Primary Healthcare Technicians' Preferences for Appropriate Traditional Chinese Medicine Technologies: A Discrete Choice Experiment Post-Print

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Date: 2023-04-03T11:24:35+00:00

Abstract

Background Promoting appropriate traditional Chinese medicine (TCM) technologies in primary-level medical and health institutions is an important task for "giving equal emphasis to Chinese and Western medicine," and also a crucial action for promoting the inheritance and development of TCM. Objective To analyze the preferences of primary-level health technicians in using appropriate TCM technologies, and to provide policy recommendations for the promotion and utilization of appropriate TCM technologies in primary-level medical and health institutions. Methods From July to August 2021, using a multi-stage random cluster sampling method, 23 primary-level medical and health institutions were selected from eastern and western regions of China, and 319 health technicians on duty that day were included for a questionnaire survey. Among the 319 questionnaires, 295 passed the consistency test, with an effective questionnaire rate of 92.5%. The discrete choice model questionnaire in this study included 7 attributes, using an efficient orthogonal design to obtain 18 choice sets, which were evenly divided into 3 questionnaire versions. Each version included 6 choice sets (including an opt-out option) and 1 consistency test question. Additionally, basic information of primary-level health technicians was surveyed, including gender, age, education level, professional technical title, etc. Conditional Logit model and latent class model were used to analyze preferences for appropriate TCM technology use among primary-level health technicians. Willingness to pay was used to monetize changes in utility of primary-level health technicians after attribute level changes. Results In the conditional Logit model, whether within the medical insurance scope, single operation duration, impact on income, impact on workload, help for professional title (position) promotion, technical efficacy, and impact on patient expenditure all had significant ef-

fects on health technicians' preferences for using appropriate TCM technologies (P<0.05). The latent class model showed that the TCM-technology-wait-and-see group (16.2%) had an opt-out option coefficient of -3.660 (P<0.001), while the TCM-technology-supporting group (83.8%) had an opt-out option coefficient of 2.189 (P<0.001). The TCM-technology-wait-and-see group was more willing to use appropriate TCM technologies with confirmed efficacy (β=1.275), while the TCM-technology-supporting group had no obvious preference for technologies with unchanged efficacy (β=0.054). Conclusion Primary-level health technicians prefer to use appropriate TCM technologies that can increase income, maintain workload unchanged, reduce or maintain patient costs, facilitate promotion, fall within medical insurance coverage, and have superior efficacy. Promoting appropriate TCM technologies into the medical insurance reimbursement catalog and linking the use of appropriate TCM technologies with technician promotion systems can effectively improve the enthusiasm of primary-level health technicians to use appropriate TCM technologies. Differentiated incentive approaches should be adopted for different types of health technicians.

Full Text

Preferences for the Use of Appropriate TCM Techniques among Primary Health Workers: A Discrete-choice Experiment-based Study

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Abstract

Background

The promotion of appropriate traditional Chinese medicine (TCM) techniques in primary care institutions is an important measure emphasizing the co-development of Chinese and Western medicine, and enhancing the inheritance and development of TCM.

Objective

To analyze primary health workers' preferences for the use of appropriate TCM techniques, providing policy recommendations for the promotion and use of such techniques in primary healthcare institutions.

Methods
This questionnaire survey was conducted between July and August 2021. A discrete choice model with seven attributes and 18 choice sets obtained through the use of an efficient orthogonal design were used to develop the questionnaire. The questionnaire had three versions (each version with evenly allocated six choice sets including an opt-out option). Additionally, the three versions had a common general demographic section (sex, age, education level, professional title, etc.) and one common consistency test question. A randomized multi-stage stratified cluster sampling was used to select 319 health workers on duty on the survey day from a total of 23 primary healthcare institutions in three counties in eastern, central, and western China (one county was extracted from each region). Each worker completed one version of the questionnaire extracted sequentially. Two hundred and ninety-five cases who returned a questionnaire passing a consistency test were included for analysis, resulting in a response rate of 92.5%. Primary health workers' preferences for appropriate TCM techniques were analyzed using conditional Logit models and latent class models. Furthermore, the changes in utility of primary health workers due to attribute level changes were monetized using willingness to pay and presented accordingly.

Results
The conditional Logit analysis showed that medical insurance coverage, the average duration of each operation with the TCM technique, the influence of operation with the TCM technique on income, work burden, the promotion of professional title, and patient healthcare cost, as well as effectiveness of the TCM technique were associated with primary health workers' preferences for the use of appropriate TCM techniques ($P<0.05$). The latent class model revealed that the opt-out option coefficient for those holding a wait-and-see attitude toward the use of TCM techniques (16.2%) was -3.660 ($P<0.001$), while that for those supporting the use of TCM techniques (83.8%) was 2.189 ($P<0.001$). Moreover, those holding a wait-and-see attitude exhibited a stronger preference for appropriate TCM techniques that have been proven to be efficacious (β=1.275), and those supporting the use of TCM techniques showed no significant preference for those with unchangeable effectiveness (β=0.054).

Conclusion
Primary health workers prefer to use appropriate TCM techniques that can increase their income without workload increase, facilitate their professional title promotion, retain or reduce patient costs, and are covered by health insurance and have good efficacy. To effectively promote primary health workers' enthusiasm in the use of appropriate TCM techniques, it is suggested to add these techniques to the medical insurance reimbursement list and make a connection between the use of these techniques and title promotion. In addition, different incentive strategies should be adopted for different types of primary health workers.

Keywords
Traditional Chinese medicine therapy; Community health services; Community

health workers; Preference; Discrete choice experiment; Conditional logistic regression analysis; Latent class analysis

Introduction

Appropriate TCM techniques constitute an important component of TCM services, typically referring to safe, effective, low-cost, and easy-to-learn TCM technologies characterized by simplicity, convenience, proven efficacy, and affordability [1]. The "Opinions on Promoting Inheritance and Innovation of Traditional Chinese Medicine" issued by the Central Committee of the Communist Party of China and the State Council emphasizes "equal emphasis on Chinese and Western medicine," and promoting appropriate TCM techniques in primary healthcare institutions represents a crucial initiative for advancing TCM inheritance and development. The dissemination of appropriate TCM techniques at the primary level helps enhance healthcare service capacity and patient satisfaction while reducing medical expenses and alleviating the economic burden of disease [2-3]. However, in actively promoting these techniques, most regions have focused on practical innovations such as information dissemination and base construction, neglecting the cultivation and motivation of primary health technicians—the key agents of implementation [4-5]. On one hand, the number of health technicians mastering appropriate TCM techniques in primary units is insufficient, resulting in a relative shortage of human resources. On the other hand, influenced by factors such as work environment, performance systems, technique-related income, and operation time, primary health technicians show low enthusiasm for participating in training and clinical application of appropriate TCM techniques [6].

Given this context, this study adopts the perspective of primary health technicians and employs Discrete Choice Experiment (DCE) to investigate the usage patterns and preferences for appropriate TCM techniques among health technicians in sample regions, aiming to provide theoretical foundations for establishing incentive and promotion mechanisms.

Methods

Study Participants

Between July and August 2021, we conducted a survey using multistage randomized cluster sampling. One county (or county-level city) was selected from each of China's eastern and western regions (Laizhou City in Shandong Province and Qingzhen City in Guizhou Province). From these target counties, we randomly selected 17 township health centers and 6 community health service institutions. All health technicians on duty during the survey day were included; for larger institutions, 50% of on-duty staff were randomly sampled. Inclusion criteria comprised active medical personnel, including TCM and Western medicine licensed (assistant) physicians, public health physicians, and licensed (assistant) nurses. Exclusion criteria included those with physician qualifications who had never

participated in clinical diagnosis and treatment. The study enrolled 319 health technicians from 23 primary healthcare institutions. All 319 questionnaires were returned, with 295 passing consistency tests, yielding a 92.5% validity rate. This study was approved by the Ethics Committee of West China Hospital, Sichuan University (approval number: 2023-398).

Discrete Choice Experiment Design

DCE is a quantitative method for measuring respondent preferences by simulating realistic decision-making processes to examine how different product attributes influence choices. This study simulated potential clinical decision-making scenarios involving appropriate TCM techniques to investigate primary health technicians' usage preferences.

Attribute and Level Selection Attributes and levels constitute the fundamental elements of DCE. Attributes refer to product or service characteristics, while levels represent their degrees—together forming the basis for choice scenarios. This study systematically reviewed literature on key factors influencing health technicians' use of appropriate TCM techniques and identified seven influencing factors from three dimensions (technique attributes, users, and medical institutions): (1) whether the technique is covered by medical insurance, (2) average operation duration, (3) expected efficacy, (4) assistance with professional title (position) promotion, (5) impact on work burden, (6) impact on patient expenses, and (7) impact on income [7-11]. After consulting experts in appropriate TCM techniques, health policy makers, health economists, DCE specialists, and primary care physicians, we finalized seven attributes and their levels (Table 1).

Questionnaire Design The discrete choice model questionnaire included seven attributes: two with two levels and five with three levels. A full factorial design would have generated 972 (2^2\$×3^{5}\$) different TCM technique combinations. To simplify the experiment, we employed an efficient orthogonal design to obtain 18 choice sets (Table 2). To reduce respondent burden, these 18 choice sets were evenly divided into three questionnaire versions, each containing six choice sets plus one consistency test question (which presents options with clearly dominant relationships to assess whether respondents answer rationally). An opt-out option was included for each choice set [12]. The questionnaire also collected basic information about primary health technicians, including gender, age, education level, and professional title, as well as respondents' self-rated enthusiasm for learning appropriate techniques on a 1-10 scale (higher scores indicating greater enthusiasm).

Survey Administration Each respondent completed only one questionnaire version. To ensure approximately equal distribution across the three versions, respondents sequentially rotated through versions 1 to 3. Questionnaires failing the consistency test were excluded from analysis.

Statistical Analysis

We used SAS 9.2 software for efficient orthogonal design and EpiData 3.1 software for double data entry to ensure quality. Categorical data were expressed as frequencies and percentages, while non-normally distributed continuous data were presented as median (interquartile range) [M (QR)]. Stata 16.0 software was used to analyze preference data. Conditional Logit models were employed for overall preference analysis, and latent class models for preference classification. Willingness to Pay (WTP) monetized utility changes resulting from attribute level variations, with $P<0.05$ considered statistically significant.

Conditional Logit Model Based on utility maximization theory [13], primary health technicians compare various appropriate TCM techniques and select the one that provides maximum satisfaction—i.e., the technique with the greatest utility, as shown in Equation :

$$U_{ij} = \beta_0 + \beta_{1X_{1ij}} + \beta_{2X_{2ij}} + ... + \beta_{mX_{mij}} + \varepsilon_{ij}$$

where U represents utility. Observed attributes include X_1 = medical insurance coverage, X_2 = operation duration, ..., X_7 = impact on patient expenses, each with corresponding weights (β_1, β_2, ..., β_7) that reveal the direction and magnitude of primary health technicians' preferences for each attribute level.

Latent Class Model The latent class model [14] assumes that different groups of primary health technicians exhibit heterogeneous preferences for appropriate TCM techniques following a discrete distribution. This model classifies respondents, with the optimal number of categories typically determined by Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values—the category count corresponding to the minimum BIC is selected. Latent class model results reveal preference differences and personal characteristic variations across categories.

Willingness to Pay WTP measures the monetary value of each attribute level [15], calculated as the ratio of the regression coefficient β for non-monetary attributes to the coefficient β for the monetary attribute. With respondents' average monthly salary being 4,231.4 yuan, income in the regression equation was measured in units of 1% monthly salary (42.3 yuan/month). As shown in Equation , WTP represents the monthly income increase equivalent to the utility gain from attribute level x:

$$\mathrm{WTP}_x = \frac{\beta_x}{\beta_{\mathrm{income}}} \times 42.3$$

Results

Sample Characteristics

Among the 295 respondents, 65.76% were female. The median age was 35 (13) years. 52.88% had bachelor's degree or higher education, and 49.83% held junior professional titles. 18.64% were TCM licensed (assistant) physicians. Approximately 64.75% had monthly incomes of 5,000 yuan or less, 77.97% worked in township health centers, and 63.39% were permanent staff. The median enthusiasm score for learning appropriate techniques was 9 (3) points (Table 3).

Conditional Logit Model Analysis

The model included seven key attributes. Using respondents' choices as the dependent variable and the seven attributes as independent variables, we conducted conditional Logit analysis. Initial dummy variable coding for operation duration and income impact revealed good linear relationships between regression coefficients and level values, so these were treated as continuous variables in the main analysis while other attributes used dummy coding. Results showed that medical insurance coverage, operation duration, income impact, work burden impact, professional title promotion assistance, technique efficacy, and patient expense impact all significantly influenced preferences ($P<0.05$). The preferred characteristics of appropriate TCM techniques were: covered by medical insurance (β=0.7946), enabling early professional title promotion (β=0.4142), keeping patient expenses unchanged (β=0.4001) or reduced (β=0.4001), improved efficacy (β=0.3778), no impact on work burden (β=0.1465), and increasing income by 10% (β=0.0324). Techniques with longer operation durations were avoided (β=-0.0105).

Willingness to Pay Analysis

Using an appropriate TCM technique covered by medical insurance provided utility equivalent to a monthly income increase of 1,036 yuan. Compared to a technique requiring 20 minutes, one requiring 5 minutes provided utility equivalent to 205 yuan more per month. Relative to a technique increasing work burden by 10%, one with no burden impact provided utility equivalent to 191 yuan more monthly. A technique enabling early professional title promotion provided utility equivalent to 540 yuan more per month compared to one with no promotion impact. Relative to a technique with uncertain efficacy, one with improved efficacy provided utility equivalent to 493 yuan more monthly. Compared to a technique increasing patient expenses, one reducing or maintaining patient expenses provided utility equivalent to 522 yuan more per month (Table 5).

Latent Class Model Analysis

The latent class model classified respondents based on their answers. Analysis of seven key attributes showed that BIC was minimized when the number of categories was three (Table 6). However, some categories had insufficient sample sizes for reliable parameter estimation. Therefore, after comprehensive consideration, we selected two categories for the final model estimation.

Latent class model results revealed that the primary difference between the two categories lay in the opt-out option—the choice of whether respondents would actually apply their preferred TCM technique in clinical practice (coded as: willing to use = 1, unwilling = 0). Category 1 had an opt-out coefficient of -3.660 ($P<0.001$) and was named the "Wait-and-See Group" (16.2% of respondents), showing reluctance to adopt appropriate TCM techniques. Category 2 had an opt-out coefficient of 2.189 ($P<0.001$) and was named the "Supportive Group" (83.8%), demonstrating readiness to accept and apply appropriate TCM techniques in practice.

These groups also differed in preferences regarding work burden and technique efficacy. The Wait-and-See Group strongly preferred techniques with proven efficacy (β=1.275, WTP=1,123.60 yuan/month) even if efficacy was unchanged from previous treatments, whereas the Supportive Group showed no significant preference for techniques with unchangeable effectiveness (β=0.054, WTP=69.22 yuan/month). Regarding work burden, the Wait-and-See Group only experienced significant utility gains when burden decreased (β=0.517, WTP=455.61 yuan/month), while the Supportive Group was more sensitive to burden changes, showing significant utility from either unchanged burden (β=0.142, WTP=182.02 yuan/month) or 10% burden reduction (β=0.123, 157.66 yuan/month).

To explore potential sources of preference heterogeneity, we examined individual characteristics showing statistical significance in stepwise regression, including education level (coded: secondary school and below = 1, junior college = 2, bachelor's = 3, graduate = 4), monthly income, and learning enthusiasm. Results indicated that the Wait-and-See Group had significantly lower enthusiasm for learning appropriate techniques (β=-0.258, $P<0.001$) compared to the Supportive Group (Table 7).

Discussion

Health Insurance Coverage as a Critical Factor

Analysis results demonstrate that medical insurance coverage (β=0.7946, $P<0.001$) represents the most important factor influencing primary health technicians' use of appropriate TCM techniques, with a WTP of 1,036 yuan/month. Primary health technicians' preferences are influenced by their service recipients, as patients prefer treatment methods covered by medical insurance [16]. Literature also indicates that including appropriate TCM

techniques in medical insurance coverage with clear fee standards can reflect health technicians' labor value and influence their work motivation [6]. Currently, however, the promotion of appropriate TCM techniques in primary care lacks adequate institutional support, with many techniques not yet included in medical insurance reimbursement lists [17]. To address this critical issue, health administrative departments should widely solicit opinions to improve evaluation and approval standards for insurance coverage of TCM techniques. Simultaneously, active screening and assessment should be conducted to include frequently used appropriate techniques in medical insurance coverage, thereby promoting and guiding primary health technicians to more actively use these techniques in clinical practice.

Income Incentives to Promote Technique Adoption

Income represents a significant attribute affecting primary health technicians' use of appropriate TCM techniques (β=0.0324, P<0.001). Due to inherent characteristics of some TCM techniques, operation time and treatment courses can be relatively long, creating greater labor burden than conventional diagnostic and treatment procedures [18]. We recommend that health administrative departments take the lead in establishing special funds to promote appropriate TCM techniques. These funds would serve both as labor compensation for operators and as incentives for primary health technicians to select appropriate TCM techniques in clinical practice. Specific reward mechanisms should be built upon assessments of technique applicability and standardized operations, fully considering factors such as technical difficulty, risks, and labor burden to truly reflect the original intent of establishing such special funds and maximize their positive guiding and promotional effects.

Combined Incentive Strategies for Optimal Promotion

Professional title promotion, patient costs, technique efficacy, operation duration, and work burden all influence primary health technicians' use of appropriate TCM techniques. Compared to techniques with no impact on professional title promotion, those facilitating early promotion had a WTP of 541 yuan. Relative to techniques increasing patient costs, those maintaining or reducing patient costs both had WTP values of 522 yuan. Compared to techniques with uncertain efficacy, those with improved efficacy had a WTP of 493 yuan. Operation duration and work burden showed relatively lower WTP values. Operation duration primarily reflects technical complexity, while work burden reflects overall workload after technique application. Although these attributes had lower WTP values in this study, they still affect health technicians' job satisfaction and status [19].

The WTP values for professional title promotion, patient costs, and technique efficacy demonstrate the relative importance of these attributes. When motivating health technicians to use techniques not covered by insurance, multiple incentive measures can be combined. For example, using a technique covered by

medical insurance (WTP=1,036 yuan/month) that increases patient expenses has a similar total WTP to using a technique linked to professional title promotion (WTP=541 yuan/month) that reduces patient expenses (WTP=522 yuan/month). Professional title promotion requires comprehensive evaluation; some hospitals have explored point-based promotion systems that comprehensively assess clinical, teaching, and research performance [20]. Linking appropriate TCM technique usage to title promotion by incorporating it into supplementary point calculations could effectively motivate primary health technicians. Combined incentive strategies can better promote the use of appropriate TCM techniques.

Heterogeneity in Preferences Across Technician Groups

Latent class model results reveal heterogeneity in primary health technicians' preferences for using appropriate TCM techniques. This study identified two major groups: the Wait-and-See Group, which harbors skepticism and distrust toward appropriate TCM techniques and only considers using them when they significantly reduce workload and demonstrate clear therapeutic effects. To promote technique adoption among this group, simple, easy-to-learn, and easy-to-operate techniques that reduce work burden and show obvious efficacy should be promoted to improve their attitudes. The Supportive Group believes in the efficacy of appropriate TCM techniques and is willing to use them even when work burden is not reduced, showing acceptance even when burden increases.

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Author Contributions: YAN Hao conceptualized the study and performed statistical analysis; YAN Hao, CHEN Sisi, and NIE Hanlin drafted the manuscript; YAN Hao, HUANG Zhengwei, HU Hanxu, ZHAO Weihan, and SHI Xuefeng participated in field investigations and provided critical feedback; YANG Yong revised the manuscript; SHI Xuefeng supervised study design and approved the final article.

Conflict of Interest Statement: The authors declare no conflicts of interest.

Funding: National Natural Science Foundation of China (7207040925) — Research on the Diffusion Mechanism of Appropriate TCM Techniques Based on Discrete Choice Experiments

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Digital Publication Date: March 30, 2023

Note: Figure translations are in progress. See original paper for figures.