The effect of pairing assistance under medical alliance policy on healthcare utilization for patients with chronic diseases in rural China

Haoqing Tang[1], Mingyue Li[1], He Zhu[2], Xiaoran Cheng[1], and Xiaoyun Liu[2]

[1]Peking University School of Public Health Department of Health Policy and Management
[2]Peking University

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Abstract

Pairing assistance (PA) of health professionals between county hospitals and township health centers is one of the key components of the reform of medical alliances in China to strengthen the development of health workforce in primary health care (PHC). This study aims to examine the effect of PA on healthcare utilization for patients with chronic diseases in rural areas. Two waves of National Health Services Survey (2013 and 2018) were used. A total of 13893 and 22725 rural residents with chronic diseases were included in the 2013 and 2018 waves, respectively. Multiple logistic regressions were used to examine the associations between PA and outpatient and inpatient service utilization in PHC. Chow test was used to examine the difference between PA in two models. Among rural patients with chronic diseases, two-week outpatient visits increased from 22.69% to 27.54%, and annual hospitalization admission increased from 20.72% in 2013 to 25.44%. PA was associated with a significant decrease in outpatient visits (p<0.001) in 2018 after controlling for individual and county characteristics. Patients in PA counties were 1.45 times (95% CI 1.10-1.90) more likely to use PHC outpatient care in 2013, but the difference disappeared in 2018 (OR=0.85, 95% CI 0.71-1.01). PA did not reverse the downward trend in the share of PHC outpatient visits. PA under medical alliances in China provides a potential model for building integrated people-centered health systems for other low- and middle-income countries.

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Corresponding author:

He Zhu; China Center for Health Development Studies, Peking University, 38 Xueyuan Road, Haidian District, Beijing, 100191, P. R. China; Email:

he.zhu@pku.edu.cn

Each authors affiliation and qualification

Mingyue Li (**First author**)

Affiliation: Department of Health Policy and Management, School of Public Health, Peking University, Beijing, China; China Center for Health Development Studies, Peking University, Beijing, China. Email: *mingyueli@pku.edu.cn*

He Zhu (**corresponding author**)

Affiliation: China Center for Health Development Studies, Peking University, Beijing, China. Email: he.zhu@pku.edu.cn

Haoqing Tang

Affiliation: Department of Health Policy and Management, School of Public Health, Peking University, Beijing, China; China Center for Health Development Studies, Peking University, Beijing, China.*Email:* haoqingtang@stu.pku.edu.cn

Xiaoran Cheng

Affiliation: Department of Health Policy and Management, School of Public Health, Peking University, Beijing, China; China Center for Health Development Studies, Peking University, Beijing, China.*Email:* shawnchan0113@163.com

Xiaoyun Liu

Affiliation: China Center for Health Development Studies, Peking University, Beijing, China.*Email:* xiaoyunliu@pku.edu.cn

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Abstract

Pairing assistance (PA) of health professionals between county hospitals and township health centers is one of the key components of the reform of medical alliances in China to strengthen the development of health workforce in primary health care (PHC). This study aims to examine the effect of PA on healthcare utilization for patients with chronic diseases in rural areas. Two waves of National Health Services Survey (2013 and 2018) were used. A total of 13893 and 22725 rural residents with chronic diseases were included in the 2013 and 2018 waves, respectively. Multiple logistic regressions were used to examine the associations between PA and outpatient and inpatient service utilization in PHC. Chow test was used to examine the difference between PA in two models. Among rural patients with chronic diseases, two-week outpatient visits increased from 22.69% to 27.54%, and annual hospitalization admission increased from 20.72% in 2013 to 25.44%. PA was associated with a significant decrease in outpatient visits (p<0.001) in 2018 after controlling for individual and county characteristics. Patients in PA counties were 1.45 times (95% CI 1.10-1.90) more likely to use PHC outpatient care in 2013, but the difference disappeared in 2018 (OR=0.85, 95% CI 0.71-1.01). PA did not reverse the downward trend in the share of PHC outpatient visits. PA under medical alliances in China provides a potential model for building integrated people-centered health systems for other low- and middle-income countries.

Key words: pairing assistance, medical alliance, health care utilization, chronic disease

Introduction

Primary health care (PHC) is the cornerstone of any health system and a catalyst for achieving Sustainable Development Goals (SDGs) and Universal Health Coverage (UHC)[1][2]. The availability of qualified primary care healthcare workers is a key step in improving PHC. Many countries have implemented interventions to address the lack of health workers in primary care settings, especially in rural and remote areas [3]. China's reform of the health system continued to invest efforts in PHC (in 2009, China launched a huge and complex health reform to provide equal access and eliminate financial risk for all residents) [4]. However, challenges

remain for PHC. The share of outpatient visits in PHC facilities decreased from 71% in 2005 to 57% in 2018[5].

To enhance the capacity of PHC facilities in rural areas and respond to fragmentation of care throughout the health system, China issued guidelines for building a hierarchical health system in which different levels of hospitals would provide care according to designated scopes in 2015 and the government encouraged counties to explore medical alliances in various forms [6]. Pairing up physicians to PHC facilities (mainly township health centers) is one of the major and common strategies in different medical alliances to provide care and guide PHC doctors to improve their ability [7]. The pairing of doctors has been a strategy for staffing the health workforce in rural areas [3, 8]. Currently, pairing doctors is given priority in salary and promotion as incentives[9]. Medical alliances are the most important initiative to operationalize a hierarchical health delivery system so that PHC facilities can be supported and improved and care across levels of hospitals can be coordinated and integrated. Currently, a tight medical alliance that shares unified responsibilities, resources, risks, and economic interests has become the policy direction. Under the medical alliance, township health centers and village clinics can pair up with county hospitals and receive support and training. To date, progress in promoting unified administrative management, such as drugs and consumables, procurement, and payment, still varies greatly in different regions[10].

Pairing up with county hospitals is expected to improve PHC facilities and benefit patients through several channels. First, pairing assistance can increase the supply of rural health workers, which could temporarily relieve the shortage of rural health workers [11]. Second, the pairing assistance can improve the capacity of the rural health workforce, which will improve PHC in the long run and increase the utilization of PHC [12]. Third, for patients, pairing assistance can help them enjoy high-quality care in PHC facilities, shorter travel costs, and fewer payments.

Despite the nationwide implementation of medical alliances, little is known about the actual effect of pairing up with county hospitals to rural PHC facilities. This study aims to examine the effect of partnership with county hospitals on the utilization of healthcare for chronic disease patients in rural areas in the context of the construction of medical alliances throughout the country.

Materials and methods

Data source and study sample

Data came from the 2013 and 2018 National Health Services Survey (NHSS) waves in China[13, 14]. The NHSS is a nationally representative sample conducted every five years by the Center for Health Statistics and Information, National Health Commission of China. The NHSS covers 31 provinces/autonomous regions/ municipalities and adopts a multistage cluster random sampling method to ensure representativeness for different regions and the whole country. The NHSS is the largest comprehensive investigation of information on operational characteristics of county hospitals and PHC facilities (i.e., township health centers and village clinics) and on health status, healthcare need and demand, healthcare utilization, and financial burden of healthcare services in China. In 2013 and 2018, the NHSS sampled 156 counties with two county hospitals and five township health centers in each county, respectively. The NHSS received ethical approval from the National Statistics Bureau of China[15].

In this study, we focus on a subsample of patients with chronic diseases aged 15 or older in rural areas from the 2013 and 2018 NHSS waves. People who answered yes to at least one of the following three questions were defined as having a chronic disease: 1) Have you been diagnosed hypertension? 2) Have you been diagnosed with diabetes mellitus? 3) Do you have other diagnosed chronic diseases? Rural patients were identified by hukou status (i.e., the Chinese household registration method). We excluded counties that did not match between the 2013 and 2018 waves because their status of pairing assistance cannot be identified. People under 15 years of age were excluded to reduce the heterogeneity of the sample. We also dropped observations with missing values in important variables. Finally, the study sample included 13893 and 22725 patients with chronic diseases in rural areas who lived in the sampling counties in 2013 and 2018, respectively.

Study variables

Outcomes

We adopted three outcome variables for healthcare utilization that are widely used in China's context and in accordance with the existing literature, including outpatient visit, inpatient admission, outpatient visit in PHC facilities, and hospital admission within counties.

First, outpatient visit was defined as seeing a doctor in the last two weeks, which was based on the question in the survey "Have you seen a doctor in a clinic or a hospital outpatient department due to illness in the past two weeks before the survey?".

Second, inpatient admission was defined as receiving inpatient care in the past year, which was based on the question "Have you been hospitalized due to illness, physical examination, delivery, and other reasons in the past year before the survey?".

Third, outpatient visit in PHC facilities was based on the question "Where was your first visit in the past two weeks before the survey?"

Lastly, hospital admission inside counties was based on the question "Where were you admitted to?", and those who answered "my county" were recognized.

Independent variable

Our main independent variable was the status of pairing assistance (PA) of a county. We assigned a dichotomous variable for all people that denoted whether they are in a PA county or not. If a county hospital sent more than 30% (>30%) of its practicing physicians to paired-up PHC facilities within the medical alliance, this country was coded as having PA. If a count-level hospital report that there is no establishment of a medical alliance or send 30% or less ([?]30%) of its practicing physicians to its medical alliance, this county was coded as having no pairing assistance (NPA). The medical alliance policy was gradually implemented in different regions, so some counties were still in the process of building alliance when the NHSS survey started in 2018. The distribution of the PA proportion was highly skewed, and thus we used a considerable proportion of doctors to define PA county that represented the county has built a relatively more stable PA mechanism within their medical alliances. It should be noted that the medical alliance was launched between 2013 and 2018, but due to data constraints, the definition of PA was generated from the NHSS 2018 wave.

Covariates

The covariates included characteristics at the individual and county level. Individual-level characteristics included age group (15-34, 35-59, [?]60 years old), gender (male, female), marital status (married, unmarried), educational level (primary school or below, junior middle school, senior middle school, college degree or above), annual household income, self-rated health (very poor, poor, fair, good, very good), diabetes mellitus (yes, no), hypertension (yes, no), and health insurance (yes, no). County-level characteristics included population size, county gross domestic product (GDP), and health human resources (ratio of physicians with bachelor's degree or higher in the total number of licensed physicians). We selected these covariates to include relevant sociodemographic, health status and health system characteristics that may confound or mediate the relationship between PA and healthcare utilization.

Data analysis

We first used descriptive analysis to describe the characteristics of the study sample. Then multiple logistic regressions were used to examine the associations of PA with outpatient visit, inpatient admission, outpatient visit in PHC facilities and inpatient admission inside counties. Individual and county characteristics were controlled. Lastly, we compared PA estimates between 2013 and 2018 using a fully interactive model to examine changes in PA impact, and the Chow test was used to compare the differences[16, 17]. Two-sided p-values less than 0.05 were considered statistically significant. Stata 15.0 (Stata Corp LP, College Station, TX, USA) was used to perform all analyzes.

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Results

The characteristics of the study sample are presented in Table 1. Overall, the majority of rural patients with chronic diseases were female, aged 60 years or older, married and had a low education level of primary school or below, consistent with the 2013 and 2018 waves. In 2018, 37.9% of middle-aged 35-59-year-olds in rural areas had chronic diseases, which was greater than 28.5% in 2013. The majority of rural patients with chronic diseases were covered by health insurance. We also presented the characteristics of all rural residents in two waves of survey (Supplementary file, Table S1).

Table 1. Characteristics of the study sample

Characteristics	2013 N	2013 Column %	2018 N	2018 Column %
Total	13893		22725	
Gender				
Female	7854	56.51	12530	55.13
Male	6039	43.50	10195	44.87
Age in years				
15-34	134	0.97	522	2.32
35-59	3952	28.49	8597	37.85?¿?
60	9807	70.54	13606	59.83
Marital status				
Unmarried	2567	18.54	3801	16.68
Married	11326	81.47	18924	83.33
Education				
Primary school and below	9357	67.37	14691	64.39
Junior middle school	3621	25.98	6288	27.83
Senior middle school	915	6.66	1746	7.80
Household income (thousand CNY)/Mean (SD)	2.84	2.48	3.14	3.06
Self-rated health status				
Very poor	197	1.42	694	3.05
Very poor	844	6.08	2126	9.32
Fair	3701	26.67	8592	37.85
Good	6300	45.37	8431	37.16
Very good	2845	20.47	2873	12.65
Diabetes				
Yes	1752	12.64	3456	15.22
No	12141	87.36	19269	84.79
Hypertension				
Yes	8212	59.20	12710	55.91
No	5681	40.81	10015	44.09
Health insurance				
Yes	13768	99.11	22421	98.66
No	125	0.90	304	1.34

Notes: Data sources: NHSS 2013 and 2018 wave; Mean and standard deviation were reported for household income (thousand CNY).

Table 2 presents the healthcare utilization pattern in the study sample. The proportion of outpatient visits among rural patients with chronic diseases increased from 22.69% in 2013 to 27.54%, while annual hospitalization admission increased from 20.72% in 2013 to 25.44% in 2018. Meanwhile, fewer patients visited PHC facilities, and the share of PHC outpatient visits decreased from 79.02% in 2013 to 75.43% in

2018. The share of inpatient admissions inside counties was 86.6% in 2018. We also present healthcare care utilization for all rural residents in the survey (Supplementary file, Table S2).

Table 2. Healthcare utilization of rural residents with chronic diseases

Characteristics	2013		2018	
	N	Column %	N	Column %
Outpatient visits				
Yes	3152	22.69	6259	27.54
No	10741	77.31	16466	72.46
Inpatient visits				
Yes	11015	20.72	5782	25.44
No	11015	79.28	16943	74.56
Setting of outpatient visit				
Primary health care facilities	2376	79.02	4412	75.43
Secondary/tertiary hospitals	631	20.98	1437	24.57
Location of inpatient visit				
Outside the county	..	..	775	13.40
Inside the county	..	..	5007	86.60

Note: data for location of inpatient visit was not collected in 2013.

Table 3 presents the effect of PA on outpatient and inpatient admissions. PA had a significant retention effect on outpatient utilization and also retained inpatient admission to some extent. In 2018, patients with chronic diseases in PA counties were 10% (OR=0.90, 95% CI 0.83-0.98) less likely to use outpatient care than in NPA counties. For comparison, OR for PA was 1.31 (95% CI 1.16-1.47) in 2013, indicating that patients with chronic diseases in PA places were 1.31 times more likely to use outpatient care in 2013. For inpatient admissions, patients in PA counties were more likely to use inpatient care in 2013 (OR=1.22, 95% CI 1.07 - 1.39), and patients in PA and NPA counties did not show differences in inpatient admissions in 2018, although the Chow test showed that the change in PA coefficients was not statistically significant (p=0.052).

Table 3. The effect of pairing assistance on healthcare utilization for rural patients with chronic diseases

Characteristics	Outpatient visits 2013 OR	Outpat 2013 95% CI
Pairing assistance (PA)	1.31***	(1.16 -
Personal Characteristics		
Gender (ref. female)	0.87**	(0.80 -
Age (ref. 15-34)		
35-59	1.50	(0.92 -
60	1.41	(0.87 -
Marital status (ref. unmarried)	0.99	(0.88 -
Education (ref. primary school and below)	Education (ref. primary school and below)	Educati
Junior middle school	1.11	(0.99 -
Senior middle school	1.13	(0.93 -
College degree and above	..	..
Self-rated health (ref. very poor)		
Poor	0.83	(0.53 -
Fair	0.81	(0.54 -
Good	0.75	(0.50 -

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Very good	0.66	(0.43 -
Household income	0.96***	(0.94 -
Medical insurance (ref. uninsured)	0.86	(0.54 -
County characteristics		
Area (ref. eastern China)		
Central China	1.05	(0.92 -
Western China	1.00	(0.87 -
County GDP (million CNY)	1.06***	(1.03 -
Ratio of those with bachelor's degree or above in licensed physicians	0.99***	(0.98 -
Beds for emergency and ICU	1.00	(1.00 -
Observations	13,877	
Chow test (PA in 2013 vs PA in 2018)	Chi-square value=24.42	Chi-squ

Notes: *** p<0.001, ** p<0.01, * p<0.05; OR, odds ratio; CI, confidence interval; ICU, intensive care unit of the hospital; CNY, Chinese yuan renminbi.

Table 4 presents the effect of PA on places of healthcare utilization. PA did not transfer more patients to PHC facilities. Rural patients with chronic diseases in PA counties were more likely to use PHC outpatient care in 2013 (OR=1.45, 95% CI 1.10-1.90), but the significance disappeared in 2018 (OR=0.85, 95% CI 0.71-1.01), which indicated that PA could not contribute to the transfer of patients with chronic diseases to PHC facilities (p=0.001). The OR for PA was 1.72 (95% CI 1.32-2.24), indicating that inpatients in PA counties were more likely to choose hospitals inside counties. PA and NPA counties did not have any differences in the use of PHC outpatient care in 2018 after controlling covariates, but PA counties were associated with increased odds of using inpatient care within counties.

Table 4. The effect of pairing assistance on places of healthcare utilization for rural patients with chronic diseases

Characteristics	Outpatient visits in PHC 2013 OR	Outpat 2013 95% CI
Pairing assistance	1.45**	(1.10 -
Personal Characteristics		
Gender (ref. female)	0.98	(0.79 -
Age (ref. 15-34)		
35-59	3.39**	(1.43 -
60	6.11***	(2.55 -
Marital status (ref. unmarried)	0.86	(0.64 -
Education (ref. primary school and below)	Education (ref. primary school and below)	Educati
Junior middle school	1.12	(0.87 -
Senior middle school	1.18	(0.75 -
College degree and above	..	..
Self-rated health (ref. very poor)		
Poor	0.73	(0.27 -
Fair	1.46	(0.56 -
Good	1.71	(0.66 -
Very good	2.68	(1.00 -
Household income	0.89***	(0.85 -
Medical insurance (ref. uninsured)	0.80	(0.29 -
County characteristics		
Area (ref. eastern China)		
Central China	0.55***	(0.40 -

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Western China	0.67*	(0.47 -
County GDP (million CNY)	0.86***	(0.81 -
Ratio of those with bachelor's degree or above in licensed physicians	1.01*	(1.00 -
Beds for emergency and ICU	1.00	(0.99 -
Observations	3,007	
Chow test (PA in 2013 vs PA in 2018)	Chi-square value=10.43	Chi-squ

Notes: *** p<0.001, ** p<0.01, * p<0.05; OR, odds ratio; CI, confidence interval; ICU, intensive care unit of the hospital; CNY, Chinese yuan renminbi.

Discussion

This paper examined the effect of PA on PHC facilities on outpatient and inpatient utilization among rural patients with chronic diseases in the context of the development of medical alliances in China. There were two key findings in this study. First, PA contained the rising outpatient and inpatient utilization for rural patients with chronic diseases in China. Second, PA did not appear to transfer more rural patients with chronic diseases to PHC facilities. This study added evidence to the ongoing reform of the medical alliance in China and could provide implications for other countries that planned similar vertical integration of health facilities.

The fragmentation of the health system has been a worldwide problem that leads to inefficiency, ineffectiveness, inequality, depersonalization, and commercialization [18]. The World Health Organization has called for an integrated people-centered health system to improve health and health care for all people, and building strong PHC-based systems has been emphasized greatly [19]. Countries around the world are exploring different strategies of integrated care models, such as Australia [20]. PA under the national medical alliance policy in China is an exploratory initiative that strives to ensure appropriate training and intersectoral action in health and coordination of comprehensive services for all conditions across disciplines.

Our findings indicated that PA had a positive impact on containing the rising outpatient and inpatient utilization in China. The overuse of healthcare services has been recognized globally as a problem. Studies have suggested that the overuse of various services ranged from approximately 1 to 80% in the United States [21]. The overuse of healthcare services has become an increasingly serious problem in China and has attracted more attention [22, 23]. When health insurance coverage is universal, the moral hazard that providers overprovide and patients overuse healthcare services arises, resulting in a waste of resources and massive health expenditures[23]. PA under medical alliances has positive effects on containing the increased utilization of outpatient and inpatient care, which would help save unnecessary utilization and contain increasing medical expenditure in the long run.

Under-resourced PHC and lack of health professionals are key barriers to integrated care [24]. PA in China's medical alliance policy proposed a promising solution. Doctors were sent to the lower level PHC facilities allied to county hospitals to not only provide medical services directly to rural patients, but also provide training in treatment, recovery and skills in specific diseases to PHC doctors[25, 26]. The capabilities of PHC doctors could be improved after PA. Patients with chronic diseases usually have more frequent healthcare utilization and require continuous treatment and management to prevent complications and early death[27]. Under the medical alliance policy, prevention services are tailored to routine care for patients with chronic diseases, which could help to reduce unnecessary healthcare utilization and increase resource efficiency.

The share of outpatient PHC visits among total outpatients decreased significantly between 2013 and 2018. This phenomenon has also been documented in other studies [5, 23]. PA under medical alliances did not reverse the downward trend of the share of PHC outpatient visits until now. This finding was consistent with a recent study that found that the performance of township health centers had not improved significantly [28]. In medical alliances, county hospitals used to be medical facilities with more resources, but now they were

empowered to also have administrative functions over PHC facilities. Within a county, county hospitals have the advantage of monopoly that will be further reinforced by building medical alliances[12]. Without competition pressure, medical alliances will have no continuous motivation to reform and innovate. Paired physicians attracted and transferred more patients to county hospitals through their contact with patients. The financing schemes of township health centers and county hospitals are different – township health centers are fully funded by government funding but county hospitals are only partially funded and still need to earn most of the revenue by providing services. Therefore, PA doctors who belong to county hospitals have incentives to attract more patients to their hospitals. Future policies on medical alliance should pay attention to the risk of the monopoly of county hospitals, especially in counties where local government health departments had a weak power of coordination and supervision. The benefit package could be delivered to the medical alliance to incentivize prevention services and utilization of PHC.

Without data for 2013, we cannot determine whether pairing assistance contributed to retaining patients within counties because it could be due to differences between counties with respect to implementing medical alliances; for example, wealthy local governments with platform support are more likely to seek innovation in building medical alliances[29]. The increase in the share of visits within counties is more a comprehensive effect of medical alliance rather than pairing assistance alone. A study that examined the first three provinces that implemented medical alliances found that the counties that implemented medical alliances all had a large increase in the share of inpatient admission within counties [30].

This study was subject to several limitations. First, the NHSS was a repeated cross-sectional survey. Although we controlled sociodemographic characteristics, health status, medical insurance and county characteristics, we cannot eliminate the effect of unobserved individual characteristics. Second, the establishment of medical alliances involves multiple policies simultaneously, for example, enhancing the capacity of county hospitals. Therefore, changes in the outcomes might also contain the effect of other policies. Third, our definition for PA might not reflect the assistance quality. Services among paired doctors from different medical alliances in China varied. Future research could explore better definitions and measurements for PA to strengthen the evidence base.

Conclusions

Pairing assistance from county hospitals with PHC facilities has been a major strategy in medical alliances to improve the healthcare delivery system. This study examined the effect of pairing assistance on rural patients with chronic diseases as vulnerably frequent PHC users, and we found that pairing assistance contained the increasing outpatient visits and inpatient admissions. Pairing assistance did not reverse the downward trend in the share of PHC outpatient visits. Pairing assistance under medical alliances provides a potential path toward integrated people-centered health systems for other low- and middle-income countries. However, the government should pay attention to avoiding the potential monopoly of county hospitals.

Declarations

Ethical approval and consent to participate: The study has been approved by the National Statistics Bureau of China and was performed in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to questionnaire administration.

Consent for publication: not applicable

Data availability: The data underlying this article will be shared upon reasonable request to the corresponding author.

Competing interests: The authors declare that they have no conflict of interest.

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