

**Effects of the New Health Care Reform on Hospital Performance in China:
A Seven-Year Trend from 2005 to 2011**

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Abstract

Background

Since the market economy reform healthcare expenditures have escalated in China, especially out-of-pocket payments. A new policy intervention begun in 2005, aimed to reshape the health care system.

Objectives

To examine effects of the new health care reform on hospital performance and patients' economic burdens in China, and provide evidence of the need for further public hospital reform in China.

Methods

Discharge records from 2005-2011 in a tertiary cancer hospital were abstracted. Changes in total charges, revenue structures, length of hospital stay and illness burden of patients were analyzed.

Results

During the seven-year period, total charges per discharge increased at a cumulative growth rate of 7.0%, which was far slower than that of the local GDP (105.9%). The hospital volume increased by 138.9%, annual revenues grew by 206.4%, and average length of stay declined by 28.4%. Prescription drugs accounted for 60.2% of the revenues. The ratio of total hospital charges to the per capita annual disposable income decreased from 1.38 to 0.84, and the percentage of out-of-pocket payment was reduced by 20 percent. Similar trends were observed in the national statistics.

Conclusions

The new health reform policy showed positive effects on alleviating both hospital operation and patients' economic burden; however, only short-term effects on containing the increase in total charges of hospitalization were observed. The highest proportion of hospital revenues was generated from prescription drugs, and the lowest proportion from bed fees and nursing fees which remained virtually unchanged. More effective approaches are merited to adjust hospitals' revenue structure and make hospital care more efficient.

Effects of the New Health Care Reform on Hospital Performance in China: A Seven-Year Trend from 2005 to 2011

When altering the behaviors of healthcare providers, such as reducing length of hospital stay, and increasing charges per discharge and patient revenues; health policy can also affect access to and equity of medical services. China's health care delivery, once characterized as being low cost but with high equality, has changed significantly since the national economic reform started in the late 1970's [1-3]. With the implementation of market-oriented and decentralized health care delivery, from 1980 to 2006, per capita medical expenditures skyrocketed 64 fold, out-of-pocket (OOP) medical expenditures increased by 156 times, and the percentage of OOP expenditures among the total medical expenditures increased from 20.4% in 1978 to 60.0% in 2001 [4]. In turn, these factors led to China's rank of 188th out of 191 countries and regions by the World Health Organization (WHO) on the dimension of fairness of financial contribution [3]. To respond to this setback, China started a new round of health care reform (NHCR) in 2005.

The process of health policy initiative in China is unique, especially in terms of the time frame for policy implementation. It often begins with the pilot phase of a new policy initiative. The government then makes modifications during the next two or three years. By the time a national policy is formally issued, it has actually been in effect for several years. China had implemented several policy initiatives in the past three decades [5], but in 2005, openly accepted the failure of those early efforts [6] and meantime launched a new policy initiative or so called "a new round of health reform". This new initiative from the central government aimed to address public concerns of rapid health care cost inflation, financial barriers in access to care, and quality of care. As a result, hospitals were requested to achieve both high quality and cost control [7]. Accordingly, local health authorities implemented such measures as publishing hospital fee schedules and annual revenue summaries with the goal of keeping average service charges flat for several years [8-10]. The service charge control also became a part of the performance evaluation on hospitals. Although the design of the new reform started in 2006, "The 2009 - 2011 Health Care Reform Key Programs (HCRKP)" did not start until 2009. At that point of time, the central government issued two documents: "Views of Deepening the Reform of Medicine and Health System" [11] and "Current Priorities in Implementing the Health Care Reform (2009-2011)" [12]. These two important documents reclaimed the government's leading role in shaping health care delivery, including strengthening health insurance programs, developing a generic drug formulary, as well as improving hospital performance, and primary care and public health services [13].

There are numerous studies on the effects of China's NHCR, but most of them either focus on public health services and medical insurance coverage, or based on population-based surveys or data from health insurance programs [14-16]. The literature is barren in examining effects of policy on hospital performance in terms of service volume, length of stay, charges, and revenue structure. Hospitals in China (about 80% are public) provide more than half of all the medical services and are responsible for more than 50% of health expenditures nationally (54.2%-63.2% of all in-patients and 54.7%-68.8% of expenditures during the period from 2004 to 2009) [17-18]. Therefore, success of the new health care reform depends on whether hospitals are able to improve quality and, at the same time, control the excessive revenue growth [13].

China now has completed its implementation of HCRKP and the national statistics and reports demonstrated some changes in hospital performance [17-19]. As it moves forward with the national implementation of the hospital reform [20], efforts are needed to evaluate those changes in a more systematic and comprehensive fashion. This study serves as one of these efforts.

Methods

Data

All discharges, from January 1, 2005 to December 31, 2011, in a public tertiary cancer hospital in the Eastern China were extracted. Among the 124,085 discharges, 1,869 (1.5%) of them could either not be verified, contained invalid value, missing value, or logic errors; and 121 had lengths of stay longer than 60 days which we defined as outliers in hospitalization. The final number of discharges for analysis was 122,095. In addition, we used similar national statistics from 2005 to 2011 to verify our findings.

Measures

In order to measure the changes over time, we formed the following indicators:

Accumulative Growth Rate = (Value of present year - Value of baseline) / Value of baseline × 100%

$AGROGDP_i = ([1 + GROGDP_1] \times [1 + GROGDP_2] \dots \times [1 + GROGDP_i] - 1) \times 100\%$

For the aspect of hospital financial performance, the accumulative growth rate was adjusted with the consumer health care price index (CHCPI).

Accumulative Growth Rate = (Value of present year / CHCPI_i / Value of baseline - 1) × 100%

$CHCPI_i = (1 + HCPRI_1) \times (1 + HCPRI_2) \dots \times (1 + HCPRI_i) \times 100\%$

AGROGDP_i was the *i*th year's accumulative growth rate of GDP; GROGDP_i was the *i*th year's growth rate of GDP. CHCPI_i was the *i*th year's cumulative health care prices index; HCPRI_i was the *i*th year's health care price rise index. *i* = 1, 2, ..., 7. The baseline value was the value of 2005; the baseline value of GROGDP and HCPRI was set to 0.

Per capita income refers to the per capita income of a county or city where a patient resided before being admitted to a hospital. HCPRI and GROGDP were based on those of the local province where the hospital is located. These indicators were obtained from the city's and province's Bureau of Statistics website, Statistical Yearbook and the "National Economic and Social Development Bulletin" published by the government.

Analytical Techniques

Descriptive analysis, correlation analysis, non-parametric test, and multiple regression were conducted on the three dependent variables: total charges, daily charges, and length of stay, respectively. Covariates included the patient's demographics, such as age, sex, marital status, occupation, and area of residence (i.e., urban or rural); health insurance status (i.e., government insurance program, social insurance program, and self-pay); and clinical department (i.e., department of medical oncology, general surgery, thoracic surgery, head and neck surgery, radiation oncology, gynecology surgery, intervention, traditional Chinese medicine, and the rest) where the patient was hospitalized and received treatment.

Results

In regard to the patients' demographic characteristics, about half of them were female, 61,347 (50.2%), and 60,748(49.8%) discharges were male. Their ages ranged from one to 97 years old with an average of 54.4 years old (with a standard deviation if 12.6). The number and percentage of discharges from the respective age groups were: 1,034 (0.8%) from the group <20 years, 3,040 (2.5%) from the group 20-29 years old, 9,662 (7.9%) from the group 30-39 years old, 27,012 (22.1%) from the group 40-49 years old, 37,303 (30.6%) from the group 50-59 years old, 30,243 (24.8%) from the group 60-69 years old, 12,521 (10.3%) from the group

70-79 years old, and 1,280 (1.0%) from the group ≥ 80 years old. 121,771 (99.7%) of them were of the Han ethnicity, and 108,578 (88.9%) were from the province where the hospital is located. With regard to occupation, 1,885 (1.5%) were full-time students, 32,084 (26.3%) were factory workers, 20,290 (16.6%) were professionals, 42,243 (34.6%) were farmers or unemployed, 18,896 (15.5%) were retired, and 6,697 (5.5%) had other types of jobs. In addition, 62,373 (51.1%) of the patients were from the city (i.e., local town) where the hospital is located; among those, 52,612 (84.4%) and 9,761 (15.6%) were urban and rural residents, respectively.

Among all discharges, the predominant type was primary malignant neoplasm, accounting for 109,658 (89.8%) of all discharges. The remaining discharges were of malignant neoplasm (1,889, 1.5%), carcinoma in situ (378, 0.3%), borderline tumors (659, 0.5%), benign tumors (5,465, 4.5%), enclosed mass (2,464, 2.0%), and cancer-associated diseases (e.g., complication and sequela) (1,582, 1.3%). Top 10 single diagnoses (i.e., malignant neoplasm of: lung, breast, stomach, rectum, ovary, cervix uteri, esophagus, middle esophagus, cardia, liver) were all primary malignant neoplasm, counting for 78,936 (64.7%) of the discharges and 65.6% (1,598 million yuan) of the total inpatient revenues with total average charges per discharge of 19,560 yuan (Table 1).

Table 1. Top 10 Diagnoses in Volume and Their Charges and Length of Stay

Diagnosis	ICD-10	Average			Proportion of Total (%)		
		LOS	Total Charges	Daily Charges	Discharges	Hospital Days	Total Charges
Malignant neoplasm of lung	C34.901	13.2	20,172	1,525	14.4	12.7	15.1
Malignant neoplasm of breast	C50.902	12.8	15,989	1,250	13.2	11.2	10.9
Malignant neoplasm of stomach	C16.902	12.7	20,925	1,650	8.6	7.3	9.3
Malignant neoplasm of rectum	C20.01	15.0	20,041	1,336	5.3	5.3	5.5
Malignant neoplasm of ovary	C56.02	8.8	12,858	1,457	4.7	2.7	3.1
Malignant neoplasm of cervix uteri	C53.902	23.1	16,720	723	4.4	6.8	3.8
Malignant neoplasm of esophagus	C15.901	17.8	24,522	1,378	4.2	5.0	5.4
Malignant neoplasm of middle esophagus	C15.401	22.6	29,225	1,294	4.0	6.0	6.0
Malignant neoplasm of Cardia	C16.001	14.3	21,851	1,529	3.1	2.9	3.5
Malignant neoplasm of liver	C22.901	13.6	20,018	1,473	2.8	2.5	2.9
Total		14.5	19,560	1,348	64.7	62.5	65.6

As Table 2 shows, there were 50,632 hospitalized patients (2.4 discharges per inpatient) treated in the hospital and 2,354.5 million yuan of total inpatient revenue generated over seven years. Among the 11 clinical departments in the hospital, the top three generating the most revenues were medical oncology (947.8 million yuan, 40.3%), radiation oncology (368.9 million yuan, 15.6%), and general surgical oncology (341.7 million yuan, 14.5%), for a combined total of 1,658.4 million (70.4%) yuan. The three departments that had the highest average charges per

discharge were radiation oncology (36,204 yuan), thoracic surgical oncology (26,903 yuan), and general surgical oncology (23,576 yuan).

Table 2. Annual Changes in Hospital Volume, Length of Stay, and Revenue of Medical Services

	2005-2011 Total	Annual Increase (%)						
		2005 ^a	2006	2007	2008	2009	2010	2011
Volume								
Number of Patients(thousand)	50.63	6.342	0.7(10.8)	0.3(4.7)	0.5(7.4)	1.6(20.0)	0.9(10.0)	0.9(9.0)
Number discharges(thousand)	122.1	10.903	1.8(16.8)	1.4(10.7)	1.9(13.4)	3.7(22.8)	3.0(15.5)	3.4(14.8)
Hospital days (thousand)	1833.5	198.89	21.7(10.9)	8.9(4.0)	10.7(4.7)	46.5(19.4)	31.2(10.9)	22.2(7.0)
Average length of stay	15.0	18.2	-0.9(-5.0)	-1.0(-6.0)	-1.3(-7.7)	-0.4(-2.8)	-0.6(-4.0)	-1.0(-6.8)
Revenue								
Total revenue (million yuan)	2354.5	196.6	18.3(9.3)	22.2(10.3)	36.0(15.2)	97.7(35.8)	88.7(23.9)	142.9(31.1)
Total charges per discharge (yuan)	19284	18031	-1152.4(-6.4)	-53.4(-0.3)	260.2(1.5)	1796.4(10.5)	1370.2(7.3)	2870.6(14.2)
Average daily charges (yuan)	1284	989	-14.3(-1.4)	59.1(6.1)	103.5(10.0)	156.2(13.7)	151.8(11.7)	325.9(22.6)

a. Absolute value.

Annual increases in volume and revenues are displayed in Table 2. During the seven-year span, the number of patients, hospital discharges, and hospital days, as well as inpatient revenues rose every year. The number of hospital inpatients and discharges had cumulative growths of 79.3% (from 6,342 to 11,369) and 138.9% (from 10,903 to 26,051), respectively. Total inpatient days had an accumulated increase of 71.1% (from 198,800 days to 340,080 days), and inpatient revenues had an accumulated growth of 206.4% (from 196.6 million yuan to 602.37 million yuan). On the other hand, the average length of stay decreased year by year by a total of 28.4% (from 18.2 days to 13.1 days) over the seven years; whereas the average interval between two adjacent admissions of the same patient within one year after discharge increased from 31.1 (95% confidence interval (CI), [29.3, 32.3]) days in 2005 to 33.4 (95% CI, [32.7, 34.2]) days in 2011. Total charges decreased by 6.7% (from 18,031 yuan to 16,825 yuan) during the first three years before rising again with a seven-year total increase of 28.2% (from 18,031 yuan to 23,123 yuan). The daily charges increased 79.1% (from 989 yuan to 1,771 yuan). In addition, while the number of hospital employees increased by 28.1% (from 996 to 1,276), the number of inpatient days per employee increased by 33.6% (not shown in Table 2).

The similar national statistics are shown in Table 3: Nationwide hospital admissions accumulatively increased 110.5%; hospital revenue increased 188.7%. Total charges per discharge decreased in the first three years and then increased slowly. The rate of cumulative growth in total charges per discharge from 2005 to 2011 was 38.3%, far lower than the per capita income in the same period (rural 90.3%, urban 101.9%). In addition, the out-of-pocket

payment percentage declined year by year from 52.2% in 2005 to 34.9% in 2011. The inpatient days per doctor went up 56.3% from 2005 to 2011 [21, 22].

In regard to the payment of medical services among local patients (information of out-of-town patients not available): the urban employee insurance plan paid 32,838 yuan (52.6%), the government employee insurance program paid 2,138 yuan (3.4%), the self-insured program paid 140 yuan (0.2%), and the remaining 27,257 yuan (43.7%) were paid out-of-pocket by the patients. The out-of-town patients needed to pay cash in advance before receiving services and some of them would receive reimbursement after returning home (Table 3).

Table 3. Changes in Hospital Performance and Patient Economic Burdens of Health Care in China: 2005 - 2011

	Accumulative increase in number of hospital admission	Accumulative increase in medical service revenue (in million yuan) (%) ^a	Accumulative increase in total charges per discharge (yuan) (%) ^a	% of prescription drug revenue	% of test & therapy revenue	Accumulative increase in inpatient days per doctor per day (%)	% of out-of-pocket health care expenditure	Ratio of patient health care expenditure and disposable income (net)	
								Urban	Rural
2005	51.1(0)	34.7 ^b (0)	4661.5(0)	43.9	36.0	1.6(0)	52.2	5.7	5.2
2006	4.5(8.9)	3.1(8.8)	7.4(-0.04)	42.7	36.2	0.1(6.2)	49.3	5.3	5.3
2007	13.8(27)	10.9(28.8)	72(-0.54)	42.6	34.9	0.4(25.0)	44.1	5.1	5.1
2008	22.8(44.7)	22.4(61.0)	572.6(9.9)	43.5	34.5	0.5(31.3)	40.4	5.0	5.2
2009	33.8(66.2)	35.7(100.2)	1022.5(20.2)	43.6	34.2	0.7(43.8)	37.5	5.0	5.6
2010	44.2(86.4)	50.7(138.2)	1532.4(28.6)	43.1	34.4	0.8(50.0)	35.3	4.6	5.5
2011	56.5(110.5)	68.4(188.7)	1970.7(38.3)	41.8	34.2	0.9(56.3)	34.9	4.4	6.3

a. Percentages of accumulative increase were adjusted with national accumulative health care price index.

b. Baseline value: the average of national govern-owned public hospitals in 2005.

Sources

(1) Health Ministry of P.R.C. 1-2-1 Health Institutions, 4-1-1 Whole Health Expenditures, 4-1-5 Health Expenditures of Urban and Rural Household, 4-4-1 Hospital Revenues, 4-5-1 Average Charges of Hospital Discharges and Outpatients, 5-4-2 Hospital Admissions, 5-9-2 General Hospital Efficiency. China Health Statistical Yearbook 2012, Union Medical University Press, Beijing, 2012.

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(5) Health Ministry of P.R.C. 1-2-1 Health Institutions, 4-4-1 Hospital Revenues, 4-5-1 Average Charges of Hospital Discharges and Outpatients. China Health Statistical Yearbook 2008, Union Medical University Press, Beijing, 2008.

(6) Health Ministry of P.R.C. Hospital Revenues. China Health Statistical Yearbook 2007, Union Medical University Press, Beijing, 2007.

(7) National Statistics Bureau of China. 9-6 Price Indices (continued 3), 10-2 Per Capita Annual Income and Engel's Coefficient of Urban and Rural Household. China Statistics Press, Beijing, 2012.

Table 4 shows the inpatient revenue structure. Prescription drugs generated the most with 60.2%, followed by diagnostic and therapeutic services with 15.8%, and materials costs with 7.9%. These three categories accounted for 83.9% of the total revenue. In addition, the trend in the percentage of prescription drugs held steady at around 60% during the period, which is consistent with the flat national trend around 43% displayed in Table 3.

Table 4. Hospital Revenue Structure During the Seven-Year Period^a

Revenue Component	2005	2006	2007	2008	2009	2010	2011	Total
Medical device diagnoses	8.89(4.5)	9.04(4.2)	10.64(4.5)	13.17(4.8)	19.38(5.2)	27.33(5.9)	34.33(5.7)	122.79(5.2)
Laboratory	9.44(4.8)	10.73(5.0)	12.96(5.5)	15.57(5.7)	21.22(5.7)	23.88(5.2)	32.42(5.4)	126.23(5.4)
Prescription drug	118.94(60.5)	130.01(60.5)	139.34(58.8)	161.85(59.3)	220.99(59.6)	270.1(58.8)	377.02(62.6)	1418.25(60.2)
Therapeutic service	31.16(15.8)	36.95(17.2)	42.57(18)	45.96(16.8)	58.49(15.8)	74.21(16.2)	83(13.8)	372.34(15.8)
Material	14.04(7.1)	13.35(6.2)	16.87(7.1)	20.45(7.5)	30.12(8.1)	40.69(8.9)	50.15(8.3)	185.67(7.9)
Bed and nursing care	7.97(4.1)	9.12(4.2)	9.49(4.0)	10.05(3.7)	12.38(3.3)	13.94(3.0)	15.34(2.5)	78.3(3.3)
Other services	6.16(3.1)	5.73(2.7)	5.29(2.2)	6.08(2.2)	8.22(2.2)	9.29(2.0)	10.1(1.7)	50.88(2.2)

a. In million yuan (%)

Figure 1 provides an in-depth view of changes in the hospital's charges compared to the trend of gross domestic product (GDP). After adjusting with the health care price index (HCPI), only the ratio of cumulative growth in total revenue passed that of local GDP, and only for the last three years, with a cumulative increase of 1.56 times from 2005 to 2011 (GDP increased 1.06 times). However, both total charges and daily charges increased slower than did the local GDP. The daily charges accumulatively increased by 49.8%, while the trend of total charges per discharge was virtually a flat curve with an accumulated rate of increase of a mere 7.2%, as shown in Table 5.

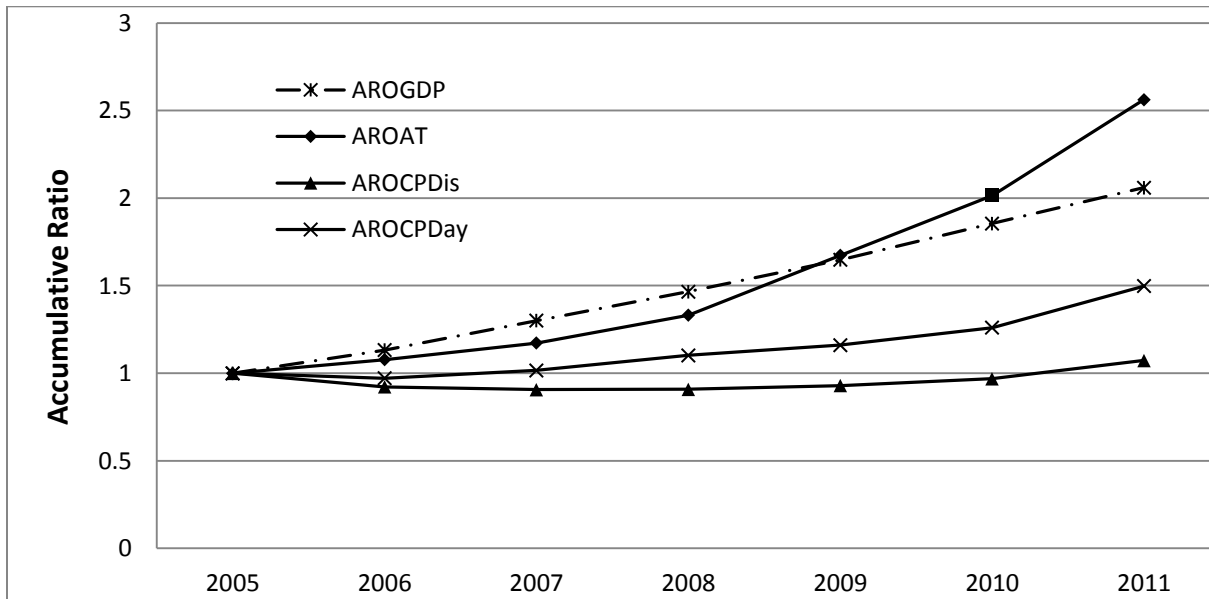


Figure 1. Trends of Hospital Revenue and Charges and GDP Growth

AROGDP: accumulative ratio of GDP;

AROAT: accumulative ratio of total inpatient revenue;

AROCPDis: accumulative ratio of total inpatient charges per discharge;

AROCPDay: accumulative ratio of total inpatient charges per hospital day.

Accumulative ratio = Value of present year/ CHCPIi / Value of baseline × 100%

Table 5. Accumulative Growth Rates of GDP, Hospital Revenue and Charges (%)

	2005 ^a	2006	2007	2008	2009	2010	2011
GDP	0	13.2	30.1	46.6	64.8	85.5	105.9
Total revenue	0	7.7	17.2	33.1	67.3	101.5	156.3
Total charges per discharge	0	-7.8	-9.3	-9.2	-7.1	-3.2	7.3
Total charges per day	0	-2.9	1.6	10.2	16.0	26.0	49.8

a. The baseline value was set to 0.

When looking at the urban residents (data was not available for rural residents), 1,195.7 million yuan (50.8% of the total inpatient revenues) was generated by their medical care during the seven year period. Health insurance programs paid 546.2 million (45.7%) yuan and the remaining 649.4 million (54.3%) yuan was paid by patients' out-of-pocket. The out-of-pocket payment, during the first six years, declined from 67.7% (76.7 million / 113.7 million) in 2005 to 47.8% (107.9 million / 225.8 million) in 2010; it rose slightly to 49.7% (154.9 million / 311.6 million) in 2011, with a seven-year cumulative decline of 18.0%. More importantly, the ratio of total charges to per capita income declined five consecutive years, from 1.38 in 2005 to 0.84 in 2010 and staying flat in 2011; but the overall ratio over the seven years was 0.91. The bivariate analysis between this ratio and year showed statistical significance for all pairs of two-year comparisons ($p < 0.01$), except for the comparisons among years of 2009 to 2011. The ratio of out-of-pocket payment to per capita income declined six straight years, from 0.94 in 2005 to 0.40 in 2010; rebounding slightly to 0.42 in 2011, but ending with a seven-year overall ratio of 0.49. The bivariate analysis between this ratio and year showed statistical significance for all pairs of two-year comparisons ($p < 0.01$). These decline trends were also in accordance with the national statistics displayed in Table 3.

Table 6. Relationships of Year with Total Charges, Daily Charges, and Length of Stay

Year	Total (yuan)	Charge	Daily (yuan)	Charge	Length of Stay	
	Estimate	p-Value	Estimate	p-Value	Estimate	p-Value
Intercept (2005)	19,164	<.0001	1,054	<.0001	19.7	<.0001
Changes in:						
2006	-1,052	<.0001	-35	0.0151	-0.6	<.0001
2007	-1,262	<.0001	53	0.0002	-1.6	<.0001
2008	-1,002	<.0001	168	<.0001	-2.6	<.0001
2009	-562	0.0005	243	<.0001	-3.0	<.0001
2010	-81	0.6068	396	<.0001	-3.7	<.0001
2011	3,213	<.0001	894	<.0001	-4.4	<.0001

Results of multivariable analysis are displayed in Table 6. First, when compared to the total charges of 19,164 yuan in 2005, all subsequent years declined significantly from 2006 - 2009, but the rate of reduction decreased each year. Second, changes in daily charges showed a different pattern. As compared to the daily charges of 1,054 yuan in 2005, the amount only slightly declined in 2006, then showed yearly mono-increases since 2007. By 2011, the daily charges were 894 yuan higher than 1,054 yuan of 2005. Finally, the length of stay had decreased in each of the seven years, from 19.7 days in 2005 to 15.3 (i.e., 19.7 - 4.4) days in 2011.

Note: Six dummy variables were created to indicate years of 2006 - 2011, respectively, while the year of 2005 served as the reference. Covariates included the patients' age, sex, marital status, occupation, area of residence (i.e., urban or rural), health insurance status (i.e., government insurance program, social insurance program, and self-pay), and outcome of treatment; hospital day were used for daily charge analysis.

The investigation indicated that a lot of measures had been taken by the hospital to implement the new health policy in the early years. First, the hospital educated its staff and conveyed the government request of keeping average service charges flat across years to all medical departments and doctors. Second, the hospital established a special department, the Hospital Management Program Office, to monitor doctors' medical behavior by three standards of rationality (rationality of examination, treatment and prescription). A doctor and his work team would be warned by the Office if he or she broke the baseline of medical expenditure or proportion of prescription drug cost. Finally, the hospital summarized the actions and outcomes every month, and reported them to the Province Health Department. However, most of these actions were concentrated in the years before 2009, and special actions for control of medical expenditures declined since then.

Discussion

The latest health care reform in China, to a certain extent, has achieved its dual goals of slowing down increases in health care costs and alleviating patients' financial burdens. Our findings indicate that (a) total charges for inpatient care had shown virtually no increase during the seven year period; (b) the increase in average daily medical cost ratio was far slower than the growth of GDP; (c) the total charges to income ratio steadily dropped; (d) most especially, the ratio of out-of-pocket payment to per capita income declined more than half. Those achievements are, in part, attributed to the improvement in efficiency of hospital care delivery, including the continuous decline in length of stay and increase in workload indicated by the number of patient days per employee, which is consistent with the national statistics.

Although the goals of the new policy were attained in the short-run, sustaining its effects in the long-run remains challenging. Our findings indicate that total revenues of the hospital, after taking into account the inflation factor, had a slower increase than did the GDP in the first four years. However, total revenues eventually passed the GDP increase during the last three years, and the total charges went up again after initially declining for the first three years. Similar changes in outpatient settings have also been reported [23]. It appears that the new policy showed strong early effects on hospital revenue control but hospitals later on found new ways of generating revenues. This might also be partially due to the global financial crisis in 2008 and 2009, during which the Chinese government mainly focused on stimulating the economy and became less concerned about controlling health care costs. Furthermore, the central governments slackened the Hospital Management Program implementation in hospitals nationwide, and shifted their efforts to the pilot reform hospitals since the documents "Views of Deepening the Reform of Medicine and Health System" and "Current Priorities in Carrying Out the Health Care Reform (2009-2011)" were issued. As a result, hospitals' revenues started increasing fast again after several years of stabilization.

Nevertheless, increases in health care revenues which are much slower than that of the overall economy may hinder health care organizations' healthy growth, and isn't helpful for maintaining health care reform achievements in the long-run. This seems to have been proved in this study, and is especially an issue deserving further discussion in health care reform. Ideally, the growth of health care should be on the same pace as the growth of economy. In a macro-environment, where the overall economy enjoys fast growth, it may be difficult for hospitals and their staff to follow the governmental policy on their freewill alone, with little or no increase in revenues. It is very easy for them to abolish their efforts to control the growth of medical expenditures and, to the contrary, they will try to catch up if their growth is behind that of the economy. This can explain why we observed the strong policy impact on hospital performances in the first several years but the effects diminished a few years later from the hospitals' point of view. The similar observation was also reported in Taiwan [24].

It is worth noting that the new health care reform did not seem to be able to change the hospital's revenue structure that has heavily relied on prescription drugs to generate revenues. For decades, the government has kept fees low for physician and nursing services, as well as bed fees. Because of this, the government allows health care providers to have a 15% - 30% mark-up on prescription drugs. Our findings showed that over half of the inpatient revenues were generated from prescription drugs and the national average was around 43%. Although the government realizes that this long-time fee schedule severely undervalues services provided by health care professionals, which in turn results in inefficiency due to overpriced prescriptions [25], the new health reform does not seem to achieve its desirable goals and purpose it initially set out to accomplish.

Several limitations existed in this study. First, it was based on only one special hospital, but most hospitals are operated in essentially the same way regardless of their types. It is shown that our findings were consistent with the national statistics. Second, the hospital in this study is located in a relatively developed eastern region of China, where hospitals tend to perform better than those in the less developed middle and western regions [26]. Third, due to the unavailability of data, we only examined economic burdens of hospitalization of local patients. Fourth, categorizations of both revenue and clinical department in China may be different from those in other countries; thus, some clarification may be needed before a cross-country comparison. Furthermore, analysis on the relation of medical cost and education of patients failed to be conducted since patients' educational information is now considered to be records, according to the latest national statistics though we found some evidence of the relation in a former study[27]. In addition, the national statistics indicated that the ratio of people's health care expenditure and net income of rural household increased in 2010 and 2011. This is opposite to that of urban households, but the ratio of hospital charges and inpatient net income of rural households failed to be analyzed. Finally, many of articles we cited are in Chinese, which makes it inconvenient for English readers to track the original articles.

In conclusion, China's latest health care reform has achieved its original goals of slowing down the increase in health care expenditures and reducing financial burdens of patients. However, whether this positive effects will last in a long-term remains to be seen. That the new policy showed little effect on the high proportion of revenues generated from prescription drugs is an indication that the current health care reform may not be able to fundamentally shape the health care delivery towards a more efficient system. Future health care reform needs to emphasize designing an efficient payment mechanism to reward health care providers [23, 28] and fundamentally change the current health care delivery system in which hospitals' revenues are heavily dependent on prescription drugs. An appropriate revenue structure can benefit hospitals

and physicians, and ultimately patients. Moreover, the new system should be able to make all major players in health care sector, such as health services providers, pharmaceutical industry, and health insurance programs, to work together to control cost and ensure access to and quality of care [29-31]. Finally, the new system should enable health care organizations to incorporate the government's health goals and objectives into their strategic planning and decision-making process, as well as in their daily operation. The nationwide hospital reform program ought to be issued and implemented as soon as possible instead of a long-term pilot hospital reform, lest the medical expenditures increase by a large margin another time in China.

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