

Analysis of current situation and influencing factor of medical disputes among different levels of medical institutions based on the game theory in Xiamen of China

A cross-sectional survey

Yanbing Zeng, PhD^{a,b}, Liangwen Zhang, PhD^{a,b}, Guanhua Yao^c, Ya Fang, PhD^{a,b,*}

Abstract

With continuous development of the Chinese health care system, the doctor–patient relationship is increasingly tense in recent years. China has witnessed a surge in medical disputes, including many widely reported violent riots, attacks, and protests in hospitals. This study aimed to help to theorize the doctor–patient relationship based on the game theory, and analyze the current situation and influencing factors for medical disputes among different hospitals.

A total of 17 hospitals were randomly selected in Xiamen city, including 8 tertiary hospitals and 9 secondary hospitals. All medical dispute cases, between 2012 and 2014, were collected through questionnaires. Multiple logistic regression analyses were used to identify risk factors associated with medical disputes.

In total, 896 medical dispute cases happened in 2012 to 2014, 733 (81.8%) of which occurred in tertiary hospitals. Medical disputes mainly were reported in the departments of obstetrics and gynecology (24.9%). The main causation of medical disputes was improper communication (24.0%) in tertiary hospitals and lower therapeutic skills (43.7%) in secondary hospitals, respectively. The negotiated rate (91.4%) in secondary hospitals was significantly higher than the tertiary hospitals (54.8%). The patients' age, occupation and the doctor's medical location, professional title were the main risk factors for the occurrence of medical violence.

Relationships between doctors and patients have become worse increasingly, whereas doctor–patient disputes or conflicts and their compensation have aggrandized year by year. The game relationship of doctor–patient is noncooperation, dynamic, and incomplete information game, and the advantages of cooperation are far greater than the competition between doctors and patients. Therefore, we need to take targeted measures to prevent and control the medical disputes by establishing a harmonious doctor–patient relationship in different levels of medical institutions.

Abbreviations: ADR = alternative dispute resolution, CI = confidence interval, OR = odds ratio, WHO = World Health Organization.

Keywords: China, countermeasures, current situation, game theory, influencing factor, medical disputes

1. Introduction

Medical dispute cases have increased dramatically worldwide in recent decades.^[1–5] Annually, 7.4% of all physicians had a

malpractice claim, of which 1.6% leading to an indemnity payment in the United States from 1991 to 2005.^[6] The number of medical disputes has more than tripled in 2005 compared with that of 1991.^[7] Such rapid growth violence has existed not only in European-American countries, but also has reported in Asian countries, such as Japan, where a 10-fold increase in medical malpractice litigation was reported, from 102 cases in 1960 to 1019 cases in 2003.^[8] In China, the number of medical disputes has increased rapidly since the beginning of the 21st century due to the supply and demand mismatch of health services and patients' rising awareness of their rights as well as imperfect law system. The Chinese Ministry of Health showed that the number of outpatients was 73 million among all national medical institutions in 2015, and about 70,000 ended up in medical disputes.^[9] Although its proportion was not exceedingly high (9‰), every piece of disputes increased the barriers between doctors and patients.^[1,9] In 2010, a total of 17,243 medical disputes occurred in China, which has increased by nearly 7000 cases compared with 5 years ago.^[10] The avalanche of medical disputes in China including many widely reported riots, attacks, and protests in hospitals is a confluence of inappropriate incentives in the healthcare system, the resulting distorted behaviors of physicians, mounting social distrust of the medical profession, and institutional failures of

Editor: Daryle Wane.

This study was supported by the Center for Health Economics and Policy at the School of Public Health, Xiamen University, the Project of Fujian Province Natural Science Fund (2017J01133), and the Project of National Natural Science Fund (81573257) in China. The authors have no conflicts of interest to disclose.

^a State Key Laboratory of Molecular Vaccinology and Molecular Diagnostics, School of Public Health, Xiamen University, ^b Key Laboratory of Health Technology Assessment of Fujian Province University, School of Public Health, Xiamen University, ^c Health and Family Planning Commission of Xiamen, Xiamen, Fujian, PR China.

* Correspondence: Ya Fang, School of Public Health, Xiamen University, Xiamen, Fujian 361102, PR China (e-mail: Fangya@xmu.edu.cn).

Copyright © 2018 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial License 4.0 (CCBY-NC), where it is permissible to download, share, remix, transform, and buildup the work provided it is properly cited. The work cannot be used commercially without permission from the journal.

Medicine (2018) 97:38(e12501)

Received: 24 April 2017 / Accepted: 29 August 2018

<http://dx.doi.org/10.1097/MD.00000000000012501>

the existing legal framework. Therefore, the disharmony of doctor–patient relationship was not just a simple medical problem, but evolved into a crucial social issue.

Medical disputes are defined as a patient proposal in return for the argument, which may or may not correlate with medical malpractice. Usually, a medical dispute is started once patient claims that doctors fail in their care and obligations in medical practice and the patient's symptoms is worsened or death as a result of their neglect.^[10] Medical disputes include medical malpractice, medical litigation, medical assessment, and medical violence whose associations are depicted in Figure 1. Medical malpractice is defined as any act or error by a physician, nurses, or other medical technicians during diagnosis and treatment of a patient that deviates from the accepted norms of practice in the medical activities and causes injury to the patient.^[11] This is judged by the official medical committee in China. Medical litigation occurs when the patient files a lawsuit against the physician over a medical dispute.^[11] Medical dispute or malpractice does not necessarily lead to medical litigation. In addition, medical violence infers to the situation that the safety, well-being, and health of health workers are posed with a clear or implicit challenge when they are subjected to abuse, threats, or attacks in their workplace according to the World Health Organization (WHO) in 2002.^[10]

The medical system in China is regulated by the government, and comprises 2 sets of evaluation standard: one based on size or services provided, such as levels of care or teaching institute, which is divided into primary hospitals, secondary hospitals, and tertiary hospitals in order from low to high. And the other founded on funding sources, management, and operations, including public hospitals and private hospitals. Due to the decline in government revenues, starting from 1980, central government had to substantially limit its foundation to the health system. Although most hospitals in China are “public hospitals,” yet 50% to 60% of their cost was covered by itself.^[12] Thus, the hospitals took a series of measures such as expanding the scale, purchasing large medical equipment, reducing the hospitalization time to pursue economic benefits, which resulted in an embarrassing fact that medical treatment was difficult and expensive. According to statistics, as the unequal allocation of medical resources and the limitations of medical technology in

primary hospitals, the tertiary and secondary hospitals occupy 74% of medical resources, which caused overcrowded large hospitals.^[13] Medical disputes (97.5%) occurred in the tertiary and secondary hospitals.^[14] Therefore, with continuous development of the unequal healthcare system, the doctor–patient relationship has become increasingly tense in China. So how to implement a win–win path for a harmonious doctor–patient relationship is of paramount importance.

Because of the rapidly increasing number of medical dispute cases and increasingly tense doctor–patient relationship in China, it is urgent to study both the risk factors for the disputes and the incidence and prevention measures. In the global escalation of medical disputes, many measures have been recognized, such as increasing communication, strengthening medical technology, application of the Alternative dispute resolution (ADR) to reduce dispute cases by scholars.^[6,15] Targeted solutions for medical disputes are rare in different hospitals, and there is little literature using game theory as a theoretical framework to investigate the doctor–patient relationship for medical disputes. Similar to other countries, China is in the process of carrying out national health care reforms. How to build a harmonious doctor–patient relationship is increasingly pressing. Therefore, the purpose of this study is to analyze the relationship between doctors and patients, evaluate the current situations and influencing factors of medical dispute cases in different hospitals, and put forward some suggestions for building a harmonious healthcare system by mediating the doctor–patient contradictory.

2. Methods

2.1. Game theory

Game theory—a theory based on assumptions of rational choice and focusing on interactive decision making—has the potential to provide models of the consultation. It was emerged in the 1940s following preliminary work by Von Neumann and further development by John Nash. It has been extensively applied in economics, politics, social psychology, and biological sciences.^[12] Combined with in-depth interviews, game theory was used as the theoretical framework to analyze the competitive relationship between doctors and patients, as well as the

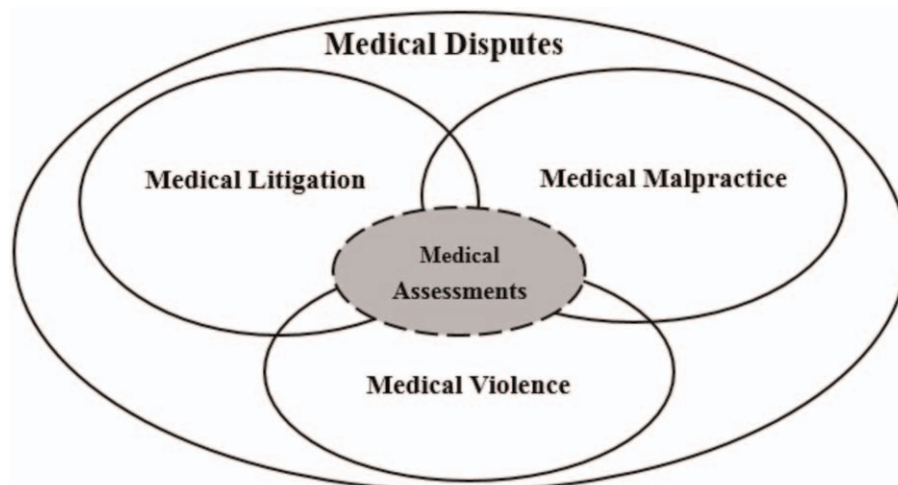


Figure 1. The relation among medical dispute, malpractice, litigation, assessments, violence.

consequences in terms of competition and cooperation in this study. Finally, it provided a theoretical basis for finding a win-win path for a harmonious doctor-patient relationship.

The game theory generally can be divided into 3 basic types based on different criteria.^[12] First, according to whether there is a binding agreement between the parties involved, it can be classified to cooperative game and noncooperative game. Second, game theory can be divided into another 2 types: static game and dynamic game on the basis of the chronological order of the 2 parties' behavior. The patient has the right to choose the hospital, but after the patient makes a choice, the doctor becomes the decision-maker in the next stage. The doctor can determine his or her own behavior based on patient behavior information. Third, according to the participant's understanding of other participants, the game is divided into complete information game and incomplete information game.

2.2. Study design

The study was conducted in Xiamen municipal area, which is located on the southeast coast of China. As the forefront of the southeast coastal economic zones, Xiamen is one of the pilot cities to conduct nationwide healthcare reforms. It has made gratifying achievements in terms of medical information construction, controlled medical fee, drug prices reform, and commercial health insurance. Simultaneously, the status quo of doctor-patient relationship has drawn public attention.

There were 38 hospitals in Xiamen, consisting of 23 secondary hospitals and 15 tertiary hospitals. The number of beds was 10,220 in total.^[16] Our survey was mainly conducted in 17 major medical institutions with large-scale medical and health services including 9 secondary hospitals and 8 tertiary hospitals. A total of 17 hospitals were identified and stratified by region and hospital grade, including secondary and tertiary hospital in Xiamen. Considering only 1% to 3% of the dispute occurrence in primary hospitals,^[17] they were not included in this study. The total number of sickbeds surveyed accounted for 71% of the total number of sickbeds in Xiamen city. According to the 2010 Xiamen Health Statistical bulletin, the number of beds and annual treatments in 8 tertiary hospitals are 13% and 19% higher than those in 9 secondary hospitals, and the number of hospitalizations in 9 secondary hospitals is 4% higher than that in 8 tertiary hospitals.^[16]

A cross-sectional survey was conducted to collect information about medical dispute cases occurred between 2012 and 2014 in 17 hospitals in Xiamen. Detailed information about each case of medical violence was extracted using a questionnaire. It included the basic situation of the patients and medical staff in each case of medical dispute, as well as the occurrence of the department, the cause, the result of the treatment, and whether there was a violent conflict or not. The questionnaire was required to be answered by specialized administrative staffs in medical administrative departments. It took 2 weeks to complete the whole survey without any gifts or rewards to any participant. A return survey was conducted to check missing data if questionnaires were incomplete. The effective recovery rate of the questionnaire was 100%. The study protocol was approved by the School of Public Health, Xiamen University, and the survey items were as follows: case number, compensation, departments, personnel characteristics, main causations and resolution methods, violent behavior of medical dispute cases in different hospitals during the survey period.

The collection of qualitative data, undertaken through 45 semistructured in-depth interviews with 20 licensed doctors (male 50%; different departments and different levels of medical staff), 15 patients, and 5 health administrative executives in Xiamen took place in October 2015. The sampling was purposive to balance sex and seniority of physicians as well as type and level of hospitals, and to avoid missing any major specialty. The interview framework was structured to explore physicians' general views, personal experience related to medical disputes, and the doctor-patient relationship. The interview lists mainly included the cognition of the current doctor-patient relationship and solutions for medical disputes.

2.3. Statistical analysis

Descriptive analysis was initially performed for both quantitative and qualitative data. Chi-square test was used to evaluate the association between the hospital and patient characteristics. Multiple logistic regression analysis was used to determine the variables significantly associated with violent medical disputes. Medical violence was the dependent variable. The independent variable included the sex, age, occupation, residence and payment method of the patients, as well as the type, professional title and hospital level. All analyses were conducted through SAS software version 9.3. A value of $P < .05$ was considered statistically significant.

2.4. Qualitative results

All interviewees agreed that the current doctor-patient relationship was relatively tense in recent years. Approximately 60% of doctors had experienced the medical disputes, but none attributed to malpractice. The results of in-depth interviews indicated that there was an obvious informational asymmetry between doctors and patients and no binding agreement was achieved. Moreover, the behavior between them has a clear chronological order. Thus, the game relationship between doctors and patients is noncooperation, dynamic and incomplete information game.

The current doctor-patient relationship was extremely complex and subtle. Patients did not fully trust medical staff, but they had to seek their assistance for medical problems. Although doctors were psychologically alerted as they treat their patients. It was crucial to apply game theory to deal with the complex, interpersonal meta-relations balance of the doctor-patient relationship. The results of doctor-patient competitive relationship are presented in Figure 2, which showed the competitive relationship between doctors and patients in terms of medical prognosis, cost, outcome, disputes resolution, medical knowledge. First, patients wanted to be diagnosed and treated reasonably, and doctors hope that patients could realize the complexity, high risk and unpredictability of medical in the course of medical diagnosis and treatment. Second, patients wanted to spend the least amount of money on the diagnosis and treatment of diseases, whereas doctors wanted patients to understand the importance of medical diagnosis in terms of medical costs. Third, patients tended to have higher expectations for prognosis, but doctors wanted patients to know about the limitations, uncertainties and high risk of medical. Moreover, doctors hoped to get the patient's respect and self-value realization. Fourth, patients tended to take more aggressive behaviors (such as medical violence) to get higher compensation to maintain their interests, whereas doctors hoped to strictly

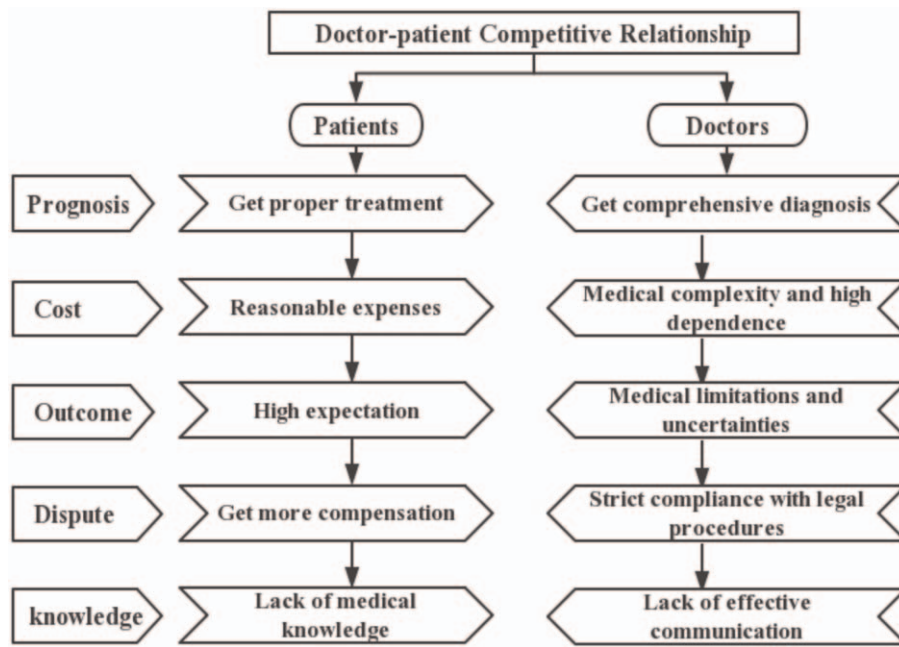


Figure 2. The results of doctor-patient competitive relationship.

Table 1

The results of competition and cooperation between doctors and patients.

	Competition	Cooperation
Microcosmic	<ul style="list-style-type: none"> • Big hospitals get crowded • Excessive diagnosis and treatment • Rising costs of health care • Medical alarm and medical violence 	<ul style="list-style-type: none"> • Doctors get reasonable reward, respect, self-realization • Patients get effective treatment, spend a reasonable cost
Macroscopic	<ul style="list-style-type: none"> • An unbalanced and uncoordinated medical system • The waste of medical resources • Lack of social trust system • Social instability 	<ul style="list-style-type: none"> • The virtuous circle of the medical system • The establishment of an honest, mutual trust, respect and harmony of social values

follow legal procedures to resolve disputes between doctors and patients. Fifth, the competitiveness in the doctor-patient relationship was reflected in information asymmetry. On one hand, patients lacked the necessary medical knowledge. On the other hand, doctors lacked effective communication skills.

In the micro- and macroperspectives, the results of competition and cooperation between doctors and patients are shown in Table 1. In the game process, if winning was on the basis of damage to each other's interests, the other party was bound to make corresponding responses. Obviously, it was the worst solution, which would lead to lose-lose and the result was poorer treatment outcomes. For example, from a microscopic point of view, this a large extension could end with terrible medical ethics and eventually wasteful and uncoordinated development of medical resources at the macro level.

2.5. Quantitative results

A total of 896 medical disputes occurred, of which 18.2% happened in secondary hospital and 81.8% in tertiary hospital. Both the amount of disputes and the compensation were on the rise, as shown in Figure 3. Compared with 2013, the amount of compensation has gone up rapidly. The amount of compensation

due to disputes had been doubled from 8.67 million Yuan in 2013 to 17.89 million Yuan in 2014. More disputes happened in tertiary hospitals and the growth rate was higher than the secondary hospitals, as shown in Figure 4.

The characteristics of medical disputes are presented in Table 2. It showed that female patients had a higher proportion in dispute cases, which accounted for 59.3% and 53.5% in secondary and

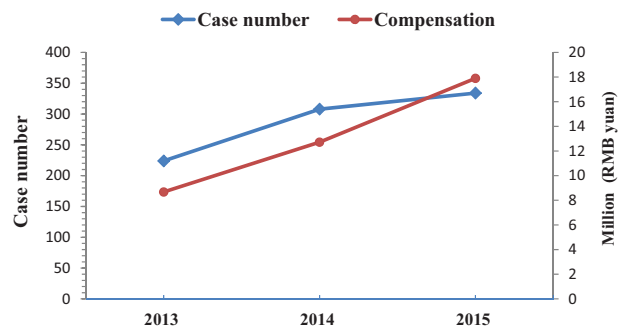


Figure 3. The total number and compensation of medical disputes, 2012 to 2014.

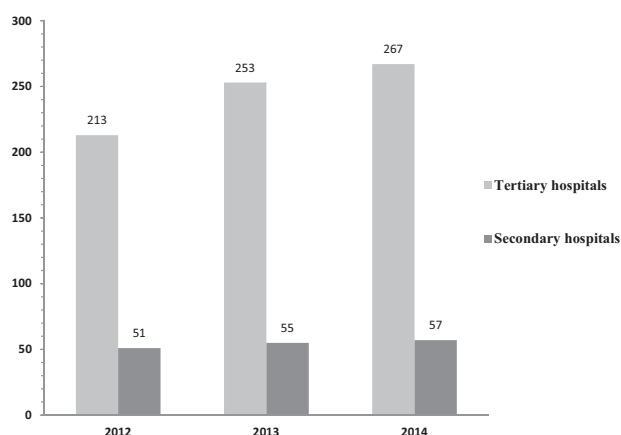


Figure 4. The total number and compensation of medical disputes in different medical institutions, 2012 to 2014.

tertiary hospitals, respectively. The farmers and workers had high incidence of disputes, accounting for 32.8% and 28.6%, respectively. There was a statistically significant difference in different grade hospitals ($P < .01$) but not for residence and payment methods. In addition, 77.4% dispute cases occurred mainly in doctors, and 35.7% and 29.4% in physician with middle and higher professional title, respectively. The difference

above the types and technical titles of medical staff in medical disputes was a statistically significant in different level hospitals ($P < .01$).

The incidence of medical disputes mainly occurred during hospitalization (54.5%), followed by outpatient (24.9%), and the emergency department (20.6%). The medical disputes involved the departments of obstetrics and gynecology (24.9%), surgery system (21.0%), internal medicine (19.8%), and pediatric (10.5%) (Table 3). There were statistically significant differences in different level hospitals and its practice settings ($\chi^2 = 573, P < .01$).

As shown in Figure 5, the reason for medical disputes in tertiary hospitals mainly included improper communication (24.0%), lack of medical knowledge for patients (22.1%), and poor medical skills (17.0%), but the reason in secondary hospitals mainly included poor medical skills (43.7%) and lack of medical knowledge (19.2%) for patients. In terms of dispute resolutions, 61.5% cases of medical disputes were negotiated mainly through bilateral negotiations, and only 16.0% cases were settled by medical litigation. The negotiation rate (91.4%) in secondary hospitals was much higher than the tertiary hospitals. There was a statistically significant difference between tertiary hospitals and secondary hospitals in dispute resolution methods ($P < .01$) (Table 4).

In total, 94 violent medical dispute cases happened in 2012 to 2014, 51 (31.3%) of which occurred in secondary hospitals. The main forms of medical violence were abused, threats, attacks and property damage, accounting for 96.2%, 87.3%, 49.8% and

Table 2
Characteristics of medical disputes in different medical institutions.

Variable	Tertiary hospitals N (%)	Secondary hospitals N (%)	Total N (%)	χ^2	P
Characteristics of patients					
Sex					
Male	304 (46.5)	66 (40.7)	370 (45.3)	10.31	.001
Female	350 (53.5)	96 (59.3)	446 (54.7)		
Age, y					
0–14	141 (25.4)	17 (10.5)	158 (22.0)	37.39	<.001
15–59	301 (54.1)	131 (80.9)	432 (60.2)		
≥60	114 (20.5)	14 (8.6)	128 (17.8)		
Occupation					
Civil servant	40 (5.7)	2 (1.2)	42 (4.9)	22.93	<.001
Worker	186 (26.7)	60 (36.8)	246 (28.6)		
Farmer	216 (31.0)	66 (40.5)	282 (32.8)		
Unemployed	191 (27.4)	28 (17.2)	219 (25.5)		
Others	63 (9.1)	7 (4.3)	70 (8.1)		
Residence					
Rural	370 (51.9)	61 (37.9)	431 (49.3)	1.73	.189
Urban	343 (48.1)	100 (62.1)	443 (50.7)		
Payment methods					
Medical insurance	322 (49.5)	71 (44.7)	393 (48.5)	1.34	.511
Self-pay	317 (48.7)	84 (52.8)	401 (49.5)		
others	12 (1.8)	4 (2.5)	16 (2.0)		
Characteristics of medical staff					
Classification					
Doctor	579 (77.7)	124 (76.1)	703 (77.4)	18.48	.001
Nurse	95 (12.8)	15 (9.2)	110 (12.1)		
Medical technicians	58 (7.8)	13 (8.0)	71 (7.8)		
Others	13 (1.7)	11 (6.8)	24 (2.6)		
Technical title					
Senior	124 (19.3)	19 (12.6)	143 (18.0)	12.58	.001
Vice senior	190 (29.5)	44 (29.1)	234 (29.4)		
Middle	230 (35.7)	54 (35.8)	284 (35.7)		
Junior	100 (15.5)	34 (22.5)	134 (16.9)		

Table 3

Distribution of hospital departments in medical disputes, 2012 to 2014.

Department	2012, N (%)	2013, N (%)	2014, N (%)	Total N (%)
Surgery	67 (27.9)	54 (19.5)	53 (17.0)	174 (21.0)
Internal Medicine	45 (18.8)	54 (19.5)	65 (20.9)	164 (19.8)
Obstetrics and Gynecology	51 (21.3)	77 (27.8)	78 (25.1)	206 (24.9)
Pediatrics	31 (12.9)	22 (7.9)	34 (10.9)	87 (10.5)
Emergency	10 (4.2)	30 (10.8)	13 (4.2)	53 (6.4)
Ophthalmic	7 (2.9)	11 (4.0)	8 (2.6)	26 (3.1)
Otolaryngology	7 (2.9)	6 (2.2)	9 (2.9)	22 (2.7)
Laboratory	15 (6.3)	9 (3.2)	17 (5.5)	41 (5.0)
Department of Anesthesiology	3 (1.3)	1 (0.4)	22 (7.1)	26 (3.1)
Others	4 (1.7)	13 (4.7)	12 (3.9)	29 (3.5)
Total	240 (29.0)	277 (33.5)	311 (37.5)	828 (100)

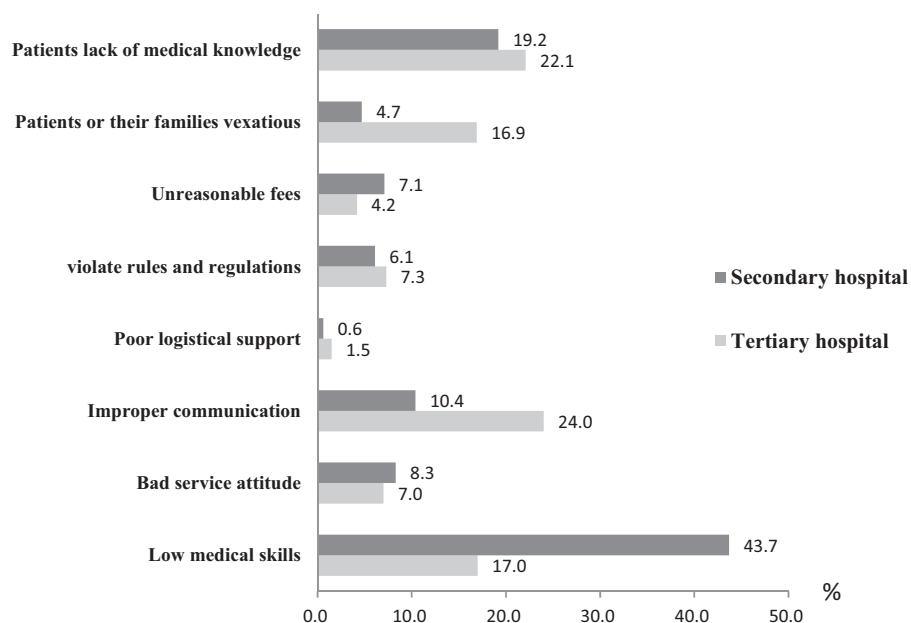


Figure 5. Distribution of medical disputes causation in secondary and tertiary hospitals.

78.9% of the total violent medical disputes, respectively. Furthermore, the results of multiple logistic regression analysis showed that the age (OR=2.33; 95% CI, 1.16–3.91 for the elderly), occupation (OR=3.24; 95% CI, 2.98–4.37 for the “unemployed” in comparison with “farmer”) and hospital levels

(OR=3.37; 95% CI, 1.21–5.89 for secondary hospitals), professional title (ORs=1.91; 95% CI, 4.21–3.12 for the “vice senior,” “middle,” “junior,” respectively, in comparison with “senior”) are the significant risk factors the occurrence of violent medical disputes (Table 5).

Table 4

Dispute cases and resolution methods in different medical institutions.

Resolution methods	Tertiary hospitals, N (%)	Secondary hospitals, N (%)	Total N (%)
Negotiation	402 (54.8)	149 (91.4)	551 (61.5)
Mutual agreement	271 (37.0)	98 (60.1)	369 (67.0)
Administrative mediation	60 (8.2)	19 (11.7)	79 (14.3)
Judicial mediation	65 (8.9)	31 (19.0)	96 (17.4)
Others	6 (0.8)	1 (0.6)	7 (1.3)
Litigation	106 (14.5)	14 (8.6)	143 (16.0)
Identification	128 (17.5)	41 (25.2)	169 (18.9)
Mass media intervention	9 (1.2)	16 (9.8)	25 (2.8)
Medical violence	43 (5.9)	51 (31.3)	94 (10.5)

Table 5
Multiple logistic regression analysis of violent medical disputes.

Variable	OR (95% CI)	P
Characteristics of patients		
Sex		.56
Male	1	
Female	2.56 (0.96–3.63)	
Age, y		.01
0–14	1	
15–59	0.45 (0.37–0.65)	
≥60	2.33 (1.16–3.91)	
Occupation		.03
Farmer	1	
Workman	0.87 (0.64–0.96)	
Civil servant	0.21 (0.16–0.46)	
Unemployed	3.24 (2.98–4.37)	
Residence		.63
Urban	1	
Rural	0.59 (0.19–9.68)	
Payment methods		.79
Medical insurance	1	
Self-pay	3.56 (0.59–3.61)	
Characteristics of medical staff		
Hospitals type		.02
Tertiary	1	
Secondary	3.37 (1.21–5.89)	
Classification		<.01
Medical technicians	1	
Doctor	6.45 (5.76–8.13)	
Nurse	4.21 (3.34–6.57)	
Technical title		.04
Senior	1	
Vice senior	1.91 (0.19–3.34)	
Middle	4.21 (3.27–6.58)	
Junior	3.12 (1.98–4.29)	

3. Discussion

3.1. The doctor–patient relationship

Doctor–patient relationship referred to the interpersonal relationship between the medical care providers and the receivers established during the medical treatment and it was one of the core research areas of medical ethics.^[18] In recent years, domestic doctor–patient relationship is becoming more strained with the occurrence of multiform doctor–patient crisis events with high risk, high attention, and wide spread, and it turns to be the tendency. There have been many researches and discussions in domestic and foreign academia forming various theory systems and research achievements in different views. Game theory may have particular value in improving our understanding for doctor–patient relationships. The theoretical and experimental literature on game theory and experimental games included a huge body of research on the factors for promoting cooperation, reciprocity and trust, which could be applied to develop an understanding of cooperation and trust in the consultation. Based on the game theory, this study shows the commonalities of doctor–patient relationship. The current doctor–patient relationship is very complex and subtle, the patient both suspected medical side, but they had to rely on the treatment of the medical side.^[18] The medical side was also concerned about helping the patient at the same time there was alert psychology, the 2 sides were in a complex contradiction. This crisis of confidence and lack of cooperation led to the occurrence of doctor–patient conflicts.

The information asymmetry between doctors and patients further intensifies the contradiction, so that the original trust and cooperation with the doctor–patient relationship gradually transformed into a vicious game between doctors and patients.

The game between doctors and patients was a reality and was unable to avoid. The success of the strategy should be cooperation, mutual benefit and win–win situation through extensive literature analysis. Therefore, both doctors and patients must understand that the 2 sides are interdependent and indispensable, we must understand each other, mutual respect and trust, mutual cooperation is the only way to achieve win–win situation.

3.2. Current situation analysis of medical disputes

This study showed that both the incidence and the amount of compensation of medical disputes in Xiamen had a clear upward tendency in 2012 to 2014, which may be related to the configuration imbalance of medical resources caused by development of market economy, supply and demand mismatch of health services, patients' increasing self-awareness of their rights defensive medicine, increase in medical costs, and mistrust between doctors and patients. China's market transition since 1978, although promoted the rapid development of medical and health services, also resulted in increased medical costs, uneven distribution of resources and other problems and contradictions.^[18] For example, abuse of profitable tests and the over-prescription of drugs, especially antibiotics, is now ubiquitous in Chinese hospitals. Thus, the total health expenses for health and medicine soared up from 1754 billion Yuan RMB in 2009 to 3166 billion Yuan RMB in 2014, but the government health expenses only grew from 481 billion Yuan RMB in 2009 to 954 billion Yuan RMB in 2014.^[19] The medical economic burden of the residents was very heavy, and the serious shortage of public health and medical resource still remained unimproved. At present, the first problem should be mentioned was the limited coverage and low payment rate of basic medical insurance. There were still >300 million people who did not have any medical insurance.^[20] In face of the major diseases of disasters, even people with insurance will lead to poverty due to illness. Another serious problem was that scarce medical resource was unevenly distributed among regions. Hospitals in metropolis have well trained clinicians and advanced medical equipment, whereas the township hospitals and rural health clinics were short of medical personnel and basic medical equipment. Lots of rural patients could not get basic medical aid even under emergency status. Moreover, with the surge of patients in tertiary hospitals, the difficulty and high expense in medical treatment are becoming more and more prominent, which have caused lots of people's dissatisfaction with the current medical system and seriously affected the relation between doctors and patients.

Growth of number of medical dispute cases occurred has slowed down in 2014 compared with 2013, but the amount of compensation has increased rapidly. One possible reason was that Xiamen City initiated the "To be a human doctor" Campaign from 2013, the city set up 13 humanistic care pilot ward in 2014 to promote the construction of medical humanities, respect life, love patient, enhance mutual trust, and communication between doctors and patients.^[21] Because 24% of medical disputes in Xiamen mainly caused by poor communication between doctors and patients, it curbs the growth in the number of disputes to a certain extent. However, as the price level raised, the development of the news media, the hospital increasingly

focused on its own brand image, especially hospitals would prefer a negotiated settlement with the parties without resort to the courts, the patient frequently exorbitant demands, which resulted in a significant increase trend in the amount of compensation.^[6]

Simultaneously, this research found that the growth rate of disputes in tertiary hospitals was significantly higher than that in secondary hospitals, however, the incidence of violent medical disputes was less than the secondary hospitals. This may be related to their different medical environment. Tertiary hospitals had a large number of outpatients resulting in overworked medical staff, seriously affecting the quality of health services delivery.^[6] However, tertiary hospitals have a good dispute resolution department, a good staffing and dispute resolution mechanism can resolve violent disputes. Secondary hospitals, most of which were in the private hospital, paid more attention to the attitude of medical services and the construction clinic environment, which were conducive to the formation of a relatively harmonious doctor–patient relationship to reduce the instability between doctors and patients. However, due to the limited level of medical care in the secondary hospitals, the vast majority of medical disputes were mainly caused by serious consequences because of improper operation, which was more likely to increase the occurrence of medical disputes.

In this study, we found that medical disputes were mainly reported in the departments of obstetrics and gynecology (24.9%), surgery system (21.0%), internal medicine (19.8%), and pediatric (10.5%). Previous studies have indicated that the high-risk departments of medical disputes mainly were obstetrics and gynecology,^[22] general surgery, internal surgery,^[23] cardiothoracic,^[24] and emergency department.^[25,26] Consistent with previous research results, this study demonstrated that a high incidence of disputes in the inpatient department, obstetrics and surgery, where the patients' health condition was generally more serious and needed better medical technology. Patients and their families had higher expectations of medical technology, as well as surgical infections and complications and other extreme events occurred during surgery, which could easily lead to serious psychological gap. Moreover, the situation about deterioration of the medical environment and overwork of the medical staff would lead to a surge of patients' complaints due to the dissatisfaction on health care and hospital surroundings. In case not effectively protected the privacy right of patients and lack of effective communication, medical staffs due to high intensity of the work in the surgical departments were easy to produce fatigue and inevitably negligence leading to medical disputes. Therefore, disputes occurred mainly in the obstetrics and gynecology, surgery and emergency, where a multitude of anesthesia, surgery and other highly dangerous medical treatments were acquired. In addition, it was worth noticing that the department of medical technology and test had a high incidence of disputes, probably because of defensive medical phenomenon existed in medical procedure.^[27]

This study found that medical disputes mainly occurred among farmers, workers, unemployed people, and patients with relatively lower socioeconomic status and cultural level, especially in violent medical dispute cases. Due to medical information asymmetry between doctors and patients and communication barriers, they were more prone to dispute. Disputes involving medical staff were mainly doctors and nurses who had direct contact with patients, and they needed to have specialized medical technology with the highest risk of medical disputes. Compared with other countries, Chinese doctors often complain that their work was more stressful and their income was

lower. In some underdeveloped areas, the income of Chinese junior medical personnel was even lower than the waiters in the restaurants.^[16] This is inconceivable in most countries including many developing countries. Furthermore, some of the disputes that were caused by primary doctors were often attributed to their supervisor. Thus, this increased the proportion of doctors with intermediate or higher professional title to produce the medical disputes.

3.3. Causes and solutions of medical disputes

As demonstrated in Figure 5, the reason for medical disputes in tertiary hospitals was mainly included improper communication (24.0%) and patient's lack of medical knowledge (22.1%), whereas the reason in secondary hospitals was mainly for doctor's low medical skills (43.7%). In recent years, there are more outpatients in tertiary hospitals, and the average treatment time is shorter.^[28] Doctors have great work pressure, which results in poor communication between doctors and patients. By contrast, because of fewer outpatients, shorter treatment time, and better medical service environment, the proportion of medical disputes due to poor communication was only 10.4% in secondary hospitals. In addition, lacking of medical knowledge of patients and their families has been increasingly become the main obstacle to medical disputes.^[29]

Dispute resolution methods were important in the study of medical disputes. In this study, 62% of disputes were solved by mutual agreement, and 16% were solved by civil suits. The result was consistent with some previous research.^[30,31] Currently, China has not developed a specialized medical law. The rule of legal system, which is 2-tiered system of medical compensation, has the dualization problems of the law application and confounding rules. Medical fault liability applies to "Civil Law" and malpractice liability applies to "Medical Malpractice." The gap between the 2 provisions varies greatly. In the application of law, the judge naturally uses civil law perspective to review, and the state has also developed rules and treatment advice to the general civil tort compensation have no differences. The reason is that the United States for special medical behavior has a clear understanding, compared with Chinese. The aim of medical contract is not for the result.^[32] In dealing with medical malpractice cases, the United States can strictly abide by the rules of medical science and medical behavior characteristics to judge, and only apply the principle of fault liability in civil legal principle without the fair principle and the principle of no-fault liability. Besides, they also established a system of compulsory medical risk insurance covering both doctors and patients reducing the prescriptions of the liability for compensation.^[33] In the end, it will lead to medical disputes resolved primarily through negotiation and there are few proportion of litigation in Xiamen city because of the situation of misapplication of the legal system, the rule of chaos coupled with long litigation period, lacking accurate definition about medical behavior and the mass media false reports in order to attract public attention.

In addition, different hospitals have different rules in the institutional framework and organizational operations. Compared with tertiary hospitals, secondary hospitals paid more attention to maintain its image and earnings and more tended to choose negotiation to resolve the disputes.^[31] This also explains why secondary hospitals are prone to high-risk medical violence disputes. Owing to the lack of legal constraints, patients and their families hope to gain more benefits through violent behavior during the consultation process.

3.4. Conclusion and policy implication

Both the number and the amount of compensation of medical disputes in Xiamen had a clear upward tendency in 2012 to 2014. The patients' age, sex, occupation, socioeconomic status, and the doctor's professional level, department, doctor-patient communication are the main factors for the occurrence of medical disputes. Furthermore, the patients' age, occupation and the doctor's practice setting, professional title are the main factors for the occurrence of violent medical disputes. Based on the competition analysis of doctor-patient relationship, the advantages of the cooperation between doctors and patients are greater than the competition between each other's. Therefore, we need to take targeted measures to prevent and control the medical disputes based on the game theory in different levels of medical institutions.

First, medical institutions should improve medical skills of healthcare workers, especially those worked in secondary hospitals. We should strengthen skills training for medical personnel, carry out medical education for intermediate and associate chief physicians, emphasize on the management and training of interns, enhance legal awareness, and build the management assessment system. Furthermore, hospitals ought to pay more attention to the humanistic concern and construct a service-oriented medical care and strengthen the sense of responsibility and professionalism of the medical staff.

Second, the doctor-patient communication is a process of information transmission by face to face, and it should be timely, clear, and explicit. In the daily diagnosis and treatment of diseases, a clinician should fully communicate with patients and their families about therapeutic protocols, limitations, and other disease outcomes before treatment in order to protect patients' right of information and privacy, and should choose appropriate manner and words based on their cultural level and comprehensive ability. In addition, governments are supposed to establish and improve the system of medical social work in terms of responsibility content, staffing, qualification accreditation and performance appraisal, attaching importance to improve medical social workers' skills.

Third, key departments' hospitals should focus on creating health, warm and harmonious hospital environment by strengthening the management of inpatient department, enhancing standardization training and education of the medical residency, and reinforcing the humanistic concern for patients. For patients who need surgery and auxiliary examination, medical workers should communicate with patients sufficiently to ensure their rights to be informed. As high incidence departments in medical disputes, obstetrics and gynecology departments should take a notice of the following things: first, the rules and regulations should be strictly adhered, such as the system of initial diagnosis and subsequent visit of obstetrics, the system of checking by senior physician and the system of perinatal discussion. Second, hospitals should strengthen medical education of mothers-to-be to improve self-protection awareness and strengthen their prenatal care management to guarantee their rights of information and privacy. Last but not least, obstetrics and gynecology should improve the service capability of health care technology and implement the system of adverse event reporting.

Fourth, a series of measures should be used to prevent medical disputes in surgery. First of all, we should identify potential patients who may lead to medical disputes in the early stage, and communicate with them sufficiently and guarantee their right of information and privacy effectively. Then, tertiary inspection and

supervision mechanism about the first doctor, department director and functional departments should be established. And relevant rules and regulations should be strictly enforced throughout the whole medical procedure. Second, hospital should intensify education on laws and safety of the key departments such as orthopedic and key groups like primary and secondary physicians. Lastly, hospital should enhance the quality of professional ethics and medical technology of medical personnel and establish the idea of medical humanities.

Finally, the reason why there is such a problem between doctors and patients, which fundamentally is due to the contradiction between supply and demand caused by medical resources imbalance, and unreasonable hospital remuneration system. Therefore, the government should further deepen the medical system reform, speed up the development of medical insurance, increase the payment scope and proportion of serious medical insurance, and promote the reform of the payment system and the payment system. On the one hand, doctors get a reasonable labor remuneration to achieve their life value. On the other hand, the government protects the health and property rights of patients, by standardizing the standardization of medical processes. The mass media and social organizations should strive to create a respectful, understanding, trustful and inclusive medical environment and promote the right values and orientation. In short, resolving disputes between doctors and patients cannot be achieved overnight, which requires long-term process. Doctors, patients, government, society need to strengthen cooperation, and work together to create mutual aid, mutual trust, harmony, win-win doctor-patient relationship.

There are several limitations in this study. First, the data in our study were a cross-sectional survey and this limited the interpretation of our results, making it hard to draw causal conclusions. Second, the object of study was sampled from one city in China, which may be local characterized and in turn exist some bias for interpretation in countrywide. Third, game theory only provides a new perspective on the doctor-patient relationship research. However, the doctor and patient may differ greatly in the value they put on different consultation outcomes, and their preferences for different outcomes may not be symmetrical. Thus, further supplement or perfection of this research will be carried out in prospective studies.

In conclusion, with the service idea of "patient-centered," hospitals ought to further sort and refine various medical activities and medical procedures, focus on the construction of the hospital management system, and strengthen the hospital supervision system concentrating on the details to improve the treatment processes and the rating system of surgical treatment. We should concentrate on patients' feedback on the quality and effectiveness of hospitals and implement medical supervisions through the information platform. Then, the information disclosure system and the mechanism of interest demands should be improved to guide people's correct expression of their legitimate aspirations by the media. Furthermore, legal guidelines and regulations for medical should be established for the resolution of medical disputes rather than relying on mutual agreement between doctors and patients. All forms of medical violence behavior should be cracked down by law.

Author contributions

Data curation: Liangwen Zhang, Guanhua Yao.

Formal analysis: Liangwen Zhang, Ya Fang.

Funding acquisition: Ya Fang.

Investigation: Liangwen Zhang.

Methodology: Liangwen Zhang.

Software: Liangwen Zhang.

Writing – original draft: Liangwen Zhang.

Writing – review and editing: Yanbing Zeng.

References

- [1] Shin H-K, Jeong S-J, Kang B-K, et al. Medical dispute cases involving traditional Korean medical doctors: A survey. *Eur J Integr Med* 2014;6:497–501.
- [2] Wu CY, Weng HC, Chen RC. Time trends of assessments for medical dispute cases in Taiwan: a 20-year nationwide study. *Intern Med J* 2013;43:1023–30.
- [3] Zhao M. Evaluation of the third-party mediation mechanism for medical disputes in China. *Med Law* 2011;30:401.
- [4] Quraishi N, Hammett T, Todd D, et al. Malpractice litigation and the spine: the NHS perspective on 235 successful claims in England. *Eur Spine J* 2012;21:196–9.
- [5] 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.
- [6] Sohn DH, Bal BS. Medical malpractice reform: the role of alternative dispute resolution. *Clin Orthop Relat Res* 2012;470:1370–8.
- [7] Jena AB, Seabury S, Lakdawalla D, et al. Malpractice risk according to physician specialty. *N Engl J Med* 2011;365:629–36.
- [8] Hiyama T, Yoshihara M, Tanaka S, et al. Trend in Japanese malpractice litigation involving gastrointestinal endoscopy. *Am J Gastroenterol* 2009;104:251–2.
- [9] According to the National Planning Commission statistics: last year there were 70000 medical disputes, medical problem is particularly prominent. 2014. Available at: http://news.xinhuanet.com/gongyi/2014-04/08/c_126366391.htm.
- [10] Chinese increased 7000 medical trouble event in 5 years. 2013. Available at: <http://politics.people.com.cn/n/2014/0306/c70731-24552070.html>.
- [11] Louisell D W, Williams H, Kramer C. *Medical malpractice*[M]. M. Bender, 1960.
- [12] Hsiao WC. The Chinese health care system: lessons for other nations. *Soc Sci Med* 1995;41:1047–55.
- [13] The Statistical Bulletin of National Health and Family Planning of China in 2013. 2014. Available at: <http://www.nhfpc.gov.cn/guihuaxxs/s10742/201405/886f82dafa344c3097f1d16581a1bea2.shtml>.
- [14] Net CE. The Blue Book of health reform in 2014: secondary and tertiary hospitals have more medical disputes. 2014. Available at: http://www.ce.cn/xwzx/gnsz/gdxw/201412/09/t20141209_4082481.shtml.
- [15] Yu H, Hu Z, Zhang X, et al. How to overcome violence against Healthcare professionals, reduce medical disputes and ensure patient safety. *Pak J Med Sci* 2015;31:4–8.
- [16] Statistical bulletin of the national economic and social development in Xiamen in 2012. 2012. Available at: http://www.stats-xm.gov.cn/tjzl/tjdy/201207/t20120712_20855.htm.
- [17] HU Peng CF. Analysis of Situation and Strategy of Medical Disputes in One District of Shanghai in Recent Five Years. *J Clin Misdiagn Error Treat* 2014;27:87–91.
- [18] He AJ. The doctor–patient relationship, defensive medicine and overprescription in Chinese public hospitals: evidence from a cross-sectional survey in Shenzhen city. *Soc Sci Med* 2014;123:64–71.
- [19] Kopelman LM. Make her a virgin again: when medical disputes about minors are cultural clashes. *J Med Philos* 2014;39:8–25.
- [20] Zhu S, Li L, Li Y. China's criminal penalty for medical malpractice: too lenient or not? *Legal Med* 2011;13:116–9.
- [21] To be a human doctor. 2013. Available at: http://www.xmnn.cn/dzkb/xmrb/20131012/20131012_3536475.htm.
- [22] Lyu S-Y, Liao C-K, Chang K-P, et al. Analysis of medical litigation among patients with medical disputes in cosmetic surgery in Taiwan. *Aesthetic Plast Surg* 2011;35:764–72.
- [23] Chen KY, Yang CM, Tsai SH, et al. Medical malpractice in Taiwan: injury types, compensation, and specialty risk. *Acad Emerg Med* 2012;19:598–600.
- [24] Zenilman JC, Haskel MA, McCabe J, et al. Closed claim review from a single carrier in New York: the real costs of malpractice in surgery and factors that determine outcomes. *Am J Surg* 2012;203:733–40.
- [25] Fenn P, Rickman N. Information and the disposition of medical malpractice claims: a competing risks analysis. *J Law Econ Organ* 2013; ewt002.
- [26] Studdert DM, Mello MM, Gawande AA, et al. Claims, errors, and compensation payments in medical malpractice litigation. *N Engl J Med* 2006;354:2024–33.
- [27] Studdert DM, Mello MM, Sage WM, et al. Defensive medicine among high-risk specialist physicians in a volatile malpractice environment. *JAMA* 2005;293:2609–17.
- [28] Lei Shang XG. Analysis on the efficiency of doctors in a hospital clinic. *Mod Hosp Manag* 2006;4:40–2.
- [29] Aoki N, Uda K, Ohta S, et al. Impact of miscommunication in medical dispute cases in Japan. *Int J Qual Health Care* 2008; 20:358–62.
- [30] Yanlin C, Jiangjun W, Xueqian Z, et al. Application of third-party mediation for medical disputes: an introduction of Chinese experience. *Chin Med J* 2014;127:2707–10.
- [31] Sieg H. Estimating a bargaining model with asymmetric information: evidence from medical malpractice disputes. 1998.
- [32] Kessler DP, Summerton N, Graham JR. Effects of the medical liability system in Australia, the UK, and the USA. *Lancet* 2006; 368:240–6.
- [33] Louisell DW, Williams H, Kramer C. *Medical malpractice*. Vol. 3: M. Bender; 1960.