Association Between Service Scope of Primary Care Facilities and Patient Outcomes: A Retrospective Study in China

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Abstract

Background: Extending the service scope of primary care facilities (PCFs) has been widely concerned in China. However, no current data about the association between service scope of PCFs with patient outcomes are available. This study aims to investigate the association between service scope of PCFs and patient outcomes.

Methods: We first sampled four counties randomly from rural Guizhou, China. Claim data of 299,633 inpatient cases covered by 64 PCFs were derived from the local information system of New Rural Cooperation Medical Scheme. The service scope of PCFs was collected with self-administrated questionnaires. Primary outcomes were 1) level of inpatient institutions, 2) length of stay, 3) per capita total health cost, 4) per capita out-of-pocket cost, 5) reimbursement ratio, 6) 30-day readmission. A total of 64 PCFs were categorized into five groups per facility-level service scope scores. Generalized linear regression models, logistic regression model, and ordered regression model were conducted to identify the association between service scope of PCFs and patient outcomes.

Results: On average, the median service scope score of PCFs was 20, with wide variation across PCFs. After controlling for demographic and clinical characteristics, patients living in communities with PCFs of greatest service scope (Quintile V vs. I) tended to have smaller rates of admission by county-level hospitals (-6.2% [-6.5%, -5.9%], city-level hospitals (-1.9% [-2.0%, -1.8%]), and provincial hospitals (-2.1% [-2.2%, -2.0%]), smaller rate of 30-day readmission (-0.5% [-0.7%, -0.3%]), less total health cost (-201.8 [-257.9, -145.8]) and out-of-pocket cost (-210.2 [-237.2, -183.2]), and greater reimbursement ratio (2.3% [1.9%, 2.8%]) than their counterparts from communities with PCFs of least service scope.

Conclusion: The service scope of PCFs varied a lot in rural Guizhou, China. PCFs' greater service scope was associated with a reduction in secondary and tertiary hospital admission, reduced total cost and out-of-pocket cost, and 30-day readmission and increased reimbursement ratio. These results raised concerns about access to care for patients discharged from hospitals, which suggests potential opportunities for cost savings and improvement of quality of care. However, further evidence is warranted to investigate whether extending the service scope of PCFs is cost-effective and sustainable.

Background

Worldwide, to meet the health needs of the ageing population and increasing non-chronic disease burden, strengthening the capacity of primary care systems by extending the service scope of primary care facilities (PCFs) or hospitals in rural areas has been widely concerned [1-3]. One previous study pointed out that reform on the healthcare delivery system might be a more productive solution to promote healthcare services' appropriate use [4]. Historical studies have revealed that comprehensiveness of care which is provided by primary care physicians was associated with reduced medical expenditures, hospitalizations and emergency department visits [5], so does the service scope of family physicians [6]. Meanwhile, access to after-hour services, patient-centered medical home services, urgent care centers and

walk-in care could also lead to less utilization of inpatient services and unnecessary emergency department visits [7, 8]. Loosening restrictions on the practice of service scope by the registered nurse could also promote more significant cost savings than retail clinics did [9]. Conversely, the closure of hospital-based obstetric services in rural counties among the United States (US) has increased rates of out-of-hospital and preterm births, and births in hospitals without obstetric units [10]. Also, the scope of primary care physicians varied a lot by health insurance schemes [11].

In China, previous studies have focused on the determinants of service scope of PCFs. Ineffective incentives, insufficient reimbursement by the health insurance schemes have caused the closure of surgical care and obstetric care in rural facilities [12, 13]. Narrowed scope of practice of primary care facilities in China has been well documented [12, 13]. However, these studies have concentrated on the outcome evaluation of implementing different payment methods on the service quality, utilization of inpatient services by different level hospitals, length of stay, cost, and other patient outcomes [14-16]. Studies from the perspective of healthcare service delivery system remain scarce. Historic reforms and substantial investments have been tried to establish a more effective financial and administrative incentive system to promote primary care services provision and utilization, but the scope of primary care services in China is disproportionally distributed. Preventive and public health services have been widely implemented among the PCFs [17]. However, scope of medical care services geographically varied a lot [18, 19], especially community-based mental health services and hospice care services [18, 20]. The health care system remains fragmented and uncoordinated [2, 21], which would mean unnecessary hospitalization and other undesirable treatments provided by urban hospitals and underutilized primary care services regarding curative, rehabilitative and hospice care [20, 22].

Facing these pressures, favorable policies, such as the gatekeeping and home care services to address long-term care needs, have been introduced to strengthen the primary health care system [23], thus building a patient-centric integrated healthcare system [2]. Meanwhile, loosening restrictions on the nurse practitioners' scope-of-practices has been piloted to meet the shortages of primary care physicians [24]. Expanding the role for the primary care system and aligning the incentives has also been advocated to achieve cost-effective, high-quality care [2, 23]. However, international experiences showed that these policies would often be criticized for their potential to place inappropriate restrictions and expectations on healthcare providers [1]. Moreover, to which extend it will reduce unnecessary inpatient hospital utilization by high-level hospitals, and promote cost-savings that have not been analyzed empirically, which are significant to improve the cost-effectiveness of intervention programs for strengthening the primary care delivery system. Therefore, this study aims to investigate the association between service scope of PCFs and utilization of inpatient services, quality of care and its cost.

Method

Study design and data collection

We first randomly selected two cities from Guizhou, China per level of economic development; we then selected two counties from each city (Sinan counties and Jiangkou counties from Tongren city, Meitan counties and Yuqing counties from Zunyi city) per the same principle (Appendix Table 1) [18]. Claim data of 299,633 inpatient cases covered by 64 PCFs was derived from the local information system of New Rural Cooperation Medical Scheme, which is generally purchased by residents living in the rural China. The service scope of PCFs was collected by a web-based survey with self-administrated questionnaires under the coordination of chief or deputy chief of each facility.

Outcome variable

Primary outcomes were 1) level of inpatient institutions (1 = primary care facilities, 2 = county-level hospitals, 3 = city-level hospitals, 4 = provincial hospitals), 2) length of stay, 3) per capita total health cost, 4) per capita out-of-pocket cost, 5) reimbursement ratio, 6) 30-day readmission [14-16].

Independent variable

Per our previous study, the independent variable of this study was the facility-level service scope divided into preventive and public health services, and basic medical care services. The service scope score was calculated per cumulative service scope by PCFs, ranging from 1 to 32 [18].

Control variables

In this study, covariates were age group, gender, poverty or not, Critical Illness Insurance or not, referral, per capita total cost to represent the severity of the disease; We used the length of stay to represent the severity of the disease when outcome variables were costs-related indicators [14-16, 25]. Per capita total health cost was used as a covariate as illness severity with different regression models.

Statistical analysis

A total of 64 PCFs was categorized into five groups per facility-level service scope. Chi-squared tests and Fisher's exact tests, independent t-tests were used to compare patient outcomes between PCFs within different groups; the Kruskal-Wallis tests followed by Dunn's pairwise comparison were used to estimate the differences between different groups when the outcomes variables are not normally distributed. Given that cost data were skewed distributed, generalized models with a gamma distribution and log link function were used to estimate the marginal associations between the service scope of PCFs and patient outcomes. An ordinary logit model was conducted to estimate the association between service scope of PCFs and patients' choice of inpatient institutions with different levels. For the outcome variable of 30-day readmission, ordinary logistic regression was used. Multicollinearity between various variables was assessed with the variance inflation factor (VIF > 10). In this study, VIFs of all regression models are both

less than 2. All procedures were conducted with Stata 14.0. $P < 0.05$ was set to indicate statistical significance.

Results

Basic characteristic

As shown in the Table 1, a total of 299,633 inpatient cases occurred in four counties in 2017; more than 20% of inpatient cases are the elderly. Nearly 60% of inpatient cases are female; 13.6% of inpatient cases are under poverty status. A total 6.2% of inpatient cases are covered by Critical Illness Insurance. Differences on the age ($\chi^2 = 770.6$, $P < 0.001$), gender ($\chi^2 = 130.0$, $P < 0.001$), poverty status ($\chi^2 = 725.1$, $P < 0.001$), referral or not ($\chi^2 = 542.3$, $P < 0.001$), and Critical Illness Insurance ($\chi^2 = 20.0$, $P < 0.001$) are statistically significant.

As shown in Table 2, A total of 12.0% of inpatient cases occurred in the city-level or provincial hospitals; 3.7% of inpatient patients were readmitted within 30 days, the median of length of stay was 6 days, per capital total cost was 1,873.1 Chinese Yuan, per capita out-of-pocket cost was 663.8 Chinese Yuan within a reimbursement ratio of 63.6%. Differences on the level of inpatient institution ($\chi^2 =5600.0$, $P < 0.001$), readmission in 30 days ($\chi^2 = 65.7$, $P < 0.001$), length of stay ($U = 535.9$, $P < 0.001$), per capita total cost ($U = 1,202.3$, $P < 0.001$), per capita out-of-pocket cost ($U = 1,756.8$, $P < 0.001$), reimbursement ratio ($U = 1,720.4$, $P < 0.001$) between different groups of service scope are statistically significant. Detailed service scope of sample primary care facilities was shown in the Appendix Table 2. Basic characteristics and patient outcomes of enrolled patients by counties are shown in Appendix Table 3 and Appendix Table 4.

Association between service scope of primary care facilities and patient outcome

As shown in Table 3, after controlling demographic and clinical covariates, patients living in the communities with the PCFs of greatest service scope were less likely to be admitted into the county-level hospitals (Quantile 5 vs. Quantile 1: Marginal difference[95% CI]: -6.19% [-6.49%, -5.89%]), city-level hospitals (Quantile 5 vs. Quantile 1: Marginal difference[95% CI]: -1.88% [-1.97%, -1.78%]) and provincial hospital (Quantile 5 vs. Quantile 1: Marginal difference[95% CI]: -2.11% [-2.22%, -2.00%]) than their counterparts living in the communities with facilities of least service scope. As shown in Table 4, after controlling other covariates, patients living in the communities with facilities of greatest service scope were less likely to be re-admitted within 30 days (Quantile 5 vs. Quantile 1: Marginal difference [95% CI]: -0.52% [-0.72%, -0.33%]) with an equal length of stay (Quantile 5 vs. Quantile 1: Marginal difference [95% CI]: -0.02 [-0.16, 0.11]) than their counterparts living in the communities with facilities of least service scope. Meanwhile, patients living in the communities with facilities of greatest service scope spent less both in the total cost (Quantile 5 vs. Quantile 1: Marginal difference [95% CI]: -201.8 [-257.9, -145.8]) and out-of-pocket cost (Quantile 5 vs. Quantile 1: Marginal difference [95% CI]: -210.2 [-237.3, -183.2]), and

had a greater reimbursement ratio (Quantile 5 vs. Quantile 1: Marginal difference [95% CI]: 2.3% [1.9%, 2.8%]) than their counterparts living in the communities with PCFs of least service scope.

Discussion

To the best of our knowledge, this study is the first study to examine the association between the service scope of PCFs and patient outcomes in China. Understanding marginal changes in the patient outcomes associated with the service scope of PCFs might inform policymakers on how to strengthen the current primary care system and develop tailored and feasible interventions more effectively. PCFs' service scope in rural Guizhou, China geographically varied a lot, which is consistent with the national level reported by one previous study [18]. This study also revealed significant geographic disparities in inpatient services utilization, quality of care and cost, indicating potential benefits to strengthening the current primary care system.

First, patients living in the communities with facilities with greater service scope were more likely to be admitted into the PCFs. It may be related to improved accessibility to care provided by PCFs for patients with common illness or continuity of care discharged from high-level hospitals [26]. These results might also be caused by a greater reimbursement ratio for inpatient services provided by PCFs than high-level hospitals, which are more attractive to low-income residents [12,13]. These results are similar to findings of one previous study in the US that expanded service scope of nurse practitioners could reduce unnecessary utilization of hospitalization [5], and comprehensive care by family practitioners is associated with reduced utilization of services and decreased cost [6].

Second, a total of 3.2% of patients were re-admitted in 30 days. This result is similar to findings (3.3%) of one previous study in a county from rural Guizhou [27]. Our results indicated that the greater service scope of PCFs is associated with lower 30-day readmission rates. It would mean that improved service scope of PCFs is associated with increased quality of care. Meanwhile, smaller service of scope by PCFs might lead to a greater 30-day readmission rate due to limited diagnosis capacity. One previous study also pointed out that the educational intervention programs could improve the quality of care for child upper respiratory tract infections in resource-poor settings [28]. Expansion of telehealth for stroke services could also improve the quality of care provided in super rural areas [29]. Meanwhile, nurse practitioners could provide health care services with comparable quality of care with an even lower cost when nurse practitioners practiced independently [9]. Even the effect of removing restrictive scope-of-practice laws on the primary care workforce's capacity was modestly in the short run [30], regulation restricting scope-of-practice for nurse practitioners does not improve quality of care [30]. These experiences remind us in the rural and remote areas, extending the scope of PCFs could be started from education and training of primary care providers, innovative healthcare delivery initiatives, and eliminating scope-of-practice policies and laws, thus mitigating the shortage of primary care physicians.

Third, we also found that PCFs' greater service scope could also reduce per capita total cost and per capita out-of-pocket cost and increased reimbursement ratio. It might be related to the fact that the

hospitals' fee-for-service payment system would incentive testing and treatment [23]. This result is consistent with findings of one previous study that healthcare provided by the retail clinic was associated with a lower cost of per episode [9]. These results might also lead to greater satisfaction among residents [31]. Meanwhile, the autonomy of primary care practitioners is also associated with their satisfaction and intention to stay in their jobs [32]. These findings indicate that it is urgent to change patient's preference for inpatient services both from the availability and affordability of services provided by PCFs in rural China, thus inducing utilization of services provided by PCFs [33]. However, the transition to innovative care initiatives, such as patient-centered medical homes, is challenging for small facilities, which raises concerns about the appropriateness of the scope of practice expected from the primary care providers and calls for external supports, such as practice design, payment reform [34].

Limitation

This study has several limitations. First, self-reported service scope may be subject to social desirability bias. Second, Guizhou is a less developed province in China, which indicates that the current findings might be limited in those areas with similar resource-limited settings. Third, we could not make the causal inference based on the cross-sectional study, and future studies should conduct intervention trials to determine whether expanding the scope of primary care practice could increase utilization of primary care services, improve quality of care and achieve the goal of cost-savings or not. In addition, areas for future research include cost-effectiveness analysis of strengthening the service scope of PCFs with long-term health outcomes.

Conclusion

This study revealed the association between the service scope of PCFs and patient outcomes in rural China. These findings demonstrate the potential to increase utilization of primary care services, quality of care and cost-savings by extending the service scope of PCFs. To effectively meet primary care needs in rural China, policymakers and healthcare providers should appropriately enact more tailored support for rural physician practices.

Declarations

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Authors' Contribution

Zhong Li, Meng Shi, Boyang Li, and Liang Zhang designed this study; Liang Zhang coordinated with the local department of health to obtain their support, Liang Zhang supervised the data collection and quality control; Zhong Li and Meng Shi analyzed the data and interpreted the results, Zhong Li and Meng Shi drafted the manuscript; Mei Zhang, Chi Zhang, Xinyu Xiong, Liang Zhang; Ruibo He, Boyang Li critically revised the manuscript. All authors read and approved the final manuscript.

Abbreviations

Primary care facilities, PCF;

Variation inflation factor, VIF;

United States, US.

Conflict of interest

We declared no conflict of interest.

Ethics approval and Informed Consent

The study was approved by the ethics committee of Tongji Medical College, Huazhong University of Science and Technology (No: IORG0003571). Informed consent was obtained from the medical staff enrolled in the survey.

Availability of data and material

All the research data is available from the corresponding author upon reasonable request.

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Tables

Table 1. Basic characteristic of enrolled patients by facilities grouped by service scope, 2017

Variables	Service scope						χ^2	P
	Overall	Quantile 1	Quantile 2	Quantile 3	Quantile 4	Quantile 5		
Variables	299,633 (100.0)	58,636 (19.6)	50,539 (16.9)	81,332 (27.1)	39,637 (13.2)	69,489 (23.2)		
Age group							770.6	**< 0.001**
< 18	56,322 (18.8)	10,616 (18.1)	8,681 (17.2)	15,425 (19.0)	6,616 (16.7)	14,984 (21.6)		
18-29	33,030 (11.0)	6,415 (10.9)	5,362 (10.6)	9,341 (11.5)	4,356 (11.0)	7,556 (10.9)		
30-44	49,123 (16.4)	10,099 (17.2)	8,425 (16.7)	13,255 (16.3)	6,381 (16.1)	10,963 (15.8)		
45-64	92,353 (30.8)	18,578 (31.7)	16,319 (32.3)	24,969 (30.7)	12,571 (31.7)	19,916 (28.7)		
> 64	68,805 (23.0)	12,928 (22.0)	11,752 (23.3)	18,342 (22.6)	9,713 (24.5)	16,070 (23.1)		
Gender (%)							130.0	**< 0.001**
□	125,103 (41.8)	23,564 (40.2)	20,889 (41.3)	33,850 (41.6)	16,764 (42.3)	30,036 (43.2)		
□	174,530 (58.3)	35,072 (59.8)	29,650 (58.7)	47,482 (58.4)	22,873 (57.7)	39,453 (56.8)		
Poverty (%)							725.1	**< 0.001**
Yes	40,696 (13.6)	9,528 (16.2)	5,427 (10.7)	10,705 (13.2)	5,332 (13.5)	9,704 (14.0)		
No	258,937 (86.4)	49,108 (83.8)	45,112 (89.3)	70,627 (86.8)	34,305 (86.5)	59,785 (86.0)		
Referral (%)							542.3	**< 0.001**
Yes	18,424 (6.2)	4,815 (8.2)	2,948 (5.8)	4,588 (5.6)	2,231 (5.6)	3,842 (5.5)		
No	281,209 (93.9)	53,821 (91.8)	47,591 (94.2)	76,744 (94.4)	37,406 (94.4)	65,647 (94.5)		
Critical Illness Insurance (%)							20.0	**< 0.001**

Yes	18,551 (6.2)	3,444 (5.9)	3,058 (6.1)	5,145 (6.3)	2,452 (6.2)	4,452 (6.4)
No	281,082 (93.8)	55,192 (94.1)	47,481 (93.9)	76,187 (93.7)	37,185 (93.8)	65,037 (93.6)

Note: Age group: 1 < 2, $\chi2$ = 41.4, P < 0.001; 1< 3, $\chi2$ = 54.5, P < 0.001; 1 < 4, $\chi2$ =106.8, P < 0.001; 1< 5, $\chi2$ = 344.0, P < 0.001; 2 < 3, $\chi2$ = 110.5, P < 0.001; 2 < 4, $\chi2$ = 27.4, P < 0.001; 2 < 5, $\chi2$ = 430.0, P < 0.001; 3 < 4, $\chi2$ = 134.8, P < 0.001; 3 < 5, $\chi2$ = 202.0, P < 0.001; 4 < 5, $\chi2$ = 404.0, P <0.001. Gender: 1 < 2, $\chi2$ = 14.8, P < 0.001; 1< 3, $\chi2$ = 14.8, P < 0.001; 1 < 4, $\chi2$ = 43.4, P < 0.001; 1< 5, $\chi2$ = 120.6, P < 0.001; 2 < 4, $\chi2$ = 8.4, P = 0.004; 2 < 5, $\chi2$ = 42.9, P < 0.001; 3 < 5, $\chi2$ = 5.0, P = 0.026; 4 < 5, $\chi2$ = 8.9, P = 0.003. Poverty: 1 < 2, $\chi2$ = 697.4, P < 0.001; 1< 3, $\chi2$ = 262.6, P < 0.001; 1 < 4, $\chi2$ = 144.2, P < 0.001; 1< 5, $\chi2$ = 130.1, P < 0.001; 2 < 3, $\chi2$ = 170.6, P < 0.001; 2 < 4,$\chi2$ = 155.7, P < 0.001; 2 < 5,$\chi2$ = 276.5, P < 0.001; 3 < 4, $\chi2$ = 134.8, P < 0.001; 3 < 5, $\chi2$ = 20.6, P < 0.00; 4 < 5, $\chi2$ = 5.6, P = 0.018. Referral: 1 < 2, $\chi2$ =232.5, P < 0.001; 1 < 3, $\chi2$ =359.3, P < 0.001; 1 < 4, $\chi2$ =363.3, P < 0.001; 2 < 5, $\chi2$ =363.3, P = 0.024; Critical Illness Insurance: 1 < 3, $\chi2$ = 12.1, P < 0.001; 1 < 4, $\chi2$ = 4.1, P < 0.043; 1 < 5, $\chi2$ = 15.6, P < 0.001; 2 < 3, $\chi2$ = 4.0, P < 0.044; 2 < 5, $\chi2$ = 6.3, P < 0.012.

Table 2. Patient outcomes of enrolled patients by facilities grouped by service scope, 2017

Variables	Service scope					U/χ^2	P
	Quantile 1	Quantile 2	Quantile 3	Quantile 4	Quantile 5		
Level of inpatient institution%							
Township-level	17,546 (29.9)	14,757 (29.2)	24,244 (29.8)	12,757 (32.2)	29,884 (43.0)	5600.0	< 0.001
County-level	34,083 (58.1)	31,065 (61.5)	48,864 (60.1)	22,919 (57.8)	31,335 (45.1)		
Prefecture-level	4,141 (7.1)	1,937 (3.8)	3,763 (4.6)	1,775 (4.5)	4,410 (6.3)		
Provincial	2,866 (4.9)	2,780 (5.5)	4,461 (5.5)	2,186 (5.5)	3,860 (5.6)		
Readmission in 30 days							
Yes	2,193 (3.7)	1,613 (3.2)	2,441 (3.0)	1,297 (3.3)	2,163 (3.1)	65.7	< 0.001
No	56,443 (96.3)	48,926 (96.8)	78,891 (97.0)	38,340 (96.7)	67,326 (96.9)		
Length of stay (Median, [p25, p75])	6 (4, 8)	5 (3, 8)	6 (4, 8)	5 (4, 8)	6 (4, 8)	535.9	< 0.001
Length of stay (Mean± SD)	7.8 ± 13.7	7.3 ± 14.0	7.3 ± 11.7	7.4 ± 12.2	7.8 ± 12.9		
Per capita total cost (In Chinese Yuan)	1,873.1 (1066.0, 3,754.1)	1,652.5 (892.5, 3,344.7)	1617.5 (857.0, 3,388.8)	1,610.4 (869.5, 3,311.8)	1,684.5 (920.2, 3,460.5)	1,202.3	< 0.001
Per capita out-of-pocket cost (In Chinese Yuan)	663.8 (317.4, 1,330.8)	559.7 (231.0, 1,177.7)	540.7 (217.3, 1,169.9)	534.7 (221.4, 1,153)	545.9 (227, 1,144.5)	1,756.8	< 0.001
Reimbursement ratio (%)	63.6 ± 17.9	66.1 ± 39.0	66.8 ± 64.8	66.6 ± 21.2	66.6 ± 21.2	1,720.4	< 0.001

Note: Level of inpatient institution (%): 1 < 2, χ^2 = 583.8, P < 0.001; 1< 3, χ^2 = 403.2, P < 0.001; 1 < 4, χ^2 = 320.0, P < 0.001; 1< 5, χ^2 = 2600.0, P < 0.001; 2 < 3, χ^2 = 59.3, P < 0.001; 2 < 4, χ^2 = 136.7, P < 0.001; 2 < 5, χ^2 = 3400.0, P < 0.001; 3 < 4, χ^2 = 73.4, P < 0.001; 3 < 5, χ^2 = 3600.0, P < 0.00; 4 < 5, χ^2 = 1700.0, P <0.001. Readmission in 30 days: 1 < 2, χ^2 =24.3, P < 0.001; 1< 3, χ^2 = 58.1, P < 0.001; 1 < 4, χ^2 =15.1, P < 0.001; 1< 5, χ^2 =38.1, P < 0.001; 3 < 4, χ^2 =6.5, P = 0.011. Length of stay (Median, [p25, p75]): 1 > 2: U = 7.6, P <

0.001; 1 > 4: U = 2.7, P = 0.004; 1 < 5, U = -14.1, P < 0.001; 2 <3, U = -6.9, P < 0.001; 2 < 4, U = - 4.3, P < 0.001; 2 < 5, U = -21.3, P < 0.001; 3 > 4, U = 1.72, P = 0.043; 3 < 5, U = 16.6, P = 0.001; 4 < 5, U=-15.3, P < 0.001. Per capita total cost (In Chinese Yuan): 1 > 2: U = 25.2, P < 0.001; 1 > 3: U = 31.1 P < 0.001; 1 > 4: U = 26.8, P < 0.001; 1 > 5: U = 21.1, P < 0.001; 2 > 3: U = 2.76, P = 0.003; 2 > 4: U = 3.2, P < 0.001; 2 < 5: U = -5.84, P < 0.001; 3 < 5: U = -9.63, P < 0.001; 4 < 5: U = -8.8, P < 0.001. Per capita out-of-pocket cost (In Chinese Yuan): 1 > 2: U = 28.6, P < 0.001; 1 > 3: U =36.9, P < 0.001; 1 > 4: U =31.4, P < 0.001; 1 > 5: U = 33.4, P < 0.001; 2 > 3: U = 4.6, P < 0.001; 2 > 4: U = 4.6, P < 0.001; 2 > 5: U = 33.4, P = 0.009; 3 < 5: U = -2.4, P = 0.009; 4 < 5: U = -2.7, P = 0.003. Reimbursement ratio (%): 1 < 2: U = -22.3, P < 0.001; 1 < 3: U = -33.9, P < 0.001; 1 < 4: U = -27.5, P < 0.001; 1 < 5: U = -37.9, P < 0.001; 2 < 3, U = -8.5, P < 0.001; 2< 4, U = -6.5, P < 0.001; 2 < 5, U=-5.6, P < 0.001; 3 < 5, U = -5.6, P < 0.001; 4 < 5, U = -5.3, P < 0.001.

Table 3. Marginal differences of facility-level service scope on patients' choice on the level of inpatient institution, 2017

Variables	Level of inpatient institution	
	Marginal differences (%) (95% CI)	
Quantile 2 vs. Quantile 1)	Township-level	0.78 (0.29, 1.27)
Quantile 3 vs. Quantile 1)		0.86 (0.42, 1.29)
Quantile 4 vs. Quantile 1)		2.59 (2.05, 3.12)
Quantile 5 vs. Quantile 1)		**10.18 (9.70, 10.67)**
Quantile 2 vs. Quantile 1)	County-level	-0.40 (-0.64, -0.15)
Quantile 3 vs. Quantile 1)		-0.44 (-0.66, -0.21)
Quantile 4 vs. Quantile 1)		-1.38 (-1.66, -1.09)
Quantile 5 vs. Quantile 1)		**-6.19 (-6.49, -5.89)**
Quantile 2 vs. Quantile 1)	Prefecture-level	-0.18 (-0.29, -0.06)
Quantile 3 vs. Quantile 1)		-0.19 (-0.29, -0.09)
Quantile 4 vs. Quantile 1)		-0.56 (-0.67, -0.44)
Quantile 5 vs. Quantile 1)		**-1.88 (-1.97, -1.78)**
Quantile 2 vs. Quantile 1)	Provincial	-0.21 (-0.34, -0.08)
Quantile 3 vs. Quantile 1)		-0.23 (-0.34, -0.11)
Quantile 4 vs. Quantile 1)		-0.65 (-0.78, -0.52)
Quantile 5 vs. Quantile 1)		**-2.11 (-2.22, -2.00)**

Note: age group, gender, poverty, referral, Critical Illness Insurance and total cost were set as covariates.

Table 4. Marginal differences of facility-level service scope on patients' 30-days readmission, cost, length of stay and reimbursement ratio, 2017

Variables	30-days readmission*	Length of stay*	Per capita total cost**	Per capita total out-of-pocket cost**	Reimbursement ratio **
	Marginal differences (%) 95% CI				
Quantile 2(vs. Quantile 1)	-0.36 (-0.58, -0.15)	-0.08 -0.22, 0.07)	-279.2 -339.1, -219.3)	-137.8-167.3, -108.3)	1.81.3, 2.2)
Quantile 3(vs. Quantile 1)	-0.61 (-0.80, -0.42)	-0.44 -0.57, -0.31)	-295.7 -349.4, -241.9)	-188.7-215.0, -162.3)	2.52.1, 2.9)
Quantile 4(vs. Quantile 1)	-0.38 (-0.61, -0.15)	-0.46 -0.61, -0.31)	-322.7 -386.1, -259.3)	-190.6 -221.6,-159.7)	2.31.8, 2.8)
Quantile 5(vs. Quantile 1)	**-0.52 (-0.72, -0.33)**	-0.02 -0.16, 0.11)	-201.8 -257.9, -145.8)	-210.2 -237.3,-183.2)	2.31.9, 2.8)

Note: *age group, gender, poverty, referral, Critical Illness Insurance and total cost were set as covariates; ** age group, gender, poverty, referral, Critical Illness Insurance and length of stay were set as covariates.

Supplementary Files

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- AppendixTables.docx