

# What is the most important factor affecting patient satisfaction – a study based on gamma coefficient

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Jinming Fang<sup>1,2</sup>  
Ling Liu<sup>2</sup>  
Pengqian Fang<sup>1</sup>

<sup>1</sup>School of Medicine and Health Management, Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430030, People's Republic of China; <sup>2</sup>Wuhan Forth Hospital, Puai Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, 430033, People's Republic of China

**Objective:** To analyze the influencing factors of patients satisfaction and find out the key factors, so as to provide suggestions for improving health policy.

**Methods:** A questionnaire survey was conducted in Wuhan China. A total of 2,719 questionnaires were collected and 2,626 valid answer sheets were obtained. Through statistical description, chi-square test. Gamma coefficient analysis and binary logistic regression, the key factors affecting patient satisfaction were obtained.

**Results:** It was found that the “Medical staff’s service attitude” was the most important factor affecting patient satisfaction, followed by “Medical staff services technology” and “Hospital convenience”. The demographic characteristics of patients had no significant effect on satisfaction, and “Medical services utilization” of patients had a certain impact on satisfaction. Patients had a higher degree of satisfaction with the “Hospital convenience”, “Hospital facilities and environment”, “Medical staff services technology”, “Medical staff service attitude”, but had a lower degree of satisfaction with “Medical expense” and “Reimbursement ratio for medical expenses”.

**Conclusion:** “Medical staff’s service attitude”, “Medical staff services technology” and “Hospital convenience” was the most three important factors. The health managers should focus on the above three aspects and implement appropriate management decisions to improve patient satisfaction.

**Keywords:** patient satisfaction, urban, hospitals, health care reform, public policy

## Introduction

Medical and health services were public utilities to promote people’s health. Patients were the objects of medical and health services. The fundamental goal of the government in developing health services was to meet the growing health needs of the people. Patient satisfaction, which referred to the conclusion reached by patients and their families after comparing their feelings during the medical service with their previous expectations, was the criterion of medical service quality.

Patient satisfaction was usually measured by a patient’s questionnaire and was critical in assessing the quality of medical care.<sup>1</sup> In today’s highly competitive medical environment, satisfaction had become the core competitiveness of medical and health institutions.<sup>2,3</sup> Therefore, it was very important for medical institutions and their superior departments to find out the factors that affect patients’ satisfaction with medical services.

Correspondence: Pengqian Fang  
School of Medicine and Health Management, Tongji Medical College, Huazhong University of Science and Technology, 13 Hangkong Road, Qiaokou District, Wuhan 430030, People's Republic of China  
Tel +861 339 715 3995  
Email pfang@mails.tjmu.edu.cn

Some countries tried to improve medical satisfaction through health care reform. The Netherlands had gradually introduced a competition mechanism in the field of health care through a series of administrative reforms, so as to improve the efficiency of the reform in the field of health care and medical satisfaction. Britain implemented the patient-centered concept and introduced a competition mechanism in the general practitioner, to increase the patient's right of choice.<sup>4,5</sup> The Obama administration took medical insurance as the breakthrough point in the reform, which to strengthen the government role, trying to keep the doctor from the medical insurance, medical authorization and medical lawsuit of trivial matters, in order to improve the satisfaction on both patients and medical staff.<sup>6,7</sup>

In 2009, China launched a new round of medical and health system reform.<sup>8-10</sup> Its short-term goals included five areas: accelerating the establishment of the basic medical security system, implementing the national essential drug system, improving the primary health care service system, promoting the equalization of basic public health services, and initiating the pilot reform of public hospitals.<sup>8,11,12</sup> Among them, the pilot reform of public hospitals included the following contents: establishing the management system of public hospitals, establishing new operating mechanism of public hospitals, especially compensation mechanism, reducing the price of drug consumables, establishing the division of labor and cooperation between different levels of medical institutions, carrying out graded diagnosis and treatment and two-way referral.<sup>13</sup> The purpose was to reduce the medical economic burden of residents, increase the income of the medical staff, reduce the risk of the medical security system, and provide safe, effective, convenient and cheap health services for the whole people, in order to improve the patient satisfaction.

Previous studies had shown that there were many factors influencing patient satisfaction. Some researchers found that, among demographic characteristics, age, health status, and race consistently had a statistically significant effect on satisfaction scores. Among the institutional characteristics, hospital size consistently had a significant effect on patient satisfaction scores.<sup>14</sup> Some studies suggested that patients with better health tend to be more satisfied with their medical care, but the cause and effect of this relationship had not been determined.<sup>15</sup> Some researchers believed that age and illness are important factors affecting patient satisfaction, and elderly patients tended to be satisfied with the medical process, while severe patients tended to be dissatisfied with the medical

process.<sup>16,17</sup> Other studies had found that hospital environment, service attitude of hospital staff and other basic services, such as catering, can affect patient satisfaction.<sup>18</sup>

Through literature review, it could be found that the factors affecting patient satisfaction mainly come from two aspects. One was the individual factors of patients, including gender, income, health status, medical insurance, marital status, family size, etc. The second was the factors from the hospital, including medical conditions, fees, institutional level, environmental facilities.<sup>19-24</sup>

However, the results of different research were not consistent, and there were few studies on the importance of factors affecting patient satisfaction. This study was based on the background of China's medical and health reform. Try to explore the key factors affecting patient satisfaction and provide some suggestions for the reform.

## Methods

### Study populations

We chose to investigate in the Wuhan city in China. Wuhan was the capital of Hubei Province and was located in central China. Wuhan was rich in medical resources and its economic development was at a medium level in China. There were many medical institutions of various affiliations and levels. Wuhan City initiated the reform of the medical and health system at the end of 2015. In 2017, all public hospitals in Wuhan were carried out reform. The reform of public hospitals in Wuhan was relatively mature and stable, which could accurately reflect the effect of China's medical reform policies. We believed this survey was representative of China's public hospital reform.

We stratified hospitals according to their affiliation and adopt the method of stratified sampling. The stratum of hospitals included: Hospital administered by the National Health Commission, Provincial Hospital, Municipal hospital, District hospital, Military hospital, and Enterprise-owned hospital. The purpose was used to make the sample more representative. Finally, thirteen hospitals were selected, and the hospital level included Secondary hospital and Tertiary hospital, and the category included General Hospital, Specialized Hospital, Hospital of Chinese Medicine, and Maternal and Child Health Hospital.

At least 200 patients were investigated in each hospital. For outpatients, a convenient sampling method was used to investigate the patients who had been treated. For inpatients, the inpatient departments of the hospital were randomly sampled first, and then all patients with more than 3 days

of hospitalization in the department were investigated. A total of 2,860 questionnaires were distributed and 2,719 were returned. After removing incomplete and illogical questionnaires, 2,626 valid answers were finally obtained. This study was approved by the Ethics Committee of Puai hospital (No: KY 2018-027-01). The privacy was strictly protected by filling in the questionnaires anonymously.

## Questionnaires

From previous studies, we selected possible influencing factors and put them in our questionnaire. The questionnaire consisted of three parts. The first part collected the basic Socio-demographic characteristics of patients, including “Gender”, “Age”, “Place of residence” and “Type of medical insurance”. The second part was medical services utilization of patients including “Hospital affiliation”, “Hospital level”, “Hospital category”, “Treatment type”, “Reason for medical”, “Whether this hospital is the preferred medical institution”, and “Registration method”. The third part was patients’ overall satisfaction and factors related to patient satisfaction, such as “Hospital convenience”, “Hospital facilities and environment”, Medical staff services technology, “Medical staff service attitude”, “Medical expenses”, “Reimbursement ratio for medical expenses”. Considering the cultural level and cognitive ability of the patients, the questions about satisfaction adopted the Likert’s three-point method, that was, one point meant very dissatisfied (which meant very bad, very inconvenient, and very expensive), three points meant moderate (which meant not too bad), and five points meant very satisfied (which meant very good, very convenient, and very cheap).

## Index of measurement

The Gamma coefficient was considered to be a good indicator for the correlation analysis of ordered classification data. Its value was between  $-1$  and  $1$ . When  $G=0$ , it meant the two variables were irrelevant. When  $G>0$ , the two variables were positively correlated, and  $G<0$  meant negatively correlated. The closer the absolute value of  $G$  was to  $1$ , the greater the degree of association was, the closer its value was to  $0$ , and the smaller the correlation degree was.

## Statistical analyses

Excel 2016 was used for the preparation of a database, and a double check method was used to enter the data. SPSS 24.0 was used for statistical analysis. First, a preliminary analysis of the overall data was performed using statistical descriptions. Second, the chi-square test was used to

screen the influencing factors of satisfaction. Third, the Gamma coefficient was used to analyze the correlation between patients’ overall satisfaction and factors related to patient satisfaction. Fourth, Multiple analysis was utilized to explore deeper relationships.

We took patient satisfaction as the dependent variable, encoding “very satisfied” as ‘1’, “Moderate” and “very dissatisfied” as ‘0’, and then used binary logistic regression to determine the significant factors influencing patient satisfaction. A linear regression model was used first to determine whether there was multicollinearity between independent variables. After that, the variables were placed in binary logistic regression and the variable selection method was using the forward LR. Socio-demographic characteristics and medical services utilization of patients were included in the equation in the form of dummy variables, and factors related to patient satisfaction were included in the equation in the form of ordered variables. the type I error rate was set to 0.05. Odds ratios(OR) were recorded with 95% confidence interval.

## Results

### Statistical description

Descriptive statistics were performed on the patients’ basic characteristics and Table 1 was obtained. The patients investigated were mainly comprised of female (53.8%). The majority of the patients were under the age of 35 years old (38.6%). Most of the patients lived in Wuhan (71.4%), and 83.0% of the patients had social medical insurance. According to the patient’s medical services utilization, the municipal hospitals (30.8%), tertiary hospitals (92.4%), and general hospitals (77.2%) were the main hospitals. and the main reason for medical was to be sick (87.2%). The hospital Surveyed in was the patients’ preferred medical institution accounted for the majority(88.2%), and the Registration method was mainly concentrated in hospital registration (80.2%). The information was shown in Table 2. The percent of patients’ overall satisfaction was 85.5%, The percent of satisfaction on the “Hospital convenience”, “Hospital facilities and environment”, “Medical staff services technology”, “Medical staff service attitude”, “Medical expenses”, and “Reimbursement ratio for medical expenses” was 72.0%, 75.0%, 83.8%, 84.5%, 15.6%, 45.6% respectively (Table 3).

### Univariate analyses

Taking the overall satisfaction as the indicator variable and the Socio-demographic characteristics and medical

**Table 1** Socio-demographic characteristics of patients

Characteristics		Participants (n=2,626)	Percent (%)
Gender	Male	1,214	46.2
	Female	1,412	53.8
Age (years)	≤35	1,014	38.6
	36–50	567	21.6
	51–65	570	21.7
	>65	475	18.1
Place of residence	In Wuhan	1,876	71.4
	Hubei province outside of Wuhan	567	21.6
	Outside Hubei province	183	7.0
Type of medical insurance	Medical insurance systems for urban workers	1,154	43.9
	Medical insurance for urban residents	494	18.8
	New rural cooperative medical insurance	532	20.3
	Free medical care	155	5.9
	Commercial medical insurance	47	1.8
	Other medical insurance	82	3.1
	Uninsured	162	6.2

services utilization of patients as the grouping factors, the chi-square test was performed, and Table 4 was obtained. There was no statistically significant difference in “Gender”, “Place of Residence”, “Hospital level”, and “Reason for medical” ( $p>0.05$ ), the other factors exhibited significant differences ( $p<0.05$ ).

In the Gamma test, all factors related to patient satisfaction had a positive correlation with overall satisfaction (Table 5) and were statistically significant ( $p<0.001$ ). The three most relevant factors were “Medical staff service attitude” (Gamma=0.87), “Medical staff services technology” (Gamma=0.85) and “Hospital convenience” (Gamma=0.77). All the statistically significant factors would be analyzed in the Multivariate analysis.

## Multivariate analyses

Prior to binary logistic regression, a linear regression model was used to test for the existence of multicollinear-

**Table 2** Medical services utilization of patients

Medical services utilization of patients		Participants (n=2,626)	Percent (%)
Hospital affiliation	Hospital administered by the National Health Commission	415	15.8
	Provincial hospital	600	22.8
	Municipal hospital	810	30.8
	District hospital	401	15.3
	Military hospital	200	7.6
	Enterprise-owned hospital	200	7.6
Hospital level	Secondary hospital	200	7.6
	Tertiary hospital	2,426	92.4
Hospital category	General hospital	2,026	77.2
	Specialized hospital	200	7.6
	Hospital of Chinese Medicine	200	7.6
	Maternal and Child Health Hospital	200	7.6
Treatment type	Outpatient	867	33.0
	Inpatient	1,759	67.0
Reason for medical	Be sick	2,290	87.2
	Prescribe drugs regularly	102	3.9
	Prescribe for others	55	2.1
	Prevention and healthcare	179	6.8
Whether this hospital is the preferred medical institution	Yes	2,316	88.2
Registration method	No	310	11.8
	Register in the hospital	2,105	80.2
	Register online	407	15.5
	Register by phone	55	2.1
	Register by community	6	0.2
	Other methods	53	2.0

**Table 3** Patients' overall satisfaction and factors related to patient satisfaction

Patient satisfaction and related factors		Participants (n=2,626)	Percent (%)
Overall satisfaction	Very dissatisfied	28	1.1
	Moderate	354	13.5
	Very satisfied	2,244	85.5
Hospital convenience	Very inconvenient	159	6.1
	Moderate	577	22.0
	Very convenient	1,890	72.0
Hospital facilities and environment	Very bad	34	1.3
	Moderate	622	23.7
	Very good	1,970	75.0
Medical staff services technology	Very bad	9	0.3
	Moderate	417	15.9
	Very good	2,200	83.8
Medical staff service attitude	Very bad	30	1.1
	Moderate	378	14.4
	Very good	2,218	84.5
Medical expense	Very expensive	813	31.0
	Moderate	1,404	53.5
	Very cheap	409	15.6
Reimbursement ratio for medical expenses	Very bad	277	10.5
	Moderate	1,151	43.8
	Very good	1,198	45.6

ity between independent variables. The result showed that all independent tolerance value of was greater than 0.1 and VIF value was not great than 5 (which could see in supplementary materials), that was to say, all the independent variables did not have multicollinearity, then we could place all variables into the binary logistic regression directly. After 6 iterations, 10 variables entered the equation. The Variables were "Hospital affiliation", "Hospital category", "Treatment type", "Whether this hospital is the preferred medical institution", and all factors related to patient satisfaction ( $p<0.05$ ; Table 6). The Omnibus Tests of Model Coefficients showed the chi-square value was 914.993 ( $p<0.001$ ), which meant the model is statistically significant. The Hosmer and Lemeshow Test showed the chi-square value was 15.518 ( $p=0.050$ ), which meant that the information in the current data had been fully extracted

and the goodness-of-fit of the model was enough. This model could correctly predict 90.7% of the study subjects, with the sensitivity of 97.3%.

In particular, compared with the "Hospital administered by the National Health Commission", the odds of patient satisfaction in the "Provincial Hospital", "Municipal hospital", "District hospital", "Military hospital", and "Enterprise-owned hospital" was higher (the OR was 2.697, 1.004, 1.144, 1.523, 1.517 respectively). Compared with the "Maternal and Child Health Hospital", the odds of patient satisfaction in "General Hospital", "Specialized Hospital", and "Hospital of Chinese Medicine" was lower (the OR was 0.405, 0.106, 0.516 respectively). Compared with "inpatients", the "Outpatients" were less likely to feel satisfied (OR=0.475,  $p<0.001$ ). Compared with "non-preferred hospitals", the patients were more likely to feel satisfied with the "preferred medical institution" (OR=1.755,  $p=0.003$ .)

With the improvement of "Hospital convenience" for each grade, the patients' overall satisfaction odds would increase by 60.9% (OR=1.609,  $p<0.001$ ). With the improvement of "Hospital facilities and environment" for each grade, the patients' overall satisfaction odds would increase by 45.1% (OR=1.451,  $p<0.001$ ). With the improvement of "Medical staff services technology" for each grade, the patients' overall satisfaction odds would increase by 93.8% (OR=1.938,  $p<0.001$ ). With the improvement of "Medical staff service attitude" for each grade, the patients' overall satisfaction odds would increase by 103.0% (OR=2.030,  $p<0.001$ ). With the improvement of "Medical expense" for Each grade, the patients' overall satisfaction odds would increase by 26.9% (OR=1.269,  $p<0.001$ ). With the improvement of "Reimbursement ratio for medical expenses" for each grade, the patients' overall satisfaction odds would increase by 24.1% (OR=1.241,  $p<0.001$ ).

## Discussion

The theory of customer satisfaction originated from enterprise management. Most scholars' understanding of customer satisfaction revolves around the "expectation-difference" paradigm. The basic connotation of this paradigm was that customer expectation forms a reference point for product and service comparison and judgment. Customer satisfaction was perceived as a subjective feeling, which described the degree to which customers expect to be satisfied with the purchase of a particular commodity. Customer satisfaction was at the heart of modern marketing theory and practice. Hospitals, like enterprises, were able to survive by meeting consumer

**Table 4** Univariate analysis of patient satisfaction

Participants		Overall satisfaction							p
		Very dissatisfied		Moderate		Very satisfied			
n	%	n	%	n	%				
Gender	Male	14	1.2	161	13.3	1,039	85.6	0.885	
	Female	14	1.0	193	13.7	1,205	85.3		
Age (years)	≤35	11	1.1	177	17.5	826	81.5	<0.00	
	36–50	6	1.1	83	14.6	478	84.3		
	51–65	6	1.1	64	11.2	500	87.7		
	>65	5	1.1	30	6.3	440	92.6		
Place of Residence	In wuhan	24	1.3	252	13.4	1,600	85.3	0.495	
	Hubei province outside of wuhan	4	0.7	80	14.1	483	85.2		
	Outside Hubei province	0	0.0	22	12.0	161	88.0		
Type of medical insurance	Medical insurance systems for urban workers	10	0.9	130	11.3	1,014	87.9	0.002	
	Medical insurance for urban residents	5	1.0	68	13.8	421	85.2		
	New rural cooperative medical insurance	5	0.9	80	15.0	447	84.0		
	Free medical care	5	3.2	20	12.9	130	83.9		
	Commercial medical insurance	2	4.3	7	14.9	38	80.9		
	Other medical insurance	1	1.2	11	13.4	70	85.4		
	Uninsured	0	0.0	38	23.5	124	76.5		
Hospital affiliation	Hospital administered by the National Health Commission	5	1.2	53	12.8	357	86.0	0.026	
	Provincial Hospital	9	1.5	89	14.8	502	83.7		
	Municipal hospital	11	1.4	96	11.9	703	86.8		
	District hospital	2	0.5	74	18.5	325	81.0		
	Military hospital	0	0.0	19	9.5	181	90.5		
	Enterprise-owned hospital	1	0.5	23	11.5	176	88.0		
Hospital level	Secondary hospital	0	0.0	30	15.0	170	85.0	0.273	
	Tertiary hospital	28	1.2	324	13.4	2,074	85.5		
Hospital category	General Hospital	17	0.8	246	12.1	1,763	87.0	<0.001	
	Specialized Hospital	8	4.0	61	30.5	131	65.5		
	Hospital of Chinese Medicine	2	1.0	27	13.5	171	85.5		
	Maternal and Child Health Hospital	1	0.5	20	10.0	179	89.5		
Treatment type	Outpatient	20	2.3	222	25.6	625	72.1	<0.001	
	Inpatient	8	0.5	132	7.5	1,619	92.0		
Reason for medical	Be sick	25	1.1	303	13.2	1,962	85.7	0.452	
	Prescribe drugs regularly	0	0.0	19	18.6	83	81.4		
	Prescribe for others	1	1.8	10	18.2	44	80.0		
	Prevention and healthcare	2	1.1	22	12.3	155	86.6		
Whether this hospital is the preferred medical institution	Yes	25	1.1	263	11.4	2,028	87.6	<0.001	
	No	3	1.0	91	29.4	216	69.7		
Registration method	Register in the hospital	24	1.1	290	13.8	1,791	85.1	0.003	
	Register online	2	0.5	48	11.8	357	87.7		
	Register by phone	0	0.0	4	7.3	51	92.7		
	Register by community	0	0.0	5	83.3	1	16.7		
	Other methods	2	3.8	7	13.2	44	83.0		
□									



**Table 5** Correlation analysis of patients' overall satisfaction and factors related to patient satisfaction

Participants		Overall satisfaction						Gamma	p
		Very dissatisfied		Moderate		Very satisfied			
n	%	n	%	n	%				
Degree of hospital convenience	Very inconvenient	13	8.2	66	41.5	80	50.3	0.77	<0.001
	Moderate	9	1.6	187	32.4	381	66.0		
	Very convenient	6	0.3	101	5.3	1,783	94.3		
Hospital facilities and environment	Very bad	3	8.8	15	44.1	16	47.1	0.72	<0.001
	Moderate	14	2.3	198	31.8	410	65.9		
	Very good	11	0.6	141	7.2	1,818	92.3		
Medical staff services technology	Very bad	4	44.4	5	55.6	0	0.0	0.85	<0.001
	Moderate	17	4.1	190	45.6	210	50.4		
	Very good	7	0.3	159	7.2	2,034	92.5		
Medical staff service attitude	Very bad	13	43.3	11	36.7	6	20.0	0.87	<0.001
	Moderate	11	2.9	187	49.5	180	47.6		
	Very good	4	0.2	156	7.0	2,058	92.8		
Medical expense	Very expensive	19	2.3	175	21.5	619	76.1	0.46	<0.001
	Moderate	8	0.6	161	11.5	1,235	88.0		
	Very cheap	1	0.2	18	4.4	390	95.4		
Reimbursement ratio for medical expenses	Very bad	14	5.1	95	34.3	168	60.6	0.62	<0.001
	Moderate	9	0.8	198	17.2	944	82.0		
	Very good	5	0.4	61	5.1	1,132	94.5		

needs.<sup>25</sup> In modern hospital management, patient satisfaction was also the embodiment of hospital comprehensive strength. There were many factors influencing patient satisfaction, and through this study, we identified the key factors that affect patient satisfaction.

### “Medical staff service attitude”, “medical staff services technology”, and “hospital convenience” were the three most important factors affecting patient satisfaction

Previous studies had revealed that Chinese patients were more concerned about doctors' attitudes toward services, medical quality and rationality of medical costs. Dissatisfaction among Chinese patients had focused on high costs (including expensive drugs, high testing costs, expensive medical devices, and over-treatment), long waiting times (including long queues and many medical links) and unreasonable processes (such as paying first and then seeing a doctor),<sup>26</sup> Some experts had shown that interpersonal skills, the humanitarian quality of the staff, a good doctor-patient relationship, information

provided to the patient about his or her condition are crucial,<sup>1,27,28</sup> There were also studies believed that doctors' professional knowledge was one of the main factors that affect patient satisfaction,<sup>29</sup> and many patients were highly dissatisfied with hospital facilities.

In our research, “Hospital convenience”, “Hospital facilities and environment”, “Medical staff services technology”, “Medical staff service attitude”, “Medical expense”, “Reimbursement ratio for medical expenses” were all influential factors with statistical significance. this was roughly the same as the previous study, but our research had taken a further step. We ranked these factors, among which, the strongest influencing factor was “Medical staff service attitude”, followed by “Medical staff services technology” and “Hospital convenience”. This indicated that most patients were more concerned about whether their condition was cared about and respected by doctors. It also showed that being patient-centered was more important than being disease-centered. The weakest influencing factor was “Reimbursement ratio for medical expenses”, that meant, although the “Reimbursement ratio for medical expenses” had

**Table 6** Multiple analysis of the factors influencing patient satisfaction

Influencing factors	Reference category	p	OR	95% CI	
				Lower	Upper
Hospital affiliation	Hospital administered by the National Health Commission	0.024*			
Provincial Hospital		0.002	2.697	1.430	5.088
Municipal hospital		0.988	1.004	0.591	1.706
District hospital		0.628	1.144	0.664	1.970
Military hospital		0.242	1.523	0.753	3.080
Enterprise-owned hospital		0.242	1.517	0.754	3.053
Hospital category	Maternal and Child Health Hospital	<0.001*			
General Hospital		0.010	0.405	0.203	0.805
Specialized Hospital		<0.001	0.106	0.042	0.270
Hospital of Chinese Medicine		0.102	0.516	0.233	1.140
Treatment type	Inpatient				
Outpatient		<0.001	0.475	0.349	0.646
Whether this hospital is the preferred medical institution	No				
yes		0.003	1.755	1.205	2.557
Degree of hospital convenience		<0.001	1.609	1.444	1.794
Hospital facilities and environment		<0.001	1.451	1.244	1.692
Medical staff services technology		<0.001	1.938	1.631	2.304
Medical staff service attitude		<0.001	2.030	1.748	2.358
Medical expense		<0.001	1.269	1.115	1.445
Reimbursement ratio for medical expenses		<0.001	1.241	1.101	1.399
Constant		<0.001	0.000		

**Notes:** Variable screening using the forward LR method. The Socio-demographic characteristics factors and Medical services utilization of patients were included in the equation in the form of dummy variables, and the *p*-value marked with an asterisk was the omnibus *p*-value. Factors related to patient satisfaction were included in the equation in the form of ordinal variables.

statistical significance on patient satisfaction, it was not a strong influence factor. It could only be considered as a secondary factor in improving patient satisfaction.

For the health care reform department and hospital administrators, it was very difficult to improve all aspects of patient satisfaction, so it was especially important to grasp the most important factors affecting patient satisfaction. Our results showed that if hospitals wanted to quickly improve patient satisfaction, they should focus on improving service attitudes.

## The demographic characteristics of patients had no significant effect on satisfaction, and the medical services utilization of patients had a certain impact on satisfaction

Some studies had shown that older patients, patients with low education levels, married patients and patients with high social status have higher satisfaction.<sup>30</sup> Some studies believed that

the patient's personal characteristics were the decisive factor of satisfaction,<sup>31</sup> in addition, some studies had shown that men tended to have higher satisfaction scores than women.<sup>32</sup> Conversely, others believed that patients' demographic variables were not associated with patient satisfaction,<sup>33,34</sup> In this study, after adjusting confounding factors by multivariate regression analysis, we found that "Gender", "Age", "Place of Residence", "Type of medical insurance" had no significant effect on satisfaction.

We also found that the medical services utilization of patients had a certain impact on satisfaction. The hospitals' affiliation determined the medical resources it received and the comprehensive medical capacity.<sup>35</sup> This might affect the patient's feeling. The satisfaction of inpatients was higher than that of outpatients, which was consistent with previous research.<sup>26,36</sup> Perhaps the inpatients had more contact with the medical staff and had a better understanding of the hospital's complicated service processes, so they could be more considerate of the hard work of the medical staff.



However, outpatients often experienced complicated procedures and needed to wait a long time to get a shorter treatment service,<sup>26</sup> which could cause dissatisfaction. It was suggested that the hospital should strengthen outpatient management, optimize the diagnosis and treatment process, shorten the waiting time of patients. Patients were more satisfied with the preferred hospital, which might be due to their approval of the preferred hospital. In China, the hierarchical medical system was not yet established, and patients were not restricted by medical insurance, they could choose any hospital for diagnosis at will. Therefore, the assessment would be more naturally satisfied when the patient chose a hospital that was familiar and trusted. When patients came to a non-preferred hospital, they were unfamiliar with everything, so it was easy to bring about communication problems and caused dissatisfaction. It was suggested that hospital managers should pay more attention to referral patients from other hospitals, strengthen the introduction of the basic hospital information, make patients more familiar with the hospital environment and medical service process, and make full communication for the treatment and prognosis of the disease, so the patients would feel more comfortable and satisfied.

### Other relevant information obtained from the statistical analysis

From descriptive statistics, patient satisfaction rate with the “Hospital convenience”, “Hospital facilities and environment”, “Medical staff services technology” and “Medical staff service attitude” were much higher than “Medical expense” and “Reimbursement ratio for medical expenses”, indicating that further efforts were needed to control the cost of patients and increase the reimbursement ratio of medical insurance. Patients with social medical insurance accounted for the majority, the proportion of uninsured patients was very small, indicating that China’s health insurance coverage was quite good. The relatively low proportion of commercial insurance indicated that the commercial insurance market had not yet fully developed. The main reason for medical treatment was “Be sick”, indicating that the concept of medical treatment was still the mainstream, and the concept of health prevention still needed to be popularized. Although various channels such as online booking and telephone booking had been used in each hospital, the utilization rate of them was not high. The vast majority of patients still chose to register in the hospital. These issues must be taken seriously by the health care reform department.

### Limitation

This study was a cross-sectional study. It could only obtain the views of patients at that time, and could not compare the situation before and after. The categories of some influencing factors in this study were not detailed enough, which will be further improved in subsequent studies.

### Conclusion

We found that the three factors most associated with patient satisfaction were “Medical staff service attitude”, “Medical staff services technology”, and “Hospital convenience”. The demographic characteristics of patients had no significant effect on satisfaction, and medical services utilization of patients had a certain effect on satisfaction. The medical reform department should make policy adjustment accordingly to promote the reform development.

### Ethics approval

The study was reviewed and approved by the Ethics Committee of Puai hospital, Wuhan, China (No: KY 2018-027-01). The survey documentation included printed instructions and information for patients about the anonymous nature of the survey and aggregated data processing which ensured that patient identification was not possible. Given that no identifiable information was collected, and the format of “informed oral consent” was accepted by the Ethics Committee, no signed informed consent was requested. All the patients were informed and provided oral consent. The voluntary return of completed questionnaires was taken as consent to participate in the study.

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### Author contributions

All authors contributed to data analysis, drafting and revising the article, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

### Disclosure

The authors report no conflicts of interest in this work.

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## Supplementary material

Before binary logistic regression, a linear regression model was used to examine whether there was multicollinearity between independent variables. The result showed that the tolerance value of all independent was

greater than 0.1 and the value of VIF was less than 5, that was to say, all the independent variables did not have multicollinearity, then we could put all variables into the binary logistic regression directly (Table S1).

**Table S1** Multicollinearity test in independent variables

Model	Collinearity statistics	
	Tolerance	VIF
(Constant)		
Age (years)	0.816	1.226
Type of medical insurance	0.933	1.071
Hospital affiliation	0.904	1.106
Hospital category	0.934	1.070
Treatment type	0.810	1.234
Whether this hospital is the preferred medical institution	0.954	1.048
Registration method	0.969	1.032
Hospital convenience	0.767	1.305
Hospital facilities and environment	0.735	1.360
Medical staff services technology	0.661	1.513
Medical staff service attitude	0.700	1.429
Medical expense	0.844	1.185
Reimbursement ratio for medical expenses	0.762	1.312

**Note:** Dependent variable was the overall satisfaction.

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