

# BMJ Open Factors determining intention to leave among physicians in tertiary hospitals in China: a national cross-sectional study

Chunyu Zhang,<sup>1,2</sup> Linlin Hu,<sup>2</sup> Jing Ma,<sup>3</sup> Shichao Wu,<sup>2</sup> Jing Guo,<sup>2</sup> Yuanli Liu<sup>2</sup>

**To cite:** Zhang C, Hu L, Ma J, *et al*. Factors determining intention to leave among physicians in tertiary hospitals in China: a national cross-sectional study. *BMJ Open* 2019;**9**:e023756. doi:10.1136/bmjopen-2018-023756

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2018-023756>).

Received 24 April 2018

Revised 24 December 2018

Accepted 31 December 2018



© Author(s) (or their employer(s)) 2019. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

<sup>1</sup>China-Japan Friendship Hospital, Beijing, China

<sup>2</sup>School of Public Health, Chinese Academy of Medical Sciences and Pecking Union Medical College, Beijing, China

<sup>3</sup>Department of Population Medicine, Harvard Medical School, Harvard Pilgrim Health Care Institute, Boston, Massachusetts, USA

## Correspondence to

Yuanli Liu;  
liuyuanli\_pumc@163.com

## ABSTRACT

**Objective** The reasons that physicians leave the institutions have not been extensively studied. We aimed to evaluate these reasons, which include the desire to work at another hospital or the intention to make a career change, among physicians in tertiary hospitals in China and explore the associations between the individual-level and organizational-level factors related to these two reasons for leaving.

**Methods** We conducted a national survey of 136 tertiary hospitals across all 31 provinces in China between December 2017 and January 2018. A total of 20785 physicians were selected to self-report on the two evaluated reasons related to physicians' intent to leave. A univariate analysis and multilevel regression model were applied to evaluate the factors associated with intention to leave.

**Result** In all, 10.4% of the participating physicians had thought about working at another hospital, and 20.5% intended to leave to make a career change. At the hospital level, the government subsidy per bed (OR=0.88, 95% CI: 0.86 to 0.98 and OR=0.91, 95% CI: 0.90 to 0.99), personnel funding per capita (OR=0.86, 95% CI: 0.76 to 0.96 and OR=0.80, 95% CI: 0.73 to 0.88) and the number of physicians per bed (OR=0.83, 95% CI: 0.81 to 0.86 and OR=0.89, 95% CI: 0.81 to 0.92) were negatively associated, while the number of hospital-level medical disputes (OR=1.04, 95% CI: 1.03 to 1.05 and OR=1.06, 95% CI: 1.01 to 1.11) was positively associated with both reasons for leaving. At the individual level, income (OR=0.74, 95% CI: 0.71 to 0.79 and OR=0.88, 95% CI: 0.83 to 0.92) and job satisfaction (OR=0.18, 95% CI: 0.17 to 0.20 and OR=0.16, 95% CI: 0.15 to 0.18) acted as preventive factors against both reasons for leaving, while work hours per week (OR=1.11, 95% CI: 1.06 to 1.17 and OR=1.23, 95% CI: 1.19 to 1.28) and medical dispute (OR=1.49, 95% CI: 1.35 to 1.65 and OR=1.77, 95% CI: 1.64 to 1.91) acted as promotive factors.

**Conclusions** Although the intention to leave is not prevalent among physicians in tertiary hospitals in China, providing more organisational support and a better occupational environment may promote retention among physicians.

## INTRODUCTION

Physician shortages have become a common issue worldwide. Kirch and Petelle predicted that the USA will face a shortage of between 40 800 and 104 900 physicians by 2030.<sup>1</sup> China is also experiencing a chronic shortage of

## Strengths and limitations of this study

- The large sample size (20785 physicians) across 31 provinces offers a certain representativeness.
- We studied two reasons for intending to leave: leaving for another hospital and leaving for another career.
- Multilevel analysis was applied to examine the associations between hospital-level and physician-level factors and leaving intention.
- The main limitation of the study was that we were unable to determine the direction of causality due to the cross-sectional nature of the survey.

physicians. For example, Lien *et al* reported that the proportion of physicians aged 25–34 years had decreased from 31.3% to 22.6%, while that of physicians aged more than 60 years had increased from 2.5% to 11.6% in the most recent 10 years.<sup>2</sup> The departure of physicians from jobs is one of the main reasons for this shortage. Physicians leaving jobs is significantly associated with decreases in productivity and in access to healthcare.<sup>3,4</sup> These vacancies must be filled, and time is wasted in recruiting and training new physicians. The training cycle is longer and more expensive for physicians than for other occupations. In developed countries, such as the USA, physicians usually have a doctorate degree. In addition to the long period of study in medical school, additional years in postgraduate resident training are required for a physician to be qualified. Retaining physicians has become an important issue for hospital managers.

Researchers agree that it is important to study physicians' intention to leave because it may allow leaving behaviour to be predicted. Degen reviewed 17 studies from 5 countries including the UK, Germany, the USA, France and Finland and found that the physicians' leaving intention ranged from 11.8% to 22%.<sup>5</sup> In a study performed in Taiwan, Tsai *et al* found that 14.5% of physicians reported

a strong intention to leave their current hospital.<sup>6</sup> In China, Haiqing *et al* investigated 111 physicians working in secondary hospitals in China and found that 41.0% of them reported that they intended to leave.<sup>7</sup> As many as 40%–50% of village doctors were found to have intentions to leave their current hospital.<sup>8–10</sup> However, national data, especially for Chinese physicians, are limited.

In China, the government advocated for ‘initial diagnosis at the primary level’, and has made great efforts to invest in grassroots medical institutions and promote standardised training for general practitioners since the beginning of health system reform in 2009. However, the primary healthcare system is still faced with equipment obsolescence and shortages of resources and personnel due to financial limitations.<sup>11</sup> As a result, the general public still lacks trust in primary healthcare institutions, and tertiary hospitals are overcrowded for even minor problems.<sup>12–14</sup> A total of 48% of patients were treated in tertiary hospitals in 2015, growing from only 28.6% in 2005.<sup>15</sup> Moreover, the population is rapidly ageing. The number of individuals over 65 years old increased 44.0%, from 104 million in 2006 to 150 million in 2016.<sup>16</sup> Tertiary hospitals, which play the role of local medical centres, are faced with the substantial challenges associated with treating the complicated diseases caused by ageing.<sup>17</sup> Chinese physicians in tertiary hospitals are therefore burdened with a heavier workload and more responsibility than specialists in other countries.

Considering that tertiary hospitals undertake almost half of all clinical work in China, that research about leaving intention has been conducted in Western countries or rural China and that little is known about Chinese tertiary hospitals, more attention should be focused on physicians’ intention to leave in tertiary hospitals. Furthermore, the intention to leave the current hospital should be specifically addressed with regard for whether the physician is moving between hospitals or between occupations: past studies have seldom considered this point.

Therefore, the purpose of this study is to investigate the intention to leave, including moving to another hospital and changing careers, among physicians in tertiary hospitals in China and to explore the factors that may affect the intention to leave at both the individual and organisation levels.

## METHODS

### Study participants

A national cross-sectional survey was conducted between December 2017 and January 2018. Participants were selected using a multistage sampling method. During the first stage of sampling (hospital level), one provincial general hospital, one provincial traditional Chinese medicine (TCM) hospital and one maternal and child (MC) hospital were selected based on convenience in each of the 31 provinces in China. We also included 43 national health and family planning commission-affiliated hospitals, including 25 general hospitals, 3 MC

hospitals and 15 specialty hospitals. The second sampling stage targeted physicians who had worked for more than 1 year in the previously sampled hospitals. Those who had been absent from clinical work for more than 6 months were excluded. We assumed that the proportion of physicians who intended to leave was 25% based on the results of pilot tests, and we therefore set the relative error  $((\text{measured value} - \text{true value}) / \text{true value})$  and significance level at 0.3 and 0.05, respectively. We planned for a minimum sample size of 130 physicians at each hospital. The human resources department of each sampled hospital provided a list of all their physicians, and we proportionally selected 150 physicians in three categories (junior, middle and senior) based on the actual ratio of physicians in each of the above professional title categories. Ultimately, 20 785 physicians from 136 tertiary hospitals completed the questionnaire. The response rate was 95.5%.

### Design

We implemented a self-administered questionnaire instrument on a smartphone platform (WeChat V.6.5, Tencent). Physicians were required to use their own cell phones to complete the questionnaire. All answers were sent directly and anonymously via the internet to a centralised account to assure confidentiality. A 5-point Likert scale was used to score the answers to the leaving intention questions. Physicians were invited to consider the following statements—‘I intend to leave my current hospital for another one in the near future’ and ‘I intend to leave my current career in the near future’—and to rate their perception of each as ‘strongly agree’, ‘agree’, ‘neither agree nor disagree’, ‘disagree’ or ‘strongly disagree’. In addition, the physician questionnaire collected information on physician characteristics (including age, gender, educational background, professional title, management position and specialty), weekly work hours, income (including compensation from the hospital and any grey income) and job satisfaction. Job satisfaction was rated by ‘I am satisfied with my current job as a whole’ with the response captured on a 5-point Likert scale. With the help of local authorities, the hospital-level variables were exported from hospital information systems and sent to a designated email address. The information collected in the hospital questionnaires was related to hospital type, region, the number of beds, the number of patients and physicians, government subsidies, personnel funding (including salary, bonus, welfare and insurance) and hospital-level medical disputes. To compare the distribution between the sample and the population and determine whether the participating physicians were representative, the sampled hospitals provided the total number of physicians in every professional title. Trained surveyors were assigned to every sampled hospital to help the physicians and hospitals complete the questionnaire. All survey questions were mandatory to complete the survey.

## Statistical analysis

Continuous measures with a normal distribution are presented as the mean±SD. Those with a non-normal distribution are presented as the median (range). Categorical variables are presented as percentages.  $\chi^2$  tests were performed to compare the intention to leave among subgroups. Associations between intention to leave to change hospitals or to start a new career were estimated using multilevel logistic regression models with a binomial distribution assumption and a logit link. We defined 'strongly agree' and 'agree' as a positive answer (1=yes); 'neither agree nor disagree', 'disagree' and 'strongly disagree' were defined as a negative answer (0=no). In each model, government subsidy per bed, personnel funding per capita, physicians per bed, medical disputes, the number of patients, hospital type and region were included as hospital-level independent variables, while physician gender, age, professional title, management position, weekly work hours, monthly income, specialty, job satisfaction and medical dispute experience were included as independent individual-level variables. The effect of each variable is expressed as an OR with a 95% CI. All analyses were performed using the SAS V.9.4 software package (SAS Institute). All tests for statistical significance were two sided, and the significance level was set as  $\alpha=0.05$ .

## Patient and public involvement statement

There is no patient or public participation in this study.

## RESULTS

### Characteristics of participating physicians and hospitals

In [table 1](#), we present the descriptive characteristics of the participating physicians. The participating physicians were distributed equally among junior, middle and senior professional titles, and this distribution was close to the actual distribution. Of the 20 785 participating physicians, 43.6% were male and 56.4% were female. The mean age was 36.88±8.22 years old, and 72.2% were between 30 and 49 years old. Most of the responding physicians (73.3%) reported feeling overworked, and the average weekly work load was 50 (range, 7–120) hours. The median monthly income was 9000 (range, 2000–27 000)¥. A total of 34.8% of the responding physicians had encountered a medical dispute in the last year, and of these, 54.1% said they experienced physical or verbal violence from patients.

In [table 2](#), we present the data obtained from the sampled hospitals. From the 136 hospitals, the percentages that were general hospitals, TCM hospitals, MC hospitals and specialty hospitals were 41.9%, 22.8%, 22.1% and 13.2%, respectively; 41.2% of the sampled hospitals were located in Eastern China, 27.2% in Central China and 31.6% in Western China. Most of the sampled general hospitals (61.4%) had more than 2000 beds, and most of the sampled specialty hospitals (55.6%) had fewer than 500 beds. In 2017, the average subsidy received from

the government was 82.52 (range, 0–391.84) million ¥, and the proportion of total hospital income represented by government subsidies was 0.05 (range, 0.01–0.50). Personnel funding provided 440 million (range, 380–26 280)¥, and the proportion of total hospital income represented by personnel funding was 0.33 (range, 0.03–0.63). The median for medical disputes was 33 per hospital (range, 0–754) in 2017. Meanwhile, 66.1% of the responding physicians agreed that their hospitals had adopted actions aimed at preventing medical disputes, and 64.8% of those physicians agreed that the security staff at their institution could respond quickly when violence occurred.

### Physician intention to leave

Two questions were used to evaluate physician intention to leave. With regard to the first question, 'I intend to leave my current hospital for another one in the near future', 10.4% of the surveyed physicians responded positively. To the second statement, 'I intend to leave my current career in the near future', 20.5% of the surveyed physicians responded positively.

From [table 3](#), intention to leave is shown to have an inverted U-type distribution when displayed by age. The proportions of physicians changing hospitals and making a career change were higher in the middle-age group than in the younger and older groups. Physicians in MC hospitals reported the highest likelihood of intention to leave for another hospital or to change a career (12.1%, 22.8%), followed by those in general hospitals (11.1%, 21.3%). Among practitioners in all specialties, paediatricians were the most likely to intend to leave their current hospital for another (14.4%) or to change careers (30.4%). The likelihoods of intention to leave for a new hospital or a new career were highest in Western China (12.4%, 24.3%) and lowest in Eastern China (8.4%, 15.8%). Physicians who reported dissatisfaction with their job had a higher likelihood of intending to leave for both reasons (27.6%, 50.2%) than was found in those who felt satisfied (5.5%, 12.1%). The majority (45.9%) chose 'the income distribution policy' as the top factor influencing job satisfaction, followed by 'work environment safety' (25.9%).

### Hospital-level and physician-level factors associated with intention to leave

The associations between intention to leave and factors at the physician and hospital levels are shown in [table 4](#), which displays data resulting from a multilevel logistic regression analysis. The hospital type, region, and number of physicians and the physician's gender, age, management position, professional title and specialty were controlled as confounders.

At the hospital level, government subsidies per bed (OR=0.88, 95% CI: 0.86 to 0.98 and OR=0.91, 95% CI: 0.90 to 0.99), personnel funding per capita as provided by the hospital (OR=0.86, 95% CI: 0.76 to 0.96 and OR=0.80, 95% CI: 0.73 to 0.88) and the number of physicians

**Table 1** Characteristics of the responding physicians

Characteristics	Overall (%)	Male (%)	Female (%)
Total	20785	9055 (43.6)	11730 (56.4)
Age (years)			
<30	3711 (17.9)	1295 (14.3)	2416 (20.6)
30–39	10382 (49.9)	4539 (50.1)	5843 (49.8)
40–49	4633 (22.3)	2226 (24.6)	2407 (20.5)
≥50	2059 (9.9)	995 (11.0)	1064 (9.1)
Educational background			
Bachelor's degree and below	5952 (28.6)	2475 (27.3)	3477 (29.6)
Master's	9711 (46.7)	391 (43.3)	5792 (49.4)
Doctorate	5122 (24.6)	2661 (29.4)	2461 (21.0)
Professional title			
Junior	6768 (32.6)	2599 (28.7)	4169 (35.5)
Middle	7483 (36.0)	3269 (36.1)	4214 (35.9)
Senior	6534 (31.4)	3187 (35.2)	3347 (28.5)
Management position			
Yes	2568 (12.4)	1382 (15.3)	1186 (10.1)
No	18217 (87.6)	7673 (84.7)	10544 (89.9)
Specialty			
Internal medicine	4878 (23.5)	1881 (20.8)	2997 (25.5)
Surgery	3151 (15.2)	2716 (30.0)	435 (3.7)
Obstetrics	2939 (14.1)	401 (4.4)	2538 (21.6)
Paediatrics	1762 (8.5)	433 (4.8)	1329 (11.3)
Emergency medicine	696 (3.3)	387 (4.3)	309 (2.6)
Traditional Chinese medicine	724 (3.5)	316 (3.5)	408 (3.5)
Otolaryngology	433 (2.1)	200 (2.2)	233 (2.0)
Anaesthesiology	1037 (5.0)	433 (4.8)	604 (5.1)
Ophthalmology	706 (3.4)	226 (2.5)	480 (4.1)
Stomatology	986 (4.7)	451 (5.0)	535 (4.6)
Dermatology	441 (2.1)	151 (1.7)	290 (2.5)
Other	3032 (14.6)	1460 (16.1)	1572 (13.4)
Monthly income (¥)			
<5000	2909 (14.0)	1130 (12.5)	1779 (15.2)
5000≤10000	9781 (47.1)	4021 (44.4)	5760 (49.1)
10 000≤15000	5513 (26.5)	2620 (28.9)	2893 (24.7)
15 000≤20000	1766 (8.5)	847 (9.4)	919 (7.8)
≥20000	816 (3.9)	437 (4.8)	379 (3.2)
Weekly work hours			
≤40	5556 (26.7)	2247 (24.8)	3309 (28.2)
40≤50	6745 (32.5)	2864 (31.6)	3881 (33.1)
50≤60	4595 (22.1)	2097 (23.2)	2498 (21.3)
>60	3889 (18.7)	1847 (20.4)	2042 (17.4)

per bed (OR=0.83, 95% CI: 0.81 to 0.86 and OR=0.89, 95% CI: 0.81 to 0.92) were negatively associated with the desire to work at another hospital and the intention to make a career change. As the number of medical disputes

increased to some extent (ie, 50), the estimated number of positive responses to the two reasons for intending to leave also increased (OR=1.04, 95% CI: 1.03 to 1.05 and OR=1.06, 95% CI: 1.01 to 1.11, respectively).



**Table 2** Characteristics of the sampled hospitals

Characteristics	Overall (%)	General hospital		Specialty hospital	
		(%)	TCM hospital (%)	MC hospital (%)	(%)
<b>Region</b>					
Eastern	56 (41.2)	23 (40.4)	10 (32.3)	11 (36.7)	12 (66.7)
Central	37 (27.2)	18 (31.6)	9 (29.0)	8 (26.7)	2 (11.1)
Western	43 (31.6)	16 (28.1)	12 (38.7)	11 (36.7)	4 (22.2)
<b>Beds</b>					
<500	16 (11.8)	0 (0)	0 (0)	6 (20.0)	10 (55.6)
500≤1000	28 (20.6)	3 (5.3)	6 (19.4)	14 (46.7)	5 (27.8)
1000≤1500	28 (20.6)	8 (14.0)	11 (35.5)	8 (26.7)	1 (5.6)
1500≤2000	23 (16.9)	11 (19.3)	8 (25.8)	2 (6.7)	2 (11.1)
≥2000	41 (30.1)	35 (61.4)	6 (19.4)	0 (0)	0 (0)
<b>Government subsidy (¥)</b>					
<50 million	38 (27.9)	4 (7.0)	8 (25.8)	18 (60.0)	8 (44.4)
50 million≤100 million	46 (33.8)	17 (29.8)	14 (45.2)	10 (33.3)	5 (27.8)
≥100 million	52 (38.2)	36 (63.2)	9 (29.0)	2 (6.7)	5 (27.8)
<b>Medical disputes</b>					
<20	43 (31.6)	12 (21.1)	12 (38.7)	10 (33.3)	9 (50.0)
20≤50	41 (30.1)	15 (26.3)	10 (32.3)	12 (40.0)	4 (22.2)
≥50	52 (38.2)	30 (52.6)	9 (29.0)	8 (26.7)	5 (27.8)
<b>Personnel funding (¥)</b>					
<0.5 billion	74 (54.4)	16 (28.1)	23 (74.2)	24 (80.0)	11 (61.1)
0.5 billion≤1 billion	37 (27.2)	19 (33.3)	8 (25.8)	5 (16.7)	5 (27.8)
≥1 billion	25 (18.4)	22 (38.6)	0 (0)	1 (3.3)	2 (11.1)
<b>Number of inpatients</b>					
<1000	10 (7.4)	1 (1.8)	1 (3.2)	1 (3.3)	7 (38.9)
10 000≤30 000	24 (17.6)	4 (7.0)	8 (25.8)	9 (30.0)	3 (16.7)
30 000≤60 000	40 (29.4)	5 (8.8)	17 (54.8)	14 (46.7)	4 (22.2)
60 000≤100 000	38 (27.9)	24 (42.1)	4 (12.9)	6 (20.0)	4 (22.2)
≥100 000	24 (17.6)	23 (40.4)	1 (3.2)	0 (0)	0 (0)

MC hospital, maternal and child hospital; TCM hospital, traditional Chinese medical hospital.

At the physician level, overtime work was associated with a higher likelihood of physicians intending to change hospitals or to leave their current career (OR=1.11, 95% CI: 1.06 to 1.17 and OR=1.23, 95% CI: 1.19 to 1.28, respectively). Income (OR=0.74, 95% CI: 0.71 to 0.79 and OR=0.88, 95% CI: 0.83 to 0.92, respectively) was negatively associated with both reasons for intending to leave. Physicians who were satisfied with their job were less likely to change hospitals (OR=0.18, 95% CI: 0.17 to 0.20) or leave their current career (OR=0.16, 95% CI: 0.15 to 0.18) than those who gave a negative answer to job satisfaction. Physicians who had experienced a medical dispute during the last year were more likely to change hospitals (OR=1.49, 95% CI: 1.35 to 1.65) or to leave their current career (OR=1.77, 95% CI: 1.64 to 1.91) than those who had not encountered a medical dispute.

## DISCUSSION

In this study, we conducted a national survey to analyse and examine the factors associated with intention to leave among physicians in Chinese tertiary hospitals. We found that 10.4% of the participating physicians thought about changing hospitals, and 20.5% of them intended to change careers. Through multilevel logistic regression models, we found that the government subsidy per bed, personnel funding per capita, the number of physicians per bed and the number of hospital medical disputes significantly affected physician intention to leave. Additionally, at the physician level, we found that income and job satisfaction were negatively associated, while weekly work hours and experience with medical disputes were positively associated with the two reasons for intending to leave. To improve physician retention, it is necessary to

**Table 3** The intention to leave among subgroups

Characteristics	Total number	Changed hospital (%)	P value	Changed career (%)	P value
Total	20785	2171 (10.4)		4271 (20.5)	
Age (years)			<0.001		<0.001
<30	3711	341 (9.2)		671 (18.1)	
30–39	10382	1179 (11.3)		2298 (22.1)	
40–49	4633	521 (11.2)		970 (20.9)	
≥50	2059	139 (6.8)		332 (16.1)	
Gender			<0.001		0.669
Male	9055	1075 (11.9)		1873 (20.7)	
Female	11730	1096 (9.3)		2398 (20.4)	
Specialty			<0.001		<0.001
Internal medicine	4878	479 (9.8)		1069 (21.9)	
Surgery	3151	346 (11.0)		635 (20.2)	
Obstetrics	2939	302 (10.3)		594 (20.2)	
Paediatrics	1762	254 (14.4)		536 (30.4)	
Emergency medicine	696	83 (11.9)		196 (28.2)	
Traditional Chinese medicine	724	84 (11.6)		156 (21.5)	
Otolaryngology	433	50 (11.5)		75 (17.3)	
Anaesthesiology	1037	79 (7.6)		104 (10.0)	
Ophthalmology	706	61 (8.6)		110 (15.6)	
Stomatology	986	128 (13.0)		184 (18.7)	
Dermatology	441	34 (7.7)		71 (16.1)	
Other	3032	271 (8.9)		541 (17.8)	
Monthly income (¥)			<0.001		<0.001
<5000	2909	394 (13.5)		714 (24.5)	
5000≤10000	9781	1071 (10.9)		2221 (22.7)	
10 000≤15000	5513	485 (8.8)		967 (17.5)	
15 000≤20000	1766	154 (8.7)		272 (15.4)	
≥20000	816	67 (8.2)		97 (11.9)	
Weekly work hours			<0.001		<0.001
≤40	5556	420 (7.6)		780 (14.0)	
40≤50	6745	619 (9.2)		1182 (17.5)	
50≤60	4595	569 (12.4)		1130 (24.6)	
>60	3889	563 (14.5)		1179 (30.3)	
Job satisfaction			<0.001		<0.001
Negative perception	4623	1276 (27.6)		2319 (50.2)	
Positive perception	16162	895 (5.5)		1952 (12.1)	
Region			<0.001		<0.001
Eastern	8028	675 (8.4)		1267 (15.8)	
Central	5384	579 (10.8)		1216 (22.6)	
Western	7373	917 (12.4)		1788 (24.3)	
Hospital type			<0.001		<0.001
General hospital	8754	973 (11.1)		1863 (21.3)	
TCM hospital	5214	441 (8.5)		1005 (19.3)	
MC hospital	4218	512 (12.1)		963 (22.8)	
Specialty hospital	2599	245 (9.4)		440 (16.9)	

MC hospital, maternal and child hospital; TCM hospital, traditional Chinese medical hospital.

**Table 4** Hospital-level and physician-level factors associated with intention to leave

Factors	Model 1	Model 2
<b>Hospital-level factors</b>		
Government subsidy per bed (¥)	0.88 (0.86, 0.98)*	0.91 (0.90, 0.99)*
1='<50 000'		
2='50 000≤100 000'		
3='≥100 000'		
Personnel funding per capita (¥)	0.86 (0.76, 0.96)*	0.80 (0.73, 0.88)*
1='<200 000'		
2='200 000≤300 000'		
3='≥300 000'		
Number of physician per bed	0.83 (0.81, 0.86)*	0.89 (0.81, 0.92)*
1='<0.3'		
2='0.3≤0.5'		
3='≥0.5'		
Medical disputes	1.04 (1.03, 1.05)*	1.06 (1.01, 1.11)*
1='<20'		
2='20≤50'		
3='≥50'		
<b>Physician-level factors</b>		
Weekly work hours	1.11 (1.06, 1.17)*	1.23 (1.19, 1.28)*
1='≤40'		
2='40≤50'		
3='50≤60'		
4='>60'		
Monthly income (¥)	0.74 (0.71, 0.79)*	0.88 (0.83, 0.92)*
1='<5000'		
2='5000≤10 000'		
3='10 000≤15 000'		
4='15 000≤20 000'		
5='≥20 000'		
Job satisfaction	0.18 (0.17, 0.20)*	0.16 (0.15, 0.18)*
0='Negative perception'		
1='Positive perception'		
Encountered medical disputes	1.49 (1.35, 1.65)*	1.77 (1.64, 1.91)*
0='No'		
1='Yes'		

Results are presented as OR and 95% CI. The estimated random effect is 0.296 and 0.249 for model 1 and model 2, respectively (both  $p < 0.01$ ). Model 1, intention to leave current hospital for another. Model 2, intention to leave current career. \* $p < 0.01$ .

discuss those factors associated with the two reasons for intending to leave so that we can provide suggestion to authorities and hospital administrators.

Our analysis of ratings related to the intention to leave produced results similar to those found for developed countries and areas, which range from 11.8% to 22%.<sup>5 6</sup> Studies have reported that 5%–27% of nurses in China,

Japan and 10 European countries state that they intend to leave their current hospital.<sup>18–20</sup> The proportion of individuals intending to leave is similar for nurses and for our participating physicians. However, compared with village doctors in China, where approximately 40%–50% reported planning to leave the organisation where they were currently employed,<sup>8–10</sup> the physicians included in our survey were relatively less likely to intend to leave. Filho and colleagues found that physicians did not intend to leave their hospitals because they desire to work at a prestigious institution.<sup>21</sup> Our sampled hospitals were all tertiary institutions and top-ranked hospitals in China. Finally, in our study, the proportion of physicians with the intention to leave was lower than that for village doctors in China.

In this report, the hospital-level and physician-level factors that affect a physician's decision to leave his or her current hospital were studied. Some of our findings were interesting. Few studies have characterised whether personnel funding and government subsidies affect physicians' intention to leave. Hence, the results of this study add to this evidence base by providing the first data indicating that receiving financial support from the hospital and the government can prevent physicians from leaving. Personnel funding, which is usually paid in the form of salary, benefits, welfare and insurance, is a predictor of the organisation's financial support to the individuals it employs. As a result, the data obtained in our study demonstrate that physicians working at hospitals providing a higher level of personnel funding per capita are less likely to intend to leave. Because the sampled hospitals were all public hospitals run by the government, government subsidies are an important source of hospital funds. Meanwhile, among types of support from the government such as tax exemption policies, government subsidies provide a measurable index that could represent the support of the government and the importance it places on the hospital. It was found in our study that a higher government subsidy per bed is associated with a lower intention to leave. However, in China, only 4%–5.28% of the gross domestic product is spent on healthcare, whereas this number is 17.4% in the USA and 8.5% in Japan.<sup>22</sup> Because subsidies from the government are small, physicians must make a profit to improve their compensation. The high pressure of making a profit is an obstacle to retaining physicians.

We found that a higher income was associated with a lower likelihood of intending to leave. The average income reported by participating physicians was 9000¥ (1364\$) which is only 1.6 times higher than the national average. Considering the long training period and high risk associated with becoming a physician, this income does not reflect the value that physicians provide. In developed countries, such as the UK and the USA, the income of specialists is usually to 3 to 4 times of the national average income<sup>22</sup>; therefore, the income found in our study was relatively low. Physicians, like everyone, are interested in their income.<sup>23–25</sup> Hence, the mechanism through which

physicians are paid and how much they are paid can affect intention to resign.

In line with the results of many previous studies, we found that work hours were independently related with intention to leave.<sup>6 26 27</sup> The average number of work hours among the participating physicians was 50 per week, which is higher than that for physicians in the USA (49.6 hours per week).<sup>28</sup> More importantly, 73.3% of the participating physicians reported working more than 40 hours per week, which is the legal number of work hours per week in China, and 18.7% worked more than 60 hours per week. The number of work hours is a tangible and actionable factor. By reasonably regulating work hours, we can reduce the possibility that physicians will leave their current hospital.<sup>29 30</sup> Our study also found that the number of physicians per bed was a preventive factor against the two reasons for leaving. The number of full time employees might need to be increased in tertiary hospitals. Sufficient physicians could lessen a heavy work load and prevent overtime work beyond the regulated work hours.

We found that medical disputes were a significant contributor to physicians' intention to leave. Furthermore, we provide evidence showing that a hospital's total number of medical disputes also affected physician intention to leave. In China, the physician-patient relationship has been characterised as tense, lacking in trust and counterproductive.<sup>31-33</sup> More than one-third of physicians surveyed in this report had encountered a medical dispute in the last year, and more than half of them reported experiencing physical or verbal violence from patients. Hence, the tense nature of the physician-patient relationship was confirmed by the results of our study. However, only 66.1% of the surveyed physicians agreed that their hospital had adopted actions aimed at preventing medical disputes, and only 64.8% of the participants said that the security staff at their institutions responded as soon as the violence occurred. Considering the unsatisfactory response of the hospital system to medical disputes, we suggest that hospital administrators could improve their responsiveness to retain physicians.

We found that job satisfaction plays a role in physician retention, consistent with former studies.<sup>4 34 35</sup> Job satisfaction is a mediator between the workplace and employees' intention to leave.<sup>36-39</sup> When an organisation or work environment does not achieve employee expectations, employees will feel dissatisfied, which can result in a decision to quit.<sup>40 41</sup> In our study, we asked physicians to identify the main factors affecting their job satisfaction, and most cited the income distribution policy and work environment safety. As a result, fairness in reimbursement and the organisation's quick response to medical violence have been suggested to increase physician satisfaction.<sup>42-44</sup>

Paediatricians had the highest rate of intending to leave in our survey. Compared with general hospitals, TCM hospitals and other specialty hospitals, MC hospitals, which have a higher proportion of paediatricians, also consistently showed a higher likelihood of intending

to leave. The Chinese medical doctor association claimed that the shortage of paediatricians is severe, and China is short at least 200 000 paediatricians.<sup>45</sup> Low income and high pressure stemming from the high expectations of children's parents were the main explanation for the paediatrician shortage.<sup>46</sup> Income and medical disputes were also proven to affect the leaving intention of physicians in our survey. Therefore, attention should be given to measures to improve the income and work environment of paediatricians.

Physicians in Western China reported a higher intention to leave, followed by those in Central and Eastern China. Regions with a better socioeconomic environment attract more physicians.<sup>47</sup> Western China has a lower economic status and thus suffers from greater human health resource inequality than Central and Eastern China, which have higher economic status.<sup>48</sup> Perhaps, the physicians in Western China had a higher likelihood of intending to leave because of their poor economic status.

There are important limitations to our study. First, because this was a self-reported survey, we cannot be sure whether intention to leave was under-reported or over-reported. However, the physicians may have been more forthcoming because the survey was anonymous. Meanwhile, physicians may have been cautious about reporting grey income, and so the total compensation could have been underestimated. Second, because this was a cross-sectional study, we were unable to ascertain the directionality of causal relationships between the potential factors and intention to leave, and this should therefore be addressed in future longitudinal studies. Third, in this study, we examined the variables commonly used to explain intention to leave. The associations between individual and organisational factors and intention to leave are complex. Culture, coworkers and other predictors of the doctor-patient relationship were not included in our study. Finally, we lack the information to analyse the different characteristics and reasons behind intention to leave. We will conduct detailed interviews in the near future.

## CONCLUSIONS

In this study, we explore factors that contribute to the intention to leave among physicians in tertiary hospitals in China and demonstrate that there are associations between hospital-level and physician-level factors and two types of intention to leave: the intention to change to a different hospital and the intention to leave the career altogether. Although most of the surveyed physicians reported that they did not intend to leave their current hospital, we found that government subsidy per bed, personnel funding per capita, number of physicians per bed, individual income and job satisfaction were negatively associated with both reasons for leaving, while the total number of medical disputes reported by a hospital, individual experience with medical disputes and weekly work hours were positively related to both reasons for



leaving. Our findings provide important insights that authorities and hospital administrators should consider when attempting to improve physician retention.

**Acknowledgements** The authors gratefully acknowledge the health authorities and experts in the 31 provinces who helped coordinate activities at the sample hospitals.

**Contributors** CZ, LH, JM and YL conceived and designed the study. CZ, SW and JG collected, cleaned and analysed the data. CZ wrote the first draft of the manuscript. LH and YL edited the manuscript and provided expert advice based on their medical specialist knowledge. All authors critically read and approved the final manuscript.

**Funding** This work was supported by a grant from the National Health and Family Planning Commission, P.R. China.

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Ethics approval** This study was approved by the Research Ethics Committee of the Chinese Academy of Medical Science and Peking Union Medical College.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data sharing statement** The data that support the findings presented in this study are available from the Public Health School of Peking Union Medical College with a few restrictions. The data were used under licence for the current study and so are not publicly available. Data are, however, available from the authors upon reasonable request and with permission from the Authority of Public Health School of Peking Union Medical College.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

## REFERENCES

- Kirch DG, Petelle K. Addressing the physician shortage: the peril of ignoring demography. *JAMA* 2017;317:194–8.
- Lien SS, Kosik RO, Fan AP, *et al.* 10-year trends in the production and attrition of Chinese medical graduates: an analysis of nationwide data. *The Lancet* 2016;388:S11.
- Freeborn DK, Hooker RS, Pope CR. Satisfaction and well-being of primary care providers in managed care. *Eval Health Prof* 2002;25:239–54.
- Dewa CS, Loong D, Bonato S, *et al.* How does burnout affect physician productivity? A systematic literature review. *BMC Health Serv Res* 2014;14:1–10.
- Degen C, Li J, Angerer P. Physicians' intention to leave direct patient care: an integrative review. *Hum Resour Health* 2015;13:74.
- Tsai YH, Huang N, Chien LY, *et al.* Work hours and turnover intention among hospital physicians in Taiwan: does income matter? *BMC Health Serv Res* 2016;16:667.
- Haiqing F, Xiaoxu Z, Shuliang M, *et al.* Study of country pilot hospital personnel working condition and management strategy. *China Hosp Manag* 2012;32:12–14.
- Fang P, Liu X, Huang L, *et al.* Factors that influence the turnover intention of Chinese village doctors based on the investigation results of Xiangyang City in Hubei Province. *Int J Equity Health* 2014;13:1–9.
- Wen T, Zhang Y, Wang X, *et al.* Factors influencing turnover intention among primary care doctors: a cross-sectional study in Chongqing, China. *Hum Resour Health* 2018;16:10.
- Zhang X, Fang P. Job satisfaction of village doctors during the new healthcare reforms in China. *Aust Health Rev* 2016;40:225–33.
- Li H, Liu K, Gu J, *et al.* The development and impact of primary health care in China from 1949 to 2015: A focused review. *Int J Health Plann Manage* 2017;32:339–50.
- Kong X, Yang Y. The current status and challenges of community general practitioner system building in China. *QJM* 2015;108:89–91.
- Jing L, Shu Z, Sun X, *et al.* Factors influencing patients' contract choice with general practitioners in Shanghai: a preliminary study. *Asia Pac J Public Health* 2015;27:77S–85.
- Hung LM, Rane S, Tsai J, *et al.* Advancing primary care to promote equitable health: implications for China. *Int J Equity Health* 2012;11:2–5.
- National Health and Family Planning Commission PRC. *China Health and Family Planning Yearbook*. Beijing: China Health and Family Planning Commission Yearbook press, 2016.
- National Bureau of Statistics of China. Chinese statistic year books in 2017. 2017 <http://www.stats.gov.cn/tjsj/ndsj/2017/indexch.htm> (Accessed 18 Mar 2018).
- Prince MJ, Wu F, Guo Y, *et al.* The burden of disease in older people and implications for health policy and practice. *Lancet* 2015;385:549–62.
- Leineweber C, Chungkham HS, Lindqvist R, *et al.* Nurses' practice environment and satisfaction with schedule flexibility is related to intention to leave due to dissatisfaction: A multi-country, multilevel study. *Int J Nurs Stud* 2016;58:47–58.
- Saijo Y, Yoshioka E, Kawanishi Y, *et al.* Relationships of job demand, job control, and social support on intention to leave and depressive symptoms in Japanese nurses. *Ind Health* 2016;54:32–41.
- Zhang LF, You LM, Liu K, *et al.* The association of Chinese hospital work environment with nurse burnout, job satisfaction, and intention to leave. *Nurs Outlook* 2014;62:128–37.
- de Oliveira Vasconcelos Filho P, de Souza MR, Elias PE, *et al.* Physicians' job satisfaction and motivation in a public academic hospital. *Hum Resour Health* 2016;14:75.
- OECD. OECD statistic. <http://stats.oecd.org/> (Accessed 18 Mar 2018).
- Coniglio D, Akroyd D. Factors predicting physician assistant faculty intent to leave. *J Physician Assist Educ* 2015;26:113–22.
- Feng D, Su S, Yang Y, *et al.* Job satisfaction mediates subjective social status and turnover intention among Chinese nurses. *Nurs Health Sci* 2017;19:388–92.
- Erus B, Hatipoglu O. Physician payment schemes and physician productivity: analysis of Turkish healthcare reforms. *Health Policy* 2017;121:553–7.
- Rabatin J, Williams E, Baier Manwell L, *et al.* Predictors and outcomes of burnout in primary care physicians. *J Prim Care Community Health* 2016;7:41–3.
- Degen C, Li J, Angerer P. Physicians' intention to leave direct patient care: an integrative review. *Hum Resour Health* 2015;13:74.
- Staiger DO, Auerbach DI, Buerhaus PI. Trends in the work hours of physicians in the United States. *JAMA* 2010;303:747–53.
- Lu Y, Hu XM, Huang XL, *et al.* The relationship between job satisfaction, work stress, work-family conflict, and turnover intention among physicians in Guangdong, China: a cross-sectional study. *BMJ Open* 2017;7:e014894.
- Wada K, Arimatsu M, Higashi T, *et al.* Physician job satisfaction and working conditions in Japan. *J Occup Health* 2009;51:261–6.
- Wang Z, Xie Z, Dai J, *et al.* Physician burnout and its associated factors: a cross-sectional study in Shanghai. *J Occup Health* 2014;56:73–83.
- Tang L, Guan M. Rise of health consumerism in china and its effects on physicians' professional identity and the physician-patient relationship and communication. *Health Commun* 2018;33.
- He AJ, Qian J. Explaining medical disputes in Chinese public hospitals: the doctor-patient relationship and its implications for health policy reforms. *Health Econ Policy Law* 2016;11:359–78.
- Mohr DC, Burgess JF. Job characteristics and job satisfaction among physicians involved with research in the veterans health administration. *Acad Med* 2011;86:938–45.
- Seo HS, Kim H, Hwang SM, *et al.* Predictors of job satisfaction and burnout among tuberculosis management nurses and physicians. *Epidemiol Health* 2016;38:e2016008.
- Muchinsky PM, Morrow PC. A multidisciplinary model of voluntary employee turnover. *J Vocat Behav* 1980;17:263–90.
- Zeffane RM. Understanding employee turnover: the need for a contingency approach. *Int J Manpow* 1994;15:22–37.
- Quarles R. An examination of promotion opportunities and evaluation criteria as mechanisms for affecting internal auditor commitment, job satisfaction and turnover intentions. *J Manage Issues* 1994;6:176–94.
- Iverson RD. An event history analysis of employee turnover: the case of hospital employees in Australia. *Human Resource Management Review* 1999;9:397–418.
- Wu D, Wang Y, Lam KF, *et al.* Health system reforms, violence against doctors and job satisfaction in the medical profession: a cross-sectional survey in Zhejiang Province, Eastern China. *BMJ Open* 2014;4:e006431.
- Maslach C, Leiter MP. Early predictors of job burnout and engagement. *J Appl Psychol* 2008;93:498–512.
- Girdhari R, Harris A, Fallis G, *et al.* Family physician satisfaction with two different academic compensation schemes. *Fam Med* 2013;45:622.



43. Pathman DE, Konrad TR, Williams ES, *et al.* Physician job satisfaction, dissatisfaction, and turnover. *J Fam Pract* 2002;51:593.
44. Tucker JD, Cheng Y, Wong B, *et al.* Patient-physician mistrust and violence against physicians in Guangdong Province, China: a qualitative study. *BMJ Open* 2015;5:e008221.
45. Chinese Medical Doctor Association. Paediatricians flee away in China. <http://www.cmda.gov.cn/xinwen/redianxinwen/2014-01-24/12845.html> (Accessed 27 Jun 2018).
46. Hu KJ, Sun ZZ, Rui YJ, *et al.* Shortage of paediatricians in China. *Lancet* 2014;383:954.
47. Omrani-Khoo H, Lotfi F, Safari H, *et al.* Equity in distribution of health care resources; assessment of need and access, using three practical indicators. *Iran J Public Health* 2013;42:1299–308.
48. Li D, Zhou Z, Si Y, *et al.* Unequal distribution of health human resource in mainland China: what are the determinants from a comprehensive perspective? *Int J Equity Health* 2018;17:29.