

Effect of public hospital managers' risk and gain perception on their attitude towards physician dual practice: a cross-national study in 31 provinces of China

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Abstract

Background

This study aims to explore the effect of public hospital managers' risk and gain perception on their attitude towards physician dual practice (PDP).

Methods

A cross-sectional study enrolling 1513 managers from East, Middle and West of China in public hospitals was conducted. Generalized linear mixed models (GLMM) were used to find the determinants of managers' support for PDP.

Results

The rate of managers support for allowing PDP or implementing PDP with restriction was 94.3% (95%CI: 0.93, 0.95). The mean score of managers' risk perception was 67.7 ± 14.46 and the mean score of managers' gain perception was 24.0 ± 5.56 . After controlling for individual and institutional characteristics, GLMM presented the score of risk perception increased 1 point, the rate of managers' support for PDP decreased 5% (OR=0.95, 95%CI: 0.93, 0.97); the score of gain perception increased 1 points, the rate of managers' support increased 18% (OR=1.18, 95%CI: 1.12, 1.24).

Conclusions

The majority of Chinese public hospital managers are in favor of allowing or implementing PDP with restrictions. While managers in public hospitals have stronger risk consciousness. Although gain perception is comparatively weaker than risk perception, but they are much influential in determining public hospital managers' support for PDP.

Background

Governments all over the world are struggling to attract and retain health workers in underserved regions. In contrast to the population health care needs, the supply of health care services always in shortage, which is a common characteristic for both developed and developing countries[1, 2]. The shortage of health care workers, especially physicians, reduces the access to health care services and further limits health care provision. Indeed, density of health care workers has been shown to be negatively associated with maternal mortality, infant mortality and under-five mortality[3]. Hence, the medical human resources are of vital important to "universal health coverage". According to 15 of the world's top medical experts' common opinions of health policy makers from 24 countries and, World Health Organization (WHO) pointed out that Physician dual practice (PDP) ranks the second in global healthcare human resources research events [4]. PDP is referred to as a combination of public and private clinical practice by physicians. In most of the economic literature, PDP is understood as a situation where a physician combines clinical practice in the public sector with a clinical practice in the private sector [5–7]. PDP certainly allows physicians to increase their income and professional satisfaction [8], provides more access to health care services for the patients [9–11], and is believed beneficial in reducing the financial burden on governments to retain high quality physicians in the public sector[10, 12]. However, further exploration and confirmation are needed as the context may change from country to country[7].

China initiated New Health Care Reform with aims of achieving accessible and affordable health care service for the population in full coverage, that mainly consists of "Enhancing Public Hospital Reform" and "Encouraging Private Hospital Establishment". Since PDP is essential to bridge the gap between Public Hospitals and Private Hospitals. it's gradually taken into consideration by China government as an effective measurement [13]. Policies and regulations on PDP are undergoing changes in China (Fig. 1). At the early stage, the government merely allowed "Out for Consultation". In 2009, PDP was first tried in capital cities of several pilot provinces, with requirement on practice sites number no more than 3. Then, in 2011 PDP was expanded to the whole nation, but physicians involved need documentary approval from their employer, normally the public hospital. It was not until 2014, when five central ministries and commissions, including National Health Commission, co-

released a "dividing crest" policy, finally entitled physicians with greater autonomy by canceling restrictions on practice sites number and replacing "documentary approval" with "recording". Since 2016, the government upheld a series of policies that encouraged physicians to work for underserved areas, with the aim to promote rational mobility of medical human resource vertically and laterally. In 2017, PDP On-line Registration System was developed, achieving "One-place registration, valid for the whole region". In 2018, physicians practicing within "Medical Association" were exempt from PDP registration. In 2019, the government streamlined application procedures for clinic to provide more access for PDP. In such a favorable policy background, however, the phenomenon of PDP didn't enter into a booming stage as expected[14]. Unfortunately, the enthusiasm of the public hospital for PDP left much to be desired, with extremely-low PDP registrations from the public hospital.

There have been hot debates on how PDP would affect performance of the public sector [8]. Involvement in PDP implies physicians could practice concurrently in both the public and private sectors[4], and greatly challenges the traditional running system of public hospital, including human resource management, medical risk management, salary administration, invention and innovation ownership management. According to a survey co-launched by Mckinsey and DXY on 35,500 China physicians in 2018, 50% non dual practitioners said the reason lay in public hospitals' reluctant attitudes towards PDP[15]. This result was in accordance with another previous nationwide survey, revealing 71.6% investigated physicians replied the extreme resistance was from public hospitals[16]. China's PDP policy was designed in a top-down approach with emphasis on government's role and administrative intervention. Therefore, it is essential to explore PDP practices in an Eastern culture such as in China, and necessary to carry out contextualized studies in the Chinese mixed health care market context. Concerns about quality control and legal responsibilities for physicians are found widespread in China[4] [17]. This paper draws from survey data collected in the East, Middle and West of China, aims to explore determinants of public hospital managers' support for PDP from the risk and gain perspectives, and tries to share China's experience with other countries confronting with the common predicament of inadequate health care provision and imbalance medical resources allocation.

Methods

Data source

From January to October in 2019, we conducted a hospital-based survey with coverage of 31 provinces in East, Middle and West of China. Managers of public hospitals who signed the informed consents were included. This study used the convenient sampling method, and selected series of meetings, conferences, training sessions organized by the National Health Commission for public hospital managers as the main participants for the field survey, including: China Modern Hospital Management Seminars, National Tertiary Public Hospital Performance Evaluation Training Courses, Conference of Experience Exchange on China's Medical Reform, Conference of Experience Exchange on Hospital Discipline Development in China and so on. Presidents, vice-presidents in charge of clinical and medical affairs, and directors of medical affairs department in China public hospitals were enrolled in this investigation, and totally 1513 effective questionnaires were collected.

Study variables and outcome variables

The risk and gain perception of managers was assessed based on the information provided by questionnaire that was showed in supply 1. The Cronbach α for the questionnaire was more than 0.8 and regarded as satisfactory of internal consistency of instruments [18], confirmatory factor analysis validated the questionnaire ($P < 0.05$)[19]. Managers were asked to self-evaluate their risk perception by answering 20 questions (Section B) and gain perception by answering 8 questions (Section C) using a 5-step Likert scale. The answers were reported as: totally disagree (1 score), less agree (2 score), ordinary (3 score), more agree (4 score) or totally agree (5 score). The outcome variables was managers' support for physician dual practice (the first question in Section E). It's a category variable and grouped as completely prohibited, allowing with restrictions and completely allowing. In this study, we divided it into binary variables (0 = completely prohibited; 1 = permission) for the convenience of explaining the managers' support for PDP.

Quality control

In order to ensure the results of the survey to be accurate and reliable, we select investigators with major in statistics and experience of field research. The final investigation team members mainly consist of postgraduates from the Wenzhou Medical University. Prior to the formal survey, investigators were trained in accordance with a unified training plan and teaching materials. The training content includes: the main purpose, content, related terminology of this article, and the required research time; the questionnaire filling method and unified guidance for each item; questions, answers and explanations that may be received at the scene. Ensure that all investigators were familiar with the purpose and significance of this survey, the meaning of the indicators and the main content of the questionnaire before the field survey. Each investigator undergone a rigorous simulate training process before participating in the formal survey. Regular double check-up was established and conducted during the whole investigation.

Statistical analysis

In this study, all records had been checked for missing data and outliers and cleaned prior to data analysis. The score of risk perception and gain perception were described with means and standard deviations with categorical variables including: sex, age, education, major, length of service, level of managers' position, institutional category, institutional level, institutional territory and location, which were ultimately summarized as percentages. The rates of managers' support for PDP were compared by Chi-squared test for selected determinants. Generalized linear mixed models (GLMM) including fixed and random effects were used in this study to find the determinants of managers' support for PDP when controlling for other confounding factors. The scores of risk and gain perception were specified as fixed effects, managers' work place as a random effect; managers' sex, age, education, major, length of service, level of managers' position, institutional category, institutional level, institutional territory and location included as covariates. There would be three models in the results to explore the determinants: Three GLMMs were established and odds ratio (OR) together with 95% confidence intervals (CIs) was estimated for each determinant on managers' support. Model 1 included the demographical determinants of managers' sex, age, education. Model 2 included determinants in model 1 plus managers' major, length of service, level of managers' position. Model 3 included determinants in model 1 and model 2 plus work environment determinants including managers' institutional category, institutional level, institutional territory and location. All analyses were used STATA statistical software version 12.0 (StataCorp LP, College station 77845, USA). A two-tailed P value < 0.05 was considered statistically significant.

Results

Basic characteristics of managers in the public hospital

The basic characteristics of managers participated from public hospitals were presented in Table 2. There were 893 male managers and 623 female managers. About 57.44% of them majored in clinical medicine, including Surgery, Internal Medicine, Paediatrics, Gynaecology, Ophthalmology, Otorhinolaryngology, Dermatology, Orthopaedics, Psychiatry, Traditional Chinese Medicine (TCM) and General Practice. Approximately 77% of them were less than 50 years old and 51.51% of them works more than 6 years. Most of the managers position were less than county level (77.86%) with education higher than bachelor (95.77%). Among the participated managers, 37.91% from the East of China, 29.69% from the Middle of China, and 32.41% from the West of China. 94.74% of them worked in public tertiary hospital, which was the largest potential source and supplier for PDP.

Table 1
List of variables and description.

Variables	Description
Demographic characteristics	
Sex	0: male; 1:female
Age (years)	1: aged less than 40 years old; 2: aged between 41 years old and 50 years old; 3: more than 51 years old
Education	1: PhD; 2: Master; 3: Bachelor; 4: Others
Work characteristics	
Major	0: other majors (including administration, technology, economics, management, et al); 1:medicine
Length of service (years)	1: works less than 5 years; 2: works between 6 years and 10 years; 3: more than 11 years
Level of manager's position	0: manager's position is less than deputy division; 1: manager's position is more than county level (including province level, city level, county level)
Working environment characteristics	
Institutional category	0: means special hospital, Chinese medicine hospital and others; 1:means general hospital
Institutional level	0: means primary level and second level; 1:means tertiary level
Institutional territory	1: east of China; 2:middle of China; 3: west of China
Location	0: means manager coming from provincial capital city; 1:means manager coming from non-provincial capital city

Table 2
Basic characteristics of managers (n = 1513)

Variables	n	%
Demographic characteristics		
Sex		
Male	893	59.02
Female	620	40.98
Age (years)		
≤ 40	452	29.87
41–50	713	47.13
≥ 51	348	23.00
Education		
PhD	72	4.76
Master	398	26.31
Bachelor	979	64.71
Others	64	4.23
Work characteristics		
Major		
Others	644	42.56
Medicine	869	57.44
Length of service (years)		
≤ 5	628	48.49
6–10	338	26.10
≥ 11	329	25.41
Level of manager's position		
≤ Deputy division	1178	77.86
≥ Country level	335	22.14
Working environment characteristics		
Institutional category		
Others	537	34.49
General hospital	976	64.51
Institutional level		
< tertiary level	72	5.26
tertiary level	1,298	94.74
Institutional territory		

Variables	n	%
East	572	37.91
Middle	448	29.69
West	489	32.41
Location		
Provincial capital city	525	34.70
Non-provincial capital city	988	65.30

Distribution of different perception of managers' support for physician dual practice

The mean score of managers' risk perception was 67.7 ± 14.46 and showed different among managers' sex, age, major, length of service, institutions category, institutional level and location of managers' hospital ($P < 0.05$). The mean score of risk perception for female managers was 68.8 ± 13.49 , which was higher than male managers (66.9 ± 15.05). With the increasing of age, the mean score of risk perception increased, managers aged 51 years old owed the highest score of risk perception (68.7 ± 15.30). Managers from major other than clinical (69.6 ± 13.46) and those with longer length of service (6–10 years: 67.4 ± 15.18 ; ≥ 11 years: 67.8 ± 15.50) held higher risk perception.

In contrast, the mean score of managers' gain perception was barely 24.0 ± 5.56 , correlated with managers' age, length of service and institutional level ($P < 0.05$). Score of managers' gain perception showed highest in managers aged less than 40 years old (24.5 ± 4.96). Managers with length of service of 6–10 years held higher score of gain perception than those less than 5 years and more than 11 years. What's worthy pointing out was that, managers in tertiary hospitals had a higher risk perception (68.6 ± 14.24 , $P < 0.001$) but lower gain perception (23.8 ± 5.51 , $P = 0.003$) than managers from the other public hospitals. (Shown in Table 3)

Table 3
Descriptive of total score of different perception of managers' support for physician dual practice

Variables	Risk perception			Gain perception		
	Mean	Std.Dev	P	Mean	Std.Dev	P
Demographic characteristics						
Sex			0.006			0.240
Male	66.9	15.05		24.1	5.66	
Female	68.8	13.49		23.9	5.42	
Age (years)			0.004			< 0.001
≤ 40	33.8	13.13		24.5	4.96	
41–50	67.8	14.83		23.9	5.68	
≥ 51	68.7	15.30		23.6	6.03	
Education			0.087			0.315
PhD	66.2	15.40		24.7	5.75	
Master	66.7	13.40		24.0	5.27	
Bachelor	68.0	14.80		24.0	5.68	
Others	71.3	13.50		23.5	5.30	
Work characteristics						
Major			< 0.001			0.058
Others	69.6	13.46		23.7	5.32	
Medicine	66.3	15.01		24.2	5.73	
Length of service (years)			0.032			0.029
≤ 5	67.3	13.85		23.9	5.34	
6–10	67.4	15.18		24.3	5.57	
≥ 11	67.8	15.50		23.7	6.06	
Level of manager's position			0.433			0.362
≤ Deputy division	67.7	14.36		24.0	5.42	
≥ County level	67.8	14.80		23.9	6.05	
Working environment characteristics						
Institutional category			0.007			0.157
Others	68.9	13.53		23.8	5.63	
General hospital	67.0	14.90		24.1	5.52	
Institutional level			< 0.001			0.003
< tertiary level	59.4	15.66		25.7	6.39	

Variables	Risk perception			Gain perception		
	Mean	Std.Dev	P	Mean	Std.Dev	P
tertiary level	68.6	14.24		23.8	5.51	
Institutional territory			0.322			0.896
East	66.3	14.10		24.0	5.55	
Middle	70.0	14.10		23.5	5.48	
West	67.3	14.9		24.4	5.60	
Location			0.004			0.076
Provincial capital city	66.4	14.78		24.3	5.69	
Non-provincial capital city	68.4	14.24		23.8	5.49	

Distribution of basic characteristics of managers among the rate of support for physician dual practice

The rate of managers' support for allowing PDP and implementing PDP with restrictions in this study was 94.3% (95%CI: 0.93, 0.95). As displayed in Table 4, the rate of managers' support for PDP showed different among age, stage and institutional territory ($P < 0.05$), while managers' sex, education, major, length of service, level of managers' position, institutional category, level and location distributed the same among different rate of the managers' support for PDP ($P > 0.05$). Managers aged 41–50 years old had the highest rate of support for PDP, it was 46.60% ($\chi^2 = 11.27$, $P = 0.004$). Managers in the East of China had the highest support for PDP, it was 38.39%, compared to that in the Middle of China (28.98%) and in the West of China (32.63%) ($\chi^2 = 6.26$, $P = 0.044$).

Table 4
Distribution of basic characteristic of managers among the rate of support for
physician dual practice

Variables	No		Yes		χ^2	P
	n	%	n	%		
Demographic characteristics						
Sex					0.54	0.464
Male	54	62.79	839	58.79		
Female	32	37.21	588	41.21		
Age (years)					11.27	0.004
≤ 40	12	13.95	440	30.83		
41–50	48	55.81	665	46.60		
≥ 51	26	30.23	322	22.56		
Education					1.26	0.738
PhD	4	4.65	68	4.77		
Master	19	22.09	379	26.56		
Bachelor	58	67.44	921	64.51		
Others	5	5.81	59	4.13		
Work characteristics						
Major					1.58	0.208
Others	31	36.05	613	42.96		
Medicine	55	63.95	814	57.04		
Length of service (years)					1.42	0.492
≤ 5	31	44.29	597	48.73		
6–10	17	24.29	321	26.20		
≥ 11	22	31.43	307	25.06		
Level of manager's position					0.626	0.429
≤ Deputy division	64	74.42	1114	78.07		
≥ Country level	22	25.58	313	21.93		
Working environment characteristics						
Institutional category					0.669	0.414
Others	27	31.40	510	35.74		
General hospital	59	68.60	917	64.26		
Institutional level					0.02	0.895
< tertiary level	4	4.94	68	5.28		

Variables	No		Yes		χ^2	P
	n	%	n	%		
tertiary level	77	95.06	1221	94.72		
Institutional territory					6.26	0.044
East	25	29.76	547	38.39		
Middle	35	41.67	413	28.98		
West	24	28.57	465	32.63		
Location					0.18	0.668
Provincial capital city	28	32.56	497	34.83		
Non-provincial capital city	58	67.44	930	65.17		

Determinants of managers' support for physician dual practice

Table 5 showed the multivariate analysis of the determinants of managers' support for PDP by generalized linear mixed model. According to model 1, there were significant strong correlations between the total score of risk perception, gain perception, age and the rate of managers' support for PDP. By controlling demographic characteristics in the model 1, when the score of risk perception increased 1 point, the rate of managers' support for PDP would decrease 6% (OR = 0.94, 95%CI: 0.92, 0.96). By controlling work characteristics and working environment characteristics, the results in model 2 and model 3 were still statistically significant ($P < 0.001$). Based on results in model 1, when the score of gain perception increased 1 points, the rate of managers' support for PDP would increase 17% (OR = 1.17, 95%CI: 1.12, 1.23), the results in model 3 were still statistically significant ($P < 0.001$) after controlling work characteristics and working environment characteristics. Therefore, we could come to a conclusion that risk perception was correlated negatively with managers' support for PDP, but gain perception was positively correlated with managers' support for PDP.

Table 5

Multivariate analysis of determinants of managers' support for physician dual practice by generalised linear mixed model (n = 1513)

Variables	Model 1			Model 2			Model 3					
	95%CI		P	OR	95%CI	P	OR	95%CI	P			
	Lower	Upper			Lower	Upper		Lower	Upper			
Risk perception	0.94	0.92	0.96	< 0.001	0.94	0.92	0.96	< 0.001	0.95	0.93	0.97	< 0.001
Gain perception	1.17	1.12	1.23	< 0.001	1.18	1.12	1.23	< 0.001	1.18	1.12	1.24	< 0.001
Demographic characteristics												
Sex												
Male	1.00				1.00				1.00			
Female	1.40	0.85	2.32	0.187	1.59	0.88	2.86	0.122	1.69	0.91	3.15	0.098
Age (years)												
≤ 40	1.00				1.00				1.00			
41–50	0.48	0.24	0.96	0.038	0.41	0.17	0.97	0.042	0.44	0.18	1.09	0.076
≥ 51	0.47	0.22	1.01	0.052	0.42	0.16	1.11	0.081	0.42	0.15	1.17	0.098
Education												
PhD	1.00				1.00				1.00			
Master	0.83	0.24	2.86	0.769	1.26	0.34	4.64	0.726	1.70	0.44	6.56	0.444
Bachelor	0.83	0.26	2.65	0.757	1.17	0.35	3.95	0.801	1.33	0.37	4.78	0.659
Others	0.78	0.17	3.53	0.748	1.39	0.23	8.33	0.721	1.65	0.25	10.83	0.602
Work characteristics												
Major												
Others	1.00				1.00				1.00			
Medicine					0.68	0.38	1.22	0.196	0.66	0.35	1.22	0.186
Length of service (years)												
≤ 5	1.00				1.00				1.00			
6–10					1.17	0.57	2.42	0.662	1.54	0.71	3.37	0.276
≥ 11					0.89	0.46	1.74	0.743	1.10	0.52	2.35	0.799
Level of manager's position												

Model 1 included the demographical determinants of managers' sex, age, education. Model 2 included determinants in model 1 plus managers' major, length of service, level of managers' position. Model 3 included determinants in model 1 and model 2 plus work environment determinants including managers' institutional category, institutional level, institutional territory and location.

Variables	Model 1	Model 2				Model 3			
≤ Deputy division		1.00				1.00			
≥ County level		1.72	0.88	3.39	0.115	1.58	0.78	3.21	0.207
Working environment characteristics									
Institutional category									
Others						1.00			
General hospital						0.87	0.47	1.59	0.647
Institutional level									
< tertiary level						1.00			
tertiary level						1.32	0.31	5.67	0.705
Institutional territory									
East						1.00			
Middle						0.65	0.26	1.63	0.357
West						0.69	0.26	1.79	0.440
Location									
Provincial capital city						1.00			
Non-provincial capital city						1.12	0.57	2.20	0.733
Model 1 included the demographical determinants of managers' sex, age, education. Model 2 included determinants in model 1 plus managers' major, length of service, level of managers' position. Model 3 included determinants in model 1 and model 2 plus work environment determinants including managers' institutional category, institutional level, institutional territory and location.									

Besides, managers' age was significantly correlated with managers' support for PDP in model 1. Compared with managers aged less than 40 years old, the rate of managers' support decreased 52% for those aged 41–50 years old (OR = 0.48, 95%CI: 0.24, 0.96); by controlling demographic characteristics and work characteristics in model 2, the rate of managers' support decrease to 59% for those aged 41–50 years old (OR = 0.41, 95%CI: 0.17, 0.97). In model 3, controlling for the demographic characteristics, work characteristics and working environment characteristics, there was no significant result between managers' age and support for PDP.

Discussion

In this study, we found the rate of managers' support for PDP in China is 94.3%, including allowing with restrictions and completely allowing, consistent with the policy introduced after 2009[20]. According to previous literature reviews, PDP had direct implications for access, equity, price and quality of the whole nation's health care service [21], and thus benefit the whole coverage of universal health. We found most public hospital managers in China agreed with its contribution for improving the health care service access[22], indicating that the “top-down designed” Medical Association works in bringing benefits to underserved areas by PDP, which usually binding profits and responsibilities of one tertiary large hospital with the other type

medical institutions within the same region mainly in four types: urban medical group, county medical community, cross-regional specialized alliance, telemedicine collaboration network.

Judging from the results of our study, except for age and region, there were not any basic characteristics that would bring difference to the managers' support for PDP. Managers aged 41–50 years old (46.60%) had the highest rate of support for PDP, compared to those at other age stages. Actually, in today's China, managers taking the high-level positions in the public health care system, such as chief party secretary, deputy party secretary, presidents, vice presidents, normally would be those above 50 years old. Therefore, we could expect PDP embracing an easier working environment in the coming next decade, with the glowing of today's middle-level managers. It's of no surprise that we found managers in the East of China (38.39%) held the highest supportive rate for PDP, followed by that from the West of China (32.63%), while such rate among managers in the Middle of China showed the lowest (28.98%). The reason may be well explained by the economic and social development gap between East and the rest of China. According to China's Gross Domestic Product (GDP) per capita (PPP) 2019[23], 8 eastern provinces were listed among TOP 10 with PPP recorded at \$16728, much higher than the nation's average PPP of \$10365, and above the threshold of \$12736 defined by World Bank for high-income countries, where the public employers in general have better tolerance towards staff mobility. Owing to the nation's West Development Strategy launched in 2000, GDP in the West of China showed the rapidest growth at most time of the past 19 years with growth rate at 7.4% in 2019. And we have the reason to expect the nation's Yangtze River Economic Belt Strategy, combining major regions in the East, Middle and West of China, also has unique advantages and comprehensive strengths in promoting PDP.

As to the determinants, we found risk perception and gain perception were correlated significantly with managers' support for PDP. Risk perception has been noticed as an intuitive and emotional construct closely related to human's cognition and behavior[24–26]. In this study, it has been noticed varied among managers of different sex, age, major, length of service, institutions category, institutional level and location. And female managers possessed higher risk perception than male managers, in accordance with most conclusions of previous related researches [5]. It's interesting that risk perception would be strengthened by age, and managers aged 51 years old held the most severe risk awareness. Since normally the age of 50 years would be a "breaking point in career life" for managers working in public hospitals. In addition, managers with longer length of service displayed higher risk perception. Probably the reason lay in that, the more accountable and responsible for the public hospital, the harder for managers to accept PDP. And managers majored in non-clinical medicine processed higher risk perception than their counter party. In China, it's common to notice that public hospital managers, are usually selected from those with background of clinical medicine, who have more opportunities to find advantages of PDP during their career life which probably in turn depress their risk awareness.

The public hospital managers' gain perception were much lower than their risk perception, especially among those of tertiary hospitals, which was correlated with managers' age, length of service and institutional level. The finding indicated that managers in public hospitals possessed extremely low gain perception, regardless of the hospital location and institutional territory, since PDP does bring great challenges for the public hospitals' whole running system and normal daily administration. In addition, we found the managers' support for PDP would increase when gain perception enhanced or risk perception controlled. More importantly, it was proved that gain perception of greater influence on managers' support for PDP than risk perception, which had much implications for the health care authority in China. Previously, the policy makers in China got used to focusing on Physicians' acquisition on PDP, neglecting the public hospital managers, another key stakeholder of PDP policy. For the most part, the hesitation of Physicians towards PDP could be explained by the negative attitude of public hospital managers. Actually, it's of vital importance to enhance the public hospital managers' sense of acquisition. In countries constrained by limited medical resources and inadequate health care financial budget, the top priority should be given to strategies and measures that effectively increase gain perception of the public hospital managers.

The slowly growing strength of PDP contributed for the booming of private sectors in China, where undervalued salaries in public sector made an attractive opportunity for physicians to seek their unmet economical needs in private sectors[8, 27]. In turn, private sectors played a significant role in facilitating the phenomenon of PDP [28, 29]. Actually, the Chinese Government utilize the private sector as a useful supplement to the public sector. In the latest 5 years, more than 30 official documents

have been released at central level with even more at regional level, to assist the establishment and development of private sectors, including Joint Clinics, Private Hospitals, International Hospitals and other non-public medical institutions[30]. Those favoring policies together with the wide application of information technologies, such as 5G, Internet+, Artificial Intelligence and telemedicine, are believed to be constructive to PDP in the long run[31]. According to China Internet Hospital Development Research Report 2020, the domestic internet medical market has experienced an exponential growth. The market scale of Internet hospitals exceeded 49 billion RMB in 2018, 67.95 billion RMB in 2019, and is expected to exceed 100 billion RMB in 2020. By 2019, the average daily visits of internet hospitals was 2000–3000[32]. It's worth noticing that private hospitals in China first exceeded public hospitals in 2015, taking account for 60.4% in 2018[33]. However, PDP by internet platform accounted for 57% in contrast to merely 28% in private hospitals, indicating that PDP integrating medical activities "on line" with "on site" has the most promising future in China.

Limitations

Firstly, in this cross-sectional study, the determinants of managers' support for PDP were limited by the pre-specified questions in the surveys. There might be some potential unobserved confounding factors we didn't control in the generalised linear mixed model. A second limitation was that, the investigation and survey was barely conducted for managers of public hospital, not including other PDP stakeholders such as managers of private hospital, health care authorities. Third, it's has been well a common view that the physicians' support for PDP, or rather, involvement in PDP was greatly affected by the managers' support for PDP. Probably vice versa. So it's necessary to figure out the interrelationship between physicians' support for PDP and that of managers. More evidence based on quantitative studies and randomized controlled trials shall be needed to throw light on the "black box" on mutual interference of stakeholders' attitude and behavior towards PDP in the next research steps.

Conclusions

This study found that the majority of public hospital managers in China didn't against PDP, instead, managers' support rate for PDP including allowing with restrictions was high. In other words, although public hospital managers in China disagreed with PDP according to various public reports, there still left much flexibility and feasibility for the government to achieve optimizing the productivity and capacity of medical human resources by implementing PDP with proper restrictions. In addition, gain perception and risk perception were important determinants to the managers' support for PDP.

List Of Abbreviations

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PDP	Physician Dual Practice
GLMM	Generalized Linear Mixed Model
WHO	World Health Organization
CI	Confidence Index
OR	Odds Risk
GDP	Gross Domestic Product
PPP	Gross Domestic Product per capita

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee in Clinical Research of First Affiliated Hospital of Wenzhou Medical University (No 2020-011).

Consent for publication

Not applicable.

Availability of data and materials

Researchers who want to use these data should contact Yuanyuan Yu (yyyzju@foxmail.com).

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

YY, XC, XZ were responsible for the field working including data collection and management. YY, WCC, XZ and QL provided constructive suggestions on data analysis. XF, YY, QL and SX were responsible for the sorting of data. YY, XF and XC were performed the statistical analysis. The manuscript was prepared by YY, XF, XC, XY, YL, WCC and XZ. All authors critically reviewed and approved the final manuscript.

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Figures

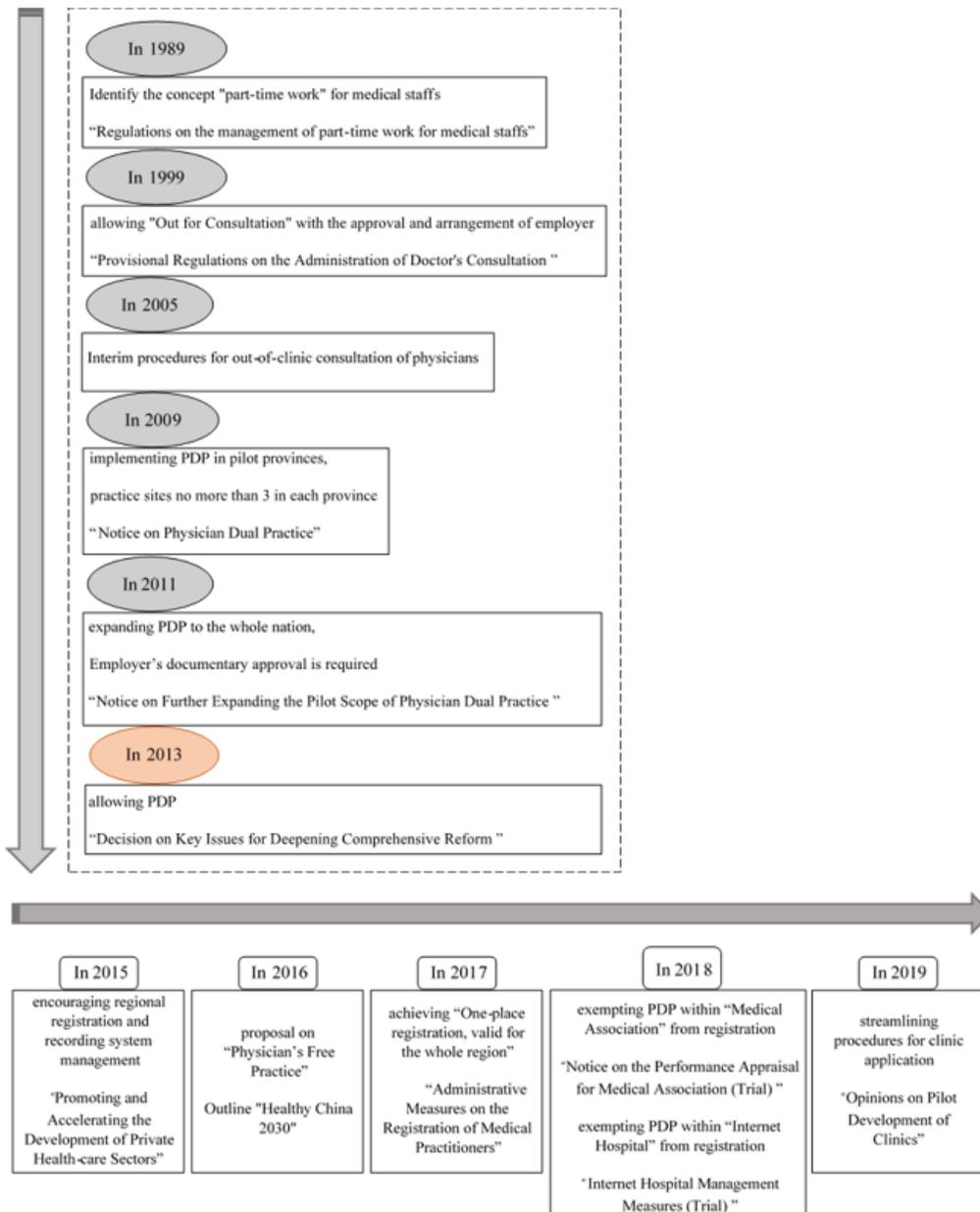


Figure 1

The flow chart of physicians' dual practice policies

Supplementary Files

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