cover only three to five typical outpatient visits (¥60–98 [\$9–14] per visit).¹ After annual caps were reached, patients with minor health conditions could 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). On the other hand, the low reimbursement caps for outpatient care in primary health-care institutions could also lead to inappropriate hospital use for inpatient and outpatient services,⁷⁴ particularly when the reimbursement rate for inpatient care was relatively high (table). In essence, the government subsidises both inpatient and outpatient hospital care, instead of favouring the delivery of care in primary health-care institutions.

Quality of care

Generally, the quality of primary health care in China is poorly characterised. However, some evidence points to substantial gaps in the quality of processes and outcomes.

There were few studies on the quality of primary health care with respect to outcome measures. Our national survey revealed substantial gaps in the management of hypertension and diabetes, two conditions that are heavily prioritised in the national basic public health service programme. A community-based screening project of 1.7 million participants reported that rate of hypertension control was low (7%) among those with hypertension, and consistently low across different subpopulations (<30%).⁷⁵ In participants with hypertension who received care from primary health-care institutions in a community-based population cohort,⁷⁶ only 8539 (70%) of 12 264 knew they had hypertension and only 707 (6%) had their blood pressure controlled (<140/90 mm Hg). The conditions were equally bad by comparison with the patients with hypertension who sought care only from hospitals (6435 [68%] of 9517 diagnosed with hypertension, and 699 [7%] had their blood pressure controlled). These results were much lower than in the USA (84% diagnosed, and 52% controlled).⁷⁷ In the Chinese primary health institutions, low availability and few prescriptions with high-value medications (low-cost and guideline recommended) were reported, which might partly explain poor blood pressure management in China.⁷⁸ Findings were similar among people with diabetes: only 2095 (46%) of 4515 usually seeking care from primary health-care

	Outpatient care	Inpatient care
Deductible (US\$)		
Primary health-care institution	\$0 (0-0)	\$22 (7-29)
Secondary hospital	\$0 (0-44)	\$58 (44-73)
Tertiary hospital	\$0 (0-73)	\$116 (87-145)
Rate (%)*		
Primary health-care 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 (US\$)		
Primary health-care institution	\$39 (15-58)	\$21777 (14518-29 036)
Secondary hospital	\$48 (22-218)	\$21777 (14518-29 036)
Tertiary hospital	\$58 (48-218)	\$21777 (14518-29 036)

Data are median (IQR). Data are from 67 rural sites. *Percentages of total expenditure that are reimbursed by insurance (ie, actual reimbursement rates) are typically lower because of the annual caps and because not all services are covered by insurance.⁷³

Table: 2016 reimbursement deductibles, rates, and annual caps of the New Cooperative Medical Scheme

institutions were diagnosed, and 134 (3%) had their blood glucose controlled (fasting glucose <7.0 mmol/L), whereas 1889 (54%) of 3502 patients who sought care only from hospitals were diagnosed and 184 (5%) had their blood glucose controlled. This performance is much poorer than in the USA (87% for diagnosis and 59% for blood glucose control).⁷⁷

Our literature review revealed consistent gaps in the quality of care, according to process measures. A previous study of incognito standardised patients in 36 village clinics in the western regions of China found that 41% of diagnoses were wrong and 64% of treatments were unnecessary or harmful.⁷⁹ Additionally, a systematic review of 24 studies, published between 2000 and 2012, showed that the overall weighted average proportion of antibiotic use was 53% of 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.⁸⁰ The proportion of antibiotic use was much higher than the performance standard recommended by WHO (30%).⁸¹ In 14 studies⁸²⁻⁹⁵ involving 2 038 872 outpatient prescriptions, the proportions of antibiotic use ranged from 30% to 85%, with an overall weighted average of 45%. The proportions of prescriptions with more than one antibiotic ranged from 10% to 25% (appendix).^{83,84,89,95,96} Additionally, 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%,^{82-92,96-100} which also exceeded the WHO recommended standard (20%).⁸¹

Results from previous studies in primary health-care settings in China indicated improved patient satisfaction

since the 2009 reform¹⁰¹⁻¹⁰³ and higher satisfaction compared with hospitals.¹⁰⁴ However, in our survey, among the patients who had been to primary health-care institutions for clinical care (n=2269), 1912 (84%) felt “not satisfied at all” or “mostly dissatisfied”. Among the patients who had chosen to bypass primary health-care institutions and went to hospitals (n=3837), the most common reasons include “do not know primary health-care institutions well” (n=523 [14%]), “do not trust primary health-care institutions” (n=493 [13%]), and “not satisfied with the quality of care in primary health-care institutions” (n=478 [12%]).

Moreover, there are substantial knowledge gaps in the quality of primary health care in China, particularly its changing patterns during the national reform effort. This reality could be because 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, its primary health-care system still needs to be substantially strengthened to manage both the rising burden of chronic non-communicable diseases and increasing health expenditures.¹⁰⁵ Despite increasing government financial investments, universal health insurance coverage, basic public health service programme, and the essential drug system,^{12,106} current policies and technology systems have marked limitations.^{33,107} 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 health-care sectors (eg, 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 do not have 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 (ie, the gatekeepers) to go to hospitals for more specialised 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 China¹ 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. At this crucial juncture, a forthcoming *Lancet* Commission on primary health care in China¹⁰⁹ will propose recommendations and indicators by pooling global expertise. Further

studies will provide comprehensive insight into root causes of the current challenges by exploring the evolution and socioeconomic environment of the primary health-care system in China. These actions, by the government and academic communities, are notable steps as China 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 health-care sector in China because they would improve the delivery of high-quality care and control rising costs. These experiences could also be helpful for other developing countries facing similar challenges.

Contributors

SheH, 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. ShuH and HZ provided data management and statistical expertise. SheH, LJ, HMK, KKC, JDM, QM, EM, DRX, and WY provided comments and suggestions in revision of the Review. All authors approved the final version of the Review.

Declaration of interests

HMK reports that he is a recipient of research agreements from Medtronic and from Johnson & Johnson (Janssen), through Yale, to develop methods of clinical trial data sharing; works under contract with the Centers for Medicare & Medicaid Services to develop and maintain performance measures that are publicly reported; chairs a cardiac scientific advisory board for UnitedHealth; is a participant/participant representative of the IBM Watson Health Life Sciences Board; is a member of the advisory board for Element Science and the physician advisory board for Aetna; and is the founder of Hugo, a personal health information platform. All other authors declare no competing interests.

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References

- National Health and Family Planning Commission of the People's Republic of China. China health and family planning statistical yearbook 2016. Beijing: Peking Union Medical College Publishing House, 2017 (in Chinese).
- Huang Y, Zeng L, Li Y, Zhou X, Liu P, Zhong D. Performance evaluation on healthcare reform policy in rural China: a systematic review. *Chin J Evid Based Med* 2012; **12**: 293–304 (in Chinese).
- Cui W. China's village doctors take great strides. *Bull World Health Org* 2008; **86**: 914–15.
- Blumenthal D, Hsiao W. Privatization and its discontents—the evolving Chinese health care system. *N Engl J Med* 2005; **353**: 1165–70.
- Yip W, Hsiao WC. The Chinese health system at a crossroads. *Health Aff* 2008; **27**: 460.
- Duckett J. The Chinese state's retreat from health: policy and the politics of retrenchment. London: Routledge, 2012.
- Policy Research Department of Ministry of Health. Brigade health facilities could be contract to barefoot doctors. *Health News*, Jan 6, 1983. http://ex.cssn.cn/ddzg/ddzg_ldjs/ddzg_sh/201701/t20170110_3377737_2.shtml (accessed Nov 16, 2017; in Chinese).
- Hu S, Tang S, Liu Y, Zhao Y, Escobar ML, de Ferranti D. Reform of how health care is paid for in China: challenges and opportunities. *Lancet* 2008; **372**: 1846–53.
- Tang S, Meng Q, Chen L, Bekedam H, Evans T, Whitehead M. Tackling the challenges to health equity in China. *Lancet* 2008; **372**: 1493–501.
- Meng Q, Yuan J, Jing L, Zhang J. Mobility of primary health care workers in China. *Hum Resour Health* 2009; **7**: 24.
- Zhang D, Unschuld PU. China's barefoot doctor: past, present, and future. *Lancet* 2008; **372**: 1865–67.
- Chen Z. Launch of the health-care reform plan in China. *Lancet* 2009; **373**: 1322–24.
- Ministry of Health of the People's Republic of China. China health statistical yearbook 2009. Beijing: Peking Union Medical College Publishing House, 2010 (in Chinese).
- Ministry of Health, Treasury Department, State Administration of Traditional Chinese Medicine. Announcement on the national basic public health service project in 2016. 2016. <http://www.nhfdc.gov.cn/jws/s3577/201606/f29a4659c7f4455ca6f62f8d14eb4b02.shtml> (accessed May 17, 2017; in Chinese).
- Ministry of Health. The national essential drug list (Version 2012). 2012. <http://www.nhfdc.gov.cn/yaosz/s3580/201303/87a46f5a3b6f46908b5ca18102581533.shtml> (accessed May 17, 2017; in Chinese).
- Ministry of Health. Regulations for Management of National Essential Drug List. 2015. <http://www.nhfdc.gov.cn/yaosz/s3581/201504/8147002103b741179217ecedad77efc.shtml> (accessed May 17, 2017; in Chinese).
- Meng Q, Xu L, Zhang Y, et al. Trends in access to health services and financial protection in China between 2003 and 2011: a cross-sectional study. *Lancet* 2012; **379**: 805–14.
- Yang G, Kong L, Zhao W, et al. Emergence of chronic non-communicable diseases in China. *Lancet* 2008; **372**: 1697–705.
- Gong P, Liang S, Carlton EJ, et al. Urbanisation and health in China. *Lancet* 2012; **379**: 843–52.
- CPC Central Committee, State Council. The plan for “Healthy China 2030”. 2016. http://www.gov.cn/xinwen/2016-10/25/content_5124174.htm (accessed May 17, 2017; in Chinese).
- Yang G, Wang Y, Zeng Y, et al. Rapid health transition in China, 1990–2010: findings from the Global Burden of Disease Study 2010. *Lancet* 2013; **381**: 1987–2015.
- Ministry of Health of the People's Republic of China. China Nutrition and Health Survey. Beijing: People's Medical Publishing House, 2002.
- Ministry of Health of the People's Republic of China. China national NCD risk factor surveillance. Beijing: Military Medical Science Press, 2007 (in Chinese).
- Kringos DS, Boerma WG, Bourgueil Y, et al. The European primary care monitor: structure, process and outcome indicators. *BMC Fam Pract* 2010; **11**: 81.
- No authors listed. Declaration of Alma Ata. *Lancet* 1978; **2**: 1040–41.
- National Health and Family Planning Commission of the People's Republic of China. 2017 China health and family planning statistical digest. Beijing: Peking Union Medical College Publishing House, 2017 (in Chinese).

- 27 Tang S, Dong D, Ji L, et al. What contributes to the activeness of ethnic minority patients with chronic illnesses seeking allied health services? a cross-sectional study in rural western China. *Int J Environ Res Public Health* 2015; **12**: 11579–93.
- 28 China Food and Drug Administration. Comments on the implementation of traditional Chinese medicine service capacity enhancement in primary health care institutions. 2012. <http://www.sda.gov.cn/WS01/CL0852/75414.html> (accessed Aug 28, 2017; in Chinese).
- 29 State Council of the People's Republic of China. Opinions on deepening the health care reform. 2009. http://www.gov.cn/jrzq/2009-04/06/content_1278721.htm (accessed May 27, 2017; in Chinese).
- 30 State Council of the People's Republic of China. Opinions on consolidation and improvement of essential drug system and new operating mechanisms in primary health care system. 2013. http://www.gov.cn/zwgk/2013-02/20/content_2335737.htm (accessed May 27, 2017; in Chinese).
- 31 Ministry of Health, National Development and Reform Commission, Ministry of Industry and Information Technology, et al. Opinions on the establishment of the national essential drug system. 2009. <http://www.nhfp.gov.cn/zwgk/wtwj/201304/f2a0d9cbc33f45e091a9d4a936c6fe58.shtml> (accessed May 17 2017; in Chinese).
- 32 Wagstaff A, Lindelow M, Wang SY, et al. Reforming China's rural health system. Washington, DC: World Bank Publications, 2009.
- 33 Meng Q, Fang H, Liu X, Yuan B, Xu J. Consolidating the social health insurance schemes in China: towards an equitable and efficient health system. *Lancet* 2015; **386**: 1484–92.
- 34 State Council of the People's Republic of China. Opinions on the integration of basic health insurance for urban and rural residents. 2016. http://www.gov.cn/zhengce/content/2016-01/12/content_10582.htm (accessed May 27, 2017; in Chinese).
- 35 Anand S, Fan VY, Zhang J, et al. China's human resources for health: quantity, quality, and distribution. *Lancet* 2008; **372**: 1774–81.
- 36 Shan H, Guo Y, Wei H. The analysis on the current status of community health human resource in Heilongjiang. *Chin Health Econ* 2013; **12**: 62–64 (in Chinese).
- 37 Ministry of Health of the People's Republic of China. China public health statistical yearbook 2011. Beijing: Peking Union Medical College Publishing House, 2011 (in Chinese).
- 38 Yang Z. Study on income level of community health agency of Fengtai district. Master's thesis, China University of Geosciences, 2014: 4 (in Chinese).
- 39 Zhang H, Wan M, Chen Z, Liu J. A comparison survey of remuneration for health professionals in eastern and western rural China. *Chin Health Serv Manage* 2015; **5**: 370–72 (in Chinese).
- 40 Liu C, Zhang L, Zhang Y, Qin J. Analysis of the status and growth trends of the staff salaries of the community health service in our country. *Chin Gen Pract* 2014; **22**: 2561–64 (in Chinese).
- 41 National Bureau of Statistics of China. China Statistical Yearbook 2016. 2017. <http://www.stats.gov.cn/tjsj/ndsj/2016/indexch.htm> (accessed May 30, 2017; in Chinese).
- 42 OECD. Health at a glance 2015: OECD indicators. Paris: Organization for Economic Cooperation and Development Publishing, 2015.
- 43 Song K. Study on turnover intention and job preference of primary health workers in five provinces of China. PhD thesis, Shandong University, 2014: 63–64 (in Chinese).
- 44 Shi L, Song K, Rane S, Sun X, Li H, Meng Q. Factors associated with job satisfaction by Chinese primary care providers. *Prim Health Care Res Dev* 2014; **15**: 46–57.
- 45 Ding H, Sun X, Chang WW, Zhang L, Xu XP. A comparison of job satisfaction of community health workers before and after local comprehensive medical care reform: a typical field investigation in Central China. *PLoS One* 2013; **8**: e73438.
- 46 Zhang X, Fang P. Job satisfaction of village doctors during the new healthcare reforms in China. *Aust Health Rev* 2016; **40**: 225–33.
- 47 Wu D, Wang Y, Lam KF, Hesketh T. Health system reforms, violence against doctors and job satisfaction in the medical profession: a cross-sectional survey in Zhejiang province, eastern China. *BMJ Open* 2014; **4**: e006431.
- 48 Luo Z, Bai X, Min R, Tang C, Fang P. Factors influencing the work passion of Chinese community health service workers: an investigation in five provinces. *BMC Fam Pract* 2014; **15**: 77.
- 49 Zhang M, Yang R, Wang W, Gillespie J, Clarke S, Yan F. Job satisfaction of urban community health workers after the 2009 healthcare reform in China: a systematic review. *Int J Qual Health Care* 2016; **28**: 14–21.
- 50 Yao W, Wei G, Xu A, Qiu L, Chen Z, Yu H. Sample survey of human resources and work situation of community health services in Guangdong province. *Chin Gen Pract* 2011; **16**: 1779–81 (in Chinese).
- 51 Fang P, Liu X, Huang L, Zhang X, Fang Z. Factors that influence the turnover intention of Chinese village doctors based on the investigation results of Xiangyang city in Hubei province. *Int J Equity Health* 2014; **13**: 84.
- 52 Ouyang T. Research on the sharing of medical information resource on the basis of bidirectional referral medical care in community health service and tertiary hospital. Master's thesis, Hefei Industry University, 2010: 17 (in Chinese).
- 53 Wang R. research on information technology system in primary health care institutions in Yunnan province. Master's thesis, Yunnan University, 2014: 11–12 (in Chinese).
- 54 Zhang Y, Chen Q, Yan X, Li J, Hu H. Application status of information system functions in community health service settings and township health centers in China. *Chin Gen Pract* 2016; **7**: 766–70 (in Chinese).
- 55 Xu L, Fang WY, Zhu F, Zhang HG, Liu K. A coordinated PCP-Cardiologist Telemedicine Model (PCTM) in China's community hypertension care: study protocol for a randomized controlled trial. *Trials* 2017; **18**: 236.
- 56 China national health development research center. Research on healthcare reform. Beijing: People's Medical Publishing House, 2015 (in Chinese).
- 57 Hu J, Mossialos E. Pharmaceutical pricing and reimbursement in China: When the whole is less than the sum of its parts. *Health Policy* 2016; **120**: 519–34.
- 58 Yi H, Miller G, Zhang L, Li S, Rozelle S. Intended and unintended consequences of China's zero markup drug policy. *Health Aff* 2015; **34**: 1391–98.
- 59 Zhu J. Study on the Influence of zero-profit drug policy on the economic operation and medical expenses of primary health care institutions. Master's thesis, Anhui Medical University, 2012: 18–19 (in Chinese).
- 60 Ministry of Finance of the People's Republic of China. Management of subsidy for implementation of national essential drug system in primary health care institutions. 2014. http://www.mof.gov.cn/zhengwuxinxi/caizhengwengao/wg2014/wg2014010/201504/t20150401_1211569.html (accessed May 27, 2017; in Chinese).
- 61 Cao Y, Li S, Gao Q, Sun J. Research into the related reforms progress and operation in basic medical and health institutions during the implementation of national essential medicine system. *Chin Health Econ* 2012; **11**: 54–56 (in Chinese).
- 62 Qin L, Jiang Z. Public financial support and distorted behavior of primary health care institutions in rural areas. *Econ Res Ref* 2011; **67**: 38–42.
- 63 Tian L. Research on the operating cost and compensating mechanism of basic medical institutions in Jilin province. Master's thesis, Jilin University, 2015: 38–40 (in Chinese).
- 64 Ge C, Fu J, Chang Y, Wang L. Factors associated with job satisfaction among Chinese community health workers: a cross-sectional study. *BMC Public Health* 2011; **11**: 884.
- 65 Zhou XD, Li L, Hesketh T. Health system reform in rural China: voices of health workers and service-users. *Soc Sci Med* 2014; **117**: 134–41.
- 66 Zhang K, Liu J. Plight of urban community health service system and status of income of general practitioners in China. *Chin Gen Pract* 2010; **34**: 3837–38 (in Chinese).
- 67 Zhang L, Liu H, Liu L, et al. Community health comprehensive reform from the perspective of medical staff. *Chin Health Econ* 2012; **10**: 54–57 (in Chinese).
- 68 Wu R. Research on performance salary reform of grassroots medical and health institutions in Sheyang. Master's thesis, Sheyang University, 2014: 2 (in Chinese).

- 69 Zhang Y, Qin J, Zhang L, et al. Comparative analysis of community health comprehensive reform of east, middle and west China in perspective of medical staff. *Chin Gen Pract* 2013; 1: 10–13 (in Chinese).
- 70 Tang S, Jiang W, Yip W, Guo Y. Impact of primary care oriented outpatient benefit package design in new rural cooperative medical system on hypertension outpatient services utilization. *Beijing Da Xue Xue Bao* 2014; 46: 445–49 (in Chinese).
- 71 Luo Y, Feng H, He G, et al. Effect of pooling funds of outpatient service in medical insurance on increasing utilization of primary health care services for community residents. *Chin Gen Pract* 2013; 5: 377–79 (in Chinese).
- 72 Zhang H, Jian W, Fang H. Analysis of substitutional effect of outpatient expenditure on inpatient expenditure in hypertensive patients with rural new cooperative medical scheme. *Beijing Da Xue Xue Bao* 2016; 48: 472–77 (in Chinese).
- 73 Barber SL, Yao L. Development and status of health insurance systems in China. *The Int J Health Plann Manage* 2011; 26: 339–56.
- 74 Zhang Y, Chen Y, Zhang X, Zhang L. Current level and determinants of inappropriate admissions to township hospitals under the new rural cooperative medical system in China: a cross-sectional study. *BMC Health Serv Res* 2014; 14: 649.
- 75 Lu J, Lu Y, Wang X, et al. Prevalence, awareness, treatment, and control of hypertension in China: data from 1.7 million adults in a population-based screening study (China PEACE Million Persons Project). *Lancet* 2017; published online Nov 5. [http://dx.doi.org/10.1016/S0140-6736\(17\)32478-9](http://dx.doi.org/10.1016/S0140-6736(17)32478-9).
- 76 Lu J, Si X, Downing NS, et al. Protocol for the China PEACE (Patient-centered Evaluative Assessment of Cardiac Events) million persons project pilot. *BMJ Open* 2016; 6: e010200.
- 77 Alabousi M, Abdullah P, Alter DA, et al. Cardiovascular risk factor management performance in Canada and the United States: a systematic review. *Can J Cardiol* 2017; 33: 393–404.
- 78 Su M, Zhang Q, Bai X, et al. Availability, cost, and prescription patterns of antihypertensive medications in primary health care in China: a nationwide cross-sectional survey. *Lancet* 2017; published online Oct 25. [http://dx.doi.org/10.1016/S0140-6736\(17\)32476-5](http://dx.doi.org/10.1016/S0140-6736(17)32476-5).
- 79 Sylvia S, Shi Y, Xue H, et al. Survey using incognito standardized patients shows poor quality care in China's rural clinics. *Health Policy Plan* 2015; 30: 322–33.
- 80 Yin X, Song F, Gong Y, et al. A systematic review of antibiotic utilization in China. *J Antimicrob Chemother* 2013; 68: 2445.
- 81 WHO. Using indicators to measure country pharmaceutical situations. Geneva: World Health Organization, 2006.
- 82 Liu L, Lu Z, Zhang X. Analysis of rational use of drugs in community health service facilities. *Chin Health Econ* 2009; 4: 45–47 (in Chinese).
- 83 Zhao W, Wu N, Zhao X. Influence of essential drug system to rational drug use in 5 primary health care institutions of Jiangxi province. *Chin Health Econ* 2012; 12: 60–61 (in Chinese).
- 84 Liu C, Zhang X, Wan J. Public reporting influences antibiotic and injection prescription in primary care: a segmented regression analysis. *J Eval Clin Pract* 2015; 21: 597–603.
- 85 Wang J, Wang P, Wang X, Zheng Y, Xiao Y. Use and prescription of antibiotics in primary health care settings in China. *JAMA Intern Med* 2014; 174: 1914–20.
- 86 Qi J. Research of drug use behavior adopted by rural area elementary institutions of medical & health and residents in Yunnan province. Master's thesis, Chinese Academy of Agricultural Sciences, 2012: 15–16 (in Chinese).
- 87 Jia H, Yin W, Zhu L, et al. Studying on the rational drug use of outpatient prescription in community health service centers of Shandong province in the essential pharmaceuticals system. *Chin Health Serv Manage* 2015; 7: 525–27 (in Chinese).
- 88 Yao Q, Liu C, Ferrier JA, Liu Z, Sun J. Urban-rural inequality regarding drug prescriptions in primary care facilities—a pre–post comparison of the national essential medicines scheme of China. *Int J Equity Health* 2015; 14: 58.
- 89 Gong Y, Chen Y, Yin X, et al. The effect of essential medicines programme on rational use of medicines in China. *Health Policy Plan* 2016; 31: 21.
- 90 Yang L, Liu C, Ferrier JA, Zhou W, Zhang X. The impact of the national essential medicines policy on prescribing behaviours in primary care facilities in Hubei province of China. *Health Policy Plan* 2013; 28: 750–60.
- 91 Yin X, Gong Y, Yang C, et al. A comparison of quality of community health services between public and private community health centers in urban China. *Med Care* 2015; 53: 888.
- 92 Zhang X, Wang L, Zhang X. Application of propensity scores to explore the effect of public reporting of medicine use information on rational drug use in China: a quasi-experimental design. *BMC Health Serv Res* 2014; 14: 492.
- 93 Yip W, Powelljackson T, Chen W, et al. Capitation combined with pay-for-performance improves antibiotic prescribing practices in rural China. *Health Aff* 2014; 33: 502.
- 94 Xiao Y, Wang J, Shen P, Zheng B, Zheng Y, Li L. Retrospective survey of the efficacy of mandatory implementation of the essential medicine policy in the primary healthcare setting in China: failure to promote the rational use of antibiotics in clinics. *Int J Antimicrob Agents* 2016; 48: 409–14.
- 95 Jiang Q, Yu BN, Ying G, et al. Outpatient prescription practices in rural township health centers in Sichuan province, China. *BMC Health Serv Res* 2012; 12: 324.
- 96 Li Y. Evaluation on the implementation of zero-profit essential medicines in health care institutions of L province. Master's thesis, Dalian Medical University, 2015: 13–17 (in Chinese).
- 97 Dong L, Yan H, Wang D. Drug prescribing indicators in village health clinics across 10 provinces of western China. *Fam Pract* 2011; 28: 63–67.
- 98 Song Y, Bian Y, Petzold M, Li L, Yin A. The impact of China's national essential medicine system on improving rational drug use in primary health care facilities: an empirical study in four provinces. *BMC Health Serv Res* 2014; 14: 507.
- 99 Ying G, Lv Y, Gan H, et al. Survey on the drug use in outpatient prescriptions from primary health care institutions in Sichuan province. *Chin Health Serv Manage* 2010; 10: 665–67 (in Chinese).
- 100 Ding J. Analysis on rational use of drugs in 12 community medical institutions of Shaoying. *China Pharm* 2010; 20: 1913–14 (in Chinese).
- 101 Li Z, Hou J, Lu L, Tang S, Ma J. On residents' satisfaction with community health services after health care system reform in Shanghai, China, 2011. *BMC Public Health* 2012; 12 (suppl 1): S9.
- 102 Zhang P, Li N, Ren X. Trend of residents' satisfaction change with community health service in Chengdu city from 2008 to 2012 and its influencing factors. *Chin Gen Pract* 2014; 22: 2579–83 (in Chinese).
- 103 Kuang L, Liang Y, Mei J, et al. Family practice and the quality of primary care: a study of Chinese patients in Guangdong province. *Fam Pract* 2015; 32: 557–63.
- 104 Li J, Wang P, Kong X, Liang H, Zhang X, Shi L. Patient satisfaction between primary care providers and hospitals: a cross-sectional survey in Jilin province, China. *Int J Health Care* 2016; 28: 346–54.
- 105 Beaglehole R, Epping-Jordan J, Patel V, et al. Improving the prevention and management of chronic disease in low-income and middle-income countries: a priority for primary health care. *Lancet* 2008; 372: 940–49.
- 106 Alderson MR. Data on sickness absence in some recent publications of the Ministry of Pensions and National Insurance. *Br J Prev Soc Med* 1967; 21: 1–6.
- 107 Yip WC, Hsiao WC, Chen W, Hu S, Ma J, Maynard A. Early appraisal of China's huge and complex health-care reforms. *Lancet* 2012; 379: 833–42.
- 108 McCollum R, Chen L, ChenXiang T, et al. Experiences with primary healthcare in Fuzhou, urban China, in the context of health sector reform: a mixed methods study. *Int J Health Plann Manage* 2014; 29: e107–26.
- 109 The Lancet. What to expect for China's health in the future. *Lancet* 2017; 389: 226.