
An empirical study on the price adjustment of healthcare services at China's public traditional Chinese medicine hospitals based on the value of professionalization

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Abstract

China's public traditional Chinese medicine (TCM) hospitals are an integral component of the public healthcare system with Chinese characteristics. This study expounds on the connotations of the value of professionalization of TCM healthcare, its influencing factors and its impact on price. An econometric model for the pricing of TCM healthcare services is constructed. Using the price data of the TCM healthcare services collected from some TCM institutions above the county level, we performed a quantitative analysis of the value of professional TCM healthcare. The purpose was to explore the price adjustment mechanism of TCM healthcare services based on the value of professional service in order to improve the technical innovation and quality of TCM healthcare services and to facilitate the pricing reform of China's public TCM hospitals.

Keywords: Value of professional services, public traditional Chinese medicine hospital, price of TCM healthcare services

1. Introduction

Treatment using traditional Chinese medicine (TCM) is a dynamic, continuous and complex process (DOU Lei et al., 2012) that is guided by the principles of treatment based on syndrome differentiation and synthesis of the four diagnostic methods and individualized therapy. TCM physicians inquire about patients' conditions using the four methods of diagnosis (looking, listening, questioning and feeling the pulse). Then, the disease is diagnosed through synthesis, analysis and induction of the collected information (DOU Lei, 2013). This process is propelled by the rich

knowledge inherent in TCM, and it creates intangible values. The existing pricing methods used for healthcare services in China generally consider the consumption of healthcare materials (MA Hongyao et al., 2013) but tend to dismiss the values created by labor capital and professional skills. Moreover, the contradictions between the public welfare nature and the commercial value of TCM healthcare further aggravate the problem (MA Huifen et al., 2015). To develop a price adjustment mechanism that fully considers the value of professional services, we performed an empirical study on the pricing mechanism of TCM healthcare services based on the value of this professional service.

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2. Theoretical basis and assumptions

2.1. Connotation of the value of professional TCM healthcare services

TCM healthcare services are a unique professional product that consists of prevention, treatment, diagnosis, rehabilitation and healthcare (health service development plan for traditional Chinese medicine, 2015). TCM professionals can provide high-quality healthcare services based on their profound knowledge of TCM. The health and social benefits created by TCM healthcare services, including the rehabilitation of patients with contagious diseases and the subsequent reduction in social burden, will be enjoyed by all members of society. In the terminology of human resources, TCM professionals represent scarce labor that is difficult to reproduce (WANG Lin et al., 2007)(ZHANG Yan, 2009; Mama et al., 2019; Xu et al., 2019); they are located at the center of the professional service network and decide on prescriptions for countless patients. TCM healthcare services are intangible outputs (WANG Weining & XU Xu, 2006)(AO Chunhai, 2010)(YU Jia & XIE Yanming, 2009; Das et al., Diwana et al., 2019) that may be highly complex and heterogeneous and are therefore difficult to standardize. Additionally, TCM professionals can provide tailored service to patients through face-to-face interaction.

2.2. Influencing factors of the value of professional TCM services

Researchers are generally concerned with the professionalization of the knowledge- and skill-based products provided by service enterprises and personnel. Greenwood (2005) believed that the

information advantage and the monopoly on professional knowledge and skills enjoyed by professionals, as well as the commercialization and producibility of professional services, are the main driving forces that promote the growth and professionalization of service enterprises (Greenwood et al., 2005). It is generally agreed that professionalization is the major reason for the growth of service enterprises (Claudia Amonini et al., 2010). In other words, the factors constituting the professionalization of TCM healthcare services (professionals, skills and service products), are also the factors that influence TCM healthcare services.

2.3. Impact of the value of TCM healthcare services on pricing

The pricing of TCM healthcare services quantifies the values of mental and physical labor at TCM healthcare institutions. The pricing is affected by many factors, including the value of labor, equipment and drugs. This study attempts to measure the values of the TCM services and skills and proposes a pricing mechanism for the TCM services. Through proper pricing of the professionalization of TCM services, we hope to justly represent the social and economic benefits of TCM healthcare services.

2.4. Building an econometric model for the pricing of TCM healthcare services

The main factors influencing the value of TCM healthcare services were first identified using a questionnaire. Utilizing the superposition property of knowledge, we constructed the econometric model for the pricing of TCM healthcare services.

3. Data collection and variable measurement

3.1. Sample selection and data collection

Sample selection

A survey was conducted in 69 TCM hospitals at the county level and higher in China's 26 provinces (districts and cities) to collect data on the developmental status and pricing of TCM healthcare services in TCM hospitals. The male-to-female ratio among the respondents was 259:209, and there was no significant difference in gender. The questionnaire was conducted from March 11th to May 31st, 2016.

Data collection

The questionnaire was conducted in 69 TCM hospitals at the county level and higher. A total of

493 questionnaires were distributed, and 468 questionnaires were retrieved; the retrieval rate was 94.9%.

3.2. Variable measurement

Building the assessment indicator system for factors influencing the pricing of TCM healthcare services

First, the competence model was constructed. Jin (2013) administered 71 testing items to the expert group and the control group and preliminarily identified 49 items for exploratory factor analysis. Then, 15 main types of competence

of TCM professionals were identified, based on which the 5A competence model of TCM professionals was developed; the five core types of competence were practical ability, morality, thinking ability, learning capacity and communication capacity (JIN Aning et al., 2013; llechukwu et al., 2019).

Next, the set of competence indicators was constructed. The concept of competence is used to measure the unique value of TCM professionals. A qualified TCM professional should possess the three major types of competence of morality, theoretical learning capacity and practical ability. Competence can be acquired only after long-time study, practice and training; TCM competence is not easily reproduced.

Knowledge-related indicators

Knowledge-related competence can be divided into the following five levels: information, explicit knowledge, structured knowledge materialized in TCM healthcare products, knowledge internalized by TCM professionals and knowledge about the TCM professionalization system (YAO Kai, 2005). These 5 levels evolve from explicit to implicit knowledge, with the last level being the most internalized knowledge, which is the most difficult to reproduce. This level of knowledge has the highest degree of fuzziness and the greatest difficulty of transmission and sharing.

TCM service brand-related indicators

The providers of TCM service products are limited in number and the scope of service. The development of TCM healthcare products is associated with a certain opportunity cost; if professionals are busy developing one product, they are less likely to develop another product. This leads to scarcity of resources for the development

$$a = \begin{bmatrix} 0.3 & 0.3 & 0.4 \\ 0.2 & 0.5 & 0.3 \\ 0.4 & 0.3 & 0.3 \end{bmatrix} \quad (1)$$

$$A = [0.4 \quad 0.3 \quad 0.3] \quad (2)$$

The assessment set is written as $B = \{B_1, B_2, B_3, B_4\}$, where B_1, B_2, B_3 and B_4 represent high, fairly high, moderate and low values of TCM healthcare services, respectively; the assigned values are 0.9, 0.7, 0.5 and 0.3, respectively.

(2) Determination of the sample matrix

Five TCM experts were invited to score each

of TCM healthcare products. Therefore, the providers of TCM service products also face the problem of reasonably determining a product portfolio. No healthcare products can be developed immediately, and there is usually a continuous demand on time devoted to the development of a certain product. Moreover, it is never easy to change the product portfolio due to constraints of the cost-benefit balance. Given the varying level of economic development across regions, there is also a large discrepancy between the demand for TCM healthcare services and their development, which represents a spatial constraint for the allocation of resources for TCM healthcare product development. In other words, the scarcity related to the spatial constraint determines the allocation of resources for development of TCM healthcare products.

3.3. Variable measurement

Once we have determined the assessment indicator system for the factors influencing the value of TCM healthcare services, we can construct the set of secondary indicators. The set of primary indicators is $U = (U_1, U_2, U_3)$, which represents the competence of TCM professionals, TCM professional knowledge structure and relative scarcity of TCM healthcare products. $V = (V_{i1}, V_{i2}, V_{i3})$ represents the first, second and third secondary indicators belonging to the i^{th} class of primary indicators, respectively. The fuzzy analytic hierarchy process (AHP) is applied to calculate the relative weight of the indicators of the second and third hierarchies of the assessment indicator system.

(1) Determination of indicator weight and assessment criteria using AHP

indicator in the table below using a range from 0 to 1. X_{ijk} is the score given by the k^{th} expert to the j^{th} secondary indicator belonging to the i^{th} primary indicator. The scores given to each indicator by the 5 experts are shown below.

Table 1: Expert scoring results

Indicator layer	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5
Morality	0.6	0.9	0.7	0.9	0.7
Theoretical learning capacity	0.8	1	0.4	0.7	0.7
Practical ability	0.8	0.8	0.6	0.7	0.2
Structured knowledge of TCM healthcare products	0.3	0.9	0.2	0.5	0.2
Implicit knowledge of TCM professionals	0.8	0.8	0.9	0.6	0.5
Knowledge of the TCM professionalization system	0.4	0.8	0.9	0.2	0.6
Scarcity related to the opportunity cost of resource allocation	0.7	0.7	0.6	0.1	0.5
Scarcity related to the temporal continuity of resource allocation	0.4	0.5	0.4	0.9	0.3
Scarcity related to the spatial constraints of resource allocation	0.7	0.5	0.1	0.6	0.1

(3) Constructing the gray classes
 The weight matrix of the assessment indicators is calculated using the gray evaluation method. The whitenization weight functions of the qualitative indicators are constructed for each of the four gray classes as follows:

$$f_1(X_{ij}) = \begin{cases} \frac{x_{ij}}{0.9} & x_{ij} \in [0, 0.9] \\ 1 & x_{ij} \in [0.9, 1] \end{cases} \quad f_2(X_{ij}) = \begin{cases} \frac{x_{ij}}{0.7} & x_{ij} \in [0, 0.7] \\ \frac{1-x_{ij}}{0.3} & x_{ij} \in [0.7, 1] \end{cases} \quad (3)$$

$$f_4(X_{ij}) = \begin{cases} \frac{x_{ij}}{0.3} & x_{ij} \in [0.3, 1] \\ 1 & x_{ij} \in [0, 0.3] \end{cases} \quad f_3(X_{ij}) = \begin{cases} \frac{x_{ij}}{0.5} & x_{ij} \in [0, 0.5] \\ \frac{1-x_{ij}}{0.5} & x_{ij} \in [0.5, 1] \end{cases} \quad (4)$$

(4) Calculating the gray relational coefficients:
 An example of the gray relational coefficient calculation of each gray class for the TCM knowledge-related indicator is shown below.

$$V_{211} = \sum_{j=1}^w f_1(x_{211}) + f_1(x_{212}) + \dots + f_1(x_{21w}) \quad (5)$$

$$V_{212} = \sum_{j=1}^w f_2(x_{211}) + f_2(x_{212}) + \dots + f_2(x_{21w}) \quad (6)$$

$$V_{213} = \sum_{j=1}^w f_3(x_{211}) + f_3(x_{212}) + \dots + f_3(x_{21w}) \quad (7)$$

$$V_{214} = \sum_{j=1}^w f_4(x_{211}) + f_4(x_{212}) + \dots + f_4(x_{21w}) \quad (8)$$

The gray relational coefficients of other indicators were obtained in a similar fashion.

(5) Calculating the weight of the gray evaluation and building the weight matrix
 For V21, the evaluation value of each gray class is estimated as follows:

$$V_{21}(r_1) = \frac{V_{212}}{\sum_{j=1}^4 V_{21j}} \quad V_{21}(r_3) = \frac{V_{213}}{\sum_{j=1}^4 V_{21j}} \quad V_{21}(r_4) = \frac{V_{214}}{\sum_{j=1}^4 V_{21j}} \quad V_{21}(r_2) = \frac{V_{211}}{\sum_{j=1}^4 V_{21j}} \quad (9)$$

The evaluation values of indicators V22 and V23 are calculated using the above procedures, and thus the matrix R₂ is constructed. R₁ and R₃ are calculated using the same method.
 (6) Calculating the fuzzy comprehensive evaluation matrix

The fuzzy comprehensive evaluation matrix V for each indicator can be obtained from the weight set of the secondary indicators and the weight matrix R_i . For the TCM knowledge-related indicator,

$$V_2 = a_2 \times R_2 = [0.2, 0.5, 0.3] \times R_2 \quad (10)$$

Similarly, the fuzzy comprehensive evaluation matrices for the competence indicators and relative scarcity indicators are determined as follows:

$$U = V \times B^T \quad (11)$$

Thus, the final score is

$$A^* = B^T \times A \quad (12)$$

The score for the TCM knowledge-related indicator is 0.35. According to the assessment criteria, the value of TCM healthcare services is high, as a high level of professionalization is needed to provide TCM healthcare services. In addition to the

strong requirement for competence and TCM knowledge structure, TCM healthcare products also have high scarcity. Therefore, the professionalization of TCM healthcare services is the major consideration in value assessment.

4. Modeling

4.1. Determining the weight of each tested item in the pricing of TCM healthcare service

As shown in the descriptive statistics, the respondents attached differing importance to social reputation in the pricing of TCM healthcare services; 41.9% of respondents assigned the greatest weight, whereas 13%, 7.5%, 12.6%, and 25% of respondents assigned high, fairly high, moderate, and small weight, respectively, to this item.

With regards to professional title, the greatest weight was assigned by 21.6% of respondents, a high weight by 31.4% of respondents, a fairly high weight by 23.1% of respondents, a moderate weight by 17.7% of respondents, and a small weight by 6.2% of respondents.

For working years, the greatest weight was assigned by 20.1% of respondents, a high weight by 25% of respondents, a fairly high weight by 30.1% of respondents, a moderate weight by 17.1% of respondents, and a small weight by 7.7% of respondents.

For educational background, the greatest weight was assigned by 6.2% of respondents, a high weight by 14.1% of respondents, a fairly high weight by 23.3% of respondents, a moderate weight by 28% of respondents, and a small weight by 28.4% of respondents.

For the master-disciple education, the greatest weight was assigned by 10.3% of respondents, a high weight by 16.5% of respondents, a fairly high

weight by 16% of respondents, a moderate weight by 24.6% of respondents, and a small weight by 32.7% of respondents.

4.2. Standardization coefficient

To prevent the impact of different dimensionalities of indicators and the large difference in the magnitude, extremum treatment was applied to the raw data of 10 classes of secondary indicators. After standardization, the values ranged from 0 to 1, and the principles of monotonicity, difference ratio invariability, translational independence, scaling independence and interval stability were followed.

The mathematical model for comprehensive evaluation was applied to synthesize the comprehensive evaluation value from the indicator values. Thus, the testing items could be ranked and screened based on the size of the comprehensive evaluation value.

Considering the method used for indicator weight determination and the application scope of the comprehensive evaluation model, the weighted sum approach was adopted to synthesize the indicator data.

4.3. Coefficient determination

The weighted average is calculated as shown below.

First, a matrix is formed with the weight coefficient obtained by the survey and normalized as follows:

$$b_{ij} = \frac{a_{ij}}{\sum_{t=1}^n a_{it}} \quad (13)$$

$$B_{mn} = [b_{ij}] \quad A_{mn} = [a_{ij}] \quad (14)$$

$$1 \leq i \leq m \quad 1 \leq j \leq n \tag{15}$$

Then, the average of each item is calculated based on the attributes of the respondents. For example, for the tested item of professional title, the average is calculated separately for respondents with different professional titles.

$$P_i = \frac{\sum_{s=1}^k P_{st}}{k} \tag{16}$$

where $1 \leq i \leq u$, u is the number of levels of the professional title, and k is the number of respondents with each level of the professional title.

Thus, the coefficient of each influence factor is given by

$$a_i = \frac{\sum_{i=1}^u P_i}{u} \tag{17}$$

where $1 \leq i \leq v$, and v is the total number of influencing factors.

The weight coefficients assigned to each of the five influencing factors for the valuation of TCM healthcare services should differ from each other, but this depends on the respondents making a clear differentiation between these influencing factors by assigning them different weights. Based on this

principle, 468 questionnaires were included in the analysis.

We believe that the value of different levels of knowledge can be described as a pyramid and that there is a geometric growth of the value for different levels of knowledge. Therefore, the weights are assigned to each level of knowledge as follows:

Table 2: Weights assigned to different levels of assessment indicators in the pricing model

Highest weight	High weight	Fairly high weight	Moderate weight	Small weight
10^4	10^3	10^2	10^1	10^0

It is calculated that $a_1 = 0.3542$, $a_2 = 0.3112$, $a_3 = 0.1689$, $a_4 = 0.0641$, $a_5 = 0.1016$.

The linear model for the valuation of TCM professionals is built to obtain the following valuation coefficient of the TCM professionals:

$$y = \sum_{i=1}^5 a_i x_i \tag{18}$$

where X_1 is social reputation; X_2 is professional titles; X_3 is working years; X_4 is educational background; and X_5 is master-disciple education.

See Table 3.

Table 3: Coefficients of the influencing factors

Influencing factor	Social reputation	Professional title	Working years	Educational background	Master-discipline education
Coefficient	0.3542	0.3112	0.1689	0.0641	0.1016

The VCLM model for the valuation of TCM professionals is built, and the valuation coefficient is calculated as follows:

$$VC = \sum_{i=1}^5 a_i x_i \tag{19}$$

where x_i is the influence factor; the value of x_{ij} for each influence factor is determined based on the price charged by outpatient clinics within healthcare institutions.

4.4. Analysis of results

A total of 56 questionnaires on healthcare pricing were retrieved. Due to missing data for items related to TCM outpatient clinic fees (registration fees, examination fees, diagnosis fees

and syndrome differentiation fees), 43 complete questionnaires were ultimately included.

Through normalization and weighted averaging of TCM outpatient clinic fees at the healthcare institutions, the coefficients of social reputation

and professional title were obtained. The factors of working years, educational background and master-disciple education were scored by the

experts, with the highest score being 1. The average score for each factor was used. Table 4 shows the scores of the influencing factors.

Table 4: Scores of the influencing factors

Social reputation	Score	Professional title	Score	Working years	Score	Educational background	Score	Master-disciple education	Score
National-level TCM master	1	Consultant	1	Over 41 years	1	Doctoral degree	1	Master-disciple education from a national-level TCM master	1
Provincial-level TCM professional	0.5	Associate consultant	0.75	31-40 years	0.8	Master's degree	0.8	Master-disciple education from a provincial-level TCM master	0.5
Others	0	Attending physician	0.48	21-30 years	0.6	Bachelor's degree	0.6	Master-disciple education from masters of other levels	0.2
		Resident physician	0.45	11-20 years	0.4	Junior college	0.4		
		Others	0.2	Below 10 years	0.2	Below junior college	0.2		

Based on the above coefficients, the VC value of outpatient clinic fees is calculated for different levels of TCM professionals. The final price, however, is calculated as follows:

$$P = M \cdot VC = M \cdot \sum_{i=1}^5 a_i x_i \quad (20)$$

where M is the highest price (RMB). That is to say, the TCM professional is a national-level master and consultant with a doctoral degree who has worked for over 41 years and has received master-disciple education from national Chinese medicine science masters. However, very few TCM

professionals meet all these criteria. Therefore, being a national Chinese medicine science master alone qualifies one for the highest price, and no other influencing factors are considered. To ensure the universality of the model, the model is optimized as follows:

$$P = \begin{cases} T & x_{11} = 1 \\ \frac{T}{\sum_{i=1}^3 a_i} \cdot \sum_{i=1}^5 a_i x_i & x_{11} \neq 1 \end{cases} \quad (21)$$

where T is the outpatient clinic fee for the national Chinese medicine science master in a

certain region. Our survey indicates that most national Chinese medicine science masters meet

the highest criteria for social reputation, professional titles and working years. However, not all national Chinese medicine science masters meet the highest criteria for educational background and master-disciple education. Therefore, for national Chinese medicine science masters, the outpatient

clinic fees are fixed at T RMB. To ensure the reasonability and interpretability, the revised value

$$M \text{ is given by } M = \frac{T}{\sum_{i=1}^3 a_i}$$

For example, the registration fees for national Chinese medicine science masters are 300 RMB in a region. On this basis, the fees are calculated for different levels of TCM professionals. The following three situations are considered:

(1) Considering professional titles, working

$$P = \frac{T}{\sum_{i=1}^3 a_i} \cdot \sum_{i=1}^5 a_i x_i = \frac{300}{a_1 + a_2 + a_3} (a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5) \quad (22)$$

Here, the social reputation indicator is $x_1=0$ and the master-disciple education indicator is $x_5=0$. For example, consider an associate chief physician who has worked for 11-20 years with a doctoral degree. In this case, the professional title

years and educational background

Professional titles, working years and educational background are considered for the valuation of the TCM professionals, while the indicators of social reputation and master-disciple education are set to zero, i.e.,

indicator is $x_2=0.75$, the working years indicator is $x_3=0.4$ and the educational background indicator is $x_4=1$; the outpatient clinic fees are calculated as follows:

$$P = \frac{300}{0.3542 + 0.3112 + 0.1689} (0.3542 \times 0 + 0.3112 \times 0.75 + 0.1689 \times 0.4 + 0.0641 \times 1 + 0.1016 \times 0) \\ = 131.27 \approx 131 \text{ RMB}$$

For different levels of professional titles, working years and educational background, the scores of the influencing factors are introduced into

the formula to calculate the outpatient clinic fees, as shown in Table 5.

Table 5: Outpatient clinic fees for different levels of professional titles, working years and educational background based on the VCLM model

		Over 41 years	31-40 years	21-30 years	11-20 years	Below 10 years
Doctoral degree	Consultant	196	184	171	159	147
	Associate consultant	168	156	143	131	119
	Attending physician	137	125	113	101	89
	Resident physician	134	122	110	98	86
	No professional title	106	94	82	70	58
Master's degree	Consultant	191	179	167	155	142
	Associate Consultant	163	151	139	127	115
	Attending physician	133	121	109	96	84
	Resident physician	130	117	105	93	81
	No professional title	102	89	77	65	53
Bachelor's degree	Consultant	186	174	162	150	138
	Associate Consultant	158	146	134	122	110
	Attending physician	128	116	104	92	80
	Resident physician	125	113	101	88	76
	No professional title	97	85	73	61	48
Junior	Consultant	182	170	158	145	133

college	Associate consultant	154	142	130	117	105
	Attending physician	124	112	99	87	75
	Resident physician	120	108	96	84	72
	No professional title	92	80	68	56	44
Technical secondary school/senior middle school and below	Consultant	177	165	153	141	129
	Associate consultant	149	137	125	113	101
	Attending physician	119	107	95	83	70
	Resident physician	116	104	91	79	67
	No professional title	88	76	63	51	39

(2) Considering the professional title, working years, educational background and master-disciple education (JIN Aning, 2009)(FU Yujuan. et al., 2008)(MA Zuoying et al., 2014).

Here, the master-disciple education indicator x_5 is considered as well. For a chief physician who has worked for less than 10 years with a bachelor's degree and has received master-disciple education from the national-level

$$P = \frac{300}{0.3542 + 0.3112 + 0.1689} (0.3542 \times 0 + 0.3112 \times 0.48 + 0.1689 \times 0.2 + 0.0641 \times 0.8 + 0.1016 \times 1)$$

$$= 120.83 \approx 121 \text{ RMB}$$

The scores of the four indicators are introduced into the formula, and the results are shown in Tables 6-8.

Table 6: Outpatient clinic fees for TCM professionals receiving master-disciple education from the national-level master but having different levels of professional titles, working years and educational background based on the VCLM model

		More than 41 years	31-40 years	21-30 years	11-20 years	Fewer than 10 years	
Master-disciple education from a national-level master	Doctoral degree	Consultant	232	220	208	196	184
		Associate consultant	204	192	180	168	156
		Attending physician	174	162	150	138	125
		Resident physician	171	159	146	134	122
		No professional title	143	131	118	106	94
	Master's degree	Consultant	228	215	203	191	179
		Associate consultant	200	187	175	163	151
		Attending physician	169	157	145	133	121
		Resident physician	166	154	142	130	117
		No professional title	138	126	114	102	90
	Bachelor's degree	Consultant	223	211	199	187	174
		Associate consultant	195	183	171	159	146
		Chief physician	165	153	141	128	116
		Resident physician	161	149	137	125	113

	No professional title	133	121	109	97	85
Junior college	Consultant	218	206	194	182	170
	Associate consultant	190	178	166	154	142
	Chief physician	160	148	136	124	112
	Resident physician	157	145	133	120	108
	No professional title	129	117	105	92	80
Technical secondary school/senior or middle school and below	Consultant	214	202	189	177	165
	Associate consultant	186	174	162	149	137
	Attending physician	156	143	131	119	107
	Resident physician	152	140	128	116	104
	No professional title	124	112	100	88	76

Table 7: Outpatient clinic fees for TCM professionals receiving master-disciple education from the provincial-level master but having different levels of professional titles, working years and educational background based on the VCLM model

		More than 41 years	31-40 years	21-30 years	11-20 years	Fewer than 10 years	
Master-disciple education from a national-level master	Doctoral degree	Consultant	214	202	190	178	165
		Associate consultant	186	174	162	150	137
		Attending physician	156	144	131	119	107
		Resident physician	152	140	128	116	104
		No professional title	124	112	100	88	76
	Master's degree	Consultant	209	197	185	173	161
		Associate consultant	181	169	157	145	133
		Attending physician	151	139	127	115	103
		Resident physician	148	136	124	111	99
		No professional title	120	108	96	83	71
Bachelor's degree	Consultant	205	193	180	168	156	
	Associate consultant	177	165	152	140	128	
	Attending physician	147	134	122	110	98	
	Resident physician	143	131	119	107	95	
Junior college	No professional title	115	103	91	79	67	
	Consultant	200	188	176	164	152	
	Associate	172	160	148	136	124	

	consultant					
	Attending physician	142	130	118	105	93
	Resident physician	139	126	114	102	90
	No professional title	111	98	86	74	62
	Consultant	196	183	171	159	147
Technical secondary school/senior middle school and below	Associate consultant	168	155	143	131	119
	Attending physician	137	125	113	101	89
	Resident physician	134	122	110	98	85
	No professional title	106	94	82	70	57

Table 8: Outpatient clinic fees for TCM professionals receiving master-disciple education from other levels of masters but having different levels of professional titles, working years and educational background based on the VCLM model

		More than 41 years	31-40 years	21-30 years	11-20 years	Fewer than 10 years
Doctoral degree	Consultant	203	191	179	167	154
	Associate consultant	175	163	151	139	126
	Attending physician	145	133	121	108	96
	Resident physician	141	129	117	105	93
	No professional title	113	101	89	77	65
Master's degree	Consultant	198	186	174	162	150
	Associate consultant	170	158	146	134	122
	Attending physician	140	128	116	104	92
	Resident physician	137	125	113	100	88
Bachelor's degree	No professional title	109	97	85	72	60
	Consultant	194	182	169	157	145
	Associate consultant	166	154	142	129	117
	Attending physician	136	123	111	99	87
Junior college	Resident physician	132	120	108	96	84
	No professional title	104	92	80	68	56
	Consultant	189	177	165	153	141
	Associate consultant	161	149	137	125	113
Technical secondary school/senior middle school and below	Attending physician	131	119	107	95	82
	Resident physician	128	115	103	91	79
	No professional title	100	87	75	63	51
	Consultant	185	172	160	148	136
Master-disciple education from masters of other levels	Associate consultant	157	144	132	120	108
	Attending physician	126	114	102	90	78
	Resident physician	123	111	99	87	74
	No professional title	95	83	71	59	46

(3) Considering social reputation, professional titles, working years, educational background and master-disciple education A revision of the social reputation indicator is

made based on the proposed VCLM model for the valuation of the TCM professionals. When the TCM professional is a national Chinese medicine science master, the highest fees will be charged, which are

300 RMB, regardless of other qualifications. If the TCM professional is a provincial Chinese medicine science master, he or she is generally a consultant or associate consultant who has worked for over 10 years. Therefore, the outpatient clinic fees are calculated based on different educational background and master-disciple education.

$$P = \frac{300}{0.3542 + 0.3112 + 0.1689} (0.3542 \times 0.5 + 0.3112 \times 1 + 0.1689 \times 0.8 + 0.0641 \times 0.6 + 0.1016 \times 0.5)$$

$$= 256.26753 \approx 256 \text{ RMB}$$

Similarly, the outpatient clinic fees for different levels of TCM professionals can be calculated.

5. Conclusions and policy implications

Professionalization is regarded as an integral part of the value of TCM healthcare services, and valuation of TCM professionals is conducted on this basis. For a long time, the value of professionalization in TCM healthcare services has been dismissed; the valuation of professionalization is inevitably not included in the TCM service pricing mechanism. This is partially responsible for the low motivation of TCM professionals in improving their professional skills (ZHANG Chunmei, 2013). Based on the survey, we analyzed the value of TCM healthcare services from three dimensions, namely, TCM professionals, professional skills and professional products. The following three competencies of TCM professionals were considered: morality, theoretical learning capacity and practical ability. Using the knowledge structure model, the following levels of TCM knowledge were considered: structured knowledge, implicit knowledge internalized in the TCM professionals, and knowledge of the TCM professionalization system (TANG Lina et al., 2014) As to the dimension of professional products, relative scarcity is the major attribute that increases the value of TCM healthcare services. The study on valuation of TCM healthcare services provides a reference for the pricing mechanism for TCM healthcare services. Following the logic of price reflecting value, it is believed that the value of professionalization in TCM healthcare services will be more comprehensively reflected in the pricing mechanism through price compensation.

Consider a provincial Chinese medicine science master who has worked for 31-40 years with a bachelor's degree and has received a master-disciple education from a provincial-level master. Using the proposed VCLM model, the social reputation indicator is $x_1=0.5$, the professional title indicator is $x_2=1$, the working years indicator is $x_3=0.8$, the educational background indicator is $x_4=0.6$ and the master-disciple education indicator is $x_5=0.5$:

These research findings shed new light on pricing reform in TCM hospitals. It is important to build a dynamic price adjustment mechanism that fully reflects the value of professionalization in TCM healthcare services. Ensuring the healthy development of public TCM hospitals and smooth operation of basic medical insurance without increasing medical costs for the general public is the primary goal of pricing reform in public TCM hospitals (ZHAN Fan, 2015). By optimizing the pricing mechanism of TCM healthcare services, the technical innovation and service quality of TCM healthcare services can be promoted; optimized allocation of TCM resources can be facilitated through a differential pricing policy. Enlarging the gap in the outpatient clinic fees between senior experts and ordinary TCM physicians is an important method for diverting patients and optimizing the allocation of high-quality medical resources. By adding new charges, such as syndrome differentiation fees and Chinese herbal medicine fees that can reflect the value of professionalization in TCM healthcare services, the long-standing problems of low income and low development of TCM hospitals can be resolved.

Much basic work remains to be conducted in order to facilitate the pricing reform of TCM healthcare services. First, the separate roles played by the government and the market should be clearly specified. The range of TCM healthcare services for which the government has set the price should be specified (XU Lingxue et al., 2010).

Excluding these services, the pricing of other services should be left to the market. Second, the components of TCM healthcare services should be clarified. While increasing the price of labor of TCM professionals, the charges of consumables and any additional fees should be strictly controlled. The fees for diagnosis, examination and

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consumables must be clearly stated. Third, addressing the existing problems in TCM healthcare services, the pricing reform of TCM healthcare service should be deepened. Relevant policies and mechanisms should be perfected to enhance the systematicity, integrity and synergy of the reform measures.

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