Chinese General Practice Journal 2 (2025) 100087

Contents lists available at ScienceDirect

Chinese General Practice Journal

journal homepage: https://www.keaipublishing.com/en/journals/chinese-general-practice-journal/

Research article

Consistency between expressed and perceived needs for family doctor contracted services among rural older adults: A survey of 456 residents in Ningxia ☆

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ARTICLE INFO

Keywords:
Rural
Older adults
Family doctor contracted services
Use-need consistency
Influencing factors

ABSTRACT

Objective: To investigate the status and influencing factors of consistency between expressed and perceived needs for family doctor contracted services among rural older adults in Ningxia Autonomous Region of China.
Methods: A cross-sectional study was conducted from July to September 2024. Stratified cluster sampling method was applied for find participants. Two counties were selected from each of the five cities in Ningxia, and one village was chosen from each of the county. A total of 456 rural older people from the 10 villages were invited into the survey. Socio-demographic information and expressed and perceived needs for family doctor contract services were collected using a self-designed questionnaire. Multiple stepwise regression analysis was used to identify influencing factors, while a random forest model was employed to rank the importance of these factors.
Results: The average score for consistency between expressed and perceived needs was (11.64 ± 5.31), indicating an overall low level of consistency. The expressed need for basic public health services (that provided to all signatories, such as establishing health records) reached 96.1%, the perceived need reached 96.7%, and the satisfaction rate also reached 92.9%, all of which are at a high level. In contrast, only 5.3% of participants expressed need for individual health services (that provided according to the specific need patients, such as home-based care), 40.1% perceived the need, and satisfaction was as low as 5.0%, all indicating low levels. Stepwise regression analysis identified several key influencing factors of demand side on the consistency, including satisfaction with services, awareness of self-health, chronic diseases, economic burden, healthcare-seeking habits at primary care facilities, and current smoking. Among these factors, satisfaction with services was the most significant predictor of consistency of the two needs.
Conclusion: The consistency between expressed and perceived needs for individual health services in the family doctor contract among rural older adults remains low, influenced by both subjective factors and objective factors, such as chronic conditions, satisfaction with services and awareness of self-health. Therefore, the author suggests designing and providing the family doctor contract service packages in a way that is tailored to local contexts, especially focusing on service items that address individual perceived needs. The improvement of consistency between expressed and perceived needs will better meet the diverse health management needs of the rural elderly.

The 2024 Revision of World Population Prospects indicated global population aging and "deep aging" in China with urban-rural gap.[1,2] Residents aged 60 and above in Ningxia Hui Autonomous Region reached 1.037 million by the end of 2022, of whom 538,600 were rural residents.[3] In response to population aging, urbanization, and the high burden of chronic diseases, China implemented the family doctor contracted services policy. Family doctor contracted services are delivered by a multidisciplinary team composed of family doctors, community nurses, and public health physicians, with support and supervision by specialists from secondary or tertiary hospitals. Residents who signed a family doctor receive a set of services, including basic medical care, public health services, and health management services.[4] The unique geographical constraints, socioeconomic disadvantages, unreasonable distribution of medical resources cause health poverty and poor disease management outcomes among older adults in Ningxia Hui Autonomous Region, particularly in the southern mountainous areas.[5] Family doctors

☆ Peer review under the responsibility of Editorial Office of Chinese General Practice Journal.

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https://doi.org/10.1016/j.cgpj.2025.100087
Received 8 November 2025; Received in revised form 17 November 2025; Accepted 10 December 2025
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provide comprehensive and continuous health services, which is favorable for elderly residents' health management.[6] However, research by Cheng Lian[7] indicated that some residents in Ningxia were enforced to contract with family doctors, which may lead to low service quality, limited patient satisfaction, even phenomena such as "contracted but not served" and low contract renewal rates (only 67.2 %) in spite of high contract rate(91.6 %). Therefore, we aim to identify the consistency between expressed and perceived needs for family doctor contracted services and influencing factors among older adults in Ningxia based on the data from ten sample villages across five cities.

Participants and methods

Participants

A stratified cluster sampling method was employed for this study.

Two counties were selected from each of the five cities in Ningxia based on convenience sampling method, one administrative village was chosen within each county, older adults from the ten selected villages were recruited to participate.

Inclusion criteria were as follows: (1) uninstitutionalized older people, aged 60 years and above; (2) contracted with a family doctor; (3) inhabited in rural areas for at least one year. If two or more older adults in the same household met the inclusion criteria, all eligible household members were included in the survey. Individuals with communication impairments and those who withdrew during the survey were excluded. A total of 459 rural older adults were interviewed. After double check of the data, three questionnaires were excluded due to internally inconsistent responses, resulting in a final sample size of 456 valid participants.

This study was approved by the Ethics Committee of Ningxia Medical University (Approval No. 2022G018). All participants were informed of the study objectives, participated voluntarily, and signed a written informed consent form prior to inclusion.

Survey instruments

General information questionnaire

This questionnaire was designed to collect basic demographic and socioeconomic information of participants, including age, gender, educational level, marital status, and occupation.

Family doctor contracted service expressed and perceived needs questionnaire

This instrument was developed by the research team based on Guidelines on Promoting Family Doctor Contract Services, National Basic Public Health Service Standards, Provincial and municipal family doctor contracted service packages for older adults, and literature on the health management needs of the elderly. The questionnaire was designed to assess the basic context of family doctor contracted services, and the participants' expressed and perceived needs. The questionnaire comprises three dimensions, each with 23 items: Expressed services needs (23 items), Perceived services needs (23 items) and Satisfaction with services(23 items). A reliability and validity analysis confirmed strong psychometric properties. The overall Cronbach's α coefficient and those of all three subscales were above 0.7, indicating high internal consistency. The Kaiser–Meyer–Olkin (KMO) measure was 0.882, suggesting excellent construct validity and sampling adequacy.

Data collection

A household-based, face-to-face survey method was employed using an electronic questionnaire. Prior to survey, all researchers underwent standardized training to ensure consistency in procedures. During the survey, researchers first explained the study objectives and confidentiality protocols. Upon obtaining informed consent, researchers followed a standardized script to conduct the survey, providing real-time clarification and on-site verification of responses to ensure accuracy and completeness. Participants received personalized health guidance tailored to their current health status after survey.

Statistical analysis

Calculation of consistency scores between expressed and perceived needs for family doctor contracted services

The term "consistency between expressed and perceived needs" refers to the agreement between the health services utilized by residents and the services they perceive as necessary within the framework of family doctor contracted services.

To quantify this consistency, participants were asked the following three standardized questions for each of the 23 service items:"Do you need this service?""Have you received this service?"

"Are you satisfied with this service?" Participants responded with either "Yes" or "No" based on their actual experiences and perceptions. If the participant answered "Yes" to both need and utilization, the service item was considered consistent between expressed and perceived needs, the item was assigned 1 point. All other response combinations (needed but not received, received but not needed, or negative responses) were considered inconsistent, and the item was assigned 0 points. The total consistency score was calculated by summing the item scores across all 23 service items, resulting in a score range of 0–23. A higher total score indicates a greater agreement between expressed and perceived needs.

Statistical analysis

Statistical analysis was conducted using SPSS version 27.0. Categorical variables were summarized using frequencies and percentages. Independent-sample *t*-tests and one-way analysis of variance (ANOVA) were used to compare consistency scores between expressed and perceived needs across different groups. A multiple stepwise regression analysis was conducted to explore the influencing factors associated with the consistency between expressed and perceived needs for family doctor contracted services among rural older adults. A two-tailed P-value < 0.05 was considered to indicate statistical significance. A random forest model was developed using R Studio to assess the relative importance of the identified influencing variables.

Results

Demographic characteristics of rural older adults

A total of 456 rural older adults were included in the study. The majority were aged 60–69 years (50.2 %) and female (53.9 %). Most participants had an educational level of primary school or below (78.5 %) and were farmers (58.6 %). In terms of marital status, 80.7 % were currently married, and 42.5 % lived in two-person households. While 97.6 % of the participants reported having a source of income, 73.7 % perceived themselves as bearing a financial burden. Regarding medical insurance coverage, 91.9 % were enrolled in the Urban–Rural Resident Basic Medical Insurance. Additionally, 46.1 % of participants reported annual medical expenses exceeding 5000 Chinese Yuan(CNY). In terms of health-related behaviors and perceptions, 62.1 % reported daily physical exercise, 87.3 % reported no-smoking, 95.6 % reported not consuming alcohol; 85.5 % indicated regular attention to health, 25.0 % rated overall health status as "good". Regarding health status and healthcare needs, 87.7 % reported having chronic disease, 97.8 % were able to take care of themselves in daily life, 77.0 % required long-term medication treatment. 82.5 % visited a primary care facility in the past year, 72.6 % were satisfied with family doctor contracted services. Moreover, 85.5 % believed their family members cared about their health, while 91.4 % reported having no family members with a medical background. The nearest healthcare facility for 84.4 % of participants was the village

Table 1
Expressed and perceived needs consistency and satisfaction of family doctor contracted services for rural elder adults (n=456).

Service items	Expressed need (%)	Perceived need (%)	Satisfaction (%)	Difference (Expressed-Perceived, %)	Consistency score (Mean ± SD)
Establishing health records	96.1	96.7	92.9	−0.6	0.9 ± 0.2
Regular check-ups and health evaluations	89.5	95.0	87.7	−5.5	0.9 ± 0.3
Health education and promotion	86.3	92.0	83.3	−5.7	0.8 ± 0.4
Nutritional and dietary guidance services	86.2	91.9	75.2	−5.7	0.8 ± 0.4
Medication guidance	85.5	91.9	83.8	−6.4	0.8 ± 0.4
Regular home visits	82.9	90.8	82.0	−7.9	0.8 ± 0.4
Exercise guidance	78.7	91.4	77.2	−12.7	0.8 ± 0.4
Psychological counseling services	56.6	70.0	56.1	−13.4	0.6 ± 0.5
Diagnosis& treatment for common/chronic diseases	69.7	88.4	68.2	−18.7	0.7 ± 0.5
Health consultation services	66.9	86.6	65.8	−19.7	0.7 ± 0.5
Infectious disease& public health incident reporting and handling	65.4	85.5	65.1	−20.1	0.6 ± 0.5
Long-term prescription services	37.7	59.2	36.6	−21.5	0.4 ± 0.5
Food safety supervision and guidance	65.6	87.5	65.4	−21.9	0.6 ± 0.5
TCM constitution identification	41.2	75.9	40.1	−34.7	0.4 ± 0.5
Home based care	5.3	40.1	5.0	−34.8	0.1 ± 0.2
Rehabilitation and health care guidance	37.5	72.8	37.3	−35.3	0.4 ± 0.5
Home Medical visit services	33.3	70.6	32.2	−37.3	0.3 ± 0.5
Special health examinations and assessments	41.4	78.9	40.6	−37.5	0.4 ± 0.5
TCM services (preventive, therapy, acupuncture, etc.)	22.6	66.0	21.1	−43.4	0.2 ± 0.4
Appointment services	14.0	58.3	13.8	−44.3	0.1 ± 0.3
Remote health monitoring	11.0	55.3	10.9	−44.3	0.1 ± 0.3
Medical treatment Pathway guidance	17.8	63.2	16.9	−45.4	0.2 ± 0.4
Dual-directional referrals	12.3	61.0	12.1	−48.7	0.1 ± 0.3

clinic; 76.5 % lived within 6 km of the nearest township health centre. Detailed data are presented in Table 2.

Consistency between expressed and perceived needs and satisfaction with family doctor contracted services

The maximum score for full agreement between expressed and perceived needs for family doctor contract services was 23 points. The mean consistency score was (11.64 ± 5.31), indicating that fewer than half of the service items showed agreement between expressed and perceived needs.

Expressed needs for specific family doctor contracted service items

Based on participants' responses, the top five service items with the highest expressed need score were establishment of personal health records, regular physical check-ups and health assessment, health education and promotion services, nutrition and dietary guidance, medication use guidance. By contrast, the five service items with the lowest expressed need were Traditional Chinese Medicine (TCM) services, medical appointment scheduling services, remote health monitoring services, medical treatment navigation and dual-directional referrals.

Perceived needs for specific family doctor contracted service items

The top five service items with the highest perceived needs were establishment of personal health records, regular physical check-ups and health evaluations, health education and promotion services, nutrition and dietary guidance and medication guidance. In contrast, the service items with the lowest perceived needs included dual-directional referrals, long-term prescription services, medical appointment scheduling services, remote health monitoring services and home-based care. Notably, among all 23 service items reported, the following five services demonstrated the largest discrepancies(over 40 %) between expressed needs and perceived needs, indicating significant service perception gaps in TCM services, medical appointment scheduling services, remote health monitoring services, medical treatment navigation and dual-directional referrals.

Satisfaction with family doctor contracted services

The top five service items with the highest satisfaction levels among rural older adults were establishment of personal health records, regular physical check-ups and health assessments, medication use guidance, health education and promotion services, regular home visit services. In contrast, the following services received lower satisfaction: medical treatment navigation, medical appointment scheduling services, dual-directional referrals, remote health monitoring services and home-based care. These results indicate that while older adults tend to be satisfied with foundational and frequently delivered services, their satisfaction with more specialized or technology-driven services remains relatively low. This may reflect limited awareness, low utilization, or inadequate quality of these services in rural settings(Refer to Table 1 for details).

Consistency scores between expressed and perceived needs among rural older adults with varying characteristics

The analysis revealed statistically significant differences($P<0.05$) in the consistency scores between expressed and perceived needs for family doctor contracted services across rural older adults with different economic characteristics(source of income and self-perceived economic burden), health-related behaviors(regular physical activity, smoking and alcohol consumption), health awareness(attention to personal health, self-rated health status), presence of chronic diseases, need for long-term medication, utilization of primary care services in the past year, satisfaction with family doctor contracted service items and attention to health from family members, and healthcare accessibility(type of the nearest healthcare facility and distance from home to township health centre)(Refer to Table 2 for details).

Multiple stepwise regression analysis of factors influencing the consistency between expressed and perceived needs

A multiple stepwise linear regression was conducted with the consistency score between expressed and perceived needs for family doctor contracted services as the dependent variable. Independent variables included those found to be statistically significant in prior univariate analyses. The regression results revealed that the following factors were significantly associated with higher consistency scores among rural

Table 2

Analysis of differences in expressed and perceived needs consistency scores of family doctor contracted services for rural elder adults with different characteristics (n = 456).

Characteristics	Number and proportion (%)	Consistency score (Mean ± SD)	*t*/*F* value	*P* value
Individual Demographics				
Age (years)			0.678	0.508
60–69	229(50.2)	11.6 ± 5.2		
70–79	170(37.3)	11.9 ± 5.3		
≥80	57(12.5)	10.9 ± 5.6		
Gender			3.676	0.056
Male	210(46.1)	11.1 ± 5.5		
Female	246(53.9)	12.1 ± 5.1		
Educational Level			1.837	0.160
Primary school or below	358(78.5)	11.8 ± 5.4		
Junior high / technical school	77(16.9)	11.7 ± 5.0		
High school or above	21(4.6)	9.5 ± 5.5		
Previous Occupation			1.125	0.338
Farmer	267(58.6)	11.9 ± 5.4		
Government/enterprise staff	19(4.2)	12.6 ± 3.5		
Unemployed	145(31.8)	11.0 ± 5.5		
Others	25(5.5)	12.0 ± 4.4		
Marital Status			0.715	0.398
Unmarried	88(19.3)	12.1 ± 5.4		
Married	368(80.7)	11.5 ± 5.3		
Household Size (persons)			1.552	0.200
1	45(9.9)	13.0 ± 4.6		
2	194(42.5)	11.8 ± 5.1		
3	33(7.2)	10.7 ± 5.8		
≥4	184(40.4)	11.4 ± 5.6		
Economic Source			4.818	**0.029**
No	11(2.4)	8.2 ± 5.1		
Yes	445(97.6)	11.7 ± 5.3		
Economic Burden			9.637	**<0.001**
None	120(26.3)	12.9 ± 5.4		
Moderate	214(46.9)	11.8 ± 5.0		
Heavy	122(26.8)	10.0 ± 5.3		
Type of Medical Insurance			0.538	0.585
Employee insurance	26(5.7)	11.7 ± 5.3		
Urban-rural resident insurance	419(91.9)	11.6 ± 5.3		
Others	11(2.4)	13.3 ± 5.4		
Annual Medical Expense(CNY)			0.704	0.550
<1000	60(13.2)	10.7 ± 5.5		
1000–2999	105(23.0)	11.8 ± 4.8		
3000–4999	81(17.8)	11.7 ± 5.2		
>5000	210(46.1)	11.8 ± 5.5		
Individual Lifestyle				
Physical Exercise			6.847	**<0.001**
None	100(21.9)	10.6 ± 5.5		
2–3 times/month	7(1.5)	10.3 ± 6.0		
1–2 times/week	42(9.2)	9.9 ± 5.8		
3–5 times/week	24(5.3)	8.5 ± 5.5		
Daily	283(62.1)	12.6 ± 4.9		
Smoking			7.999	**0.005**
No	398(87.3)	11.9 ± 5.3		
Yes	58(12.7)	9.8 ± 5.4		
Alcohol consumption			4.085	**0.044**
No	436(95.6)	11.8 ± 5.2		
Yes	20(4.4)	9.3 ± 6.4		
Individual health status				
Attention to personal health			24.906	**<0.001**
No	57(14.5)	8.4 ± 5.1		
Yes	399(85.5)	12.1 ± 5.2		
Self-rated health status			5.506	**0.004**
Good	114(25.0)	11.2 ± 5.6		
Fair	259(56.8)	12.3 ± 4.9		
Poor	83(18.2)	10.2 ± 6.0		
Chronic disease status			11.688	**<0.001**
No	56(12.3)	9.4 ± 5.8		
Yes	400(87.7)	12.0 ± 5.2		
Ability for daily self-care			0.254	0.776
Cannot care for self	10(2.2)	12.6 ± 4.7		
Partially self-sufficient	177(38.8)	11.8 ± 5.3		
Fully self-sufficient	269(59.0)	11.5 ± 5.4		
Long-term Medication			6.838	**0.009**
No	105(23.0)	10.5 ± 5.6		
Yes	351(77.0)	12.0 ± 5.2		

(*continued on next page*)

Table 2 (*continued*)

Characteristics	Number and proportion (%)	Consistency score (Mean ± SD)	*t/F* value	*P* value
Medical Behavior& Healthcare Resources				
Primary care utilization in the past year			9.263	**0.002**
No	80(17.5)	10.0 ± 6.4		
Yes	376(82.5)	12.0 ± 5.0		
Satisfaction with family doctor contracted services			73.449	**<0.001**
Satisfied	331(72.6)	13.1 ± 4.6		
Neutral	95(20.8)	8.7 ± 4.9		
Dissatisfied	30(6.6)	4.3 ± 4.6		
Family members' concern for elderly health			17.547	**<0.001**
No	66(14.5)	9.2 ± 4.9		
Yes	390(85.5)	12.1 ± 5.3		
Family member with medical background			0.283	0.595
No	417(91.4)	11.7 ± 5.3		
Yes	39(8.6)	11.2 ± 5.7		
Nearest medical institution type			6.462	**<0.001**
Nearby clinic/pharmacy	26(5.7)	7.8 ± 4.1		
Village clinic	385(84.4)	12.0 ± 5.2		
Township health centre	34(7.5)	10.1 ± 5.6		
District/county hospital	11(2.4)	12.7 ± 6.7		
Distance to health Centre (Km)			17.794	**<0.001**
<3	225(49.3)	12.8 ± 4.7		
3–6	124(27.2)	9.4 ± 5.6		
>6	107(23.5)	11.8 ± 5.4		

Table 3
Multiple stepwise regression analysis of expressed and perceived needs consistency scores of family doctor contracted services for rural elder adults.

Variable	Unstandardized coefficient	Std. error	Standardized coefficient	*T* value	*P* value	*95 %CI*
Constant	9.895	2.293	—	4.316	**<0.001**	[5.390, 14.401]
Satisfaction with family doctor contracted services	−3.988	0.348	−0.449	−11.449	**<0.001**	−4.673 ~ −3.303
Attention to personal health	2.668	0.621	0.166	4.295	**<0.001**	1.447 ~ 3.889
Chronic disease status	2.077	0.636	0.129	3.263	**0.001**	0.826 ~ 3.327
Economic burden	−1.072	0.283	−0.147	−3.795	**<0.001**	−1.628 ~ −0.517
Smoking	−1.755	0.628	−0.110	−2.797	**0.005**	−2.989 ~ −0.522
Primary care utilization in the past year	1.268	0.539	0.091	2.353	**0.019**	0.209 ~ 2.327

Table 4
Assignment of independent variables in random forest model.

Independent variable	Coding
Satisfaction with family doctor contracted services	1 = Satisfied, 2 = Neutral, 3 = Dissatisfied
Attention to personal health	0 = No, 1 = Yes
Presence of chronic diseases	0 = No, 1 = Yes
Economic burden	0 = No, 1 = Yes
Smoking	0 = No, 1 = Yes
Primary care utilization in the past year	0 = No, 1 = Yes

older adults($P < 0.05$): satisfaction with family doctor contracted service items, attention to health, presence of chronic disease, self-perceived economic burden, smoking status, utilization of primary care services in the past year(Refer to Table 3 for details).

Importance ranking of influencing factors affecting the consistency between expressed and perceived needs

To further evaluate the relative contribution of each influencing factor, a random forest model was constructed using significant variables in the multiple stepwise regression analysis as independent variables, and the consistency score between expressed and perceived needs as the dependent variable(Refer to Table 4 for variable coding and definitions). The dataset was randomly assigned into a training set (70 %) and a testing set (30 %). After hyperparameter tuning, the model achieved optimal performance when the number of decision trees (ntree) was set to 800, and the number of variables randomly selected at each split (mtry) was set to 2.

Under these conditions, the model explained 37.93 % of the total variance in consistency scores, indicating a moderate predictive capability(Fig. 1).

Discussion

Low consistency between expressed and perceived needs among rural older adults

This study found that the consistency score between expressed and perceived needs for family doctor contracted services among rural older adults in Ningxia averaged (11.64 ± 5.31), indicating a low level of agreement. The implementation of family doctor contracted services in Ningxia was constrained by shortages of primary healthcare personnel, limited public awareness of the role and scope of family doctors.[8] In addition, rural residents' understanding of family doctor contracted services and trust in primary care facilities remains weak. They are customed to the pharmacy for minor disorders and choosing hospital for serious illnesses, leading to underutilization of family doctor contracted services.[9] Services with relatively high consistency and satisfaction are mostly basic public health services, such as establishment of personal health records, health consultations and free health check-ups . It was reported that these services are family doctor contracted services items with good performance in Ningxia, meeting the needs of residents.[10] In contrast, specialized services such as home-based care tend to show lower consistency and satisfaction. From the demand side, rural residents express strong expectations for accessible medication, competent general practitioners(GPs), and personalized services for health management.[11] However, several challenges caused failure to meet residents' personalized needs for daily health management in Ningxia, including

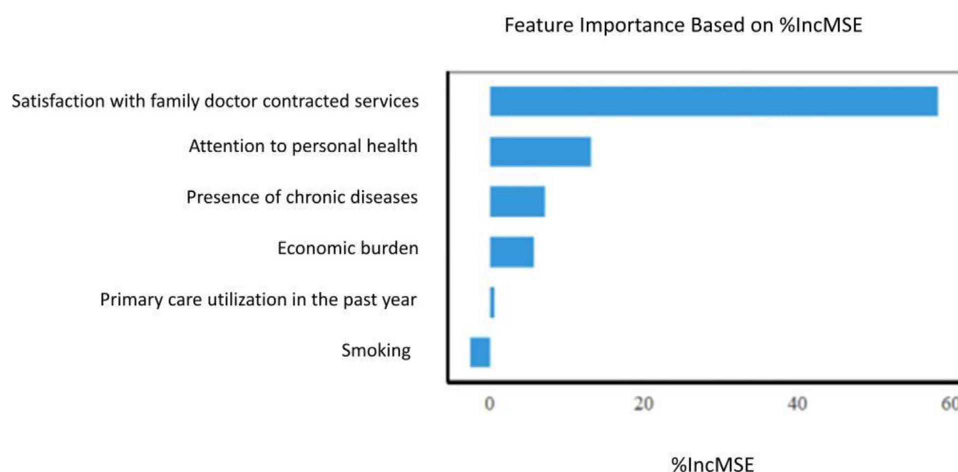

Fig. 1. Importance ranking of influencing factors for use-need matching of family doctor contract services for rural elder adults.

insufficient local resources,[12] limited capacity of GPs, lack of involvement from physicians in higher-tier hospitals, limited available service items lacking specialized and personalized contents.[8]

Significant gaps between expressed and perceived needs for five key service items

Among the 23 items included in Ningxia's family doctor contracted service package, notable discrepancies between expressed and perceived needs were found in dual-directional referrals, medical treatment navigation, remote health monitoring, appointment scheduling, and TCM services among rural older adults. The discrepancies can be attributed to several interrelated factors.[13] The prevalence of chronic diseases increases with age, driving up demand for more frequent medical consultations and comprehensive chronic disease management.[14] Accordingly, the needs for services such as medical appointment, treatment navigation, remote health monitoring, and dual-directional referrals become more pronounced. However, the gap between limited resources in rural areas[15,16] and growing demands caused underutilization of contracted services in consultation and chronic diseases management. To address the gap, it is advisable for policymakers to utilize household-level resources by designating family health coordinators and empowering them with basic health management responsibility.[17] Meanwhile, based on the characteristic of assessiblity, affordability, and long-standing cultural acceptance, TCM services are more needed,[18] however, many rural primary care facilities fails to meet requirements for TCM service provision in technology, appropriate TCM techniques for older adults remains restricted,[19] leading to sufficient utilization. Family doctors should prioritize the five service items in tailoring TCM service packages to older adults, and collaborate with family health coordinators to promote personalized health management.

Multiple factors influence the consistency between expressed and perceived needs, with service satisfaction as the primary determinant

The results of the multiple linear regression analysis indicate that the consistency between expressed and perceived needs for family doctor contracted services among rural older adults is influenced by multiple interrelated factors. These include satisfaction with services, health awareness, chronic disease status, economic burden, smoking behavior, and visits to primary care facilities in the past year. Older adults with greater health awareness show higher consistency between expressed and perceived needs, this supports findings by Zhao N et al.,[20] who observed that individuals with stronger health awareness are more proactive in seeking professional support and are better positioned to navigate policy resources effectively, thereby mitigating information asymmetry that often leads to mismatched healthcare expectations.[21] As mandated by the National Basic Public Health Service Standards, family doctors are required to provide regular health management services, particularly for chronic disease patients.[22] In Ningxia, the supply of public health services has reached both national and provincial benchmarks,[23] which has improved chronic disease management[24] and enhanced the consistency between older adults' expressed and perceived needs. However, the survey also revealed that many rural older adults lack stable income and bear a heavy economic burden, which can exacerbate health vulnerability. Financial constraints often result in delayed care-seeking, compounding health problems over time.[25] The shortage and limited capacity of GPs[26] caused difficulties in free supply of personalized or higher-level services, aggravating the discrepancy between expressed and perceived needs. Those who had accessed primary care services were more likely to understand tiered healthcare and the principles of the family doctor system,[27] they had fewer barriers such as information asymmetry and communication costs, and performed higher degree of consistency between expressed needs and perceived needs. The majority of participants had an education level of primary school or below, consistent with findings from Yu Fang.[28] This population may underestimate the health risks of smoking, lack intrinsic health motivation,[29] and receive few tailored smoking cessation interventions within standardized family doctor contracted service packages.[30] As a result, their expressed demand for such services is often minimal, limiting the potential for proactive health management. Therefore, it is recommended to improve health management efficiency of high-risk cognitive population by health risk perception education and personalized smoking cessation. The government departments can promote the experience of chronic disease services and increase the subsidy for special funds as well as the reimbursement rate for medical insurance, in order to enhance the accessibility and suitability of family doctor contracted services among the entire population. The random forest analysis confirmed that satisfaction with family doctor contracted services was the most important factor influencing the consistency between expressed and perceived needs. At its core, this consistency reflects whether residents perceive that the services provided by the family doctor team truly match their personal health management needs.[31] As the direct recipients of care, residents' sense of benefit and their evaluation of healthcare service quality are largely shaped by their experience with service delivery.[32] With the advancement of the family doctor contracted service system, the demand for personalized services continued to rise.[33] However, this study reveals that in rural Ningxia, service delivery remains largely focused on basic public health functions. The development of personalized services was limited by the inherent functional orientation of primary care facilities,

along with insufficient funding and human resources.[34] This mismatch resulted in lower satisfaction levels among rural older adults, and contributed to unagreement between expressed and perceived needs. To address this gap and enhance the quality of family doctor contracted services, we recommend to strength the responsiveness of service supply to differentiated demands by downward integration of specialized medical resources and innovate service delivery models.

Conclusion

We investigated the consistency between expressed and perceived needs regarding family doctor contract services among rural older adults in Ningxia, identified the current status and key influencing factors. The findings revealed low expressed and perceived needs for family doctor contracted services and gaps between expressed and perceived needs in five service items, such as dual-directional referrals and medical treatment navigation. The consistency is influenced by complex factors, with service satisfaction as the most influential determinant. Therefore, we recommended to expand the supply of high-demand service items, facilitate the downward integration of specialized medical resources, develop innovative, locally adapted service models packages, with the aim to improve the consistency between expressed and perceived needs among rural older adults and satisfy their multiple demands.

Declarations

Not applicable.

Authors' contributions

H.J.-Conceptualization; H.J.-Methodology; H.J., L.L., S.J., L.X., Y.C. and Y.J.-Data curation; H.J. and L.L.-Formal analysis; N.Y.-Funding acquisition; N.Y.-Project administration; N.Y.-Supervision; N.Y.-Validation; H.J.-Writing—original draft; N.Y.-Writing—review and editing.

Ethical approval and consent to participate

The study received approval from Ethics Committee of Ningxia Medical University (Approval No. 2022G018). The research content was agreed upon by all participants.

Consent for publication

This paper has been approved for publication by all the authors.

Availability of data and materials

Not applicable.

Funding

This research received a specific grant from the National Science Foundation of China (72264031).

Limitations

This study has several limitations. First, the questionnaire was developed based on the research team's perspective, and may ignore certain determinants that are more salient from the users' standpoint. Future studies could adopt qualitative research methods, such as in-depth or semi-structured interviews, to explore the issue from multiple stakeholder perspectives. Second, the inclusion of all eligible older adults within the same household may introduced intra-household opinion clustering. Third, in an effort to improve the feasibility, a binary ("Yes"/"No") response format was used to assess service needs and experiences, which may compromise sensitivity. In particular, although the results showed that perceived needs exceeded expressed needs, the survey design was too limited to reveal the specific reasons behind this gap. Fourth, the study focused on older adults, which restricts the generalizability of the findings to other age groups. Finally, although participants were from five cities in the Ningxia, the sample size was insufficient to support subgroup analyses at the city level. Future studies with larger, city-representative samples are warranted to explore geographic disparities.

Declaration of competing interest

All authors declare that there are no competing interests.

Acknowledgements

The authors gratefully acknowledge the financial support by the National Science Foundation of China.

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