ABSTRACT

Objectives We conducted this study to assess the application effect of the family doctor contract service mode of ‘basic package+personalised package’ in the management of hypertension patients.

Design Observational study.

Setting The study was conducted at a community health centre in Southwest China. Data were collected from 1 January 2018 to 31 December 2020.

Participants From 1 January 2018 to 31 December 2020, hypertensive patients (age ≥65 years) who participated in the contract services of family doctors at a community health service centre in Chengdu, Southwest China, were selected as the study subjects.

Main outcome measures The primary outcomes included mean blood pressure (systolic, diastolic) and the rate of blood pressure control, secondary outcomes included the level of cardiovascular disease risk and self-management ability. Assessments of baseline and 6 months after signing up were conducted on all outcomes. The major statistical analysis methods included two independent sample t-tests, paired t-tests, Pearson’s χ² test, McNemar’s test, two independent sample Mann-Whitney U tests and paired sample marginal homogeneity tests.

Results Of the 10,970 patients screened for eligibility, 968 (8.8%) were separated into an observation group (receiving ‘basic package+personalised package’ service) (n=403) and a control group (receiving ‘basic package’ service) (n=565) according to the type of service package they received. In comparison to the control group, the observation group had lower mean systolic blood pressure (p=0.023), higher blood pressure control rate (p<0.001), lower cardiovascular disease risk level (p<0.001) and higher self-management ability level (p<0.001) at 6 months after signing up. The mean diastolic blood pressure of the two groups was not significantly different (p=0.735).

Conclusions The family doctor contract service model of ‘basic package+personalised package (hypertension)’ has a good application effect in the management of elderly hypertension, which can improve the average blood pressure, the rate of blood pressure control, the level of cardiovascular disease risk and self-management ability of the elderly with hypertension.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This is the first large-scale study on the application effect of the ‘basic package+personalised package (hypertension)’ family doctor contract service model.

⇒ Family doctor contract services studied in this study are established according to China’s national conditions, which has far-reaching significance for developing countries with similar social and medical backgrounds to China to establish a primary healthcare system dominated by family doctors.

⇒ Chronic disease health management is the main business scope of the community health centre, and perhaps the results of this study can be extended to other chronic disease management.

⇒ As this is not a randomised controlled trial, patients choose the contract service type based on their preferences. However, because the contract service of family doctors in China follows the principle of voluntary signing, it is difficult to carry out randomised controlled trials.

INTRODUCTION

A rapid ageing society is emerging in China since the 21st century. From 2015 to 2050, the Chinese ageing rate (the proportion of the population aged 60 and above) is expected to increase by 2.39% annually, which is 1.5 times the world average and 2.6 times the average of developed countries.1 With the deepening of the degree of ageing, the prevalence of chronic diseases in the elderly has shown a significant increasing trend, from 53.88% in 2003 to 64.54% in 2008 and then to 74.20% in 2010, with a net growth rate of...
20.32% in 7 years. The results of the China Patient-Centred Evaluative Assessment of Cardiac Events million-patient population Project (15 September 2014–20 June 2017) showed that the treatment rate of elderly patients with hypertension (residents aged 65–75 years) is less than 5%, and the control rate is less than 10%. The serious situation of elderly hypertension treatment and management in China is mainly caused by the contradiction between the tense medical and health service resources and the increasing burden of elderly hypertension disease, and optimising the allocation of resources for health services is an effective way to alleviate this contradiction. In 2002, the WHO proposed the Innovative Care for Chronic Conditions Framework for low-income and middle-income countries, which proposed actively engaging chronically ill patients with contracted services based on the community. Thus, the important role of grass roots health service institutions in the prevention and control of chronic diseases was emphasised. China, as a developing country, the community is still the main place for chronic disease prevention and management. Given this, the Chinese government pointed out that the main measures for chronic disease management in China are to promote the sinking of medical and health service resources, strengthen the construction of basic medical and health service systems, promote the transformation of its service mode, and establish and improve the community-based family doctor contract service model. Therefore, the importance of integrating China’s existing community chronic disease management resources for elderly individuals, accelerating the promotion of family doctor contract services, and exploring a community chronic disease management model suitable for China’s national conditions was emphasised.

Family physicians play a key character as ‘gatekeepers’ in the field of primary healthcare. Therefore, health workers should actively explore the community chronic disease health management model with family doctors as the main body of the service. Contract family doctor service in China is a basic medical and health service model with Chinese characteristics that integrates basic medical services and public health services with general practitioners as the main body, primary-level medical institutions as the service places, and contractual services as the characteristics, and aims to solve the common health problems of residents.

Overseas family doctor services started earlier and have been widely used in the management of chronic diseases such as hypertension and diabetes. For example, in the middle of the 20th century, the UK established the national health service system (ie, the family doctor contract service system). This system has the characteristics of universal coverage, on-demand service, state tax payment and free for all; In addition, although the systems of medical care and health services and of health insurance of the USA, Germany, Australia and other countries have certain differences, they all implement the family doctor contract service as well as stipulate that all residents who enjoy social medical insurance or purchase commercial medical insurance must participate in the family doctor contract service, to ensure the smooth implementation of the first diagnosis and referral system. China’s family doctor service model is governed by China’s national conditions, which is fundamentally different from foreign models, and developed late. There are major differences between China’s medical and healthcare systems and those of developed countries. First, there is a serious problem of uneven regional distribution of medical and health resources in China; Second, Chinese residents tend to go to high-level hospitals, and their trust in grass-roots hospitals is low; Third, the serviceability and level of staff in grass roots health service institutions in China are low; Finally, the medical insurance fund does not cover all family doctor signing projects. Therefore, the family doctor contract service model implemented in China is different from that in foreign countries. It is established based on China's national conditions and highlights Chinese characteristics. The above problems are also common in the medical and health systems of low/middle-income countries. China’s family doctor service began in 2009, and in 2011, the State Council issued the ‘Guiding Opinions on the Establishment of the General Practitioner System’, proposing the establishment of a general practitioner system suitable for China’s national conditions. Since then, family doctor service has been steadily promoted. To date, China has formed six typical family doctor contract service modes, including the ‘1+1+1’ combined contract service mode, ‘three division co-management’ contract service mode, ‘integration of medical care’ contract service mode, ‘prepayment of total amount per-head’ contract service mode, ‘basic package+personalised package’ contract service mode and Luohu model. The related studies on family doctor contract service modes in China are primarily published in Chinese, less in the world, and involve many chronic diseases, such as diabetes, hypertension, osteoporosis and chronic heart failure. Among them, the ‘1+1+1’ combined contract service mode and the ‘three division co-management’ contract service mode have been proven to effectively control the blood sugar concentration of people with diabetes, promote their quality of life as well as self-management ability, and can also improve the blood pressure level, medication compliance, self-care ability and depression of patients with hypertension. Studies have also demonstrated that the ‘integration of medical care’ contract service mode can improve medication compliance, haemoglobin A1c levels, and disease awareness in patients with type 2 diabetes. The ‘basic package+personalised package’ service model is based on the ‘Iceberg Theory’ and ‘Knowledge-Attitude-Practice Theory’. It improves the health status of patients by providing basic medical services and personalised health services for patients with chronic diseases. However, there are few studies on its application effect in the management of patients with chronic diseases. This study found two studies on the effectiveness of this model for...
managing patients with type 2 diabetes. Li et al.\(^{27}\) found that the family doctor contract service of ‘basic package+personalised package’ can effectively improve the medication compliance and self-management ability of patients with type 2 diabetes, and improve the glucose metabolism and lipid metabolism of patients. Xiulan\(^{28}\) found that the personalised family doctor contract service model can significantly improve the disease awareness rate of diabetic patients and improve their blood glucose control level. At present, there is no relevant research on the application effect of the ‘basic package+personalised package’ family doctor contract service mode in hypertension management; therefore, this study intended to retrospectively study hypertension cases contracted by family doctors to evaluate the application effect of this service model in the management of hypertension patients and explore the outcomes related to the application of this model. We speculated that the implementation of this mode would improve the health outcomes of elderly patients with hypertension.

**METHODS**

**Research design**

The study is a community-based retrospective controlled study.

**Object of study**

In this study, due to the limitation of research conditions, the convenience sampling strategy was used to select hypertensive patients who participated in family doctor contract services in a community health service centre in Chengdu, Southwest China from 1 January 2018 to 31 December 2020, as the study subjects. The sample size was calculated by the following formula based on the blood pressure control rate: \(n = \frac{(U_\alpha + U_\beta)^2}{2P(1-P)/(P_1 - P_2)}\).\(^2\) According to the pre-experimental results, the blood pressure control rate of the observation group was 58.2%, that of the control group was 35.2%, \(\alpha=0.05, 1-\beta=90\%\), and the estimated sample size was 99 in each group. Overall, 968 patients met the inclusion and exclusion criteria, including 403 cases within the observation group and 565 cases within the control group.

**Inclusion criteria**

1. It meets the diagnostic criteria of hypertension in the ‘China’s guidelines for preventing and treating hypertension (2010 revision)’\(^{29}\); 2. Age 26±5 years; 3. Detailed clinical data and basic data of patients; 4. Living with family members; 5. Junior high school education or above and (6) 6 months after signing the contract, patients who have completed all projects of the contracted family doctor service.

**Exclusion criteria**

1. Secondary hypertension, pregnancy-induced hypertension or patients with a particular type of hypertension caused by drugs and other factors; 2. Patients with mental illness; 3. Patients with cognitive dysfunction; 4. Patients who are unable to express themselves in words and (5) Patients with malignant diseases such as tumours, who are receiving chemotherapy or other critical conditions. Relevant information was obtained from the patients’ electronic health records.

**Divide into groups**

For the family doctor contract service model involved in this study, patients can voluntarily choose the type of contract service package according to their own needs. For patients with hypertension, there are two options, one is the ‘basic package’ service, and the other is the ‘basic package+personalised package (hypertension)’ service. According to the type of contract service package they received, the study subjects were divided into an observation group (receiving ‘basic package+personalised package (hypertension)’ service) and a control group (receiving ‘basic package’ service).

**Procedures**

‘Basic package+personalised package (hypertension)’ family doctor contracted service model

The service undertakers of the ‘basic package+personalised package (hypertension)’ family doctor contracted service model are the family doctor teams from the community health service centre (including family doctors, nurses, public health professionals, health management professionals and other professionals), which mainly provides basic public health services and service package services (basic package+personalised package (hypertension)) for patients with hypertension. At the same time, the community healthcare service centre as well as the superior hospital form a compact regional medical community, which is conducive to improving the service level of the family doctor team. The payment methods of the service mainly include government subsidies, medical insurance payments, and patient self-payments. In detail, for the payment for the ‘basic package+personalised package’, the payment of the ‘basic package’ is borne by medical insurance and the government; and the payment of the ‘personalised package’ is borne by medical insurance, government and individuals, of which the proportion of the payment borne by the medical insurance and the government is relatively large (figure 1).

The theoretical basis for the family doctor contract service mode of ‘basic package+personalised package’

There are two main theories that best illustrate the family doctor contract service mode of ‘basic package+personalised package’; the iceberg theory and knowledge attitude practice theory. Iceberg theory proposed by Satya describes behaviour and coping styles, feelings and views, expectations and aspirations, and self-efficacy in chronic disease management.\(^{30}\) Family doctor team members can further understand patients’ disease feelings and views through disease assessment, and provide personalised health guidance to patients in combination with...
their expectations and aspirations to improve their self-efficacy in disease management and promote changes in their health behaviours and coping styles. Knowledge-attitude practice theory divides the change in human behaviour into three continuous processes: acquiring knowledge, generating belief and forming behaviour. Family doctor team members provide personalised, continuous and systematic health follow-up guidance to patients to promote them to form beliefs to promote changes in their health behaviours, which in turn is conducive to the patient’s health and overall quality of life.

Control group

‘Basic package’ service

Basic package service includes the following: (1) establishing electronic health records that include basic information, health checks, management records and other medical services; (2) face-to-face follow-up four times, the follow-up included symptoms (symptom type, frequency and occurrence time), blood pressure value (blood pressure was measured with an electronic sphygmomanometer) and medication (medication type, method, frequency, time and drug-related side effects); (3) traditional Chinese medicine (TCM) intervention, including

Figure 1  ‘Basic package+personalised package (hypertension)’ family doctor contract service model.
acupoint massage combined with TCM body constitution nursing (the selected points for acupoint massage: Baihui point, Taiyang point, Fengchi point, Neiguan point and Zusanli point. Each point is massaged clockwise and counterclockwise for 4 weeks, twice a day, 15 min/time. It is appropriate for the patient to feel local acid swelling and skin redness. The TCM constitution nursing is guided by the basic theory of TCM and based on the theory of syndrome differentiation and treatment of TCM. Hypertension patients are classified according to their constitution, of which phlegm dampness, qi stagnation and yin deficiency are the most common. Clinical nursing should provide different diets, daily life and environmental care according to their constitution. For example, the diet of patients with phlegm dampness should be light, avoid spicy and greasy food, avoid excessive fatigue, and strengthen exercise; patients with qi depression should eat more food to soothe the liver and regulate qi, exercise properly, avoid fatigue, keep the indoor temperature constant and open more windows for ventilation; yin deficiency patients should combine work and rest, keep adequate sleep, and eat more food that is sweet and cold, cool and nourishing Yin fluid; (4) physical examination one time: oral examination, visual examination, motor examination, etc and (5) interpret the results of physical examination and provide corresponding health guidance once according to the physical examination results.

Observation group

‘Basic package service+personalised package (hypertension)’ service

The basic package service is the same as that of the control group.

The personalised package (hypertension) service includes the following: After the staff assesses the condition of patients with hypertension, they give personalised health follow-up guidance to the patient according to the assessment results and in combination with the patient’s individual differences and wishes, and reassess after a certain period of time.

Hypertension assessment includes three levels: risk factor assessment, diagnostic assessment and self-management ability assessment. (1) Risk factor assessment included: personal characteristics, genetic factors, complications and bad living habits (see online supplemental table S1); (2) Diagnostic assessment included: (1) establishing the classification of blood pressure level; (2) looking for other cardiovascular disease risk factors and related disease history and assessing the patient’s cardiovascular disease risk level (see online supplemental tables S2 and S3)); (3) self-management ability assessment: the self-management ability of patients with hypertension was assessed by the self-management scale for patients with hypertension prepared by Ning et al.92 The scale includes four dimensions (treatment management dimension, diet and exercise management dimension, lifestyle management dimension, and risk factor management dimension), with a total of 21 items. Likert scoring is used, with five levels from ‘never’ to ‘always’ (1–5 points), with a total score of 21–105 points. The questionnaire score adopts positive scoring. The higher the score, the stronger the self-management ability of the research subject. The scale is suitable for Chinese cultural characteristics and has good reliability and validity. The total Cronbach’s α coefficient is 0.85, the total folding coefficient value is 0.86 and the average Content Validity Index (CVI) of all items is 0.98.

Hypertension health follow-up guidance: (1) follow-up: ① staff: public health professionals; ② methods and frequency: telephone follow-up is conducted once a month, outpatient follow-up is conducted once a quarter, and household follow-up is conducted once every 2 weeks (the three methods complement each other); ③ content: including symptoms, signs, medication, lifestyle, target organ damage and associated diseases (see online supplemental table S4); (2) guidance: ① staff: family doctor, nurse, public health professionals and health management professionals; ② content: including medication guidance, blood pressure monitoring guidance, lifestyle guidance, self-observation and treatment of the disease guidance and follow-up guidance (see online supplemental table S5). No matter what service package is selected, the community health service centre will conduct a free hypertension assessment before and half a year after the signing of the contract.

Intervention fidelity

The observation group and the control group received their family doctor contracts services from two different family doctor teams. The two groups of family doctor teams were independent of each other in the work process, and each family doctor team implemented the service in their independent studio. The family doctor teams received 3 months of training before the formal implementation of the contract service. To ensure the quality of contract services, the community health service centre designated two general nurses with intermediate or above professional titles who were specially trained to supervise the service process of the family doctor teams. At the same time, the self-designed structured questionnaire (the average CVI of all items is 0.95) was used regularly (once/half a month) to investigate the signing awareness, feelings and satisfaction of the signing service objects. The family doctor teams met weekly to discuss services. In addition, the reasons for the termination of the contract objects would be collected for assessment.

Study measures

The data measured in the study included general clinical data, primary outcome indicators and secondary outcome indicators. Relevant indicators were measured before the start of the first family doctor contract service (baseline) and 6 months after the contract.
General clinical data
The general clinical data of the subjects included gender, smoking, drinking, diet, exercise, mental status, overweight or obesity, family history of hypertension, and complications (type 2 diabetes, dyslipidaemia, coronary heart disease, chronic renal insufficiency, heart failure, stroke).

Primary outcomes
The primary outcomes included mean blood pressure and rate of blood pressure control. Blood pressure was measured by an electronic sphygmomanometer at home (first: do not smoke, drink strong tea or coffee or other drinks approximately 30 min before blood pressure measurement, and sit on a chair for at least 5 min at rest to relax the whole body. Second: check whether the connection of the electronic sphygmomanometer cuff is normal. The examinee takes the sitting position, stretches out the right arm, and the palm is upward, at the same level as the heart. The sphygmomanometer cuff was placed at approximately 2–3 cm on the horizontal line of the right arm elbow. The tightness is appropriate to accommodate one finger. Then press the start button. The value displayed on the sphygmomanometer display is the measured blood pressure and heart rate. After the measurement, press the close button). The average blood pressure value at baseline is the average value of the five blood pressure measurements closest to the start time node of the contract service within 12 months before the start of the contract service, and the average blood pressure value at 6 months after signing up is the average value of the five blood pressure measurements from the 6 months after the contract. Blood pressure control rate refers to the percentage of subjects with average blood pressure <140/90 mm Hg.

Secondary outcomes
Secondary outcomes included cardiovascular disease risk stratification and self-management ability classification. Subjects in the study were stratified in cardiovascular disease risk levels according to the criteria of ‘China’s guidelines for preventing and treating hypertension (2010 Revision)’ (see online supplemental table S3). The self-management ability score obtained from the above assessment was standardised according to the method of the literature, and the standardised score = actual score/ highest score × 100%. The self-management ability level was further divided into ‘low, medium and high’ according to the standard of <60% is the low level, 60%–79% is the medium level and ≥80% is the high level’.

Statistical analysis
SPSS V.25.0 (IBM) was used for statistical analysis, and statistically, the difference was significant (p<0.05). General clinical data of the observation group and control group were analysed by Pearson’s χ² test. Analysis of the primary outcome indicators of the subjects: Mean blood pressure was compared between groups using two independent sample t-tests, and mean blood pressure was compared within the group at baseline and 6 months after signing the contract using a paired t-test; Pearson’s χ² test was used for intergroup comparison of blood pressure control rate, and McNemar’s test was used for intragroup comparison of blood pressure control rate at baseline and 6 months after signing the contract. Analysis of the secondary outcome indicators: two independent sample Mann-Whitney U tests were used to compare the secondary outcome indicators (cardiovascular disease risk level stratification and self-management ability level classification) between groups. Secondary outcome measures (cardiovascular disease risk level stratification and self-management ability level classification) were compared between baseline and 6 months after signing the contract, using a paired sample marginal homogeneity test.

RESULTS
We assessed eligibility for 10,970 patients in total, of which 968 (8.8%) met the criteria of this study. According to the type of contracted service package, the subjects were divided into the observation group (received ‘basic package+personalised package (hypertension) service’, 403 patients) and the control group (received ‘basic package’ service, 565 patients). Observation and control groups were not significantly different in terms of general clinical characteristics (table 1). The research flow chart is shown in figure 2.

Primary outcomes
For the mean blood pressure, the t-test results of two independent samples showed that between the observation and control groups, neither systolic nor diastolic blood pressure was significantly different at baseline (p>0.05), but 6 months after contract signing, systolic blood pressure differed significantly between observation and control groups (p<0.05). While the observation group’s systolic blood pressure was lower, their diastolic blood pressure did not differ significantly from the control group’s (p>0.05) (table 2). The paired t-test indicated a significant difference in mean blood pressure (systolic and diastolic blood pressure) between the observation group at baseline and 6 months after signing the contract (p<0.05), and systolic and diastolic blood pressure at 6 months after signing the contract were lower than baseline. The mean blood pressure (systolic and diastolic blood pressure) of the control group at baseline and 6 months after signing the contract was also statistically...
significant (p<0.05), and systolic and diastolic blood pressure at 6 months after signing were lower than baseline (table 2).

For the blood pressure control rate, Pearson’s χ² test showed that blood pressure control rates did not differ significantly between the observation and control groups at baseline (p>0.05). The difference in the blood pressure control rate between the two groups 6 months after signing the contract was statistically significant (p<0.05), and the blood pressure control rate of the observation group was higher (table 2). McNemar’s test results showed that at baseline and 6 months after signing the contract, the observation group’s blood pressure control rate was significantly different (p<0.05), and the blood pressure control rate 6 months after signing the contract was lower than that at baseline. The difference of blood pressure control rate between the control group at baseline and 6 months after signing the contract was also statistically significant (p<0.05), and the blood pressure control rate at 6 months after signing the contract was higher than that at baseline (table 2).

**Secondary outcomes**

For the cardiovascular disease risk stratification, the results of the Mann-Whitney U test of two independent samples indicated that a comparison of stratifications of cardiovascular disease risk levels between the observation and control groups did not show any significant differences at baseline (p>0.05). Six months after signing the contract, the hierarchical difference in cardiovascular disease risk level between the two groups showed a statistically significant difference (p<0.05); overall, a lower risk level of cardiovascular disease was found in the observation group compared with the control group (table 3). The results of the paired sample marginal homogeneity test indicated a significant difference in the stratification of cardiovascular disease risk levels between the observation group at baseline and 6 months after signing the contract (p<0.05), and the risk level of cardiovascular disease 6 months after signing the contract was lower than that at baseline. The stratification of cardiovascular disease risk levels also differed statistically significantly between baseline and 6 months after signing the contract in the control group (p<0.05), and the risk level of cardiovascular disease 6 months after signing the contract was lower than that at baseline (table 3).

For self-management ability level classification, the Mann-Whitney U test results of two independent samples showed that the level of self-management ability of the observation group and control group at baseline did not differ significantly (p>0.05). The level of

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**Table 1** General clinical data of subjects (baseline characteristics)

<table>
<thead>
<tr>
<th>Object of study</th>
<th>Observation group (n=403)</th>
<th>Control group (n=565)</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male, n (%)</td>
<td>186 (46.2)</td>
<td>249 (44.1)</td>
<td>0.521</td>
</tr>
<tr>
<td>Smoking, n (%)</td>
<td>125 (31.0)</td>
<td>147 (26.0)</td>
<td>0.088</td>
</tr>
<tr>
<td>Excessive drinking, n (%)</td>
<td>77 (19.1)</td>
<td>85 (15.0)</td>
<td>0.095</td>
</tr>
<tr>
<td>Balanced diet, n (%)</td>
<td>273 (67.7)</td>
<td>388 (68.7)</td>
<td>0.759</td>
</tr>
<tr>
<td>Regular exercise, n (%)</td>
<td>302 (74.9)</td>
<td>409 (72.4)</td>
<td>0.376</td>
</tr>
<tr>
<td>Overweight or obese, n (%)</td>
<td>217 (53.8)</td>
<td>295 (52.2)</td>
<td>0.616</td>
</tr>
<tr>
<td>Chronic stress, n (%)</td>
<td>98 (24.3)</td>
<td>113 (20.0)</td>
<td>0.109</td>
</tr>
<tr>
<td>Family history of hypertension, n (%)</td>
<td>161 (40.0)</td>
<td>254 (45.0)</td>
<td>0.121</td>
</tr>
<tr>
<td>The diagnosis was more than 1 cases of hypertension related secondary diseases and/or type 2 diabetes and/or dyslipidaemia, n (%)</td>
<td>203 (50.4)</td>
<td>302 (53.5)</td>
<td>0.344</td>
</tr>
<tr>
<td>Type 2 diabetes, n (%)</td>
<td>137 (34.0)</td>
<td>205 (36.3)</td>
<td>0.463</td>
</tr>
<tr>
<td>Dyslipidaemia, n (%)</td>
<td>103 (25.6)</td>
<td>121 (21.4)</td>
<td>0.132</td>
</tr>
<tr>
<td>Coronary heart disease, n (%)</td>
<td>67 (16.6)</td>
<td>84 (14.9)</td>
<td>0.457</td>
</tr>
<tr>
<td>Chronic renal insufficiency, n (%)</td>
<td>114 (28.3)</td>
<td>158 (28.0)</td>
<td>0.912</td>
</tr>
<tr>
<td>Cardiac insufficiency, n (%)</td>
<td>48 (11.9)</td>
<td>73 (12.9)</td>
<td>0.640</td>
</tr>
<tr>
<td>Stroke, n (%)</td>
<td>24 (6.0)</td>
<td>31 (5.5)</td>
<td>0.756</td>
</tr>
</tbody>
</table>

Excessive drinking, including dangerous drinking (male: 41–60 g/day; female: 21–40 g/day) and harmful drinking (male: >60 g/day; female: >40 g/day); balanced diet, the diet is dominated by fruits, vegetables, low-fat dairy products, whole grains rich in edible fibre and plant-derived protein, and reduce the intake of saturated fat and cholesterol; regular exercise, in addition to the activities of daily life, moderate intensity sports (such as walking, jogging, cycling, swimming) are accumulated for 30–60 min every day 4–7 days a week; overweight or obese, overweight: BMI≥24 kg/m²; obese: BMI≥28 kg/m²; chronic stress, psychological abnormalities such as anxiety, worry, tension, anger, panic or fear, lasting for more than 1 month.

*Comparison of data between observation group and control group: Pearson’s χ² test. BMI, body mass index.
self-management ability differed significantly between the two groups 6 months after contract signing (p<0.05). In general, compared with the control group, the observation group had a higher level of self-management (table 3). The results of the paired sample marginal homogeneity test showed a significant difference in the level of self-management ability between the observation group at baseline and 6 months after signing the contract (p<0.05), and the level of self-management ability 6 months after signing the contract was higher than the baseline on the whole. A statistically significant difference in self-management ability level was also observed between the baseline and 6 months after contract signing in the control group (p<0.05), but 6 months after signing the contract, the level of self-management ability was lower than the baseline on the whole (table 3).

DISCUSSION
This study demonstrated that the ‘basic package+personalised package (hypertension)’ family doctor contracting service could improve the mean blood pressure, blood pressure control rate, cardiovascular disease risk level and self-management ability level in elderly patients with hypertension. It was better than the ‘basic package’ family doctor contract service in improving systolic blood pressure, blood pressure control rate, cardiovascular disease risk level and self-management ability level in elderly patients with hypertension.

Compared with the ‘basic package’ service, the ‘basic package+personalised package (hypertension)’ family doctor contract service proposed in this study is more significant in reducing the average blood pressure (systolic blood pressure) and improving the blood pressure control rate of elderly patients with hypertension, which suggests that the family doctor contract service...
with a personalised scheme has a better effect on blood pressure control. A scholar pointed out that poor compliance is the main reason for the unsatisfactory treatment effect and repeated condition of patients with chronic diseases. The personalised scheme proposed in this study takes into account the individual differences of patients and combined with the wishes of patients, which may be largely related to the improvement in blood pressure levels. A scholar pointed out that the poor self-management ability of the elderly with chronic diseases has become a major reason why the situation of chronic disease treatment and management in China is not optimistic. Therefore, improving the self-management ability of the elderly with chronic diseases has become a key link of chronic disease management in China. The ‘basic package+personalised package (hypertension)’ family doctor contract service proposed by this study can improve the self-management ability of elderly patients with hypertension, which may be related to the improvement in blood pressure control. A scholar pointed out that the main goal of treating hypertension is to prevent the occurrence of cardiovascular disease. The ‘basic package+personalised package (hypertension)’ family doctor contract service proposed in this study can reverse the risk of cardiovascular disease among hypertensive elderly people, which may be largely related to the improvement in blood pressure levels. Studies have shown that there is a close and direct positive correlation between blood pressure level and cardiovascular risk, and the proportion of deaths from cardiovascular and cerebrovascular diseases in China has exceeded 40% of the total deaths. Therefore, the main goal of treating hypertension is to prevent the occurrence of cardiovascular disease. The ‘basic package+personalised package (hypertension)’ family doctor contract service proposed in this study can reverse the risk of cardiovascular disease among hypertensive elderly people, which may be largely related to the improvement in blood pressure levels.

### Table 2 Analysis of primary outcome indicators of subjects

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline</th>
<th>6 months after signing the contract</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean blood pressure, mm Hg, mean±SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation group (n=403)</td>
<td>143.7±11.4</td>
<td>131.6±12.0</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Control group (n=565)</td>
<td>142.1±22.1</td>
<td>132.7±18.8</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>P value</td>
<td>0.123†</td>
<td>0.023†</td>
<td></td>
</tr>
<tr>
<td>Systolic pressure, mm Hg, mean±SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation group (n=403)</td>
<td>81.5±7.2</td>
<td>74.9±7.6</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Control group (n=565)</td>
<td>80.6±9.4</td>
<td>74.8±7.0</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>P value</td>
<td>0.138†</td>
<td>0.735†</td>
<td></td>
</tr>
<tr>
<td>Rate of blood pressure control, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation group (n=403)</td>
<td>103 (25.6)</td>
<td>308 (76.4)</td>
<td>&lt;0.001‡</td>
</tr>
<tr>
<td>Control group (n=565)</td>
<td>129 (22.8)</td>
<td>256 (45.3)</td>
<td>&lt;0.001‡</td>
</tr>
<tr>
<td>P value</td>
<td>0.327§</td>
<td>&lt;0.001§</td>
<td></td>
</tr>
</tbody>
</table>

*Data comparison between baseline and 6 months after signing the contract: paired t-test.
†Comparison of data between observation group and control group: two independent sample t-test.
‡Comparison of data between baseline and 6 months after signing the contract: McNemar’s test.
§Comparison of data between observation group and control group: Pearson’s X² test.
the duty of supervisor, reminder and motivator in disease management, while the main manager is still the patients themselves, which may also be a factor in the improvement of patients’ self-management ability.

At present, there are more than 50 countries and regions implementing the family doctor system. This system has achieved remarkable results in improving the health status of the whole population, reducing the medical expenses of residents and making rational use of health resources. The family doctor system in foreign countries started early. Although it is diversified in organisation mechanism, personnel mechanism, financing mechanism and service content, it has a relatively mature operation mode and effective guarantee mechanism. In general, the contracted services of foreign family doctors have certain commonalities and characteristics in terms of system guarantees, talent guarantees, fund guarantees and doctor–patient relationships. The compulsory first visit system and the strict referral system are the institutional guarantees for family doctors to sign up for services. Moreover, in the process of signing contracts with foreign family doctors, there is a two-way choice relationship between family doctors and residents, which is the basis for establishing a good doctor–patient relationship.

Compared with foreign countries, the characteristics of the contracted services of family doctors in China are mainly reflected in the following aspects: (1) The undertaker of contract services: community health service centre with the general practitioner team as the service provider; (2) Contract service content: while promoting basic services such as basic medical treatment, public health and health management, we should develop characteristic services such as TCM physiotherapy services and personalised package services for chronic diseases to increase the attraction of grass roots health service institutions; (3) Medical consortium form of contract services: China has formed four types of medical consortia: cross-regional specialist alliances, urban medical groups, telemedicine cooperation networks and county medical communities, which are conducive to improving the service capacity and grass roots health service institutions levels and optimising the allocation of resources for health services to improve residents’ trust in grass roots health service institutions and (4) Payment forms of contract service: take the form of government financial investments, medical insurance funds, new rural cooperative medical funds and individual payments to economic incentives such as adjusting the starting line of medical expenses and the share of residents’ self-payment and copayment to encourage people to give priority to seeking help from their family doctors after they get sick and let them specify treatment plans. Moreover, in the process of signing contracts with foreign family doctors, there is a two-way choice relationship between family doctors and residents, which is the basis for establishing a good doctor–patient relationship.

### Table 3: Analysis of secondary outcome indicators of subjects

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline</th>
<th>6 months after signing the contract</th>
<th>P value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stratification of cardiovascular disease risk levels, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium risk</td>
<td>242 (60.1)</td>
<td>322 (79.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>High risk</td>
<td>150 (37.2)</td>
<td>77 (19.1)</td>
<td></td>
</tr>
<tr>
<td>Very high risk</td>
<td>11 (2.7)</td>
<td>4 (1.0)</td>
<td></td>
</tr>
<tr>
<td>Medium risk</td>
<td>316 (55.9)</td>
<td>353 (62.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Control group (n=565)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High risk</td>
<td>227 (40.2)</td>
<td>199 (35.2)</td>
<td></td>
</tr>
<tr>
<td>Very high risk</td>
<td>22 (3.9)</td>
<td>13 (2.3)</td>
<td></td>
</tr>
<tr>
<td>P value†</td>
<td>0.170</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Level of self-management ability, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low level</td>
<td>106 (26.3)</td>
<td>51 (12.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Observation group (n=403)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium level</td>
<td>262 (65.0)</td>
<td>308 (76.4)</td>
<td></td>
</tr>
<tr>
<td>High level</td>
<td>35 (8.7)</td>
<td>44 (10.9)</td>
<td></td>
</tr>
<tr>
<td>Low level</td>
<td>136 (24.1)</td>
<td>149 (26.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Control group (n=565)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium level</td>
<td>350 (61.9)</td>
<td>370 (65.5)</td>
<td></td>
</tr>
<tr>
<td>High level</td>
<td>79 (14.0)</td>
<td>46 (8.1)</td>
<td></td>
</tr>
<tr>
<td>P value†</td>
<td>0.065</td>
<td>&lt;0.001</td>
<td></td>
</tr>
</tbody>
</table>

*Comparison of data between baseline and 6 months after signing the contract: paired sample marginal homogeneity test.
†Comparison of data between observation group and control group: Mann-Whitney U test of two independent samples.
provide economic guarantees for family doctor contract services. However, at present, the cost of personalised package service is still mainly borne by residents themselves. Therefore, to improve the signing rate of personalised package services, some changes need to be made to government finance and medical insurance funds in the future to subsidise the cost of personalised package services as much as possible. In addition, compared with foreign countries, China’s relevant systems and policy support, such as community first visits and medical insurance are relatively weak. Therefore, China should take various measures and pay attention to signing and performing contracts, implementing community first visits and guiding patients to primary medical institutions.

The ‘basic package+personalised package’ family doctor contracted service model involved in our research is an innovative practice in the exploration of the family doctor contract service model in China, which has the following advantages: (1) Different contract service packages meet the personalised needs of residents, enrich the connotation of family doctor contract services and help to improve the attraction of signing services; (2) The whole population service mode is conducive to the promotion of primary prevention in chronic disease management to reduce the prevalence of chronic diseases; (3) Health management takes the form of continuity, and chronic disease patients’ quality of life and functional status are improved; (4) Form a close regional medical community with tertiary hospitals to essentially promote the establishment of a hierarchical diagnosis and treatment system of ‘first diagnosis at the grass roots level, two-way referral, the separate treatment of acute and chronic diseases and upper and lower linkage’ for patients with chronic diseases and (5) The family doctor team is composed of multidisciplinary personnel, which is conducive to improving the quality of life and treatment compliance of patients with chronic diseases.

This study also has some limitations. First, as this is not a randomised controlled trial, patients choose the contract service type based on their preferences. However, because the contract service of family doctors in China follows the principle of voluntary signing, it is difficult to carry out randomised controlled trials. Second, participants in our study were from one general community health centre in Southwest China, which might limit the generalisation of the results. Third, the observation group and the control group received their family doctor contracts services from two different family doctor teams, which may have a certain impact on the results due to the differences in the internal work mode, efficiency and personnel enthusiasm of the family doctor team. However, this study also took a series of measures such as unified training, process supervision and effect evaluation to reduce this impact. Fourth, due to the limitations of the research conditions, this study did not control the economic status of the participants, which may bias the research results. Finally, due to the limitation of research resources, this study did not carry out a cost–benefit analysis, and further research can be carried out in the future to evaluate the economic benefits of the family doctor contracted service model.

CONCLUSION
Our research shows that the ‘basic package+personalised package (hypertension)’ family doctor contract service model has a good application effect in the management of elderly hypertension, which can improve the average blood pressure, blood pressure control rate, cardiovascular disease risk level and self-management ability of elderly patients with hypertension. The results of our research can be used as a reference for countries or regions with similar social and medical backgrounds to China to establish a primary healthcare system with family doctor services as the mainstream.

Acknowledgements We would like to thank the members of the community health service centre in Chengdu, Sichuan Province for their strong support for this study.

Contributors QD, JY and KL wrote the article, this article was modified by JF, SG produced the chart for this article, and all authors read and approved the final manuscript. KL is responsible for the overall content as the guarantor.

Funding This research was supported by the key R & D project of Sichuan Province (No. 2021YS0022).

Disclaimer The financial sponsors played no role in the design, execution, analysis, interpretation of data, or writing of the study.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval All procedures performed in this study involving human participants were in accordance with the Declaration of Helsinki. Ethical approval was granted by the Institutional Review Board of West China Hospital of Sichuan University.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data may be obtained from a third party and are not publicly available. No data are available. Data are available on request from the corresponding author, and not publicly available.

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