Consistency Between Expressed and Perceived Needs for Family Doctor Contracted Services Among Rural Older Adults: A Questionnaire Survey of 456 Permanent Rural Residents in the Ningxia Hui Autonomous Region

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Abstract

Background Rural older adults face problems in contracted family doctor services, such as generally poor patient experience and insufficient perceived benefits, as well as phenomena including "signing without service fulfillment" and "non-renewal." The underlying causes of these problems require further investigation. Objective To understand the current status of expressed needs and perceived needs for contracted family doctor services among rural older adults in Ningxia Hui Autonomous Region, and to identify factors influencing the consistency between expressed needs and perceived needs. Methods This was a cross-sectional study. From July to September 2024, convenience sampling was used to select 2 counties from each of the 5 prefecture-level cities in Ningxia Hui Autonomous Region, and 1 administrative village was selected from each county. Permanent older residents in the 10 sampled villages were included as study participants (n=456). A general information questionnaire and a questionnaire on expressed needs and perceived needs for contracted family doctor services were used to collect relevant data. Multiple linear stepwise regression analysis was used to explore factors influencing the consistency between expressed needs and perceived needs for contracted family doctor services among rural older adults, and a random forest model was used to rank the importance of these factors. Results The consistency score between expressed needs and perceived needs for contracted family doctor services among rural older adults was (11.6$±$5.3) points, which was overall at a low level relative to the total score of 23 points. For basic public health service items, such as establishing health records, expressed needs were as high as 96.1% (438/456), perceived needs reached 96.7% (441/456), and satisfaction reached 92.9% (424/456), all at relatively high levels. In contrast, for specialized health services, such as home sickbed services, expressed needs were only 5.3% (24/456), perceived needs were 40.1% (183/456), and satisfaction was as low as 5.0% (23/456), all indicating low levels. Multiple linear stepwise regression analysis showed that the consistency between expressed needs and perceived needs for contracted family doctor services among rural older adults was affected by multiple factors, including satisfaction with contracted family doctor service items, attention to one' s own health, chronic disease status, economic burden, smoking status, and visits to primary healthcare institutions in the past 1 year (P<0.05). The random forest model analysis showed that satisfaction with contracted family doctor service items had the most significant influence. Conclusion The overall consistency between expressed needs and perceived needs for specialized contracted family doctor services among rural older adults is relatively low. This is constrained by subjective factors such as satisfaction with contracted service items and personal attention to health, and is also affected by objective factors such as chronic disease status and economic burden. Therefore, based on the health status and needs of contracted rural older adults, diversified contracted family doctor service packages should be developed according to local conditions in the future, so as to improve the consistency between expressed needs and perceived needs and better meet the diversified needs of health management among rural older

adults.

Full Text

Original Article

Consistency Between Expressed and Perceived Needs for Family Doctor Contracted Services Among Rural Older Adults: A Questionnaire Survey of 456 Permanent Rural Residents in the Ningxia Hui Autonomous Region

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Abstract Background Family doctor contracted services for rural older adults face problems such as generally poor patient experience and insufficient sense of benefit, and phenomena such as "signing a contract but not fulfilling it" and "failure to renew the contract" also exist. The underlying causes of these problems require further investigation. **Objective** To understand the current status of expressed needs and perceived needs for family doctor contracted services among rural older adults in the Ningxia Hui Autonomous Region, and to identify factors influencing the consistency between expressed needs and perceived needs. **Methods** This was a cross-sectional study. From July to September 2024, convenience sampling was used in the five prefecture-level cities of the Ningxia Hui Autonomous Region to select two counties from each city, and one administrative village was selected from each county. Permanent older residents in the 10 sample villages were included as the study participants ($n = 456$). A general information questionnaire and a questionnaire on expressed needs and perceived needs for family doctor contracted services were used to collect relevant data. Multiple linear stepwise regression analysis was used to explore the factors influencing the consistency between expressed needs and perceived needs for family doctor contracted services among rural older adults, and a random forest model was used to rank the importance of the influencing factors. **Results** The consistency score between expressed needs and perceived needs for family doctor contracted services among rural older adults was (11.6 ± 5.3) points; compared with the total score of 23 points, the overall level was relatively low. For basic public health service items, such as establishing health records, expressed needs reached 96.1% (438/456), perceived needs reached 96.7% (441/456), and satisfaction reached 92.9% (424/456), all at relatively high levels. In contrast, for specialized health services, such as home sickbed services, expressed needs

were only 5.3% (24/456), perceived needs were 40.1% (183/456), and satisfaction was as low as 5.0% (23/456), all indicating relatively low levels. The results of multiple linear stepwise regression analysis showed that the consistency between expressed needs and perceived needs for family doctor contracted services among rural older adults was influenced by multiple factors, including satisfaction with family doctor contracted service items, attention to one' s own health, chronic disease status, economic burden, smoking status, and visits to primary healthcare institutions in the past year ($P < 0.05$). The random forest model analysis showed that satisfaction with family doctor contracted service items had the most significant impact. **Conclusion** The overall level of consistency between expressed needs and perceived needs for specialized family doctor contracted services among rural older adults is relatively low. This is constrained not only by subjective factors such as satisfaction with contracted service items and personal attention to health, but also by objective factors such as chronic disease status and economic burden. Therefore, based on the health status and needs of contracted rural older adults, diversified family doctor contracted service packages should be developed in the future according to local conditions, with the aim of improving the consistency between expressed needs and perceived needs and better meeting the diverse needs of rural older adults for health management.

Keywords Family doctor contracted services; Older adults; Rural health; Consistency between expressed needs and perceived needs; Influencing factor analysis

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Use-Need Matching of Family Doctor Contract Services for Rural Elderly: a Questionnaire Survey of 456 Rural Residents in the Ningxia Hui Autonomous Region

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Abstract Background The family doctor contract service for elderly people in rural areas faces issues such as a generally poor patient experience and a lack of perceived benefits, as well as phenomena such as "signing up but not fulfilling the contract" and "failure to renew the contract" . The underlying causes of these issues require further investigation. **Objective** To

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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 was applied to find participants. In the 5 prefecture-level cities of the Ningxia Hui Autonomous Region, 2 counties were selected from each city by convenience sampling method, and 1 administrative village was selected from each county. Two counties were selected from each of the five cities in Ningxia, and one village was chosen from each of the counties. 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 for family doctor contract services among rural older adults was (11.6 ± 5.3), indicating an overall low level of consistency. The expressed need for basic public health service items (such as establishing health records) was as high as 96.1% (438/456), the perceived need reached 96.7% (441/456), and the satisfaction rate also reached 92.9% (424/456), all of which are at a high level. In contrast, only 5.3% (24/456) of rural older adults expressed a need for special health services (such as home-based care services), 40.1% (183/456) perceived the need, and the satisfaction rate was as low as 5.0% (2/456), all indicating low levels. The results of multiple stepwise linear regression analysis showed that the consistency between expressed and

perceived needs for family doctor contract services among rural older adults was affected by multiple factors, including satisfaction with contracted service items, personal health attention, chronic disease status, economic burden, medical treatment experience in primary medical and health institutions in the past year, and smoking habits ($P < 0.05$). Among these factors, satisfaction with contracted service items was the most significant predictor of the 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 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.

[Key words] Family doctor contract services; Aged; Rural health; Use-need matching; Root cause analysis

According to the *World Population Prospects 2024* report, global population aging continues to intensify. China has entered a deeply aging society, and the disparity in aging between urban and rural areas is pronounced[1-2]. Survey data show that by the end of 2022, the population aged 60 years and above in Ningxia Hui Autonomous Region had reached 1.037 million, including 538 600 older adults in rural areas[3]. To actively respond to challenges such as population aging, urbanization, and the high incidence of chronic diseases, China has implemented a family doctor contracted service policy. In principle, family doctor contracted services adopt a team-based service model, mainly consisting of family doctors, community nurses, public health physicians, and others, with technical support and professional guidance provided by physicians from secondary and higher-level hospitals. After signing a contract, residents can enjoy basic medical care, public health services, and agreed-upon health management services provided by the family doctor team[4].

In Ningxia Hui Autonomous Region, especially in the southern mountainous areas, older adults face health-related poverty issues due to the influence of the unique geographical environment, socioeconomic conditions, and the distribution of medical resources, which can easily lead to poor disease management outcomes[5]. Family doctor contracted services can provide residents with comprehensive, full-cycle health services[6], helping to improve the health management level of rural older adults. The results of a study by Cheng Lian[7] showed that family doctor contracting in Ningxia Hui Autonomous Region has a certain degree of coerciveness. Although the contract signing rate is as high as 91.6%, problems remain, including low service quality, average patient experience and sense of gain, "signing without making appointments," and "not renewing contracts" (with a renewal rate of only 67.2%), all of which seriously affect service effectiveness. Based on this, in order to conduct an in-depth analysis of whether

there are differences between expressed needs and perceived needs for the family doctor contracted service policy among rural older adults in Ningxia Hui Autonomous Region, this study analyzed older adults from 10 sample villages in the 5 cities of Ningxia Hui Autonomous Region as study participants and explored the influencing factors.

1 Subjects and Methods

1.1 Study participants

From July to September 2024, convenience sampling was used to select 2 counties from each of the 5 prefecture-level cities under the jurisdiction of Ningxia Hui Autonomous Region, and 1 administrative village was selected from each county. Older adults from the 10 sample villages were taken as the study participants. Inclusion criteria were: (1) age $ $60 years; (2) not living in collective residences; (3) having signed up for family doctor services; (4) living in rural areas for $ $1 year. Exclusion criteria were: (1) having language expression or communication barriers; (2) withdrawing midway through the survey. If there were 2 or more older adults in a household who met the study requirements, all were included in the survey. A total of 459 rural older adults were surveyed. After a second check of the data, 3 participants whose answers were contradictory before and after were excluded, and 456 valid samples were ultimately included. This study was approved by the Ethics Review Committee of Ningxia Medical University (approval No.: No.2022G018). All study participants were informed of the study purpose, voluntarily participated in the survey, and signed informed consent forms.

1.2 Survey tools

1.2.1 General information questionnaire

The questionnaire was developed by the research group with reference to previous studies, and its main contents included: (1)

Individual demographic characteristics, including age, sex, educational level, main previous occupation, marital status, household size, source of income, financial burden, type of medical insurance, and annual medical expenditure; (2) individual lifestyle, including frequency of physical exercise, smoking status, and drinking status; (3) individual health status, including attention to one' s own health, self-rated health status, chronic disease status, ability to manage daily life, and long-term medication treatment; (4) health-seeking behavior and medical resource status, including visits to primary medical and health institutions in the past year, satisfaction with family doctor contract service items, family members' attention to the older adult' s health, family members' medical background, type of the nearest medical and health institution to the home, and distance from home to the township health center.

1.2.2 Survey scale on expressed need and perceived need for family doctor contract services This scale was designed by the research team with reference to the *Notice on Issuing Guidance on Promoting Family Doctor Contract Services* (National Health Reform Office [2016] No. 1), the *National Basic Public Health Service Standards (Third Edition)*, family doctor contract service packages for older adults implemented in various provinces and cities, and literature related to health management needs among older adults. The scale covers 23 family doctor contract service items and investigates rural older adults' need for, utilization of, and satisfaction with these 23 services. The survey items were, in sequence: "Do you need this service?", "Have you received this service?", and "Are you satisfied with this service?" Older adults answered "yes" or "no" according to their actual circumstances. Reliability and validity testing showed that the overall Cronbach's α coefficient of the scale and the Cronbach's α coefficients of all dimensions were all >0.700, and the KMO value was 0.882.

1.3 Data collection methods

This study adopted a household survey method and used an electronic questionnaire to conduct on-site, one-to-one question-and-answer surveys. Before the survey, investigators were trained uniformly and survey standards were unified. During the survey, the purpose of the study and privacy protection for participants were first explained to the respondents. After obtaining informed consent from the respondents, investigators used standardized instructions to survey the participants, answered questions as they arose, and conducted on-site checks. After the survey was completed, health guidance was provided according to the older adults' health problems.

1.4 Statistical methods

1.4.1 Calculation of the consistency score between expressed need and perceived need for family doctor contract services "Consistency between expressed need and perceived need for family doctor contract services" refers to the consistency between the service items actually used by residents in family doctor contract services and the items needed for residents' health management. If, for a certain service item, an older adult answered "yes" to all three items– "Do you need this service?", "Have you received this service?", and "Are you satisfied with this service?" –then the actual utilization of that service item was considered consistent with perceived service need; that is, "expressed need and perceived need were consistent," and 1 point was assigned. All other situations were identified as "inconsistency between expressed need and perceived need" for that service item and were assigned 0 points. Scores for all service items were summed to calculate the total consistency score between expressed need and perceived need for family doctor contract services, with a score range of 0–23. A higher score indicates greater consistency between expressed need and perceived need for family doctor contract services among older adults.

1.4.2 Statistical analysis methods SPSS 27.0 software was used for data analysis. Count data were expressed as relative numbers; measurement data conforming to a normal distribution were expressed as $(\bar{x} \pm s)$, and measurement data not conforming to a normal distribution were expressed as $M(P_{25}, P_{75})$. Comparisons of consistency scores between expressed need and perceived need among rural older adults with different characteristics were performed using the t test and one-way analysis of variance. Multivariate stepwise regression analysis was used to analyze factors influencing the consistency score between expressed need and perceived need for family doctor contract services among rural older adults, with $P < 0.05$ considered statistically significant. RStudio software was used to construct a random forest model to analyze the importance of factors influencing the consistency score between expressed need and perceived need for family doctor contract services among rural older adults.

2 Results

2.1 General characteristics of 456 rural older adults

In terms of individual demographic characteristics, most participants were aged 60–69 years (229, 50.2%); most were female (246, 53.9%); educational level was concentrated at primary school or below (358, 78.5%); the main previous occupation was most often farmer (267, 58.6%); marital status was mainly married (368, 80.7%); and household size was most often 2 persons (194, 42.5%). A total of 97.6% (445/456) of older adults reported having a source of income, but 73.7% (336/456) believed that they had a financial burden. Medical insurance was mainly urban and rural resident medical insurance (419, 91.9%); 46.1% (210/456) of older adults reported annual medical expenditure of $ $5 000 yuan.

In terms of individual lifestyle, 62.1% (283/456) of older adults reported engaging in physical exercise every day; 87.3% (398/456) reported not smoking; and 95.6% (436/456) reported not drinking alcohol.

In terms of individual health status, 85.5% (399/456) of older adults usually paid attention to their own health; 25.0% (114/456) rated their health status as good; 87.7% (400/456) had chronic diseases; 97.8% (446/456) reported being able to manage daily life independently; and 77.0% (351/456) reported needing long-term medication treatment.

In terms of health-seeking behavior and medical resource status, 82.5% (376/456) of older adults had visited a primary medical and health institution in the past year; 72.6% (331/456) reported being satisfied with family doctor contract service items; 85.5% (390/456) believed that family members paid attention to their health status; 91.4% (417/456) had no family member with a medical background; the nearest medical and health institution to the home was mainly a village clinic (351, 84.4%); and the distance from home to the township health center was mostly $ $6 km (349, 76.5%).

2.2 Consistency between expressed need and perceived need for family doctor contract services among rural older adults and satisfaction

Among the 456 rural older adults, the total consistency score between expressed need and perceived need for family doctor contract services was (11.6 ± 5.3) points. Relative to the total score of 23 points, the number of service items for which expressed need and perceived need were consistent was less than 50.0%, indicating a relatively low level.

2.2.1 Expressed needs for family doctor contracted service items among rural older adults

The five service items with the highest expressed needs among older adults were, in order, establishment of health records (438 persons, 96.1%), regular physical examination and health assessment services (408 persons, 89.5%), health education and promotion services (394 persons, 86.3%), nutritional and dietary guidance services (393 persons, 86.2%), and medication guidance services (390 persons, 85.5%). The five service items with the lowest rankings were Traditional Chinese medicine services (103 persons, 22.6%), guidance on medical-care pathways (81 persons, 17.8%), appointment services for medical visits (64 persons, 14.0%), bidirectional referral services (56 persons, 12.3%), and remote health monitoring services (50 persons, 11.0%). See Table 1.

2.2.2 Perceived needs for family doctor contracted service items among rural older adults

The five service items with the highest perceived needs among older adults were, in order, establishment of health records (441 persons, 96.7%), regular physical examination and health assessment services (433 persons, 95.0%), health education and promotion services (420 persons, 92.0%), nutritional and dietary guidance services and medication guidance services (419 persons, 91.9% each). The five service items with the lowest perceived needs were bidirectional referral services (278 persons, 61.0%), long-prescription services (270 persons, 59.2%), appointment services for medical visits (266 persons, 58.3%), remote health monitoring services (252 persons, 55.3%), and home sickbed services (183 persons, 40.1%). Among the 23 service items provided, Traditional Chinese medicine services (198 persons, 43.4%), appointment services for medical visits (202 persons, 44.3%), remote health monitoring services (202 persons, 44.3%), guidance on medical-care pathways (207 persons, 45.4%), and bidirectional referral services (222 persons, 48.7%) showed relatively large differences between expressed needs and perceived needs, all exceeding 40%.

2.2.3 Satisfaction with family doctor contracted service items received by rural older adults

Among the 23 family doctor contracted service items received, the five items with the highest satisfaction among older adults were, in order, establishment

of health records (424 persons, 92.9%), regular physical examination and health assessment services (400 persons, 87.7%), medication guidance services (382 persons, 83.8%), health education and promotion services (380 persons, 83.3%), and regular home follow-up services (374 persons, 82.0%). The service items with lower satisfaction were guidance on medical-care pathways (77 persons, 16.9%), appointment services for medical visits (63 persons, 13.8%), bidirectional referral services (55 persons, 12.1%), remote health monitoring services (50 persons, 10.9%), and home sickbed services (23 persons, 5.0%). See Table 1.

2.3 Analysis of differences in consistency scores between expressed needs and perceived needs for family doctor contracted services among rural older adults with different characteristics

Different economic sources, economic-burden status, physical-exercise status,

Table 1 Situation of consistency between expressed needs and perceived needs, and satisfaction with family doctor contracted service items among rural older adults ($n = 456$)

Family doctor contracted service item	Expressed need [n (%)]	Perceived need [n (%)]	Satisfaction [n (%)]	Difference between expressed and perceived needs [n (%)]	Item score (points)
Establishment of health records	438 (96.1)	441 (96.7)	424 (92.9)	3 (-0.6)	0.9 ± 0.2
Regular physical examination and health assessment services	408 (89.5)	433 (95.0)	400 (87.7)	25 (-5.5)	0.9 ± 0.3
Health education and promotion services	394 (86.3)	420 (92.0)	380 (83.3)	26 (-5.7)	0.8 ± 0.4

Family doctor contracted service item	Expressed need [n (%)]	Perceived need [n (%)]	Satisfaction [n (%)]	Difference between expressed and perceived needs [n (%)]	Item score (points)
Nutritional and dietary guidance services	393 (86.2)	419 (91.9)	343 (75.2)	26 (-5.7)	0.8 ± 0.4
Medication guidance services	390 (85.5)	419 (91.9)	382 (83.8)	29 (-6.4)	0.8 ± 0.4
Regular home follow-up services	378 (82.9)	414 (90.8)	374 (82.0)	36 (-7.9)	0.8 ± 0.4
Exercise guidance services	359 (78.7)	417 (91.4)	352 (77.2)	58 (-12.7)	0.8 ± 0.4
Psychological counseling and guidance services	258 (56.6)	319 (70.0)	256 (56.1)	61 (-13.4)	0.6 ± 0.5
Timely diagnosis and treatment of common and frequently occurring diseases	318 (69.7)	403 (88.4)	311 (68.2)	85 (-18.7)	0.7 ± 0.5

Family doctor contracted service item	Expressed need [n (%)]	Perceived need [n (%)]	Satisfaction [n (%)]	Difference between expressed and perceived needs [n (%)]	Item score (points)
Healthcare consultation services	305 (66.9)	395 (86.6)	300 (65.8)	90 (-19.7)	0.7 ± 0.5
Reporting and handling of infectious diseases and other public health emergencies	298 (65.4)	390 (85.5)	297 (65.1)	92 (-20.1)	0.6 ± 0.5
Long-prescription services	172 (37.7)	270 (59.2)	167 (36.6)	98 (-21.5)	0.0 (0.0, 1.0)a
Guidance on food hygiene and safety supervision	299 (65.6)	399 (87.5)	298 (65.4)	100 (-21.9)	0.6 ± 0.5
Traditional Chinese medicine constitution identification services	188 (41.2)	346 (75.9)	183 (40.1)	158 (-34.7)	0.0 (0.0, 1.0)a
Home sickbed services	24 (5.3)	183 (40.1)	23 (5.0)	159 (-34.8)	0.0 (0.0, 0.0)a

Family doctor contracted service item	Expressed need [n (%)]	Perceived need [n (%)]	Satisfaction [n (%)]	Difference between expressed and perceived needs [n (%)]	Item score (points)
Rehabilitation and health-care guidance	171 (37.5)	332 (72.8)	170 (37.3)	161 (-35.3)	0.0 (0.0, 1.0)a
Home-visit medical services	152 (33.3)	322 (70.6)	147 (32.2)	170 (-37.3)	0.0 (0.0, 1.0)a
Special health examinations and assessments	189 (41.4)	360 (78.9)	185 (40.6)	171 (-37.5)	0.0 (0.0, 1.0)a
Traditional Chinese medicine services (preventive treatment of disease, physiotherapy, acupuncture, etc.)	103 (22.6)	301 (66.0)	96 (21.1)	198 (-43.4)	0.0 (0.0, 0.0)a
Appointment services for medical visits	64 (14.0)	266 (58.3)	63 (13.8)	202 (-44.3)	0.0 (0.0, 0.0)a

Family doctor contracted service item	Expressed need [n (%)]	Perceived need [n (%)]	Satisfaction [n (%)]	Difference between expressed and perceived needs [n (%)]	Item score (points)
Remote health monitoring services	50 (11.0)	252 (55.3)	50 (10.9)	202 (-44.3)	0.0 (0.0, 0.0)a
Guidance on medical-care pathways	81 (17.8)	288 (63.2)	77 (16.9)	207 (-45.4)	0.0 (0.0, 0.0)a
Bidirectional referral services	56 (12.3)	278 (61.0)	55 (12.1)	222 (-48.7)	0.0 (0.0, 0.0)a

Note: a indicates that the score for the corresponding item was non-normally distributed and is expressed as $M(P_{25}, P_{75})$; the remaining scores were normally distributed and are expressed as $(\bar{x} \pm s)$.

smoking status, alcohol consumption, attention to one' s own health, self-rated health status, chronic disease status, long-term medication treatment, visits to primary medical and health institutions in the past year, satisfaction with contracted family doctor service items, family members' attention to their health, the type of medical and health institution closest to the home, and the distance from home to the township health center were compared in terms of the consistency score between expressed need and perceived need for contracted family doctor services among rural older adults; the differences were statistically significant ($P < 0.05$). Comparisons by age, sex, education level, previous main occupation, marital status, household size, type of medical insurance, annual medical expenditure, ability of daily living, and whether family members had a medical background showed no statistically significant differences in the consistency score between expressed need and perceived need for contracted family doctor services among rural older adults ($P > 0.05$), as shown in Table 2.

Table 2 Analysis of differences in consistency scores between expressed need and perceived need for contracted family doctor services among rural older adults with different characteristics

Characteristic	Number [persons (%)]	Consistency score between expressed need and perceived need for contracted family doctor services ($\bar{x} \pm s$, points)	t (F) value	P value
Personal demographic characteristics				
Age			0.678	0.508
60–69 years	229 (50.2)	11.6 ±5.2		
70–79 years	170 (37.3)	11.9 ±5.3		
80 years	57 (12.5)	10.9 ±5.6		
Sex			3.676b	0.056
Male	210 (46.1)	11.1 ±5.5		
Female	246 (53.9)	12.1 ±5.1		
Education level			1.837	0.160
Primary school or below	358 (78.5)	11.8 ±5.4		
Junior middle school / technical secondary school	77 (16.9)	11.7 ±5.0		
Senior high school or above	21 (4.6)	9.5 ±5.5		
Previous main occupation			1.125	0.338
Farmer	267 (58.6)	11.9 ±5.4		

Characteristic	Number [persons (%)]	Consistency score between expressed need and perceived need for contracted family doctor services ($\bar{x} \pm s$, points)	t (F) value	P value
Staff of government agencies, enterprises / public institutions	19 (4.2)	12.6 ±3.5		
Unemployed / jobless	145 (31.8)	11.0 ±5.5		
Other	25 (5.5)	12.0 ±4.4		
Marital status			0.715b	0.398
Not currently marrieda	88 (19.3)	12.1 ±5.4		
Currently married	368 (80.7)	11.5 ±5.3		
Household size			1.552	0.200
1 person	45 (9.9)	13.0 ±4.6		
2 persons	194 (42.5)	11.8 ±5.1		
3 persons	33 (7.2)	10.7 ±5.8		
4 persons	184 (40.4)	11.4 ±5.6		
Economic source status			4.819b	0.029
None	11 (2.4)	8.2 ±5.1		
Yes	445 (97.6)	11.7 ±5.3		
Economic burden status			9.637	<0.001
No burden	120 (26.3)	12.9 ±5.4		
Some burden	214 (46.9)	11.8 ±5.0		

Characteristic	Number [persons (%)]	Consistency score between expressed need and perceived need for contracted family doctor services ($\bar{x} \pm s$, points)	t (F) value	P value
Quite heavy burden	122 (26.8)	10.0 ±5.3		
Type of medical insurance			0.538	0.585
Basic medical insurance for urban employees	26 (5.7)	11.7 ±5.3		
Basic medical insurance for urban and rural residents	419 (91.9)	11.6 ±5.3		
Other	11 (2.4)	13.3 ±5.4		
Annual medical expenditure			0.704	0.550
<1 000 yuan	60 (13.2)	10.7 ±5.5		
1 000–2 999 yuan	105 (23.0)	11.8 ±4.8		
3 000–4 999 yuan	81 (17.8)	11.7 ±5.2		
5 000 yuan	210 (46.1)	11.8 ±5.5		

2.4 Multivariate linear stepwise regression analysis of factors influencing the consistency score between expressed need and perceived need for contracted family doctor services among rural older adults

Using the consistency score between expressed need and perceived need for contracted family doctor services among rural older adults as the dependent variable (assignment: entered as the observed value), and variables that showed statistically significant differences in the univariate analysis as independent variables, a multivariate linear stepwise regression analysis was performed. The results showed that satisfaction with contracted family doctor service items, attention to one' s own health, chronic disease status, economic burden status, smoking status, and visits to primary medical and health institutions in the past year were influencing factors for the consistency score between expressed need and perceived need for contracted family doctor services among rural older adults ($P < 0.05$), as shown in Table 3.

2.5 Importance ranking of factors influencing the consistency score between expressed need and perceived need for contracted family doctor services among rural older adults

The statistically significant factors from the multivariate linear stepwise regression analysis were used as independent variables, and the consistency score between expressed need and perceived need for contracted family doctor services was used as the dependent variable to construct a random forest model. The assignment of independent variables is shown in Table 4. The training set and test set were randomly allocated at a ratio of 7:3. After parameter tuning, the model was optimal when the number of decision trees included in the random forest model (`ntree`) was set to 800 and the number of variables included in each decision tree (`mtry`) was set to 2. The overall explanatory rate of the included variables for predicting the influencing factors of expressed need and perceived need for contracted family doctor services was 37.93%. The ranking of variable importance is shown in Figure 1.

3 Discussion

3.1 The overall consistency between expressed need and perceived need for contracted family doctor services among rural older adults is at a relatively low level

From the perspective of older adults, the results of this study showed that the consistency score between expressed need and perceived need for contracted family doctor services among rural older adults in Ningxia Hui Autonomous Region was (11.6 ±5.3) points, indicating an overall relatively low level. It has been reported that, while communities in Ningxia Hui Autonomous Region have been actively exploring and effectively advancing the process of contracted family doctor services, they still face problems such as shortages of primary-level medical and nursing staff and residents' vague understanding of the concept

of family doctors[8]. At the same time, residents in Ningxia Hui Autonomous Region have a relatively shallow understanding of the specific content of contracted family doctor services and express a lack of trust in the medical service capacity of primary medical and health institutions, as reflected in the habit of going to pharmacies for minor illnesses and choosing hospitals for serious illnesses[9]. This leads to a relatively low utilization rate of contracted family doctor services among rural residents. Contracting

(Continued Table 2)

Characteristic	Number [n(%)]	Consistency score between expressed need and perceived need for family doctor contracted services ($\bar{x} \pm s$, points)	$t(F)$ value	P value
Individual lifestyle				
Physical exercise status			6.847	<0.001
No exercise	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		
1 time/d	283 (62.1)	12.6 ±4.9		
Smoking			7.999[b]	0.005
No	398 (87.3)	11.9 ±5.3		
Yes	58 (12.7)	9.8 ±5.4		
Drinking			4.085[b]	0.044
No	436 (95.6)	11.8 ±5.2		
Yes	20 (4.4)	9.3 ±6.4		
Individual health status				

Characteristic	Number [n(%)]	Consistency score between expressed need and perceived need for family doctor contracted services ($\bar{x} \pm s$, points)	$t(F)$ value	P value
Attention to one' s own health			24.906[b]	<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[b]	<0.001
None	56 (12.3)	9.4 ±5.8		
Present	400 (87.7)	12.0 ±5.2		
Ability for self-care in daily living			0.254	0.776
Unable to care for self	10 (2.2)	12.6 ±4.7		
Partially able to care for self	177 (38.8)	11.8 ±5.3		
Fully able to care for self	269 (59.0)	11.5 ±5.4		

Characteristic	Number [n(%)]	Consistency score between expressed need and perceived need for family doctor contracted services ($\bar{x} \pm s$, points)	$t(F)$ value	P value
Long-term medication treatment status			6.838[b]	0.009
None	105 (23.0)	10.5 ±5.6		
Present	351 (77.0)	12.0 ±5.2		
Medical-seeking behavior and medical resource status				
Visits to primary medical and health institutions in the past 1 year			9.263[b]	0.002
No	80 (17.5)	10.0 ±6.4		
Yes	376 (82.5)	12.0 ±5.0		
Satisfaction with family doctor contracted service items			73.449	<0.001
Satisfied	331 (72.6)	13.1 ±4.6		
Fair	95 (20.8)	8.7 ±4.9		
Dissatisfied	30 (6.6)	4.3 ±4.6		

Characteristic	Number [n(%)]	Consistency score between expressed need and perceived need for family doctor contracted services ($\bar{x} \pm s$, points)	$t(F)$ value	P value
Family members' attention to their health			17.547[b]	<0.001
None	66 (14.5)	9.2 ±4.9		
Present	390 (85.5)	12.1 ±5.3		
Family members' medical back-ground			0.283[b]	0.595
None	417 (91.4)	11.7 ±5.3		
Present	39 (8.6)	11.2 ±5.7		

(Continued Table 2)

Characteristic	Number [n(%)]	Consistency score between expressed need and perceived need for family doctor contracted services ($\bar{x} \pm s$, points)	$t(F)$ value	P value
Type of the nearest medical and health institution to the home			6.462	<0.001
Clinic or pharmacy	26 (5.7)	7.8 ±4.1		
Village clinic	385 (84.4)	12.0 ±5.2		
Township health center	34 (7.5)	10.1 ±5.6		
District/county-level hospital	11 (2.4)	12.7 ±6.7		
Distance from home to health center			17.794	<0.001
<3 km	225 (49.3)	12.8 ±4.7		
3–6 km	124 (27.2)	9.4 ±5.6		
>6 km	107 (23.5)	11.8 ±5.4		

Note: [a] non-married includes unmarried, divorced, and widowed; [b] indicates a t value.

[Figure: horizontal bar chart. Vertical labels, from top to bottom: satisfaction with family doctor contracted service items; attention to one' s own health; chronic disease status; economic burden; visits to primary medical institutions in the past year; smoking. Horizontal axis: %IncMSE, with tick marks at 0, 20, 40, and 60.]

Note: %IncMSE = percentage increase in mean squared error; the larger the score, the more the model prediction error increases after the variable is randomly perturbed, indicating that the variable is more important and contributes more to the model' s prediction results.

Figure 1 Importance ranking of factors influencing the consistency score between expressed need and perceived need for family doctor contracted services among rural older adults

Among service items, those with higher consistency between expressed and perceived needs, as well as higher satisfaction, were mostly basic public health services such as establishing health records. Studies have shown that family doctor contracted service items in Ningxia Hui Autonomous Region include basic medical services such as establishing health records, health consultation, and free physical examinations, and that these have been relatively well implemented; residents have demand for these types of services

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. The service items with lower consistency between expressed and perceived needs and lower satisfaction with family doctor contracted services were mostly specialized service items such as home hospital-bed services. From the demand-side perspective, residents place great importance on targeted services such as medication accessibility, the competence of family doctors, health management, and follow-up frequency

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. However, Ningxia Hui Autonomous Region is located in an underdeveloped region of northwest China, where medical resources are insufficient, especially primary health resources

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. Moreover, most family doctors in Ningxia Hui Autonomous Region come from primary medical and health institutions; primary medical service capacity is limited and falls short of public expectations. Physicians from higher-level hospitals are not highly motivated to participate, specialized and personalized services are limited, and service provision is constrained by the insufficient existing service categories available in primary medical and health institutions

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. As a result, services cannot be "tailored" to residents' health needs, their general attractiveness is insufficient, and they struggle to meet residents' needs for routine disease management

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, thereby affecting residents' use of family doctor contracted service items.

Table 3 Multiple stepwise regression analysis of factors influencing the consistency scores between expressed need and perceived need for family doctor contract services among rural older adults

Item	B	95%CI	SE	B'	t value	P value
Constant	9.895	5.390~14.401	2.293	–	4.316	<0.001
Satisfaction with family doctor contract service items	−3.988	−4.673~−3.303	0.348	−0.449	−11.449	<0.001
Attention to one' s own health	2.668	1.447~3.889	0.621	0.166	4.295	<0.001
Presence of chronic disease	2.077	0.826~3.327	0.636	0.129	3.263	0.001
Economic burden	−1.072	−1.628~−0.517	0.283	−0.147	−3.795	<0.001
Smoking	−1.755	−2.989~−0.522	0.628	−0.110	−2.797	0.005
Visits to primary-level medical and health institutions in the past year	1.268	0.209~2.327	0.539	0.091	2.353	0.019

Note: $R = 0.581$, $R^2 = 0.337$, adjusted $R^2 = 0.328$, $F = 38.052$, $P < 0.001$; – indicates no corresponding data.

Table 4 Assignment of independent variables in the random forest model

Independent variable	Assignment method
Satisfaction with family doctor contract service items	1 = satisfied, 2 = fair, 3 = dissatisfied
Attention to one' s own health	0 = no, 1 = yes

Independent variable	Assignment method
Presence of chronic disease	0 = no, 1 = yes
Economic burden	0 = no, 1 = yes
Smoking status	0 = no, 1 = yes
Visits to primary-level medical and health institutions in the past year	0 = no, 1 = yes

3.2 The gaps between expressed need and perceived need were pronounced for five services, including two-way referral and guidance on care-seeking pathways

Among the 23 service items provided under family doctor contract services in Ningxia Hui Autonomous Region, older adults showed marked gaps between expressed need and perceived need for two-way referral, guidance on care-seeking pathways, remote health monitoring, appointment scheduling, and traditional Chinese medicine services. The reasons are as follows: with increasing age, the prevalence of chronic disease among older adults continues to rise, and their frequency of medical visits and demand for chronic disease management also increase [14], thereby increasing demand for appointment scheduling, care-seeking guidance, remote monitoring, and two-way referral. However, medical and health resources in rural areas are limited [15–16] and cannot readily meet the growing needs of the older population, leading to insufficient utilization of contracted services related to medical care and chronic disease management. Therefore, it is recommended that the government consider deeply exploring and making use of resources within families by selecting family health responsible persons and empowering them with basic health-management responsibilities, so that they can serve as an important supplement to health-care human resources in rural areas [17]. In recent years, demand for traditional Chinese medicine services has also increased markedly. This may be related to the characteristics of traditional Chinese medicine techniques— "simple, convenient, effective, and inexpensive" —and to their broad mass base [18]. At present, however, the range of appropriate traditional Chinese medicine techniques carried out in some primary-level medical and health institutions has not yet met the prescribed basic requirements, and the application of such techniques among older adults remains limited [19], resulting in insufficient use of this service. Therefore, in the future, family doctors should give priority to the provision of these five services and formulate personalized traditional Chinese medicine service packages according to the needs of older adults. At the same time, family doctors should be encouraged to work jointly with family health responsible persons to manage rural older adults, enabling more precise health management.

3.3 The expressed need and perceived need for family doctor contract services among rural older adults were affected by multiple factors, with satisfaction with contracted services being the primary factor

The multiple linear regression results showed that, among rural older adults, satisfaction with family doctor contract service items, attention to one' s own health, presence of chronic disease, economic burden, smoking status, and visits to primary-level medical and health institutions in the past year affected the consistency between expressed need and perceived need for family doctor contract services.

Attention to one' s own health affected the consistency between expressed need and perceived need for family doctor contract services among older adults. This is consistent with the findings of Zhao et al. [20]: older adults with stronger health awareness are more likely to actively seek professional medical support, and such older adults are better at using policy resources to reduce the mismatch between expressed and perceived needs caused by information asymmetry [21]. According to the requirements of the National Basic Public Health Services, family doctors should provide regular basic health-management services each year for key populations such as patients with chronic diseases [22]. The provision of basic public health services in Ningxia Hui Autonomous Region has reached the targets set by the state and the autonomous region [23], which can effectively improve disease management for patients with chronic diseases [24], ensure the precision of service utilization, and may thereby increase the degree of expressed and perceived needs among older patients. The survey in this study showed that most older adults reported having no source of income and bearing a relatively heavy economic burden. Economic burden can aggravate health vulnerability; such older adults often accumulate health problems because of delays in receiving basic medical care [25]. In addition, Ningxia Hui Autonomous Region faces a shortage of general practitioners, and the capacity of primary-level medical services still needs further improvement. High-level and personalized diagnosis and treatment services are difficult to provide free of charge at the primary level [26], which aggravates the mismatch between rural older adults' expressed need and perceived need for family doctor contract services. Rural older adults who had previously sought care at primary-level institutions better understood tiered diagnosis and treatment and contract-service policies [27], reducing information asymmetry such as cognitive bias regarding service content and communication costs, and therefore showing higher consistency between expressed need and perceived need. In this study, most rural older adults had an educational level of primary school or below, which is consistent with the results of Yu Fang' s study [28]. Such older adults may underestimate the health risks caused by smoking and lack motivation for health [29]. Moreover, standardized family doctor contract services lack personalized intervention plans targeting smoking behavior [30]. Rural older adults therefore more often show an attitude of not needing contracted service items, making it difficult to effectively stimulate this group' s health-management needs. In view of this, it is recommended that in

the future, the health-management effectiveness of groups with high-risk awareness be improved by strengthening risk-perception education and innovating personalized smoking-cessation services. Government departments may extend experience from chronic disease services and increase special funding subsidies and the proportion of medical insurance reimbursement, thereby improving the accessibility and fit of family doctor contract services for the whole population.

The random forest results showed that satisfaction with family doctor contract service items

Satisfaction is the primary factor influencing expressed needs and perceived needs for contracted family doctor services. The essence of concordance between expressed needs and perceived needs for contracted family doctor services lies in whether residents believe that the service items provided by the family doctor team are consistent with their health-management needs[31]. As the direct beneficiaries of medical and health services, residents' sense of gain from medical care and their judgment of the value of medical and health services depend on their intuitive experience of receiving medical services[32]. With the development of contracted family doctor services, residents' willingness for personalized services has continued to increase[33]. However, the survey in this study showed that, at present, the supply of contracted family doctor services in rural areas of the Ningxia Hui Autonomous Region still mainly consists of basic public health services such as establishing health records. Personalized specialist service items may progress slowly because of constraints such as the positioning of primary care, funding, and personnel[34], resulting in relatively low satisfaction among rural older adults with family doctor services and aggravating the substantive mismatch between expressed needs and perceived needs. Therefore, to improve rural older adults' satisfaction with contracted services, promote a balance between expressed needs and perceived needs, and improve the quality of family doctor services, future efforts may enhance the capacity of service supply to respond to differentiated needs by promoting the sinking of specialist resources and innovating service models according to the needs of rural residents.

4 Summary

From the perspective of concordance between expressed needs and perceived needs for contracted family doctor services, this study investigated the actual status of expressed needs and perceived needs for contracted family doctor services among rural older adults in the Ningxia Hui Autonomous Region, and identified various factors affecting the concordance between expressed needs and perceived needs. From the perspective of older adults, the results showed that the overall levels of expressed needs and perceived needs for contracted family doctor services among rural older adults were relatively low, and that there were clear gaps between expressed needs and perceived needs for five services, including two-way referral and guidance on medical-care pathways. Concordance between expressed needs and perceived needs for contracted family doctor services was influenced by multiple factors, among which older rural adults' satisfaction

with family doctor contracted service items was the primary factor. Therefore, in the future, it is necessary to integrate the health status and needs of older adults contracted in rural areas of the Ningxia Hui Autonomous Region, increase the supply of needed service items, promote the sinking of specialist resources, innovate service models, and develop diversified family doctor service packages suited to local conditions, so as to improve the concordance between expressed needs and perceived needs for contracted family doctor services among rural older adults and meet their diversified needs for health management.

5 Limitations

Based on the research group' s preliminary work and systematic evaluations of previous related studies, this study designed a questionnaire on the concordance between expressed needs and perceived needs for contracted family doctor services and its influencing factors from the researchers' perspective, which may have omitted other influencing factors of concern to service recipients. In the future, qualitative research with an open-ended interview design could be used to explore influencing factors from multidimensional perspectives. This study surveyed all older adults within households who met the inclusion criteria, which may have led to clustering of viewpoints. To enhance feasibility, the survey of concordance between expressed needs and perceived needs for contracted family doctor services among rural older adults adopted a "yes" or "no" response design, which may have reduced the precision of the data to some extent. In addition, perceived needs were higher than expressed needs; there are many possible explanations for this, but the questions in this study were overly simple, making it impossible to determine the specific reasons for the gap between perceived and expressed needs. This study involved only older adults; research on other age groups should be considered in subsequent studies. Regional differences may also exist among the five cities in the Ningxia Hui Autonomous Region. Owing to insufficient sample size, this study could not further analyze differences among cities; future in-depth research should include samples with city-level representativeness.

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