



Journal of Applied Sciences

ISSN 1812-5654

science
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Study on the Measurement of Patient Satisfaction of Medical Service in China

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Abstract: Customer satisfaction is an important guarantee for the survival and development of hospital in the medical market competition. Health services consumer satisfaction research is an important issue to improve medical service quality and the level of hospital management. This study reconstructed Chinese Medical Services Customer Satisfaction Index Model on the basis of Customer Satisfaction Index Model at home and abroad and used the resistant cross-section data model to estimate the customer satisfaction in various regions in China in 2012.

Key words: Medical services, customer satisfaction, resistance analysis, cross-section data

INTRODUCTION

The quality of medical services directly related to the physical and mental health of residents, at the same time, their advantages and disadvantages related to the survival and development of medical institutions. Thus, improving health care quality is not only the basic tasks and requirements in the medical institutions management but also the lifeblood of medical institutions. World Health Organization (WHO) from a supply-side perspective defined the quality of medical services as the ability which health services department and its agencies need to meet residents' explicit and implicit demands with health resources. While the foreign praised medical service quality from demand angle is defined as the gap between consumer actually received health services and their expectations. This study argue that demand-side perspective of medical services quality-patient perceived quality of medical services-is the quality medical institution to pursue, also the core of medical service quality. Thus this study use the "quality of care = medical services = medical services that customer felt-customers expect to receive medical services" to describe: When the customer's actual experience higher than expected, it will get a higher satisfaction, reflecting the quality of medical services are good. Conversely, if the customer's actual feelings lower than expectations, then the customer satisfaction with health care will be very low, reflecting the quality of medical services are poor.

MEDICAL SERVICES CUSTOMER SATISFACTION INDEX MODEL

Customer Satisfaction Index, CSI is used in many countries as a new economic indicator currently, which is

mainly used for evaluation of the quality of economic output. It is a very popular and frontier topic in the field of quality management and economy. Sweden took the lead in 1989 to establish a national customer satisfaction index, which refers to the Swedish Customer Satisfaction Barometer. Since then, the United States and the European Union have also established their own Customer Satisfaction Index-American Customer Satisfaction Index (ACSI, 1994) and the European Customer Satisfaction Index (ECSI, 1999).

Chinese scholars learn from foreign customer satisfaction research, at the same time, they also actively exploring Customer Satisfaction Index Model suitable for China. Among them, the Tsinghua School of Management's China Customer Satisfaction Index (CCSI) is representative. CCSI model is a quality evaluation method with Chinese characteristics through transforming the model structure and evaluation system in China, which is based on the American Customer Satisfaction Index (ACSI) (Gu, 2008).

From the domestic and foreign researches on customer satisfaction concept and theoretical model we can find that customer expectation, perceived quality and customer perception of value are three common factors of medical services customer satisfaction. These three factors with customer satisfaction form a close causal relationship and the study of these relationships has been the focus of research on medical services customer satisfaction theory. According to the basic principle of customer satisfaction index, based on the domestic and international customer satisfaction index model and considering the characteristics of consumer behavior and

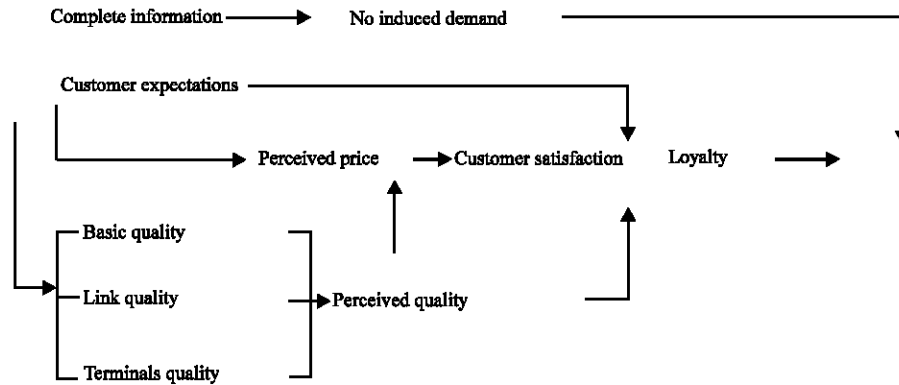


Fig. 1: Chinese medical services customer satisfaction index new model

medical service, this study rebuild the Chinese medical services customer satisfaction index model (Liu and Wang, 2005), shown in Fig. 1.

New model inherits some of the core concepts and architecture in ACSI model, such as customer expectations, perceived quality, customer satisfaction, customer loyalty. It is also absorb some innovations in ECSI model. The improvement of the new model is mainly manifested in the following aspects:

- Considering the system of customers into the health care sector is relatively complete, so we exclude the latent variable-customer complaints-in ACSI model
- The corporate image added in ECSI model can be seen as customer collected information and the information content is far more than the corporate image. Its impact on the level of customer satisfaction is also reflected in whether the customer can access to adequate information timely and the authenticity of the information. In view of this, the new model exclude the corporate image variable, replace this potential variables with the complete information and improve customer satisfaction level by containing supplier-induced demand behavior
- Because the perceived value in ECSI model is abstract for customer, so this variable is removed and replaced by perceived price (perceived price) in the new model. Establishing an independent perceived price to replace the sector driven by the price part in original analysis of customer satisfaction, can make relative path clearer. Its identification variable can use customers expected, competitors' price and quality of medical services themselves as standards. This can provide some more meaningful information in micro-level for medical institutions
- The quality of medical services can be divided into basic quality, quality links and terminal quality.

Therefore, the new model retains the overall perception of quality measures and adds these three quality factors as antecedents of perceived quality. Thus, each medical institution can determine these quality factors through factor analysis so that through a survey we can get satisfaction data used in macro-meso-analysis and also allows the medical institutions to understand the information for microscopic quality improvement clearly. These not only make the entire health care industry benchmark more targeted, but also mean that it has a stronger explanatory power than the existing models

CRITICAL FACTORS AFFECTING CUSTOMER SATISFACTION IN MEDICAL SERVICES

The core content of medical services customer satisfaction research is exploring the key factors affecting customer service satisfaction. Many foreign scholars have done a lot of theoretical and empirical research about medical services customer satisfaction factors from different angles. Based on reviewing the research results, Kang (2004) classified the impact of key factors in medical services customer satisfaction roughly.

The first class is the patient's own relevant background factors, including: Age, gender, ethnicity, education level, income level, health insurance status, medical payment categories, physical and mental health state feeling, the type of illness and severity, psychological pressure, past experience in medical services etc.

The second class is the factors related to hospital background, including: The hospital's fame and reputation, location, teaching situation, departments setting and the medical institutions category.

The third class is the factors related to medical services, including: Environment and facilities in hospital, medical procedures, waiting time, medical equipment,

medical skills, the medical staff's attitude, patients' option, the patient's right to learn the truth, protection patients privacy, medical costs and treatment effect etc.

Combined with our health care system and medical services, this study use medical services satisfaction factors are as follows:

- **Patient background factors:** Gender, age, educational level, occupation, income level, health care forms and registered place
- **Health services factors:** Staff qualifications and professional titles, medical ethics, attitude, medical skills; hospital sanitation, department layout, medical equipment, medical procedures, management systems, completeness of information, waiting time, options right, privacy protection, medical costs and treatment effects

QUANTITATIVE ANALYSIS OF HEALTH CARE SATISFACTION

Establishing measurement index system, combining qualitative description and quantitative analysis, complemented by satisfaction questionnaire is the problem to be solved in medical service satisfaction measurement. Questionnaire of medical services satisfaction including two parts: Customer evaluation on medical service and customer personal information. In the design of satisfaction questionnaire, taking into account the customer expectation, perceived quality, perceived value, customer satisfaction and customer loyalty are hidden variables, which are actually can not be directly measured, so these variables need to be explicit, forming a series of directly measure index. In order to ensure the model results with comparability between medical institutions, observations must be refined on complicated objective phenomena. Meanwhile, in order to ensure that the model can reflect the special nature of consumer behavior in medical services, observations must reflect all the factors that affect the health satisfaction. Considering the above factors, combined with the results of small sample interview to residents in the city J, we found that complete information, basic quality, link quality, final quality, medical expenses, the hospital environment and logistics job security and medical ethics these 7 indexes can basically covers the entire factors involved in medical customer the satisfaction survey.

On this basis, the author refers to SERVQUAL model studied by American scholars Parasuraman Zeithaml. Berry and the two health system responsiveness themes "respecting individuals, taking patients as the center" and eight aspects: "Safeguard the dignity of the

individual, protecting individual autonomy, respecting the privacy of individual, effectively clear information exchanging, convenient transportation and short waiting time, social network and facilities for patients, environmental quality, the right to choose health service provider" proposed by World Health Organization in "world health report 2000". Author preliminary designed investigate alternatives to form the draft and then invited practitioners and experts in medical service quality management to discuss it. Revising and improving further on this basis, this study formed customer satisfaction evaluation dimensions which include seven areas: Information completeness, basic quality, link quality, terminal quality, medical expenses, hospital environment and logistical, medical ethics, a total of 29 projects (Table 1 Evaluation System) (Ministry of Health Statistics Information Center, 2004). Then develop questionnaire learning from Likert fifth scale evaluation method which ask for participants to rate the importance of alternative projects in their own satisfaction expectations in scoring, scoring 9, 7, 5, 3, 1 corresponding to "very important", "more important", "Normal", "not very important", "very important," five degrees. Customer's personal information including gender, age, educational level, occupation, monthly income, healthcare forms, with or without experience in the local hospital, residing place eight aspects.

AN EMPIRICAL STUDY WITH RESISTANT DUAL-SECTIONAL DATA MODEL

Practice has proved that in the parameter estimation of satisfaction index, a small sample size will not be able to obtain the effective estimation of satisfaction and when the sample size is large, parameter estimation is accurate. Foreign related researches also show that, although the different industries, products (services), sampling methods of satisfaction model and model estimation methods make sample size will vary, but generally speaking, the number of sample size is at least 5 times of variable, otherwise, small size sample will cause large error in estimation, resulting in meaningless findings.

Therefore, when conducting survey this article randomly selected 3-4 cities (county, township) from 31 provinces (municipalities and autonomous regions) and then choose and train school's undergraduate, master's degree students from different municipalities (county, township). They are commissioned in the National Day holiday in the host city (county, township) in 2009, using a random intercept method to distribute 80-100 questionnaires, so as to ensure the needed sample size to make accurate parameter estimation.

Table 1: Medical service customer satisfaction evaluation system

Evaluation dimensions	Evaluation contents
Complete information	01 Informed consent before the surgery and examination 02 Inform treatment and examination in advance 03 Publicity fees and drug prices 04 Prescribe and check according to the condition
Basic quality	05 Academic qualifications and titles of medical staff 06 The hospital room layout is reasonable 07 Completeness of medical equipment in hospital 08 Hospital medical guidance services 09 Hospital management system standard
Link quality	10 Patients have the right to choose the treatment plan 11 Skilled 12 Explain the diseases and the drug 13 Accurate emergency treatment 14 Provide test and inspection results in time 15 Warm reception and a detailed account of treatment and rehabilitation considerations
Terminals quality	16 Deal with advice and complaints quickly 17 Definitive diagnosis 18 Satisfactory clinical results (including the operation effect) 19 Patient waiting time
Medical expenses	20 The cost of treatment acceptability 21 The drug cost acceptable 22 The convenient degree of query cost
Hospital environment and logistical support	23 Cleanliness of hospitals and public areas (including toilets) 24 Eye-catching signs and signage 25 Parking convenience 26 Contact with the outside world during hospitalization and the ease of visits 27 Rich and delicious cafeteria food
Medical ethics	28 Ensure the privacy and confidentiality of patient illness 29 No accept and obtain the patient's red envelopes and gifts

Questionnaire validity and reliability: The survey used random intercept manner, 6150 questionnaires were distributed and 5408 copies are valid questionnaires; the recover rate is 87.99%. The essence of the questionnaire is a measuring tool, collecting data first need to consider the reliability and validity of the questionnaire. This study uses Bartlett sphere test and KMO test to analyze the structural validity of the questionnaire. The results are as follows:

- **Alpha:** 0.9440;KMO:0.969
- **Bartlett:** 52774.01, df406, p-value is far less than 0.001

Test results show the overall questionnaire validity and reliability is good.

Medical services customer satisfaction index calculation of various regions: The idea that equation structural resistance test on sample variation which is proposed by Liu (2008) is very meaningful to deal with cross-section data. On this basis, Zhang (2010) discussed methods of dealing double cross-section data. This study uses Zhang Baolin’s method selects the equation structural resistance test idea to deal with empirical data.

Weight determination method: There are two main methods to determine the weight, one is subjective weighting method, such as the Delphi method, expert scoring method, etc. And the other is an objective weighting method, such as entropy method, the standard

deviation method, principal component analysis method, image analysis, gray relational analysis method. Diakoulaki *et al.* (1995) proposed CRITIC in 1995. Wang and Song (2003) compared the entropy method, standard deviation method and CRITIC method, finding that CRITIC method can objectively reflect the objective weight index. This study selects CRITIC as the weighting method. The basic calculation method is as follows:

Firstly, calculate the information content of each index:

$$c_j = \sigma_j \sum_{i=1}^n (1 - r_{ij}) \quad j = 1, 2, \dots, n. \sigma_j$$

is standard deviation of j, according to entropy weight method and standard deviation method, when the standard deviation is large, the index variation degree is great, the information provided by it is great, so the weight is great, whereas the weight is small. r_{ij} is the correlation coefficient between i and j. If there is a strong positive correlation between two indexes, the conflict between the two is low and the index information is overlapping. The conflict between j and other indicators can be quantified by:

$$\sum_{i=1}^n (1 - r_{ij})$$

Table 2: Weight, variance and standard deviation of second class indicators

Index	X ₁				X ₂				
	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₂₁	X ₂₂	X ₂₃	X ₂₄	X ₂₅
Weight (w _j)	0.242338	0.220439	0.274394	0.262825	0.213212	0.203895	0.185327	0.190378	0.207221
Variance (σ _j ²)	4.064302	4.399484	4.832786	5.202991	5.308740	5.236749	4.949108	5.185852	5.314887
Std variance (σ _j)	2.016011	2.097495	2.198360	2.281007	2.304070	2.288394	2.224659	2.277247	2.305404
1-Sum of correlation coefficient $\sum_{i=1}^n (1-r_{ij})$	1.622842	1.418844	1.685088	1.555562	2.351473	2.264129	2.116899	2.124380	2.284083
Information (c _j)	3.271667	2.976017	3.704429	3.548248	5.417958	5.181221	4.709378	4.837738	5.265733
Sum (Σ c _j)	13.500360	25.412030							

Index	X ₃					X ₄				
	X ₃₁	X ₃₂	X ₃₃	X ₃₄	X ₃₅	X ₃₆	X ₃₇	X ₄₁	X ₄₂	X ₄₃
Weight (w _j)	0.142322	0.139612	0.139803	0.134083	0.139733	0.146026	0.158421	0.322024	0.327385	0.350591
Variance (σ _j ²)	5.383458	5.584986	5.729476	5.552823	5.492078	5.697760	6.109973	5.573788	5.859235	5.570160
Std variance (σ _j)	2.320228	2.363257	2.393632	2.356443	2.343518	2.386998	2.471836	2.360887	2.420586	2.360119
1-Sum of correlation coefficient $\sum_{i=1}^n (1-r_{ij})$	2.981445	2.871425	2.838853	2.765684	2.898117	2.973465	3.115155	0.934733	0.926856	1.017983
Information (c _j)	6.917632	6.785917	6.795171	6.517176	6.79179	7.097656	7.700153	2.2068	2.243535	2.402561
Sum (Σ c _j)	48.605500	6.852896								

Index	X ₅		X ₆				X ₇			
	X ₅₁	X ₅₂	X ₆₁	X ₆₂	X ₆₃	X ₆₄	X ₆₅	X ₇₁	X ₇₂	X ₇₃
Weight (w _j)	0.498589	0.501411	0.199573	0.190679	0.187971	0.214208	0.207569	0.319010	0.321523	0.359467
Variance (σ _j ²)	6.094854	6.164034	5.465043	5.238332	5.496503	5.947988	5.498292	5.843232	6.225296	7.873528
Std variance (σ _j)	2.468776	2.482747	2.337743	2.288740	2.344462	2.438850	2.344844	2.417278	2.495054	2.805981
1-Sum of correlation coefficient $\sum_{i=1}^n (1-r_{ij})$	0.389147	0.389147	2.322106	2.266126	2.180845	2.389072	2.407833	1.155012	1.127820	1.121197
Information (c _j)	0.960716	0.966153	5.428486	5.186574	5.11291	5.826587	5.645991	2.791984	2.813973	3.146059
Sum (Σ c _j)	1.926869		27.200550					8.752016		

If the conflict of an index and other indicators is strong, then we know it contains information that can not be measured by other indicators. Therefore, it should be weighted high and vice versa. c_j not only measure the information in an indicator from index value variation, but also consider the conflict between indicators. It is a comprehensive method integrated of entropy method and standard deviation based on the variation degree of empowerment foundation and image analysis, gray relational analysis methods based on degree of correlation between indicators. Then determine weight w_j according to the information size of each index:

$$w_j = \frac{c_j}{\sum_{i=1}^n c_i} \quad j=1, 2, \dots, n$$

One class index data after processing: One class indexes after processing are y_{ij}, x_{1ij}, x_{2ij}, x_{3ij}, x_{4ij}, x_{5ij}, x_{6ij}, x_{7ij} I = 1, 2, 3, 4, 5, 6, 7, j = n_i y represents medical services customer satisfaction, for this article to be explanatory variables. x₁,

x₂, x₃, x₄, x₅, x₆, x₇ represent the complete information, basic quality, link quality, final quality, medical expenses, the hospital environment and logistics and medical ethics. Corresponding to the 31 provinces, municipalities and autonomous regions, the data has 31 cross-sectional points. This study uses structural equation resistant test to deal with the data set. The results were as follows:

- Firstly, analyze variance of level two indicators and determine the weights of these indexes, the results as shown in Table 2
- Secondly, analyze first level indicators with correlation and variance methods, determining the weight of first level indicators. The results are shown in Table 3 and 4

Finally, we get provinces (municipalities and autonomous regions) medical services satisfaction coefficients and converse them to percentage (divide the coefficient by the maximum score of 9), then get the medical services customer satisfaction index of provinces (municipalities and autonomous regions). The result is shown in Table 5.

Table 3: Weight and standard deviation of first level indicators

Index	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇
Weight (w _i)	0.139372	0.119553	0.115999	0.135512	0.170061	0.143511	0.175991
Std variance (σ _i)	1.676861	1.696643	1.812081	1.963051	2.222092	1.722367	2.042374
1-Sum of correlation coefficient $\sum_{i=1}^n (1-r_{ij})$	2.823023	2.393336	2.174272	2.344677	2.599434	2.830057	2.926781
Information (c _i)	4.733817	4.060635	3.939955	4.602721	5.77618	4.874397	5.977582

Table 4: Correlation between first level indicators of medical services customer satisfaction

Index	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇
X ₁	1.000000	0.668062	0.625114	0.532960	0.495118	0.459466	0.396256
X ₂	0.668062	1.000000	0.727242	0.614180	0.546278	0.555328	0.495573
X ₃	0.625114	0.727242	1.000000	0.736724	0.660608	0.547501	0.528539
X ₄	0.532960	0.614180	0.736724	1.000000	0.680433	0.541406	0.549620
X ₅	0.495118	0.546278	0.660608	0.680433	1.000000	0.490570	0.527559
X ₆	0.459466	0.555328	0.547501	0.541406	0.490570	1.000000	0.575672
X ₇	0.396256	0.495573	0.528539	0.549620	0.527559	0.575672	1.000000

Table 5: Medical services customer satisfaction index of different regions

Region	Satisfaction coefficient	Satisfaction Index (%)	Region	Satisfaction coefficient	Satisfaction Index (%)
Peking	5.731834	63.69	Hubei	6.632067	73.69
Tien Tsin	6.982184	77.58	Hunan	6.363569	70.71
Hebei	5.718412	63.54	Guangdong	6.631204	73.68
Shanxi	6.054496	67.27	Guangxi	5.881608	65.35
Inner Mongolia	6.746635	74.96	Hainan	6.375460	70.84
Liaoning	6.775162	75.27	Chunqing	6.920887	76.90
Jilin	6.130053	68.11	Sichuan	5.865833	65.18
Heilongjiang	5.804719	64.50	Guizhou	7.379528	81.99
Shanghai	6.307436	70.08	Yunnan	6.021957	66.91
Jiangsu	5.991247	66.57	Tibet	6.077669	67.53
Zhejiang	6.524622	72.50	Shaanxi	6.321737	70.24
Anhui	5.584997	62.06	Gansu	5.95014	66.11
Fujian	6.432393	71.47	Qinghai	5.228722	58.10
Jiangxi	5.710923	63.45	Ningxia	8.060699	89.56
Shandong	6.061535	67.35	Xinjiang	5.931275	65.90
Henan	6.103838	67.82			
Average	69.64%				

CONCLUSION

In this study, the medical services customer satisfaction is measured with resistant cross-section data model and draws the following main conclusions: The regional medical service satisfaction index is generally low; the national average was 69.64%, far below the standard 85% in "National General Hospital hierarchical management standards" set by Ministry of Health. Through a simple analysis of questionnaire data, author found the low satisfaction index mainly due to the "cost of treatment and drug is reasonable", "patient waiting time", "Inform treatment and examination in advance" project score is generally very low. This results in a certain extent, reflects the status quo of health care costs rising, expensive and difficult medical treatment". Based on the above analysis, this study argues that, in order to improve medical service customer satisfaction, on the one hand, requests for medical institutions to adhere a reasonable inspection, rational drug use, reasonable charging principles, stop drug rebate atmosphere, charges

in commodity price standard. On the other hand, government is requested to strengthen the macro supervision and management of medical institutions, improve status of the asymmetric information between doctors and patients and alleviate the conflicts between doctors and patients. Only in this way can we fundamentally improve customer service satisfaction level.

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