

How Do Patients and Providers React to Different Incentives in the Chinese Multiple Health Security Systems?

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Abstract

Background: China has achieved universal health insurance coverage. This study examined how patients and hospitals react to the different designs of the plans and to monitoring of patients by the local authority in the Chinese multiple health security schemes.

Methods: The sample for analysis consisted of 1006 orthopedic inpatients who were admitted between January and December 2011 at a tertiary teaching hospital located in Beijing. We conducted general linear regression analyses to investigate whether medical expenditure and length of stay differed according to the different incentives.

Results: Patients under plans with lower copayment rates consumed significantly more medication compared with those under plans with higher copayment rates. Under plans with an annual ceiling for insurance coverage, patients spent significantly more in the second half of the year than in the first half of the year. The length of stay was shorter among patients when there were government monitoring and a penalty to the hospital service provider.

Conclusions: Our results indicate that the different designs and monitoring of the health security systems in China cause opportunistic behavior by patients and providers. Reformation is necessary to reduce those incentives, and improve equity and efficiency in healthcare use.

Key words: Different Behaviors; Financial Incentives; Government Monitoring; Multiple Systems

INTRODUCTION

Access to healthcare through universal coverage is regarded as a fundamental human right in many countries.^[1,2] China started its reform of public health insurance in 1998 and achieved insurance coverage of nearly 95% of the population at the end of 2011.^[3,4] Despite this great achievement, there still remain challenges to achieve equity and efficiency across subpopulations of the nation, since different health insurance schemes with different benefit packages and incentives are adopted depending on beneficiaries' residential and occupational conditions, as will be described later. Such complexity of the system leaves room for inefficiency through opportunistic behaviors of consumers and providers based on moral hazard.^[5-7]

The financing scheme for current Chinese healthcare consists of a Basic Medical Insurance (BMI) system, a government payment system, and an out-of-pocket payment [Figure 1]. The BMI system includes three mutually exclusive schemes: Urban Employee BMI (UEBMI), Urban Resident BMI

(URBMI), and New Rural Cooperative Medical Care System (NRCMS). UEBMI run by the local government and is mandated. The premium is proportional to the employee's salary, meaning that employers provide 6%–8% of their employees' salaries and employees contribute about 2% of their salaries in general.^[8] URBMI is voluntary for urban residents, such as students, the aged, the unemployed, and the disabled. Its premium is funded by both the household and the government.^[9] NRCMS, which is voluntary for rural residents, is funded by rural residents and subsidized by the government.^[10]

There are deductible, copayment, and annual ceilings in the Chinese BMI system, with the expectation of raising cost-consciousness about medical expenditures among beneficiaries. Only the costs between the deductible and annual ceilings can be reimbursed by health insurance facilities according to different copayment rates. Otherwise, expenditure must be covered with out-of-pocket payments.

The payment schemes to providers are also under municipal insurance authority and range diversely from a fee-for-service basis to a case-mix-based inclusive payment under authority monitoring and penalty incentives. For example, hospitals in Beijing are under a case-mix-based payment system for

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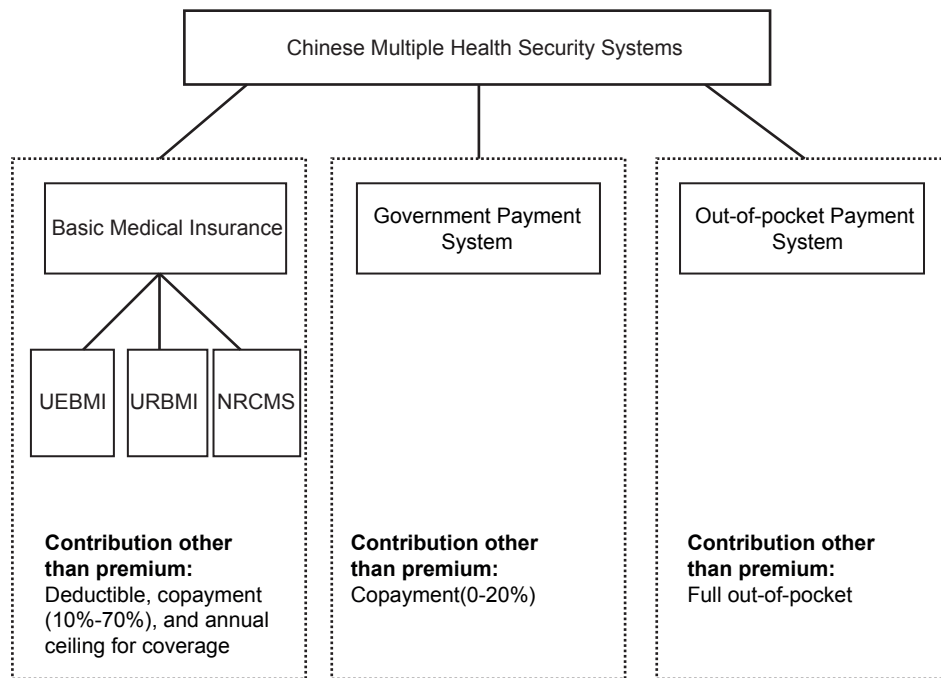


Figure 1: Summary of Chinese multiple health security systems. UEBMI: Urban Employee Basic Medical Insurance; URBMI: Urban Resident Basic Medical Insurance; NRCMS: New Rural Cooperative System.

Beijing citizens for some diagnoses, while services for nonlocal patients are on a fee-for-service basis. Besides, the municipal authority monitors length of stay for services to local patients with a potential penalty for excessive length of stay, while services for patients under a government payment system, out-of-pocket system, or nonlocal UEBMI or NRCMS system are outside of monitoring.

Finally, in the government payment system that covers employees of central and local governments, the premium is fully subsidized by the government, and its copayment rate is lower than BMI, without deductibles and an annual ceiling.^[11] Payments to patients under the government plan are on a fee-for-service basis.

In this study, we examined whether opportunistic overuse/underuse of services occurs among patients and providers, using a unique condition within the current heterogeneous systems in China as a natural experimental setting. Specifically, we hypothesized that beneficiaries who face more financial risk on their side would demand less healthcare service while overuse may be likely in the reverse situation. We also hypothesized that providers would behave differently depending on government monitoring of use and a subsequent penalties.

METHODS

Patient and provider selection

We examined the above-described hypotheses by investigating the inpatient service for selective surgical treatment in an Orthopedic Department at a tertiary teaching hospital located in Beijing. We chose this setting for several reasons. First, the hospital is one of the typical general hospitals in urban

China with a reputation of compliance with standards of care. Second, selective orthopedic surgery is a relatively standardized process of care with relatively homogeneous patients in terms of their clinical conditions, such as disease severity and comorbidities. Thus, any observed variation in expenditure is more likely to be attributed to the preference than to the patients' clinical condition. Third, owing to the standardized care process and predictable prognosis, the cost of selective orthopedic surgery is foreseeable for the patient before hospitalization. Thus, those who find it affordable will selectively receive the treatment, and the patients' socioeconomic statuses may not influence the use of the inpatient service.

Data collection

We retrospectively extracted information such as sex, age, diagnosis, operation types, admission date, discharge date, total expenditure, medicine expenditure, and material expenditure from the case records of patients who were admitted to the Orthopedic Department between January and December 2011. The total expenditures included operation charges, medicines, materials, and other charges. Patients who did not undergo surgery were excluded. Those under the URBMI scheme were also excluded because of the small sample size. The operation types were divided into two groups. The first group included relatively simple surgery with expected low costs, such as an internal fixation removal, single fracture open reduction and internal fixation, excision of lipoma, and Achilles tendon lengthening. The second group included relatively complex surgery with high costs and possible complications, such as internal fixation of femoral neck fracture, artificial joint replacement, and open reduction and internal fixation of pelvic fracture.

Statistical analysis

The Chi-square test was applied to compare characteristics across health insurance schemes. Given the nonnormal distributions of expenditure and length of stay, the variables were used after logarithmic transformation. General linear regression was employed to compare the differences in expenditure and length of stay, with adjustment for confounders such as age, sex, and operation types. All data analyses involving descriptive analyses were performed using SAS (9.1) software (SAS Institute Inc., NC, USA).

RESULTS

Patient characteristics

A total of 1006 orthopedic patients was investigated. Table 1 shows the characteristics of the patients according to the health insurance schemes. There were more females under the government payment scheme and local UEBMI scheme than under the other three schemes. Patients under the government payment scheme were older than the other patients. Patients under the nonlocal UEBMI scheme and NRCMS scheme were more likely to receive relatively complex operations.

Patients' use behaviors

Incentives of different medical security schemes

Table 2 shows the results of regression analyses on expenditures for comparisons among different health

insurance schemes. Older age and complex operation type resulted in higher use in total expenditure, medicine expenditure, and material expenditure. After controlling for age and operation types, the government health insurance scheme showed the highest use in medical expenditure, followed by out-of-pocket, UEBMI, and NRCMS. No differences across health insurance schemes reached statistical significance in total and material expenditures.

Incentives of annual ceilings

In our study patients, those under BMI schemes, including UEBMI and NRCMS, had annual ceilings. In contrast, those under government payment and out-of-pocket schemes had no annual ceilings. After adjusting for age and operation types, patients utilized significantly more medicine in the second half of the year than in the first half of the year. The interaction between annual ceiling and admission period was significant, suggesting that those with an annual ceiling used significantly more medicine in the latter period, while those without an annual ceiling spent similarly regardless of the admission period. Annual ceiling, admission period, and their interaction had no significant effects on total and material expenditures [Table 3].

Hospitals' behavior toward government monitoring

Study patients under local UEBMI were monitored by the local health insurance authority while the other patients were

Table 1: Characteristics of the examined inpatients at a Beijing hospital according to medical security schemes (n (%))

Characteristics	Government	Local UEBMI system	Nonlocal UEBMI system	NRCMS system	OOP system	P
Sex						
Male	50 (47.2)	185 (43.8)	91 (59.1)	53 (52.0)	124 (55.9)	0.005
Female	56 (52.8)	237 (56.2)	63 (40.9)	49 (48.0)	98 (44.1)	
Age (years)						
≤65	48 (45.3)	260 (61.6)	118 (76.6)	80 (78.4)	184 (82.9)	<0.001
>65	58 (54.7)	162 (38.4)	36 (23.4)	22 (21.6)	38 (17.1)	
Operation						
Simple	38 (35.9)	159 (37.7)	23 (14.9)	16 (15.7)	76 (34.2)	<0.001
Complex	68 (64.1)	263 (62.3)	131 (85.1)	86 (84.3)	146 (65.8)	
Total	106	422	154	102	222	

OOP: Out-of-pocket; UEBMI: Urban Employee Basic Medical Insurance; NRCMS: New Rural Cooperative Medical Care System; Local: Beijing residents; Nonlocal: Residents in cities other than Beijing.

Table 2: Influence of patients' characteristics on medical expenditure: Results of general linear regression analyses

Characteristics	Total expenditure		Medicine expenditure		Material expenditure	
	Estimate	P	Estimate	P	Estimate	P
Sex						
Female versus male	0.055	0.238	0.085	0.086	0.035	0.601
Age (years)						
>65 versus ≤65	0.419	<0.001	0.437	<0.001	0.547	<0.001
Operation types						
Complex versus simple	1.026	<0.001	0.443	<0.001	1.379	<0.001
Health insurance schemes						
Government versus NRCMS	-0.017	0.870	0.391	<0.001	-0.041	0.780
OOP versus NRCMS	-0.038	0.653	0.241	0.008	-0.061	0.625
UEBMI versus NRCMS	-0.084	0.278	0.221	0.007	-0.155	0.169

UEBMI: Urban Employee Basic Medical Insurance; NRCMS: New Rural Cooperative Medical Care System; OOP: Out-of-pocket.

Table 3: Influence of annual ceiling and admission period on medical expenditure

Characteristics	Total expenditure		Medicine expenditure		Material expenditure	
	Estimate	P	Estimate	P	Estimate	P
Sex						
Female versus male	0.055	0.238	0.085	0.085	0.035	0.603
Age (year)						
>65 versus ≤65	0.411	<0.001	0.462	<0.001	0.533	<0.001
Operation types						
Complex versus simple	1.034	<0.001	0.424	<0.001	1.393	<0.001
Annual ceiling						
Yes versus no	0.029	0.659	0.022	0.751	0.006	0.954
Admission period during year						
Second half versus first half	0.069	0.210	0.183	0.002	0.095	0.233
Ceiling × period						
With × second versus without × first	-0.144	0.136	-0.247	0.016	-0.170	0.225

not monitored. Table 4 shows that other than younger age and simple operation type, the length of stay was significantly shorter among the patients when there was local authority monitoring.

DISCUSSION

In this study, we examined the impact of different incentives for patients' and providers' behavior in the Chinese multiple health security systems, focusing on orthopedics inpatient services in a tertiary hospital in Beijing.

The findings revealed that after controlling for age and operation type, patients under the government insurance scheme used the most medicine while those under the NRCMS scheme consumed the least medicine. Our findings were similar to previous research results suggesting that a gap exists in medical use among subgroups with different benefit packages and contributions in the Chinese health security system.^[12-14] Patients under the government plan had the highest expenditure, because they have the least cost-consciousness based on the reduced copayment rate and exemption from premium payment and annual ceilings. More medical use through patients' opportunistic behavior occurred for prescribed medications since the choice of surgery is under the discretion of a medical specialist rather than the patient's preference. Owing to the limited data availability, we could not determine whether the beneficiaries among the government scheme overused medicine or whether those under nongovernment schemes suffered from underuse of needed medications. However, our study did identify different patterns of medication use that were unexplained by the patients' demographic and clinical conditions, which may support the existence of opportunistic behaviors based on moral hazard. The observed inequality in medication use could be amended by standardization of the benefit packages across schemes, use review, and other policies to provide fair incentives to patients with equal medical needs.^[15-17] Thailand previously faced a similar situation, with three different health insurance schemes in the earlier stages of universal coverage starting in early 2002. In fact, Thailand struggled

Table 4: Influence of Government monitoring on length of stay

Characteristics	Estimate	P
Sex		
Female versus male	0.063	0.057
Age		
≤65 versus >65	-0.235	<0.001
Operation types		
Simple versus complex	-0.445	<0.001
Authority monitoring		
Yes versus no	-0.069	0.039

to harmonize the different schemes to ensure equity, which will provide policy lessons for the Chinese systems.^[18-21]

We also confirmed that in the present study annual ceilings induced distinct behavior in medical use according to the time of the year, indicating that such policies suffer from inefficiency based on the opportunistic behavior of patients. Patients may be careful in their use of medical services in the first half of the year because of the uncertainty of medical expenditures in the second half of the year. Meanwhile, those in the second half of the year will ask physicians to prescribe more medicines until they reach the annual ceiling, because they have a better projection for medical expenditures in the rest of the fiscal year not to exceed the annual ceiling. Previous studies on universal health insurance coverage found that patients tend to use more services and/or higher quality of care, while providers tend to offer more services than needed, which may result in increased financial risk for public health insurance systems.^[22-24] In fact, the total health expenditure increased sharply from RMB 367.8 billion Yuan in 1998 to RMB 2426.8 billion Yuan in 2011.^[25] The original aim of the annual ceiling was to try and control the rapidly increasing health expenditure. Although our study could not provide answers for whether or not the original aim was achieved, at least, the rapid increase in healthcare spending in China suggests that use control is very difficult when faced with the expanding demands of the population. Besides, some argue that an annual ceiling may selectively

impoverish patients in low-income households through catastrophic out-of-pocket payments.^[26] Given the difficulty in controlling patients' behavior and the possibility of worsening inequity, an annual ceiling for the coverage needs to be abandoned as a means for cost containment, and could be replaced with other policies on the supply side, such as a global budget, case-mix-based prepayments, or incentives for standardized care.^[27-31]

The present study further indicated that hospitals behaved in response to the policy of the authority in terms of length of stay.^[32] Providers treated patients under monitoring by the local authority with shorter lengths of stay than those under other schemes to avoid penalties from the authority. Again, from our limited data, we do not know whether a shortened length of stay leads to more efficient performance of the hospital or to opportunistic behavior such as premature discharge and selection of patients with less serious conditions who are treatable within a shorter period. Besides, simple comparisons of length of stay without risk adjustment can be misleading. At least, the local government should develop a risk adjustment model of length of stay for a fair evaluation of the hospitals' performance to avoid the providers' opportunistic behavior.^[33-35]

There are several limitations to our study. First, our research was limited by lack of some information, including patients' socioeconomic statuses, which are important factors influencing medical expenditure. We, therefore, selected orthopedic inpatients who received selective surgery that was regarded as affordable before admission. Second, we only focused on orthopedic inpatients in one typical hospital, meaning that our sample is not fully population-representative. However, the inpatients analyzed in this study are still likely to be indicative of a subpopulation of urban China. Finally, we have limited information to evaluate the accuracy of diagnosis and details of clinical conditions. We postulate that the diagnosis was correct given that this is a high-tech hospital, and currently under no financial pressure for up-coding. Lack of clinical information may lead to a biased estimation of use owing to residual confounding factors, for which a larger and more detailed clinical and administrative database is required for future research to confirm our results.

Our results show that there is a gap in medication use based on different benefit packages across plans. Specifically, the annual ceiling acted as an incentive to consume more medicine, contrary to its expectation to control medical expenditure, and monitoring by the local authority seemed to influence a shorter length of stay. The complex design and monitoring of the systems leave room to improve the efficiency and equality of the Chinese health security systems. Government needs to harmonize the different schemes to ensure equity. Policies on supply side and risk adjustment evaluation of the length of stay are recommended to improve efficiency.

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