

# Realignment of incentives for health-care providers in China

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*Lancet* 2010; 375: 1120–30

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Inappropriate incentives as part of China's fee-for-service payment system have resulted in rapid cost increase, inefficiencies, poor quality, unaffordable health care, and an erosion of medical ethics. To reverse these outcomes, a strategy of experimentation to realign incentives for providers with the social goals of improvement in quality and efficiency has been initiated in China. This Review shows how lessons that have been learned from international experiences have been improved further in China by realignment of the incentives for providers towards prevention and primary care, and incorporation of a treatment protocol for hospital services. Although many experiments are new, preliminary evidence suggests a potential to produce savings in costs. However, because these experiments have not been scientifically assessed in China, evidence of their effects on quality and health outcome is largely missing. Although a reform of the provider's payment can be an effective short-term strategy, professional ethics need to be re-established and incentives changed to alter the profit motives of Chinese hospitals and physicians alike. When hospitals are given incentives to achieve maximum profit, incentives for hospitals and physicians must be separated.

## Introduction

“That any sane nation, having observed that you could provide for the supply of bread by giving bakers a pecuniary interest in baking for you, should go on to give a surgeon a pecuniary interest in cutting off your leg, is enough to make one despair of political humanity. But that is precisely what we have done.”<sup>1</sup>

Physicians play a unique and central role in medical care. What physicians do and how they render medical services determine the quality and efficiency of health care, health and wellbeing of patients, and the nation's health-care costs.<sup>2</sup> Many factors—training, education, professional ethics,<sup>3,4</sup> altruism,<sup>5–7</sup> practicing norms,<sup>8</sup> regulation, and financial incentive structure—affect how physicians practice. How physicians respond to these factors is often dependent on the organisational context, including the practice setting and market conditions.<sup>2,9,10</sup> The number and complexity of forces that affect how physicians practice, and the different emphases of the sources of information make the formulation of a unified theory for behaviour change difficult.<sup>11,12</sup> Figure 1 provides a schematic representation of these forces and their association with the health-policy goals.

### Search strategy and selection criteria

We based our Review on reports (international and domestic), official documents, and our own work, and selected those experiments that are innovative in addressing the incentive issues in China. We searched PubMed, Google Scholar, and China Knowledge Resource Integrated Database for articles and research published mainly in the past 5 years; we also included cross-references, landmark or highly regarded references, and references on the basis of comments from peer reviewers. We restricted our search to papers published in English or Chinese, and used the search terms “provider payment”, “incentives”, “pay for performance”, “provider payment and quality”, “physician behavior”, “China”, “pilot”, “evaluation”, and combinations of these terms.

How can a government or insurance fund motivate physicians to do their best for patients and society? To change professional ethics and practice norms would undoubtedly have an effect but would be difficult to achieve, especially in the short term. However, modification of financial incentives is a policy option that can be introduced quickly, and can induce a fast behavioural response from physicians.

After nearly two decades, the changes introduced in the mid-1980s in China have been recognised as creating an incentive system for hospitals and physicians that is not appropriate.<sup>13,14</sup> These incentives had powerful effects on the behaviour of providers and their treatment decisions. China's fee-for-service payment and a price schedule that overpaid for drugs and high-technological diagnostics tests and underpaid for basic primary health care, and led providers to overprescribe drugs and diagnostic tests, resulted in a rapid increase in health expenditure and inappropriate treatment (panel 1).<sup>15–17</sup> With little availability of insurance coverage, rapid increase in health costs made access to care difficult, leading to major public discontent over unaffordable health care and impoverishment because of medical expenses. In response, the Chinese Government committed to a new reform, promising an additional 850 billion Renminbi (US\$123 billion) during the next 3 years to provide universal and affordable basic health care for its 1·3 billion population.<sup>13,19</sup>

The incentive system has also seriously eroded professional ethics and practice norms in China, abetted by the changed status of physicians after 1949. Physicians became employees of hospitals, with hospital administrative control replacing professional self-regulation when the Communist Party came to power. Independent professional organisations were abolished. After the economic reform in the early 1980s, when public hospitals became underfunded and were given inappropriate incentives, they set their goals to garner revenues, pursue expansion of their facilities, and increase the sophistication of their medical technology. To generate profits to fund expansion in beds and technology, physicians working in hospitals were rewarded with

bonus payments and promotions on the basis of the profits they produced. Physicians adopted increased earnings and improved medical sophistication as their personal goals. Thus the profit motives and incentives for hospitals and physicians became closely aligned. Professional ethics and norms that made the patient's benefit the highest goal were compromised as a result. This change in hospital and physician norms affected low-ranked health practitioners (eg, community health practitioners and village doctors) because they tend to do what physicians do.

The Chinese Government recognised that substantial new spending for health care alone would not necessarily provide accessible, affordable, and reasonable quality care to the Chinese citizens unless it reformed the incentive structure. The question is how to incentivise hospitals and physicians to practise medicine with the wellbeing of the patients as the main goal.

Unsure of which incentive reform would be viable and most effective, a strategy to experiment with several incentive reform programmes was initiated in China since the early 2000s. The central government encouraged city and local governments to design their own schemes and experiments, and various experiments have been launched. Local governments have designed their experiments to incorporate the lessons learnt internationally and also to address the particular challenges of China's health-care system. Overall, many experiments have three features in common.

First, the most innovative payment experiments in China, drawing on international lessons, changed from fee for service to payment methods that are aggregated and prospective, but include companion incentives, such as pay for performance and treatment protocols to assure that quality is improved, or at least not compromised. Although international experience shows that there is no single method of provider payment that is perfect, some generalisable lessons have been learnt.<sup>20–22</sup> Fee for service, in which providers are retrospectively reimbursed for each service rendered, is inflationary. Methods of increased aggregated payment (eg, case-based payment per visit or admission, capitation per person covered, or global budget or salary per period) provide improved incentives to reduce cost, because providers' incomes do not increase with provision of more services within the payment unit. Payment methods with prospectively set rates are more likely to produce cost savings than are retrospective payment methods because financial risk is shifted from the payers (government, insurance, or individuals) to the providers. However, the unintended effects of aggregated and prospective payment methods are that providers will reduce quality, underprovide, and exclude sick patients. More recently, pay for performance, which links payment directly to quality of performance, has gained acceptance.<sup>23–27</sup>

Second, many experiments address difficulties that are unique to China as a result of the inappropriate incentive structure adopted in the 1980s, including providers' entrenched behaviour in overprescription of

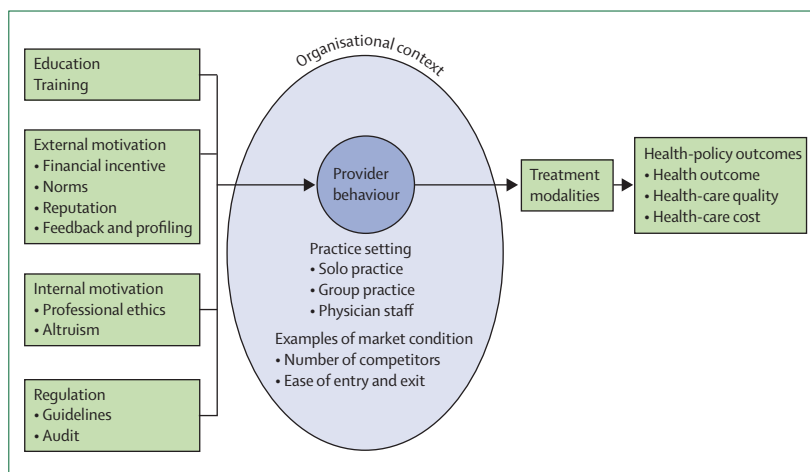


Figure 1: Factors that affect practice behaviour of physicians

### Panel 1: Health-care provision and consequences of an inappropriate incentive system in China

An incentive system that was inappropriate was introduced in China during the mid-1980s when the country reformed its socialistic economic system into a market system. The state's revenue declined greatly and the government reduced subsidies to public hospitals and clinics from more than 50% to about 10%. These providers had to rely heavily on user fees and drug sales to survive financially. However, the government still set medical prices. To assure that basic health services remained affordable even for the poor, the government set prices for these services below cost. The government wanted these facilities to be financially viable so prices for new and high-technology diagnostic services were set above cost, and a 15% profit margin for drugs was allowed. These pricing policies caused an erosion of professional medical ethics by creating perverse incentives for providers, so that hospitals, township health centres, and village doctors sought profit. Hospitals regularly receive kickbacks from drug companies and medical suppliers for prescribing their products. Bonuses for physicians, which made up a large share of their total compensation, were linked to the profit they generated for the hospital, including the free goods from companies.<sup>15–17</sup> In rural areas, village doctors often buy expired and counterfeit drugs at low cost and sell them as valid products at increased prices.<sup>16,17</sup> As a result, poor quality of services, overprescriptions, and excessive testing became widespread. Chinese health-care cost increased, and health care became unaffordable for most people. Furthermore, because each provider is motivated to keep patients rather than to refer them to other levels for diagnosis, treatment, or follow-up according to their needs, the health-care delivery system is fragmented and inadequately equipped to deal with the challenge of rising prevalence of chronic diseases that require integrated health care.

These systemic distortions have created a health-care system in which individual providers overprescribe drugs<sup>18</sup> and diagnostic tests, and hospitals compete to introduce high-technology services and expensive drugs that increase their profit margins. For example, 75% of patients with a common cold are prescribed antibiotics, and so are 79% of patients in hospital—ie, over twice the international average of 30%.<sup>16,17</sup> Consequently, the health-care expenditures in China have been increasing by 16% per year—7% faster than the increase in gross domestic product—over the past two decades. This poor use of resources is not only wasteful, but also harms patients.

	Consequences	Options for change	Examples of experiments
Fee-for-service payment method	No incentive to be cost-conscious in deciding treatment options, leading to overtreatment and cost inflation	Aggregated payment methods, and prospectively set payment rates	Shanghai CHC: prospective capitation; budget with pay-for-performance; RMHC: salary with bonus; Jining: case-based payment
Inappropriate price schedule, with prices set below cost for basic health care and above cost for high-technological diagnostic and latest procedures	Unnecessary use of diagnostic tests; treatment pattern in which emphasis is on curative care, and prevention and primary care are neglected	Set prices based on cost; pay-for-performance in which prevention and primary care are rewarded, especially for chronic conditions	Jining: set prices based on costs of services defined by clinical treatment protocol for a disease; Shanghai CHC: pay for performance rewarding prevention and primary care; RMHC: salary with bonus, which is linked to prevention and primary care
Mark up for drugs	Overprescription of drugs, antibiotics, intravenous injections	Remove drug mark ups, and unlink providers' income from drug mark up	Shanghai CHC: prospective budget plus pay-for-performance with no link to drug profit; RMHC: village clinics paid by salary plus bonuses; neither salary or bonus is linked to drug profit

CHC=community health centre. RMHC=Rural Mutual Health Care.

**Table 1: Overview of incentive issues and related experiments**

### Panel 2: China's health-care delivery system

The health-care delivery system in China consists of community health centres (CHCs), secondary and tertiary hospitals in the urban areas; and village clinics, township health centres (THCs), and county hospitals in the rural areas. CHCs, THCs, and village clinics are the core primary-care providers.

All Chinese hospitals are classified as belonging to one of three levels: tertiary, secondary, or primary. Tertiary hospitals have more than 500 beds, secondary hospitals have 100–499 beds, and primary hospitals have 20–99 beds. County hospitals are often secondary hospitals. For each level, there are general and specialist hospitals.

The main functions of CHCs include maintaining the health status of communities; providing public health services such as disease prevention and control; offering options for prevention and treatment of common health problems in the community; managing chronic diseases; and providing rehabilitation services. Many CHCs also manage community health stations that have primary functions of health education, prevention, promotion, and home visits. Some CHCs were primary hospitals whereas others have been set up by secondary hospitals. On average, CHCs have 20 beds and 30–40 medical staff. CHCs manage health stations that are usually staffed by three to five individuals, who are mainly responsible for home visits, health checkups, health education, immunisation, and other health promotion and prevention functions.

The functions of THCs are similar to those of CHCs, whereas the functions of village clinics are similar to those of community health stations.

The government is targeting its new funding towards CHCs and THCs. In addition to investing heavily in infrastructure building of these facilities, the government will fully fund basic staff salaries. By 2010, the government will also provide a per-person subsidy of 15 Renminbi (US\$1=6.8 Renminbi) for primary-care facilities to deliver a defined package of personal public health services, including immunisation, maternal and child health, and chronic disease management, for the population in their area. In exchange for these additional government subsidies, the 15% profit margin on drugs will be eliminated. Instead, only a 5% mark up is allowed for breakage.

With some exceptions, such as infectious disease and mental health hospitals, the government did not increase its subsidies for hospitals. Government subsidies will still represent only about an average of 10% total operating revenue for hospitals. Hospitals can continue to charge a drug mark up of 15%.

drugs and antibiotics, overuse of high-technological diagnostic tests, and a treatment pattern of expensive curative rather than basic primary care. In particular, not only is the overprescription of drugs costly, but it

also has long-term negative health effects—eg, antibiotic resistance.<sup>28,29</sup>

Third, like in many high-income and middle-income countries, an epidemiological transition is happening in China. While infectious diseases, such as tuberculosis, have not been completely eradicated in China, chronic diseases have already become the major disease burden.<sup>30,31</sup> China's top five disease burdens are cardiovascular disease, cancer, chronic respiratory diseases, diabetes, and other chronic diseases.<sup>30</sup> Therefore, an incentive structure that encourages curative care is not suitable. Thus, incentives are being developed to motivate providers towards working on prevention and primary care of chronic diseases.

Here we review the experimental incentive reforms in China and the early experiences with improvement of efficiency and quality of health care, and control of health expenditure increase. Since many experiments are still being developed, this review can be neither exhaustive nor definitive. Additionally, the fundamental difficulty of eroded medical professional ethics has not been tackled in any of the experiments so far (table 1).

### Payment incentives for primary-care providers Overview

The Chinese Government explicitly set the goal of building a strong primary-care-based delivery system in community health centres in cities, and in township health centres, and in village clinics in rural areas.<sup>13</sup> Panel 2 describes the background and functions of different facilities within China's health-care delivery system. However, with the traditional payment system, primary-care providers have incentives to focus on profitable activities such as prescribing diagnostic tests and drugs, and thus often neglect primary care. Many experiments in payment for primary-care providers therefore have two features. First, reduction in incentives to overprescribe drugs, especially antibiotics and intravenous injections, by disconnecting the income and budgets of primary-care providers from drug revenues and by moving from fees for service to an aggregated payment system. Second, pay for performance is used to directly motivate primary-care providers to increase

provision of services such as vaccinations, health education, maternal and child care, home visits, infectious disease control, and prevention and primary care of emerging chronic conditions.

### Community and township health centres

In 2005, the Ministry of Health began piloting a new way for the government to fund primary-care providers—ie, the separation of revenue and charges,<sup>32</sup> intended to completely disconnect the revenue of primary health facilities from their service revenue. With this system, all revenues generated from user charges are submitted to the government, which in return provides a fixed budget to cover volume-adjusted operating expenses. Separation of revenue and charges has been piloted in the community health centres of many cities, including Shanghai, Tianjin, Hangzhou, and Chengdu.<sup>32–34</sup> Although the system might reduce the incentives to prescribe unnecessary drugs and tests, it might not provide adequate motivation for these centres to change from curative to primary care or to prevent and treat chronic diseases. Therefore, in Shanghai, a global budget and pay for performance was introduced in combination with the scheme for separation of revenue and charges.

A payment reform was piloted in the Changning and Songjiang districts of Shanghai in December, 2005, and, in two phases, it was applied to all districts by 2007. Before 2006, all community health centres were paid fees for service according to the government price schedule, and they charged a 15% mark up for drugs. Staff were given bonuses according to departmental revenue, providing them with incentives to prescribe expensive drugs and high-technological diagnostic tests.

As part of the experiment, district health bureaus are given a yearly prospective budget, subject to assessment of the year-end performance. The budget consists of two parts: 50 Renminbi per person from the government for provision of a defined package of personal public health services for all district residents; and a payment from the Social Health Insurance Bureau for provision of medical services for the insured residents in the district (in Shanghai, more than 90% of residents are insured with the urban social health insurance scheme). This social insurance budget portion is based on the actual health expenditure for the insured population in the previous year, with adjustments for inflation and increases in service volume.

The district health bureau allocates funds to each community health centre on the basis of the population served by the centre, and its social insurance expenditures in the previous year. Every centre is given a share (50–70%) of its budget at the beginning of the year. Part or all of the withheld portion is disbursed on the basis of a year-end assessment by the district health bureau of performances in cost control, volume of services, delivery of preventive and primary care, and patient satisfaction (panel 3). Most

### Panel 3: Examples of performance criteria and measurement in Shanghai's community health centres and Rural Mutual Health Care

#### Shanghai's community health centres

##### Immunisation

- Proportion of children immunised.

##### Chronic disease management

- Hypertension
  - Severe (systolic blood pressure  $\geq 180$  mm Hg, diastolic blood pressure  $\geq 110$  mm Hg): check blood pressure and visit patient in clinic or at home every month, check body-mass index every 3 months. Patients are recommended to have routine tests for blood, urine, renal function, and fasting plasma glucose, and electrocardiogram; and lipid profile checked, and fundus examination once a year.
  - Moderate (systolic blood pressure 160–179 mm Hg, diastolic blood pressure 100–109 mm Hg): check blood pressure and visit patient every 3 months. Patients are recommended to have routine tests for blood, urine, and fasting plasma glucose; and lipid profile (cholesterol total) checked once a year.
  - Stable (systolic blood pressure 140–159 mm Hg, diastolic blood pressure 90–99 mm Hg): check blood pressure, and visit patient every 6 months.
  - All visits include health education.
  - Control rate: proportion of patients being followed up with blood pressure that is controlled at less than 140/90 mm Hg for more than 6 months per year.
- Diabetes mellitus
  - Group I (for less than three-quarters of year, capillary blood glucose control: preprandial blood sugar 4.4–6.1 mmol/L or  $\leq 8.0$  mmol/L, and postprandial blood sugar 5.4–9.0 mmol/L or  $\leq 11.0$  mmol/L; and venous plasma glucose control: preprandial blood sugar 4.4–6.1 mmol/L or  $\leq 7.0$  mmol/L, and postprandial 4.4–8.0 mmol/L or  $\leq 10$  mmol/L): test blood glucose every month, and do fundus examination and test microalbuminuria every 3 months.
  - Group II (for more than three-quarters of year, capillary blood glucose control: preprandial blood sugar 4.4–6.1 mmol/L or  $\leq 8.0$  mmol/L, postprandial blood sugar 5.4–9.0 mmol/L or  $\leq 11.0$  mmol/L; and venous plasma glucose control: preprandial blood sugar 4.4–6.1 mmol/L or  $\leq 7.0$  mmol/L, and postprandial 4.4–8.0 mmol/L or  $\leq 10$  mmol/L); test blood glucose every 3 months, and do fundus examination and test microalbuminuria every year.
  - Group III (with impaired glucose tolerance and fasting plasma glucose damage): test blood glucose every year.
  - Groups I and II: foot self-care; if patients have hypertension or hyperlipaemia, test blood pressure and do a lipid profile.
  - All groups: include health education, and guidance about nutrition and exercise.
  - Control rate: proportion of patients being followed up with controlled venous plasma glucose (preprandial blood sugar  $< 7$  mmol/L and postprandial blood sugar  $< 10$  mmol/L), and capillary blood glucose (preprandial blood sugar  $< 8$  mmol/L and postprandial blood sugar  $< 11$  mmol/L) for more than 9 months per year.

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districts allocate at least half the funds to cost control, and share the rest equally between service volume and delivery of primary care or public health.

The phased-in experimental design in Shanghai is best suited to isolate the payment change from other interventions to improve efficiency and quality that are concurrent in the experimental and control districts. However, Changning and Songjiang, the first pilot districts, were not randomly selected and they are not similar to Zhabei, the only other district with available

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#### Health records

- Created when residents in the community have been given health examinations.

#### Health education

- Lectures and briefings, especially to the target population, such as women of child-bearing age, pregnant women, elderly people.

#### Public and patient satisfaction

- Content of satisfaction surveys include convenience such as waiting time, ease of appointment procedure, physicians' attitudes and explanation of problems, satisfaction with cost of services, and cleanliness of facilities. Surveys are done with the general population in the service area of the community health centre, patients, and employees of the social insurance programme.

#### Services

- Number of visits: health education and promotion, and health examinations for elderly people.

#### Cost control

- Control of expenditure per visit or admission within target level (set by the district health bureau) in some cases, and in other cases based on comparison of all community health centres within the district; and balance of revenue and expenses.

### Rural Mutual Health Care village clinics

#### Primary care

- Proportion of patients treated according to protocol for 12 common health problems in rural areas—common cold, acute tracheitis, chronic tracheitis, diarrhoea, child dyspepsia, gastritis, peptic ulcer, vaginitis, urinary tract infection, diabetes mellitus, hypertension, psoriatic strain, and osteoarthritis. Assessment is done by physicians in township health centres randomly reviewing records.

#### Maintaining standard medical records

- Assessment of how well village clinics complete standardised medical records (might be subjective).

#### Immunisation and vaccination

- Same as for community health centres in Shanghai.

#### Public satisfaction

- Similar to community health centres in Shanghai; assessed on the basis of household survey and patient interview.

data that was included in the pilot in December, 2006. Table 2 shows baseline characteristics of the three districts.

Preliminary results showed that the pilot was associated with a reduction in per-visit outpatient expenditure (figure 2A). Between 2005 and 2006, per-visit expenditure fell in Changning and Songjiang compared with almost no change in Zhabei, which also had a reduction in per-visit expenditure between 2006 and 2007, after adopting the pilot. However, after an initial reduction, per-visit expenditure in Zhabei rose again in 2008. Per-visit expenditure in Changning continued to fall between 2006 and 2008, although the rate in reduction stabilised after 2006. In Songjiang, per-visit expenditure steadily decreased until 2008 and then it increased by 3%. The fluctuations in the rate of expenditure could have resulted from an increase in the number of chronically ill patients registered, or strategic behaviour of the centres to maintain high expenditures so as to argue for a bigger budget increase for the following year. The exact reasons for the increase in

expenditure and whether they are appropriate warrant further investigation.

The performance in management of patients with chronic disease varies (figure 2C–F; panel 3 provides definitions of follow-up and control rates). Rates of follow-up for patients with hypertension and diabetes mellitus increased in Changning up to 2007, reaching 90–100% of follow-up rate for patients with hypertension. However, the rate of control of diabetes mellitus was low (no data were available for hypertension control rate). In Songjiang, rates of follow-up and control in patients with hypertension were low compared with Changning and Zhabei, and they did not improve during the study. By contrast, rates of follow-up and control improved in patients with diabetes mellitus living in Songjiang. In Zhabei, rates of follow-up and control in patients with hypertension fell. Similarly for patients with diabetes mellitus, rate of follow-up fell, although the rate of control increased after 2007. A preliminary attempt to understand the falling trends in Zhabei suggests that one possible explanation was that a large number of patients with hypertension and diabetes mellitus were identified for management as the community health centres did more health examinations. For example, the number of patients with hypertension identified and managed in the centres in Zhabei increased from 12 443 to 32 509 between 2005 and 2007. Other reasons might have been lag times in re-organisation of staff to cope with the increased workload, or perhaps the conditions of the newly identified patients with hypertension or diabetes mellitus were not serious and the patients did not comply with the advice for follow-up. Perhaps, the emphasis on management of chronic disease with pay for performance might not be big enough to induce behavioural change in the providers. These findings—a reduction in cost with an unclear pattern of chronic disease management—were corroborated in a study in which similar interventions were assessed in Hangzhou and Chongqing.<sup>38</sup> Because of the role of community health centres in preventing and managing chronic diseases, elucidation of the reasons for these trends is an important next step.

### Village clinics

There are many fewer experiments with new provider payment methods for village doctors, yet, like community health workers in most low-income countries, village doctors are the backbone of prevention and primary care for rural residents. With the traditional fee-for-service system, village doctors have to generate most of their net income from drug prescriptions and dispensing activities, and are thus motivated to overprescribe antibiotics and intravenous injections even for simple health problems. Health promotion and prevention services, which result in the lowest profits, are neglected. The design of financial incentives that are correct for village doctors is crucial if a strong primary-care-based delivery system is to be built in the rural areas of China.

Between 2002 and 2006, a group of researchers did a social experiment, called Rural Mutual Health Care (RMHC), in three towns in the provinces of Guizhou and Shaanxi.<sup>39</sup> Their aim was to find a feasible model of rural insurance that would improve villagers' access to cost-effective basic health care, provide them with increased financial risk protection, and improve their health status.

To improve the efficiency and quality of the delivery system, RMHC introduced several interventions to change the organisational and incentive systems. The fund office of RMHC was the sole purchaser, and competitively selected and contracted with the best village doctors, compensating them with a salary and a bonus based on performance measurements (panel 3). The incomes of the village doctors were separated from their drug-dispensing activities, and the intention was to reduce overprescription. Additionally, the drug redistribution system was reformed from one in which the doctors obtained their own supplies to a central distribution system in which township health centres purchased drugs in bulk and distributed them to village doctors, ensuring drug safety at minimum cost. Numbers of patients declined substantially for doctors not selected because villagers who enrolled in RMHC could receive reimbursements only if they visited contracted doctors. Village doctors thus had high incentives to improve their performance.

With a control and a before-and-after study design, results from this experiment showed that the changes in payment incentives and organisation of service delivery provided measurable improvements in efficiency, quality, and access.<sup>39</sup> Cost per visit to the village doctor in intervention sites dropped from 16 Renminbi at baseline to only about 10 Renminbi after the intervention, whereas cost per visit at the control site actually increased to about 18 Renminbi.<sup>39</sup> An analysis of prescription records indicated that the reduction in cost per visit was attributed to a 10% reduction in the number of drugs prescribed (including antibiotics, steroids, and intravenous injections) and nearly 30% reduction in drug prices. RMHC also substantially increased (among people who reported being ill) the proportion of visits to formal health-care providers (from a baseline of 17% to 29%,  $p < 0.0001$ ), and reduced the proportion of self-medication by about two-thirds (from a baseline of 5.6% to 1.8%,  $p = 0.0163$ ).<sup>39,40</sup>

### Pilot reforms in payment incentives for hospitals

The case-based payment method was most commonly used in Chinese provider payment experiments for inpatient services,<sup>41</sup> whereby payment rates were set for each disease on the basis of its International Classification of Diseases code. In 2004, the Ministry of Health urged local governments to experiment with a case-based payment system.<sup>42</sup> By 2007, such a scheme had been implemented in nearly 22% of 19852 hospitals in China.<sup>41</sup>

There are several variations of this system with different incentives for efficiency and quality. The most common

	Songjiang	Changning	Zhabei
Population	550 000	614 000	696 000
Life expectancy (years)	..	83.05	81.67
Birth rate (per 1000)	7.12	6.13	6.49
Mortality rate (per 1000)	6.6	7.22	8.45
Outpatient visits	3 460 000	7 270 000	7 130 000
Health institutions	28	186	40
Community health centres	15	9	10
Licensed physicians	1373	2484	1852
Registered nurses	1248	2539	1880

Data are numbers, unless otherwise indicated. Data are from Shanghai Bureau of Statistics.<sup>35-37</sup>

**Table 2: Baseline characteristics of three districts in Shanghai**

type is a fee-for-service payment with a disease-specific cap for every admission. This type of case-based payment does not provide better incentives than does the fee-for-service payment alone to improve efficiency or quality, since hospitals do not retain savings resulting from reductions in unnecessary tests, drugs, or procedures. Existing (although little) evidence indicates a moderate reduction in expenditure or no substantive effect.<sup>41</sup>

A prospective case-based payment system was used in a few experiments, whereby hospitals were paid a fixed price per admission irrespective of the actual expenditure incurred. Prospective payment methods provide incentives for hospitals to improve efficiency since they can retain the savings. However, they also provide incentives for hospitals to increase admissions, especially of less-severe cases; provide fewer services than are clinically needed, thus adversely affecting the quality of care; or refuse treatment for patients with complications. The evidence shows that after implementation of this scheme in Zhenan, expenditures for the diseases included in the scheme remained at levels before the reform, whereas those for diseases not included significantly increased, suggesting serious transfer of costs to admissions not included in the scheme.<sup>43,44</sup>

In another group of experiments, a case-based payment method was used with an expenditure cap or a prospective global budget to reduce incentives for providers to increase volume or transfer expenditures to the non-intervention cases. In Qianjiang, Chongqing, such a pilot was introduced during 2004. One group of researchers reported that after the pilot, expenditures per case of acute appendicitis (used as a tracer condition), decreased in township (from 1246 Renminbi to 961 Renminbi,  $p = 0.02$ ) and county hospitals (from 1423 Renminbi to 1328 Renminbi,  $p = 0.03$ ); these changes were mainly attributable to a rapid reduction in drug expenditures.<sup>45</sup>

The most innovative case-based experiment is that by investigators at Jining Medical College Hospital. An important component of case-based payment is how the payment rate is set. Most rates are determined by use of

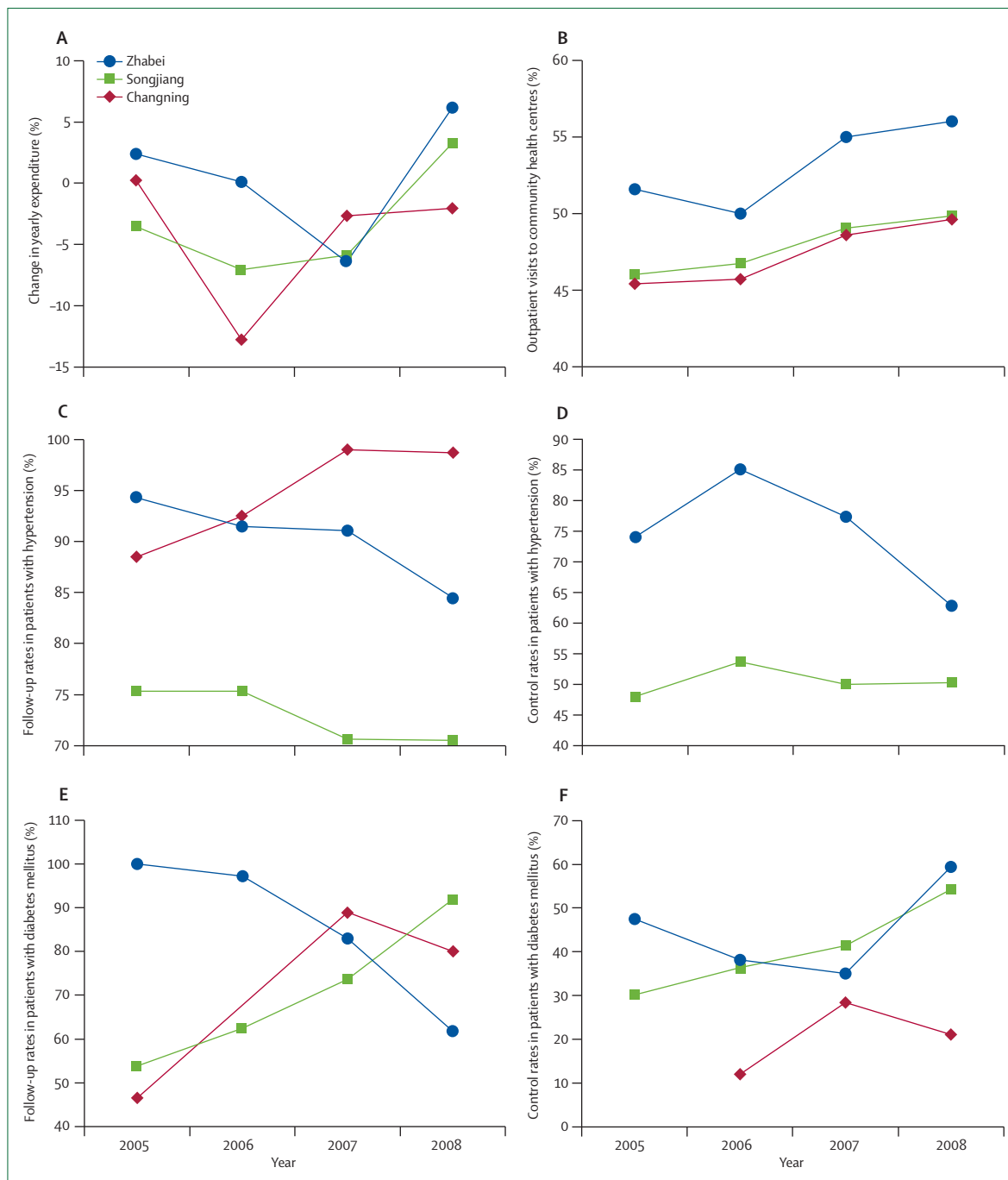


Figure 2: Change in yearly expenditure per outpatient visit (A), outpatient visits to community health centres as a proportion of total visits (B), follow-up rates (C) and control rates (D) in patients with hypertension, and follow-up rates (E) and control rates (F) in patients with diabetes mellitus

the average actual medical expenditure in previous years.<sup>46</sup> By contrast, the payment rates in Jining were based on a predefined treatment protocol. This method has been widely acknowledged as a good practice and has been highly praised by the central government.<sup>47</sup>

In 2004, investigators at Jining Medical College Hospital initiated a case-based payment system with the aim to

control the increase in medical expenditure, improve the quality of health-care services, and reduce incentives for hospitals to exclude patients with complicated conditions.<sup>48</sup> To set payment levels, a group of medical experts standardised the treatment protocols for diseases by specifying the minimum requirements for length of stay, drug use, service use, and surgical procedures for the

	Predicted behavioural response	Empirical evidence
<b>Community or township health centres</b>		
Global budget (partly based on capitation) and pay for performance	Reduce expenditure per visit or admission, and prescriptions of antibiotics, number of drugs per prescription, number of intravenous injections; improve productivity of activities included for performance assessment—eg, volume of service, management of patients with chronic disease, immunisation; and transfer sick patients to high-level hospitals	Expenditure reduced per visit and on diagnostic tests; mixed results for rates of hypertension and management of diabetes mellitus; and high rates of immunisation; and public satisfaction—eg, Shanghai
<b>Village doctors</b>		
Salary with bonus linked to—eg, number of visits, immunisation, proper record keeping, and patient satisfaction	Reduce expenditure per visit, prescriptions of antibiotics, number of drugs per prescription, and number of intravenous injections; and increase number of visits, immunisation, and personal quality of care	Reduction in per-visit outpatient expenditure, prescriptions of antibiotics, number of drugs per prescription, and number of intravenous injection; increase in number of visits, numbers of immunisation—eg, Rural Mutual Health Care

**Table 3: Experiments in provider payments for primary-care physicians**

disease. With this protocol, a maximum price was set based on estimated treatment costs for each disease. The same was done for standard nursing practices. The hospital regularly monitored indicators such as length of stay, drug use, treatment effectiveness, medical expenditure, and patient satisfaction. The goals of this experiment were to improve clinical practices and reduce variation by linking financial incentives to treatment protocol.

So far, the experiment has not been rigorously assessed, and no data have been gathered from a control group. The expenditures for the 128 included diseases decreased by 33% between 2004 and 2006,<sup>49</sup> and this reduction was greatest for expensive treatments such as heart surgery. Reduction in drug expenditure was the main contributor to a change in total expenditures, falling from about 40% to 12% as part of the share of the total revenue.<sup>41</sup> However, whether the experiment improved quality is not known.

## Discussion

### Overview

In China, innovative methods have been used to control the widespread overprescription of drugs and diagnostic tests caused by the present payment system, and to confront the rising disease burden of chronic conditions like hypertension and diabetes mellitus. Although the many provider payment experiments that are in progress in China are encouraging, definitive conclusions cannot be drawn about how well these experiments have improved the quality and efficiency of health care because many are still in the early stages of implementation, and some were not designed to allow rigorous scientific assessment.

### Preliminary lessons

On the basis of lessons learnt from the rest of the world, experiments in China were designed to change the behaviour of providers by changing from a fee-for-service system to aggregate or prospective payment to improve efficiency and reduce health-care cost. The experiments assessed in this Review show that this strategy can generate savings. In Jining, prospective case-based payment was associated with a 33% reduction in expenditure for the 128 diseases included. In Shanghai, a

prospective global budget combined with pay for performance reduced cost per outpatient visit by 7·1–12·8%. Village doctors were paid a salary plus a performance-based bonus in the RMHC experiment, resulting in a 40% reduction in the cost per visit, largely because of a reduction in the use of antibiotics and intravenous injections, which improved affordable access to health care. Drug expenditure was also reduced.

Innovations in China have also been added to the payment methods. In particular, China leads the world in developing case-based payment with service costs defined according to clinical treatment protocol as a way to assure quality and restrict health expenditure growth. The Ministry of Health has started implementing this method on a national basis.<sup>50</sup> Conceptually, this method is better than that of the Diagnosis Related Groups, the most common case-based payment adopted in the world today. These groups set payment rates based on the statistical properties of actual expenditures and do not explicitly incorporate standards of care. Meanwhile, in the primary care sector of China, experiments are in progress in which capitation, global budget, or salary are combined with pay for performance to improve quality and to encourage providers to practise prevention and management of chronic illnesses (table 3; table 4). If successful, these interventions will have long-term health and cost implications.<sup>31,51,52</sup> For example, effective control of blood pressure reduces the risk of premature mortality,<sup>51</sup> and the disability and financial burdens imposed by hypertension, coronary heart diseases, and strokes.<sup>30</sup>

### Unanswered questions

There are, however, many unanswered questions about the design of the incentive structures and assessment of these experiments that require further careful investigation.

Are these experiments improving quality and health outcome as they were intended to, or is quality being compromised when cost of care is reduced? Shanghai's experiment showed some success in reducing the use of diagnostic tests and expenditure, and directing patients from secondary-level hospitals to community health

	Predicted behavioural response	Empirical evidence
Case-based payment: fee for service with limitations set for expenditure per admission	Charge up to set amount for admissions that are included in intervention; increase expenditure for admissions that are not included in intervention; recode severely ill patients as having diseases not included in intervention; increase total expenditure for the hospital as a whole; and no effect on quality	Moderate reduction in expenditure per admission for intervention cases, but not enough available evidence
Prospective case-based payment: payment on admission, with fee for admission for complicated cases	Reduce expenditure for admissions included in interventions; possibly no effect if next year's payment level is based on this year's spending; increase number of admissions; underprovide or reduce quality for admissions subject to interventions; and refuse severely ill patients with disease that is included in intervention, or recode to diseases that are not included in intervention	Reduced per-admission expenditure for admissions included in intervention; rapid increase in expenditure for admissions not included in the intervention; recoding; examples, Zhenan and Shaanxi
Mixed payment: case-based payment (fee for service with cap per admission) with prospective global budget	Reduce total and per-case expenditures, admissions, and quality; and refuse severely ill patients admission	Reduced expenditure per admission for those included in intervention mainly due to reduction in drug expenditure, but not enough evidence is available; examples, Qianjiang and Chongqing
Case-based payment with payment level based on cost of services and drugs included in standard treatment protocols	Reduce number of unnecessary drugs and examinations, length of stay, expenditure per admission, and variation in clinical practices; and increase volume of service	Reduced expenditure per admission for diseases included in intervention, effect strongest for expensive admissions; and reduced drug expenditure and length of stay; examples, Jining and Shandong

**Table 4: Experiments in provider payments for hospitals**

centres, but more work is needed to understand the underlying causes of the unclear pattern of management and control of chronic diseases. Likewise, in the experiment at Jining Medical College Hospital, whether the reduction in cost had compromised the health of patients or whether the use of treatment protocol in setting payment has been effective in improving quality was not assessed.

In China, like in the rest of the world, pay for performance to improve quality of care has been endorsed.<sup>23,53</sup> In China, many performance indicators are related to cost control and service volume, which have little established association with health outcomes. How much of a provider's income has to be linked to quality-related performance to induce a behavioural change in treatment modality is not clear. Moreover, with pay for performance, do providers change tasks by focusing on improving the target indicators on which their assessment is based and neglect other services that are equally important in improving population health?<sup>24</sup>

All provider payment methods can induce behaviour from the providers that undermines the intended outcomes. In both the Shanghai and RMHC experiments, there was only one payment method for providers. How well would their results be applicable to situations with several payers? If only one payer changed its payment incentive, providers could circumvent the reform by transferring the costs to other payers and populations not included in the payment reform. Similarly, what is the effect of the case-based payment used at Jining Medical College Hospital on admissions for which there are no interventions? How much do providers falsify data reported for assessment of performance in relation to pay? With global budgets, do providers strategically let costs exceed the budget so as to negotiate for a larger increase for the following year?

Treatment for many health conditions, such as tuberculosis, hypertension, and diabetes mellitus, involves community-level providers for detection, referral, and management; retail pharmacies for drug

dispensing; and hospitals for diagnosis and advanced treatment.<sup>31,55,56</sup> The irrational incentive structure in China has led to a fragmented delivery system with each level of provider competing to attract and hold on to patients, rather than referring them on the basis of their clinical needs. Although explicit efforts were made in the experiment in Shanghai to reward community health centres for improved management and control of patients with hypertension and diabetes mellitus, how well these centres coordinate care for these patients with other parts of the system is largely unknown. Similarly, the extent to which salary with bonus creates an effective incentive for village clinics to detect and refer patients with tuberculosis, hypertension, and diabetes mellitus is worth investigation.

## Conclusions

In China, like in many countries, the inappropriate incentives embedded in the provider payment system have been recognised as creating inefficiencies, waste, and poor-quality health care, and compromising the goals of ensuring access to affordable, quality health care.<sup>31–34,57,58</sup> Rather than prescription of a new national policy, a strategy of experimentation with different payment methods for providers was chosen in China, accompanied with organisational changes to counteract the present inappropriate incentive structure and deal with the challenge of an increased burden caused by chronic illnesses. This approach is commendable because it allows local governments to innovate and find the best and most feasible solutions.

However, we are cautiously optimistic about these innovations. China needs to have rigorous and objective, evidence-based assessment, with focused attention of the effects on quality and health outcome before conclusions can be drawn about which models are best. So far, the assessments have not been adequate or scientific, have lacked a baseline or control group, and service volume and expenditure have been overemphasised instead of quality and clinical outcomes. We recommend that the

measurements and data gathering for high-priority outcomes should be standardised in China, including clinical outcomes, attention be paid to unintended consequences of the interventions on financial incentives, and assessment should be taken into account from the inception of experimentation. A willingness to allow external and objective assessment would help to ensure that the findings are credible.

Reform of financial incentives alone will not produce lasting improvement in the efficiency and quality of health care in China, but it might be an effective short-term solution. The incentive structure used in China since the 1980s and the change in status of physicians after 1949 has eroded professional ethics. In the long term, physicians and hospital directors will find ways to circumvent the new improved incentive system to obtain maximum income and profits, especially when the profit motives of the hospital and physicians are aligned like they have been in China since physicians became hospital employees.

All provider payment methods are imperfect and can induce unintended behavioural response from providers. Methods with strong incentives to reduce cost also tend to reduce quality. Professional ethics provide the internal balance when the physician's desire to achieve maximum self-interest comes into conflict with the charge to protect patient welfare. No external rules can replace professional ethics because medical decisions are uncertain. Hence, unless medical professional ethics and norms are re-established in China, physicians will continue to find ways to put their own interest first, even at the expense of quality care.

As part of the effort to re-establish professional ethics, any lasting reform needs to be done with a separation of incentives for hospitals and physicians when hospitals are given incentives to achieve maximum profits. Bonuses for physicians can be linked to their adherence to treatment protocol, health outcomes, and patients' satisfaction, instead of hospital revenue and profits.

Rational financial incentives can profoundly affect a physician's medical practice. However, to have lasting social benefits, any reform has to include the constellation of factors that affect physician behaviour. In particular, the re-establishment of professional ethics and norms in China, and the disconnection of profit motives for hospitals from incentives given to their employed physicians have to be considered.

#### Contributions

WCY and WH were responsible for the conceptualisation, synthesis of findings, and writing of the report. WCY coordinated the analyses. QM led the analysis of the experiments for hospital care. WCY and WC led the analysis of the experiments for primary-care providers. XS was responsible for literature review and providing data for Shanghai's analysis. All authors contributed to the discussion and have seen and approved the final version.

#### Conflicts of interest

We declare that we have no conflicts of interest.

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