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Research Article

Policy Evaluation of the Reform of Ambulatory Patient Groups Based on Access, Quality, and Cost of the Iron Triangle Value Chain in China

Lele Li,[1] **Mengyi Tian**,[1] **and Debin Gu**[2]

[1]*School of Labor and Human Resources, Renmin University of China, Beijing 100872, China*
[2]*State Key Laboratory of Oncology in South China, Guangdong Provincial Clinical Research Center for Cancer, Sun Yat-sen University Cancer Center, Guangzhou 510060, China*

Correspondence should be addressed to Debin Gu; gudb@sysucc.org.cn

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Objective. As part of the efforts to build a practical, effective, and diversified medical insurance payment method, it is crucial for China to deepen the reform of ambulatory patient groups (APGs). This study was aimed to explore the mechanism and effect of this policy from three dimensions, including medical expenses, medical insurance funds, and medical services. *Methods*. In 2020, China's pilot reform of APG was initiated in Jinhua City, Zhejiang Province. Descriptive statistics, correlation analysis, and OLS regression analysis were utilized to evaluate the effect of the APG reform in Jinhua. *Results*. The implementation of the reform can contribute significantly to establishing a comprehensive medical service governance mechanism of classified settlement and coordinated promotion. It also plays a critical role in safeguarding people's lives and health by promoting the high-level development of medical insurance systems and public hospitals, optimizing the quality of medical services, and improving the efficiency of medical insurance funds. *Conclusion*. Through the lens of policy evaluation, our findings can provide useful experience for the implementation of the outpatient medical insurance payment method in developing countries.

1. Introduction

With the development of the society and economy, people's medical and health needs are constantly growing. In addition, due to the acceleration of population aging as well as the increasing per capita medical costs, China's medical and health system is confronted with growing challenges. In order to deepen the reform of the medical and health system and achieve the strategic goal of healthy China, it is vital to carry out the reform of the medical insurance payment method by optimizing the allocation of medical resources, improving the quality and efficiency of medical services, and controlling the growth of medical expenses. Currently, China has conducted trials of diagnosis-related groups (DRGs) and diagnosis-intervention packet (DIP) reforms, mainly for inpatient medical services, to strictly control the unreasonable growth of medical expenses and improve the efficiency of medical insurance funds. However, due to the specificity and complexity of medical services, it is difficult to control and supervise medical expenses. If the medical expenses of inpatient services are strictly controlled, the inpatient medical expenses may be transferred to the outpatient department, thus increasing the pressure on the outpatient medical insurance funds. Therefore, considering the difference between outpatient and inpatient medical services and the long-term development of medical institutions, it is essential to carry out payment reforms regarding the outpatient medical services.

There have been explorations of outpatient payment reforms in many countries with promising outcomes. The United States was the first country to design ambulatory patient groups (APGs) on the basis of DRGs and developed an outpatient payment classification system to group the services funded by medical insurance funds, which was

formally implemented in 2000 [1, 2]. This change in the payment method for outpatient hospital services moved away from the previous pay-per-item method, prompting hospitals to increase the number of admissions [3]. In Europe, the APG has been initially implemented in several Nordic countries, such as Finland, Sweden, and Norway, since 2003. The APG was introduced in Denmark and the United Kingdom in 2005 and 2006, respectively. The existing APG is primarily based on the American model with slight modifications to reflect different characteristics of each country. As demonstrated by the worldwide APG operations, adopting this payment method is feasible to create a patient classification system with clinical significance, by effectively attributing the actual fee to the resource requirements and costs of patients and the hospital outpatient department. Therefore, it is helpful to achieve specific strategic goals related to health and offer financial incentives for hospitals to provide efficient medical services [4].

The Chinese government reiterated in its documents that outpatient medical expenses should be gradually included in the payment scope of the basic medical insurance pooling fund and that the mutual-aid mechanism for covering outpatient bills should be improved [5, 6]. Therefore, China constructed its own APG system by drawing on international experience of outpatient APGs and carried out a pilot project in Jinhua City, Zhejiang Province. With the rollout of this outpatient payment reform in Jinhua, the medical insurance pooling fund was managed under the global budget, which should be reasonably determined in accordance with the budget base and the growth rate. The total amount of the budget allocated to the medical institutions was a combination of capitation payments for signed patients and the APG point method payments for the unsigned patients. For those who signed up for family doctor services at primary medical and health institutions, the outpatient payment was weighted according to the age, health status, and average expenditure of the insured personnel to reasonably determine the per capita budget of the insured personnel, which was guaranteed to be used by the contracted grassroot medical institutions. In this case, the money flowed with the patients, and the remaining balance was kept by medical institutions. For the unsigned patients, the APG point payment method was employed for outpatient payments to standardize outpatient medical care services and the management of chronic disease.

As the first region in China to carry out APG reform, the effectiveness of Jinhua's APG reform will greatly affect the choice of the reform path for the outpatient medical insurance payment in China. Jinhua's APG reform experience will also be applied to the policy design of future outpatient medical insurance payments. Therefore, timely summarizing the effectiveness and mechanism of Jinhua APG reform has important practical and theoretical significance. This study mainly evaluated the APG reform in Jinhua City, Zhejiang Province, aiming to explore its effects and mechanisms in three aspects of medical access, quality, and cost, as well as provide experience for further implementation of the reform.

2. Methods

2.1. Theoretical Framework. In 2015, WHO released the *Global Strategy on Integrated People-Centered Health Services*, calling for the development of integrated care with patients at the core of healthcare systems [7]. This global strategy highlights that there should be an integrated delivery of healthcare services and management, including health promotion, disease prevention, and end-of-life care, as well as coordination of healthcare facilities at all levels to provide people with a continuum of services throughout their lives to meet their health needs [7]. However, since it is often used as an umbrella term that differs in underlying scope and value, the concept of integrated care has not been clearly defined so far [8–12]. The concept widely used at present comes from Leutz in 1999. He argues that it is the search to connect the healthcare system (acute, primary medical, and skilled) with each human service systems to improve outcomes [13]. Previous practices have proven that the integrated medical care can not only reduce geographical barriers and waiting time for patients to obtain medical resources but also improve the quality of medical services at the primary level with simplified processes of diagnosis and treatment as well as eliminated repetitive laboratory tests [9, 11, 14, 15]. Therefore, the bottom-up optimization of resource allocation and the implementation of integrated medical care can enhance the access, quality, and cost of medical services [16, 17]. Overall, the abovementioned three aspects form an iron triangle value chain to evaluate the healthcare system of various countries.

Under the framework of the above theories, this study took the three aspects of access, quality, and cost as first-level indicators and constructed 9 second-level indicators and 52 relevant third-level indicators (Table 1). The operation data of the medical insurance pooling fund before the reform in 2019 and after the reform in 2020 were collected and compared. This study can contribute to the literature database by providing a research framework for evaluating the implementation effects of the APG payment and contracted payment in outpatient clinics.

2.2. Data Sources. The data used in this study are from the dataset of the outpatient payment reform in Jinhua City, consisting of three parts. The first part is the operation data of the medical insurance pooling fund of Jinhua in 2019 (prereform) and 2020 (postreform). The second part covers the data related to medical expenses, medical insurance funds, and medical services in 2019 and 2020. The data of medical expenses include the original medical expenses, outpatient expenses of employees, hospitalization expenses of employees, outpatient expenses of residents, and hospitalization expenses of residents. The data of medical insurance funds contain the expenditure of employee medical insurance fund, the balance of employee medical insurance fund, the expenditure of resident medical insurance fund, and the balance of resident medical insurance fund. The data of medical services are related to the quantity of medical

Table 1: Descriptive statistics of the APG reform's evaluation system, 2019-2020, Jinhua, China.

First-level indicators	Second-level indicators	Third-level indicators	Rate of changes (%)	Category
Access	Employee medical expenses	Fund spending for employees as a whole	0.37	
		Coverage for hospital cost	−3.72	
		Outpatient service fee	7.45	
		General outpatient fee	1.09	
		Outpatient expenses for chronic diseases	−1.65	
		Outpatient expenses for special diseases	21.12	
	Residents' medical expenses	Fund spending for residents as a whole	−5.28	
		Coverage for hospital cost	−8.09	
		Outpatient service fee	0.54	
		Outpatient expenses for general diseases	−15.06	
		Outpatient expenses for chronic diseases	2.01	
		Outpatient expenses for special diseases	29.17	
	Number of visits	Discharged patients	−9.90	
		Hospitalized patients for surgeries	−1.59	
		Outpatient visits	9.00	
		Outpatient visits for general diseases	8.40	
		Outpatient visits for chronic diseases	17.90	
		Outpatient visits for special diseases	17.10	
	Outpatient visits	APG accounts for outpatient visits	−0.60	A
		Per capita budget accounts for outpatient visits	18.10	B
	Proportion of medical institution expenses	Proportion of expenses of tertiary medical institutions	−4.90	
		Proportion of expenses of secondary medical institutions	−0.70	
		Proportion of expenses of primary healthcare institutions	7	
Quality	Security of medical services	Qualified rate of prescriptions	2.10	
		Rate of rational drug use in the outpatient department	1.10	
		Patient satisfaction rate	2.10	B
	Capacity of medical services	Setting rate of health records	2.30	B
		Dynamic management rate of health records	1.60	B
		Enrolment rate of school-age children	0	B
		Rate of neonatal visits	0.40	B
		Health management rate for children	0.10	B
		System management rate for children	−1.10	B
		Filing rate of early pregnancy	−0.20	B
		Maternal health management rate	−0.20	B
		Postpartum visit rate	−0.10	B
		Health management rate for the elderly	5.50	B
		Completeness rate of health examination in the elderly	0.90	B
		Health management rate of hypertensive patients	−0.30	B
		Health management rate of diabetic patients	2.10	B

Table 1: Continued.

First-level indicators	Second-level indicators	Third-level indicators	Rate of changes (%)	Category
Cost	Efficiency of medical services	Average outpatient cost per visit	1.90	
		Per capita budget of average outpatient cost per visit	−6.50	B
		APG of average outpatient cost per visit	12.30	A
	Proportion of medical service expenses	Proportion of western medicine cost	−6.50	
		Proportion of cost of medical consumables	0	
		Proportion of laboratory cost	0	
		Proportion of treatment cost	10	
		Proportion of examination cost	3.80	
		Proportion of surgery and anesthesia costs	0	
		Proportion of nursing cost	0	
		Proportion of traditional Chinese medicine cost	0	
		Proportion of cost of traditional Chinese medicine decoction pieces	14.30	
		Proportion of other expenses	0	

Note. Category A stands for the data of APG payments; category B represents the data of the signed population with per capita budget; blank is two aggregated data.

services (service capacity), the average time cost of outpatient services (service efficiency), and the management of medical services (service quality). The third part refers to the relevant data of 151 medical institutions in Jinhua after the reform in 2020, including the proportion of medical services (medical treatments, drugs, nursing, and medical technologies), average outpatient cost (drug cost, medical consumables cost, treatment fee, and examination fee), and outpatient visits. Among them, the data of 77 medical institutions using APG also include the APG settlement rate, the number of cost-saving disease groups, and the number of deficit disease groups.

2.3. Research Process. Our study used STATA16.0 for data processing. The analysis process was composed of the following three parts.

First, we focused on the overall effects of the evaluation and drew the key areas of the evaluation system from the construction and changes of the indicators. Based on the theoretical framework, we collected prereform data in 2019 and postreform data in 2020 for comparative comparison (Table 1) and interpreted the overall effects of the reform mainly from three first-level indicators. In addition, according to the overall effects, we identified three key factors of the evaluation system, including medical expenses, medical insurance funds, and medical services. Therefore, we performed the *t*-test with the data related to those factors in 2019 and 2020 to observe the impact of the APG reform on each indicator (Table 2).

The second part analyzed the changes in medical expenses and medical insurance funds after the reform. Taking the relevant conclusions of Table 2 into account, we used the data from 2019 to 2020 to conduct descriptive statistical analysis on the trend of medical expenses (Table 3) and medical insurance funds before and after the reform (Table 4). Moreover, we also examined the influence trend of the APG reform on medical expenses and medical insurance funds.

Finally, we explored the changes concerning medical services after the APG reform. Based on the conclusions in Table 2, we designed subjective indicators and objective indicators, respectively, when evaluating medical services. Descriptive statistical analysis was conducted for subjective indicators (Table 5), while the *t*-test (Table 6) and regression analysis (Table 7) were performed for objective indicators to observe the influence trend of the APG pilot reform on indicators related to medical services.

2.4. Model Settings. In this part, OLS regression was used to analyze the influence trend of the APG pilot reform on medical services of medical institutions. Combined with the conclusion of Table 6, we first constructed the proportion index of medical services of medical institutions by principal component analysis (Table 8) and obtained a new index, i.e., the comprehensive index of medical services. At the same time, in order to facilitate the observation of the impact of changes in the number of APG groups on medical services, we used the number of cost-saving disease groups in APG medical institutions to subtract the number of deficit disease groups and obtained a new index, i.e., change in groups.

Two outcome indicators (outpatient visits and average outpatient cost) and two process indicators (APG settlement rate and change in groups) were included in this study. Linear probability regression analyses were conducted based on the following formula:

$$\gamma = \alpha + \beta_1 \text{APG settlement rate} + \beta_2 \text{change in groups} + \omega X, \tag{1}$$

where X comprises a set of control variables including the comprehensive index of outpatient visits or average outpatient cost. We performed regression analysis on outpatient visits and average outpatient visits, respectively. The regression analysis of outpatient visits reflected the impact of APG on the capacity of medical services, while the regression analysis of average outpatient cost indicated the impact of APG on the efficiency of medical services.

3. Results

3.1. Overall Effects. As displayed in Table 1, the evaluation system of Jinhua's reform was based on the triangular value chain, presenting the rate of changes for each indicator of the APG reform in 2019 and 2020.

The following three results can be summarized from the descriptive statistics of the APG reform in Jinhua (Table 1). First, the number of inpatients and the expenditure of the medical insurance pooling funds for inpatients decreased, while the number of outpatients and the expenditure of the pooling funds for outpatients increased with a reasonable growth rate. It should also be noted that the outpatient cases saw a substantial increase of special diseases. Second, the tiered diagnosis and treatment model demonstrated promising results, as the proportion of APG settlement declined and the settlement of primary medical institutions increased. The growth rate of tertiary institutions was −4.9%, −0.7% for secondary institutions and 7% for primary institutions, showing a positive triangular development trend. Third, among the signed population, the policy of per capita budget was implemented smoothly with improved service quality of primary medical institutions.

Table 1 presents the overall effects of the APG reform under the triangular theory framework. According to the results obtained in Table 1, the main changes after the APG reform in Jinhua focused on three areas, including medical expenses, medical insurance funds, and medical services. Therefore, we further explored the three areas by performing the *t*-test to examine the impact of the APG pilot reform on the indicators of those areas. Table 2 reports the *t*-test results of prereform data in 2019 and postreform data in 2020.

As demonstrated by the *t*-test results in Table 2, a total of six indicators were significantly changed after the APG reform. In terms of the medical expenses, the original medical expenses were significantly changed at the 90% level, and the outpatient expenses of employees were significantly changed at the 95% level. Moreover, with regard to the medical insurance funds, the balance of the employee

Table 2: *t*-test results of medical expenses, medical insurance funds, and medical services, 2019-2020, Jinhua, China.

Category	Index	2019 obs	Mean-2019	2020 obs	Mean-2020	Mean diff
Medical expenses	Original medical expenses	3	$2.36E+09$	3	$2.85E+09$	$-4.85E+08^{*}$
	Outpatient expenses of employees	8	$1.31E+08$	8	$1.44E+08$	$-1.31E+07^{**}$
	Inpatient expenses of employees	5	$1.39E+08$	5	$1.33E+08$	$5.64E+06$
	Outpatient expenses of residents	8	$1.61E+08$	8	$1.65E+08$	$-3.13E+06$
	Inpatient expenses of residents	5	$2.14E+08$	5	$1.94E+08$	$1.99E+07$
Medical insurance funds	Expenditures of employee medical insurance funds	7	$4.89E+08$	7	$5.03E+08$	$-1.39E+07$
	Balance of employee medical insurance funds	3	$7.52E+08$	3	$1.73E+08$	$5.79E+08^{**}$
	Expenditure of resident medical insurance funds	7	$6.17E+08$	7	$5.89E+08$	$2.74E+07$
	Balance of resident medical insurance funds	3	$3.34E+08$	3	$1.97E+08$	$1.38E+08^{**}$
Medical services	Medical service quantity (capacity)	8	5407552	8	5905361	-497809^{*}
	Average time cost of outpatient services (efficiency)	3	129.0927	3	134.6788	−5.5861
	Management of medical services (security)	3	0.9433	3	0.9600	-0.0167^{**}

*Significant at $p < 0.1$; **significant at $p < 0.05$. *Note.* 2019 obs = objectives in 2019; 2020 obs = objectives in 2020; mean-2019 = mean value of 2019; mean-2020 = mean value of 2020; mean diff = mean difference.

Table 3: Descriptive statistics of medical expenses and their growth, 2019-2020, Jinhua, China.

Category	Content	2019 (100 million yuan)	2020 (100 million yuan)	Growth rate (%)
Total expenses		35.74	43.03	20.40
Employee medical insurance expenses	Total cost	15.43	18.00	16.64
	Hospital cost	6.93	6.65	−4.07
	Outpatient cost	5.37	5.86	9.21
	Outpatient cost for general diseases	3.01	3.40	12.68
	Outpatient cost for chronic diseases	1.00	0.96	−4.24
	Outpatient cost for special diseases	1.07	1.29	20.18
Resident medical insurance expenses	Total cost	19.72	24.40	23.75
	Hospital cost	10.69	9.70	−9.29
	Outpatient cost	6.52	6.62	1.63
	Outpatient cost for general diseases	4.41	4.27	−3.31
	Outpatient cost for chronic diseases	0.79	0.76	−3.40
	Outpatient cost for special diseases	1.19	1.51	26.57

Table 4: Descriptive statistics of medical insurance funds and their growth, 2019-2020, Jinhua, China.

Category	Content	2019 (10 thousand yuan)	2020 (10 thousand yuan)	Growth rate (%)
Medical insurance pooling funds	Total income of the medical insurance pooling funds	199402.78	207437.21	4.03
	Employee medical insurance funds	100838.78	94872.21	−5.92
	Residents' medical insurance funds	98564.00	112565.00	14.20
	Total expenditure of the medical insurance pooling funds	199828.17	194210.75	−2.81
	Employee medical insurance funds	87451.95	87772.70	0.37
	Residents' medical insurance funds	112376.87	106438.05	−5.28
Employee medical insurance funds	Employee medical insurance fund expenditures	167705.10	176826.30	5.44
	Expenditures of pooling funds	87451.95	87772.70	0.37
	Inpatient payments	54121.04	52106.10	−3.72
	Outpatient payments	26518.48	28493.17	7.45
	Outpatient cost for general diseases	9992.39	10101.60	1.09
	Outpatient cost for chronic diseases	7136.92	7019.22	−1.65
	Outpatient cost for special diseases	9389.18	11372.35	21.12
Resident medical insurance funds	Expenditures of resident medical insurance funds	207086.97	199749.33	−3.54
	Expenditures of pooling funds	112376.87	106438.05	−5.28
	Inpatient payments	75301.08	69205.78	−8.09
	Outpatient payments	32178.56	32351.52	0.54
	Outpatient cost for general diseases	17539.68	14898.93	−15.06
	Outpatient cost for chronic diseases	5361.95	5469.77	2.01
	Outpatient cost for special diseases	9276.93	11982.82	29.17

medical insurance funds and the balance of resident medical insurance funds were both changed and were significant at the 95% level. In addition, concerning the medical services, medical service quantity (capacity) was significantly changed at the 90% level, and medical service management situation (security) was significantly changed at the 95% level.

3.2. Changes in Medical Expenses and Medical Insurance Funds. It is shown in the correlation test results given in Table 2 that several indicators of medical expenses and medical funds changed significantly after the APG reform. Table 3 reports the changes that occurred in the components of medical expenses between 2019 (prereform) and 2020 (postreform). Table 4 reports the changes that occurred in the components of health insurance funds between 2019 (prereform) and 2020 (postreform).

The following results can be concluded from Table 3. The hospitalization cost of employee medical insurance decreased from 693 million yuan in 2019 to 665 million yuan in 2020, with an increase rate of −4.07%, while the outpatient cost increased from 537 million yuan in 2019 to 586 million yuan in 2020, with a growth rate of 9.21%. According to the data analysis, the cost of special diseases increased from 107 million yuan in 2019 to 129 million yuan in 2020, with a growth rate of 20.18%. In addition, the cost of chronic diseases in outpatient clinics decreased from 100 million yuan in 2019 to 96 million yuan in 2020. Therefore, the

Table 5: Descriptive statistics of the management of medical services (security), 2019-2020, Jinhua, China.

Category	2019 (%)	2020 (%)	Growth rate (%)
Qualified rate of prescription	93.00	95.00	2.15
Rate of rational drug use in the outpatient department	95.00	96.00	1.05
Patient satisfaction rate	95.00	97.00	2.11

Table 6: *t*-test of the quantity of medical services (capacity) and the average time cost of outpatient services (efficiency), 2020, Jinhua, China.

Category	Variables	APG	Mean APG	Non-APG	Mean non-APG	Mean diff
Proportion of medical services	Medical treatment	77	0.171	74	0.408	−0.237***
	Drugs	77	0.725	74	0.504	0.221***
	Nursing (*1000)	77	0.138	74	0.000	0.138**
	Medical technologies	77	0.103	74	0.02	0.083***
Cost of medical services	Average outpatient cost	77	40.805	74	53.459	−12.654*
	Drug cost	77	28.823	74	26.981	1.842
	Medical consumable cost	77	0.273	74	2.8	−2.527
	Treatment fee	77	3.319	74	18.387	−15.068***
	Examination fee	77	4.663	74	0.835	3.828***
	Other fees	77	3.727	74	4.456	−0.729
Visits	Outpatient visits	77	$3.60E+05$	74	6117.068	$3.5E+05$***

*Significant at $p < 0.1$; **significant at $p < 0.05$; ***significant at $p < 0.01$. *Note*. APG = groups using APG; mean APG = the mean value of groups using APG; non-APG = groups without using APG; mean non-APG = the mean value of groups without using APG; mean diff = mean difference.

Table 7: Regression results of the impact of APG reform on the quantity of medical services (capacity) and the average time cost of outpatient services (efficiency), 2020, Jinhua, China.

Variables	Outpatient visits	Average outpatient cost
Outpatient visits		0.000
		(−0.000)
Average outpatient cost	−368.201	
	(−2355.94)	
Comprehensive index of medical services	451,542.406***	6.930
	(−86232.286)	(−5.002)
APG settlement rate	1804516.684**	60.923
	(−717831.864)	(−36.750)
Change in groups	−243.431	−0.094*
	(−977.75)	(−0.048)
Constant	−1136012.091*	1.552
	(−616029.795)	(−31.529)
Observations	77	77
R-squared	0.286	0.094

*Significant at $p < 0.1$; **significant at $p < 0.05$; ***significant at $p < 0.01$.

Table 8: Characteristic values and variance contribution ratio of principal components.

Components	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.19603	1.18396	0.5490	0.5490
Comp2	1.01207	0.220169	0.2530	0.8020
Comp3	0.791901	0.791901	0.1980	1.0000
Comp4	0	0	0.0000	1.0000

results were basically in line with the positioning of outpatient treatment of severe special diseases.

Moreover, the hospitalization cost of residents' medical insurance decreased from 1.069 billion yuan in 2019 to 970 million yuan in 2020, with a growth rate of –9.29%, while the outpatient cost increased by 1.63% from 652 million yuan in 2019 to 662 million yuan in 2020. According to the data analysis, the cost of special diseases in outpatient clinics increased rapidly, from 119 million yuan in 2019 to 151 million yuan in 2020, with an increase of 26.57%. Meanwhile, outpatient expenses for both general diseases and chronic diseases decreased. Therefore, the results were also basically in line with the positioning of outpatient treatment of severe special diseases.

According to the descriptive statistics in Table 4, the following results caught our attention. In 2020, the income of the employee's medical insurance pooling funds decreased by 5.92%, resulting in a gap, and the cumulative balance could be used for payments for 13.1 months. The income of residents' medical insurance pooling funds decreased by 18.57%, creating a gap, with the cumulative balance payable months of 3.01 months. The total expenditure of the medical insurance pooling funds increased from 1998.2817 million yuan in 2019 to 1942.1075 million yuan in 2020, with a growth rate of −2.81%. Among them, the growth rate of employee medical insurance funds was 5.44%, and the increase of overall fund expenditure was 0.37%, indicating that the growth rate of personal account funds was higher than that of overall fund expenditure. The expenditure of residents' medical insurance funds decreased by 3.54%.

The data of outpatient expenses paid by the medical insurance pooling funds showed that both employee and residents' medical insurance showed a relatively high increase in outpatient expenses for special diseases, both of which were more than 20%. The cost of chronic diseases paid by the employee medical insurance decreased by 1.65%, and the outpatient cost for general diseases increased by 1.09%. The cost of chronic diseases paid by residents' medical insurance increased by 2.01%, and the outpatient cost for general diseases decreased by 15.06%.

3.3. Changes in Medical Services. Considering the results from Table 2, we found that the indicators of medical services changed significantly after the APG reform. In this study, medical service evaluation criteria were divided into objective criteria and subjective criteria. The subjective criterion refers to the management of medical services (security), while the objective criteria include the quantity of medical services (capacity) and the average time cost of outpatient services (efficiency). Table 5 reports the descriptive statistics of the management of medical services (security).

It can be summarized from Table 5 that the outpatient payment reform in Jinhua has gradually optimized medical services. As shown in Table 5, the qualified rate of prescriptions increased from 93% in 2019 to 95% in 2020, the rate of rational drug use in outpatient department increased from 95% to 96%, and the patient satisfaction rate increased from 95% to 97%.

At the same time, in order to further analyze the changes brought by the APG reform to the objective indicators of medical services, Table 6 reports the *t*-test results of medical service data of medical institutions in Jinhua in 2020 to observe whether there are significant differences between the indicators of medical services of medical institutions using the APG and non-APG.

According to the results of Table 6, the four indicators of the proportion of medical services were significantly different. This was the same with the indicators of the medical service cost, with significant differences in the three indicators of the average outpatient cost, treatment cost, and examination cost. Moreover, significant differences were also observed in the indicators of outpatient visits. It can be concluded that there were significant differences in objective indicators of medical services between medical institutions that used APG and those that did not.

At the same time, due to the multicollinearity among the four indicators of medical service proportion, we used principal component analysis to construct innovative indicators. The results of principal component analysis are shown in Table 8.

It is shown in Table 8 that there were two principal components with initial eigenvalues greater than 1, and the cumulative contribution rate reached 80.2% (>75%). This indicates that the information contained in the first two principal components accounted for 80.2% of the total information, which was highly representative of the original data information. Thus, we constructed a new index, i.e., the comprehensive index of medical services.

Table 9 presents the descriptive statistics of main variables of the regression analysis. This regression analysis selected the relevant data of 77 medical institutions in Jinhua in 2020 that used APG to pay for outpatient medical insurance.

The summaries of Table 7 are as follows: For the quantity of medical services (capacity), i.e., outpatient visits, with an increase of 1% in the APG settlement rate, the number of outpatient visits would increase by 18045, which was significant at the 95% level. In regard to the average time cost of outpatient services (efficiency), the average outpatient cost decreased by 0.094 yuan when one of the changes in groups increased, which was significant at the 90% level.

Therefore, the following conclusions can be obtained from the regression analysis. With higher APG settlement rates, the outpatient service capacity would be more enhanced. In addition, after the APG reform, with more cost-saving disease groups than deficit disease groups, the efficiency of outpatient service would be higher. Overall, the APG reform played a significant role in improving the capacity and efficiency of outpatient services.

4. Mechanism Design of Reform

Jinhua outpatient APG reform attaches great importance to the policy incentive mechanism and value orientation. The implementation of APG has combined the characteristics of China's medical system with the APG experience of other countries. In terms of the group design, the APG payment method is mainly based on clinical practices. The APG payment method is formed according to the common clinical features of patients and different medical resources and costs consumed by the operation method and follows the principle of "similar operation groups." With regard to payment methods, the core concept of the APG is a combination of "total budget, group packaging, and point allocation." The total budget determines the total amount of funds that can be used for payments, controlling the expenditures of medical insurance funds. The point method measures the number of service points to adjust the operational weight, reflecting the principle of distribution according to work and fully respecting the value of medical services. The APG payment works in the following three

Table 9: Descriptive statistics of medical service quantity (capacity) and average time cost of outpatient services (efficiency) of medical services, 2020, Jinhua, China.

Variables	Obs	Mean	Std. dev.	Min	Max
Outpatient visits	77	356425.9	739686.6	1383	6004712
Average outpatient costs	77	40.80524	32.84279	16.52795	279.5432
Comprehensive index of medical services	77	$6.22E-09$	1.062902	−1.20416	4.106236
APG settlement rate	77	0.8531146	0.1277015	0.3891516	0.9816251
Change in groups	77	131.4416	77.80517	−61	330

Note. Obs = objectives; mean = mean value; Std. dev. = standard deviation; Min = minimum value; Max = maximum value.

steps: First, the APG grouping technique is employed to define the disease group. Then, the number of points is determined according to the diagnosis and treatment costs of each disease group. Finally, the budget fund is reasonably allocated according to the point value of medical services. The method of "monthly prepayment and year-end liquidation" is adopted during the whole process. This is also an important measure for the government to carry out macroeconomic regulation and control. In practice, the principle of "surplus retained and overspending not compensated" is followed to enhance the incentive for medical institutions to control costs and ensure the efficient operation of medical insurance funds. This is also the main measure for the government to provide meso guidance and microincentives.

In general, as we can learn from the APG reform in Jinhua, the following mechanisms have contributed to its promising outcomes. First of all, Jinhua has established an effective macrocontrol mechanism. On the basis of a reasonable increase in the total budget, the reform in Jinhua has gradually shifted away from the postpayment system towards the prepayment system and supported the budget management of medical institutions. Specifically, Jinhua has established a management mechanism for the annual budget base. The total amount of medical insurance funds in the current year is based on the actual reimbursement amount of the hospitalization fund in the previous year, and the budget is set according to the growth rate of the fund expenditure. Moreover, Jinhua has also established a management mechanism for the annual budget growth. The relevant department of medical insurance determines the expenditure growth rate of medical insurance funds in the current year according to the growth of the number of urban inpatients in the previous year, the level of GDP development, and the price index. If the growth rate of the fund expenditure is higher than the provincial control target for the growth rate of the city's medical expenditure, the growth rate of the fund expenditure will be determined according to its control target. This has led to reasonable increases in healthcare costs. In addition, Jinhua has established the prepayment system of medical insurance funds. Government departments clearly inform medical institutions at all levels of the total annual budget for fund expenditures, payment policies, settlement methods, advance funds, among others. As a result, the information of the medical insurance funds is open and transparent, and a good communication mechanism has been formed between medical institutions at all levels and government departments. The series of measures reflected in real-world data is an increase in the surplus of medical insurance funds.

Second, Jinhua has established a useful guidance mechanism at the medium level. The overtreatment should be restrained by such methods as a points-based payment and surplus retention mechanism, and then, assessments and incentives should be implemented for medical institutions. An incentive mechanism has been created to shift the medical institutions from treating diseases to promoting health. To be more specific, based on the total budget management, the government department of Jinhua first identifies the "points" of medical services by classification of disease groups, calculation of weight, and summary of medical records and then calculates the "value" of payments through scientific methods. Therefore, Jinhua has designed a corresponding balanced incentive mechanism to encourage the sustainable development of medical insurance funds. In addition, considering the actual conditions of medical institutions at all levels, Jinhua has carried out the APG reform and retained capitation payment in primary medical institutions, combining the two methods to implement weighted budget, total management, and surplus retention. Under this policy, the medical expenses of patients have been reduced, and the cost performance of medical services has been improved. Medical institutions can choose the payment method according to their own conditions, facilitating the APG reform. The expenditure of medical insurance funds in the government department has been reduced, while its efficiency has been improved. With the guidance of reform mechanisms, the number of inpatient services has been reduced and the average cost per visit has been reduced. The number of outpatient services has increased, while special outpatient services significantly increased. The number of visits to tertiary medical institutions has decreased, which means the structure of visits has been optimized.

Finally, Jinhua has established an efficient microincentive mechanism. The mechanism is composed of medical insurance payments, intelligent monitoring, hospital evaluation, and reward and punishment mechanisms, which can effectively promote the reform of public hospitals and continuously optimize the allocation of medical resources. The platform of intelligent auditing and big data for medical insurance built by the medical insurance department of Jinhua and third-party institutions has effectively carried out intelligent auditing and monitoring of designated medical institutions. At the same time, medical institutions, government departments, and third-party institutions have continued to strengthen agreement management, build an effective performance evaluation system, further reward partners and punish violators, and

promote the simultaneous improvement in medical quality and expenditure reduction of medical insurance funds during the reform process. Under a well-designed mechanism, both subjective and objective indicators of medical services have been significantly optimized.

5. Discussion

5.1. Jinhua's APG Reform Has Achieved Expected Reform Objectives. Overall, the outcomes of the pilot reform of APG in Jinhua basically met the expected reform objectives. When it comes to medical expenses, the outpatient cost of special diseases increased, while the outpatient cost of chronic diseases decreased. In respect of medical insurance funds, the growth rate for funds of employee personal accounts was higher than that of unified accounts, and the expenditures of resident medical insurance funds decreased, both suggesting a substantial growth of outpatient special diseases. Jinhua's payment method reform only changed the settlement method of medical insurance to medical institutions. The medical insurance treatment level of patients has not changed. The change in outpatient cost mainly stems from the spontaneous cost control behavior of medical institutions. From the changes in medical expenses and medical insurance funds, it can be concluded that the APG reform and the payment for family doctor services are coordinated to promote the transition of patients with severe and special diseases from seeking inpatient treatment to outpatient treatment while saving medical expenses. Moreover, the APG reform has gradually shifted general outpatient services from tertiary hospitals to primary medical institutions, supporting the development of hierarchical diagnosis and treatment.

Furthermore, in terms of medical services, the safety level of medical services has been continuously improved, and the capacity and efficiency of medical services have been enhanced, which is different from other reforms of medical insurance payment in outpatient [18, 19]. Significantly, Jinhua's medical services were little affected by COVID-19 in 2020, and only from January 24, to February 12, 2020, there would be restrictions on personnel mobility. The number of general outpatient attendances in Jinhua's reform only increased by 8.40%, and there was no significant sign of any supply-side-induced demand, which shows the supervision mechanism of Jinhua's insurance fund is strong and can effectively administrate medical institutions; on the other hand, it shows that Jinhua's outpatient APG reform has effectively avoided the transfer of medical services to outpatient clinics after the inpatient DRG reform. These changes have demonstrated that the APG reform has promoted the continuous optimization of medical services, which is of great significance for improving people's health.

5.2. Jinhua APG Reform Provides New Choices for China's Outpatient Medical Insurance Payment Reform. As demand for healthcare increases within the context of budgetary constraints, two efficiency-gains incentives may be applied to contain cost: demand-side incentives to reduce moral hazard and supply-side incentives to induce efficient application of resources [20]. Supply-side incentives are deemed a better option because supply-side incentives could induce providers to be cost-conscious in order to control expenditure [21]. One such supply-side incentive is reform of the provider payment system. In areas where the managed care is not implemented in China, after the reform of the DRG-PPS, the transfer of hospitalization expenses to the outpatient service (increased utilization of outpatient service) is a common problem [19]. At this time, the medical insurance payment will show three development directions. First, we establish an integrated medical and health service system, and the medical insurance will be paid by Global Budget, such as Luohu District, Shenzhen, Guangdong Province, China, and Massachusetts, USA [22, 23]. Second, the outpatient service and acute late rehabilitation treatment were changed from FFS to FFD, such as Jinhua, Zhejiang Province, China. Third, we change the copayment proportion and payment method of patients, such as South Korea and Taiwan. Different from the USA, the integrated medical and health service system needs to establish a unified medical institution management mechanism, involving the integration of human resources, medical institution assets, medical service costs, and medical information systems, which is very difficult. South Korea and Taiwan have adopted the method of increasing the copayment ratio of outpatients to control the growth of medical expenses, but the reform has only reduced the number of outpatients in primary medical institutions, which has little impact on the number of outpatients in medical centers. Moreover, increasing the copayment ratio has increased the cost of a single visit to the hospital and ultimately did not effectively control the total medical expenses [18]. Jinhua APG reform provides a third option for China to control the growth mode of medical service utilization; that is, APG-PPS can effectively control the growth of the number and cost of medical service utilization.

5.3. Limitations and Future Research. Since the APG reform in Jinhua has been implemented for only two years, there are still a series of problems, such as a low utilization rate of medical services in primary medical institutions and low efficiency of medical institutions. In addition, the reform limitations also include the lack of standardization of diagnosis and treatment operations and strictly controlled cost of the total budget with high financial risks.

Therefore, in the future, primary medical institutions should be galvanized to improve their service level and improve the efficiency of primary medical resources. It is necessary to encourage the construction of APG professional teams and strengthen the training of APG management and its utilization in medical institutions. Moreover, the APG system should be timely updated to adapt to the development of clinical diagnosis and treatment. At the same time, it is also necessary to accelerate the establishment of a supporting governance and supervision system and urge medical institutions at all levels to continuously improve their own management and operational efficiency, aiming to improve the quality of outpatient services and the efficiency of medical insurance funds.

6. Conclusion

In China, the implementation of APG is an indispensable part to deepen the reform of the medical insurance payment method and an important link to realize the sustainable development of medical insurance funds. According to a series of statistical data, the APG reform carried out for outpatients in Jinhua has achieved primary remarkable results, with a decrease in medical expenses and medical insurance fund expenditures, an improvement in the quality of medical services, and no significant increase in the number of outpatient attendances. Theoretical analysis indicates that building a macroregulation-meso guidance-microincentive and constraint mechanism based on China's national conditions is the key to the success of the APG reform.

The implementation of the policy effectively has improved the balance mechanism of medical insurance funds in the long term, enhanced the use efficiency of medical insurance funds, regulated the medical service behavior of medical institutions, optimized the allocation of medical resources, and promoted the construction of the tiered medical system and the development of family doctor contracted services. In general, it is of great significance for the sustainable development of outpatient medical insurance funds and the realization of the strategic goal of healthy China.

Data Availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Disclosure

The funders had no role in study design, data collection, and analysis, decision to publish, or preparation of the manuscript.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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