

Original Article

Effects of family doctor contract service on blood pressure control and life quality of patients with hypertension

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Abstract: Objective: The aim of this study was to explore the effects of family doctor contract service on patients with hypertension. Methods: A total of 471 patients with hypertension were recruited. In the contract group, 252 patients received family doctor contract service. In the routine group, 219 patients received routine hypertension management service. Blood pressure and biochemical parameters, before and after intervention, were compared between the two groups, including TG, LDL-C, HDL-C, TC, life quality scores, and treatment compliance scores. Results: There were no significant differences in blood pressure before service ($P>0.050$). DBP and SBP of the contract group, after treatment, were significantly lower than those of the conventional group ($P<0.001$). DBP and SBP of the two groups, after treatment, were significantly lower than those before service ($P<0.001$). There were no significant differences in TG and TC between the two groups, before and after service ($P>0.050$). LDL-C of the contract group, after service, was lower than that of the conventional group and HDL-C was higher than that of the conventional group ($P<0.001$). TG, TC, and LDL-C of the two groups, after treatment, were significantly lower than those before service. HDL-C, after service, was higher than that before service ($P<0.001$). SF-36 scale and treatment compliance scores of the contract group were higher than those of the conventional group ($P<0.001$). Conclusion: Family doctor contract service can effectively improve blood pressure control of patients with hypertension, improving their quality of life. Therefore, it is worthy of clinical application.

Keywords: Family doctor contract service, hypertension, blood pressure control, quality of life

Introduction

Hypertension is one of the most common chronic diseases among the elderly and has become a major public health problem, worldwide [1]. Hypertension is the key to a variety of cardiovascular and cerebrovascular diseases, causing a great burden on individual patients and society as a whole [2]. Incidence of hypertension has continued to increase year by year. At present, there is a lack of effective means to completely cure hypertension. Reducing risks of hypertension-induced hypertension has become a major research focus in clinical studies [3-5]. With the deepening of research, more and more studies have proven that the treatment effects of hypertension of outpatients is not significant. Therefore, re-

search should focus on strengthening the concept of disease prevention among community populations and the development of family doctor activities [6].

Family doctor contract service is a new concept that has been gradually applied into community service in recent years [7]. Establishing stable, mutual trust, and contractual service relationships between doctors and patients, patients are provided with active, continuous, comprehensive, and personalized health management. Establishment of basic first-time diagnosis and two-way referral mechanisms can make rational use of medical resources and improve the management efficiency of chronic diseases. This not only meets the needs of public health management, but also improves trust and

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health levels of residents [8-10]. Many studies have proven that application of contracted services makes a significant difference in community service.

Materials and methods

Normal information

Randomized clinical trial analysis was performed on patients with hypertension in the community of family doctors. A total of 471 subjects were studied. Of these, 252 patients receiving family doctor contract service formed the contract group. The other 219 patients receiving family doctor routine hypertension management service formed the routine group. This experiment was approved by the Ethics Committee and all subjects provided informed consent.

Inclusion and exclusion criteria

Inclusion criteria: Permanent residents of the jurisdiction; Aged from 40 to 70; Met diagnostic criteria for hypertension [11], including systolic blood pressure (SBP) ≥ 140 mmHg or diastolic blood pressure (DBP) ≥ 90 mmHg, without the use of antihypertensive drugs; Diagnosed as primary hypertension before implementation of family doctor services. Exclusion criteria: Patients with severe cardiovascular and cerebrovascular diseases; Patients with severe liver and kidney dysfunction; Patients unable to take care of themselves; Patients with mental illness; Patients with poor treatment compliance.

Methods

3monthly visits with an occupational therapist. They engaged in manual activities, games, and relaxation sessions, as well as physiotherapy follow up sessions, including aerobic activities. The service plan of the contract group included: 1) Establishment of health archives for patients in the jurisdiction: Basic information of patients and blood pressure and biochemical indexes were recorded for the last three months; 2) Household health guidance: One person was confirmed as the main contact person in the family of the patient within the jurisdiction. This person communicates and cooperates with the doctor in a timely manner, guiding patients toward the accumulation of hypertension health knowledge and disease treatment ability; 3) Follow-up survey: Face-to-face follow-up

surveys were conducted at least once a quarter. Surveys included blood pressure, blood sugar levels, living habits, and psychological changes. Patients were asked to have a complete routine examination every six months, including liver and kidney function, electrocardiogram, stool routine, and urination routine; 4) Intervention measures: According to patient data, patients were guided to live regularly, persuading patients to quit smoking and drinking and encouraging them to eat light, low-fat, and high-protein food, as well as doing simple exercises. Family members are taught to correctly use the electronic sphygmomanometer, measuring blood pressure for the patients every day. Attention is paid to blood pressure changes, notifying the service doctor or nurse immediately if there is any fluctuation. Patients in both groups were offered family doctor services for a period of one year.

Outcome measurements

Blood pressure, before and after intervention, in the two groups of patients was measured, including diastolic blood pressure and systolic blood pressure. Biochemical indexes, before and after intervention, included triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and total cholesterol (TC).

SF-36 scale was used for quality of life evaluations [13], with a full score of 100. Higher scores indicate better quality of life. Regarding treatment compliance, an anonymous questionnaire survey was conducted, investigating the attitudes and knowledge of patients concerning prevention and treatment of hypertension. The full score was 8 points, with higher scores indicating higher treatment compliance.

Statistical methods

Data were analyzed and processed using SPSS 24.0 statistical software. Count data, such as patient gender, are expressed in the form of rates. Comparisons between groups were performed by Chi-squared tests, while intragroup before and after comparisons utilized pairwise t-tests. For between-group comparisons, independent t-tests were used. Measurement data, such as blood pressure, are expressed in the form of mean \pm standard deviation. When

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Table 1. Comparison of clinical data between the two groups of patients [n (%)]

	Contract group (n=252)	Routine group (n=219)	t or X ²	P
Age	51.63±8.65	52.77±9.07	1.395	0.164
Height (cm)	164.25±11.24	165.24±10.86	0.969	0.333
Weight (KG)	76.82±8.79	78.26±8.22	1.827	0.068
Time of illness (moth)	3.84±1.86	4.05±1.68	1.278	0.202
Diastolic blood pressure (mmHg)	101.67±11.52	102.86±10.63	1.159	0.247
Systolic pressure (mmHg)	152.73±14.69	151.86±15.07	0.633	0.527
TG (mmol/L)	1.52±0.24	1.53±0.32	0.387	0.699
TC (mmol/L)	5.12±0.84	5.10±0.91	0.248	0.804
LDL-C (mmol/L)	3.92±0.89	3.87±0.95	0.589	0.556
HDL-C (mmol/L)	0.84±0.15	0.82±0.17	1.356	0.176
Gender			1.013	0.314
Male	145 (57.54)	136 (62.10)		
Female	107 (42.46)	82 (37.90)		
Smoking			0.361	0.548
Yes	159 (63.10)	144 (65.75)		
No	93 (36.90)	75 (34.25)		
Drinking			0.239	0.625
Yes	114 (45.24)	104 (47.49)		
No	138 (54.76)	115 (52.51)		
Movement			1.613	0.204
Yes	53 (21.03)	36 (16.44)		
No	199 (78.97)	183 (83.56)		

P<0.050, differences are considered statistically significant.

Results

Comparison of clinical data

Clinical data of the two groups were compared. No significant differences were found in age, height, weight, duration of disease, diastolic blood pressure, systolic blood pressure, TG, TC, LDL-C, HDL-C, gender, smoking, drinking, and exercise habits between the two groups (P>0.050, **Table 1**), indicating that the two groups were comparable.

Comparison of blood pressure

There were no significant differences in blood pressure between the two groups before service (P>0.050). The contract group had a diastolic pressure of (84.97±10.84) mmHg after service, significantly lower than the diastolic pressure (95.26±9.15) mmHg of the routine group after service (P<0.001). The contra-

ct group had a systolic pressure of (124.86±11.54) mmHg after the service, also significantly lower than the systolic pressure (136.83±10.57) mmHg of the routine group after service (P<0.001). Diastolic and systolic blood pressures of the two groups were significantly lower than those before service (P<0.001, **Figure 1** and **2**).

Comparison of biochemical indexes

There were no significant differences in biochemical parameters between the two groups before service (P>0.050). TG and TC levels of the contract group, after service, were (0.98±0.24) mmol/L and (3.94±0.26) mmol/L, respectively. These were not significantly different from TG and TC levels after routine group service (P>0.050). LDL-C of the contract group, after service, was (2.42±0.41) mmol/L, significantly lower than that of the routine group (2.83±0.32 mmol/L) after service (P<0.001). HDL-C of the contract group, after service, was (1.39±0.16) mmol/L, significantly higher than that of the routine group (1.13±0.20 mmol/L)

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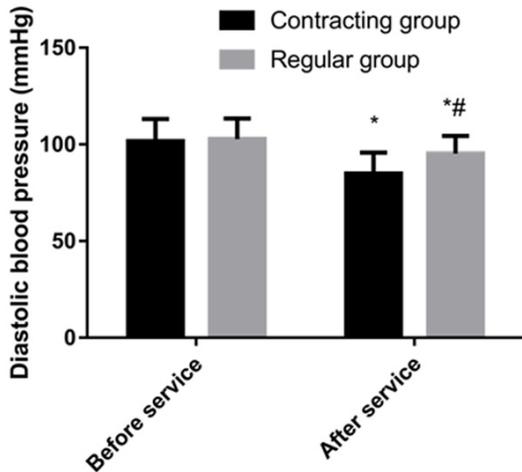


Figure 1. Changes in diastolic blood pressure, before and after service, in both groups. * indicates $P < 0.001$, compared with diastolic blood pressure of the same group before service; # indicates $P < 0.001$, compared with the diastolic blood pressure after the contract group service.

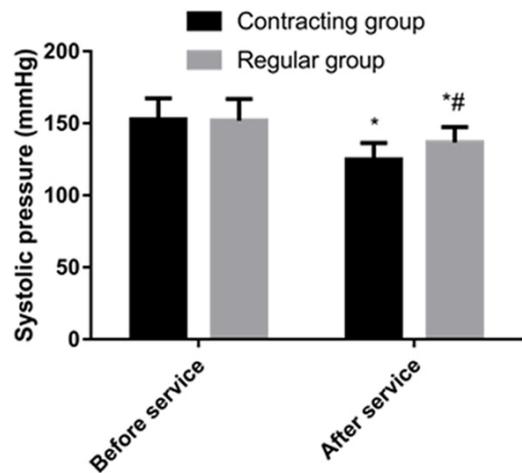


Figure 2. Changes in systolic blood pressure of the two groups of patients before and after service. * indicates $P < 0.001$, compared with systolic blood pressure before service. # indicates $P < 0.001$, compared with systolic blood pressure of the contract group after service.

after service ($P < 0.001$). TG, TC, and LDL-C levels of the two groups were significantly lower than those before service and HDL-C was significantly higher than that before service ($P < 0.001$, Figures 3-6).

Comparison of life quality scores

The contract group showed an SF-36 score of (81.24 ± 6.87), significantly higher than that of

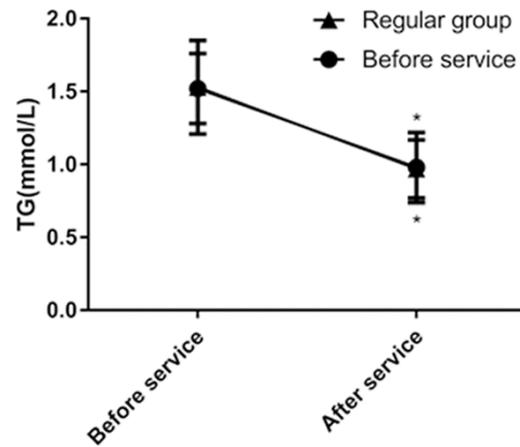


Figure 3. TG changes in both groups of patients before and after service. * indicates a comparison with pre-service TG of the same group, $P < 0.001$.

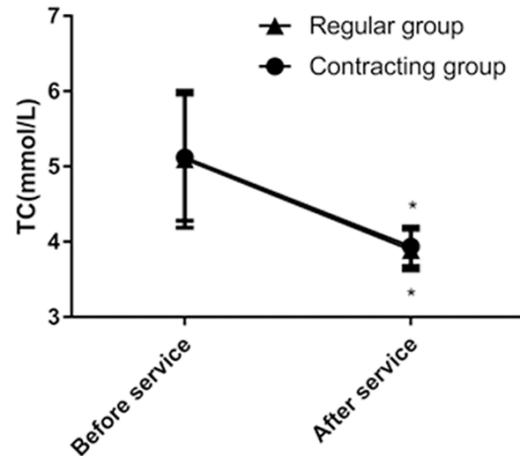


Figure 4. Changes in TC of the two groups of patients before and after service. * indicates $P < 0.001$, compared with TC of the same group after service.

the routine group (65.14 ± 7.99 , $P < 0.001$, Figure 7).

Comparison of treatment compliance scores

The contract group showed a treatment compliance score of (6.54 ± 0.86), significantly higher than that of the routine group (4.72 ± 1.24 , $P < 0.001$, Figure 8).

Discussion

Hypertension is a very common cardiovascular chronic disease. It has become an important topic in worldwide clinical research. With increasing risks of hypertension in recent years,

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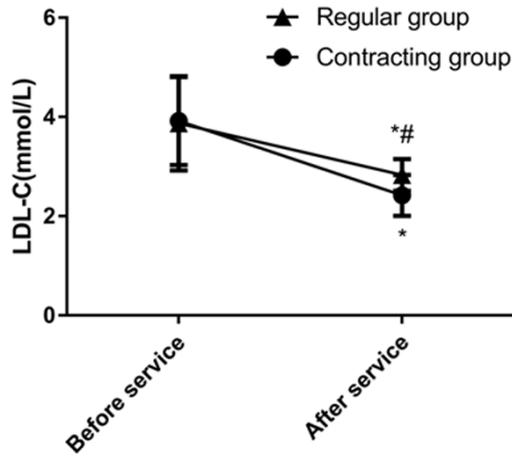


Figure 5. LDL-C in both groups changes before and after service. * indicates $P < 0.001$, compared with LDL-C of the same group before service; # indicates $P < 0.001$, compared with LDL-C of the contract group after service.

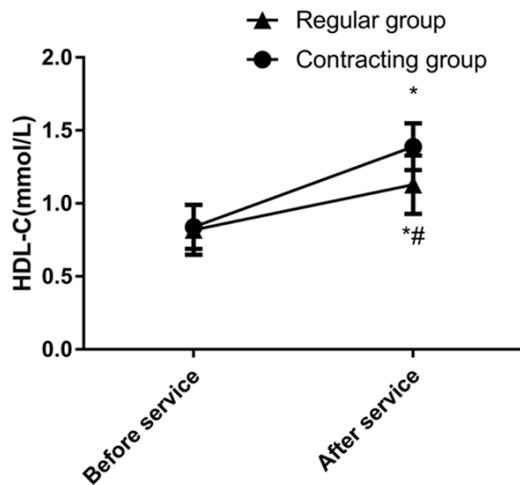


Figure 6. HDL-C changes in both groups of patients before and after service. * indicates $P < 0.001$, compared with HDL-C of the same group before service; # indicates $P < 0.001$, compared with HDL-C of the contract group after service.

effective control of hypertension is even more important [14]. Hypertension is often accompanied by a variety of complications, posing a great threat to the heart, brain, blood vessels, liver, kidneys, and other important organs [11]. Moreover, hypertension usually has a long course and there is no complete cure method. Long-term standard blood pressure lowering therapy has been commonly used in clinical practice, achieving the goal of maintaining

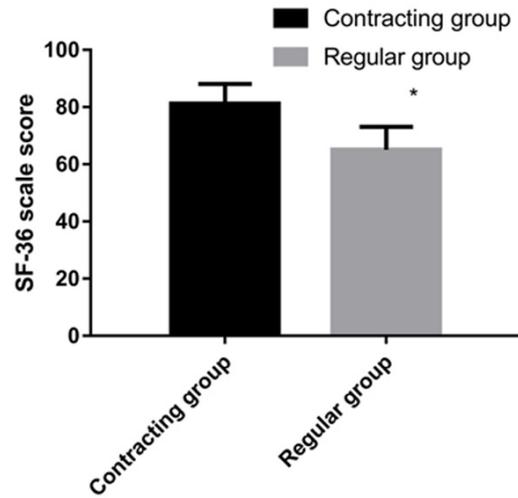


Figure 7. Comparison of life quality scores between the two groups. * indicates $P < 0.001$, compared with SF-36 scale scores of the contract group.

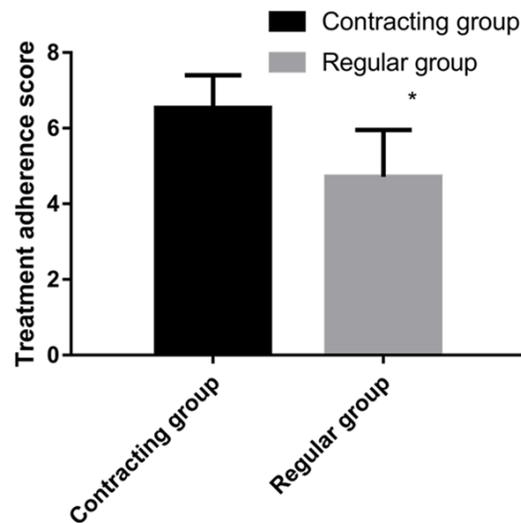


Figure 8. Comparison of treatment adherence scores between the two groups. * indicates $P < 0.001$, compared with treatment compliance score of the contract group.

patient blood pressure balance [15, 16]. However, the long treatment cycle not only places a great psychological burden on patients, but also has a great impact on patient families [17]. Therefore, patients usually choose home and out-of-hospital treatments after diagnosis of hypertension. However, due to a lack of effective supervision and accurate management mechanisms, the situation of blood pressure control is not optimistic. There is a great

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possibility that conditions may worsen [18, 19]. Therefore, how to improve the effects of out-of-hospital treatment for blood pressure patients, helping them to control blood pressure, has become a hot spot in clinical practice.

Family doctor contract service is a new medical service mode of community medical service. Its main service body is the village doctor of the community hospital from a basic service organization. It is supported by medical units at the county level and above, serving contract patients. Village doctors in community hospitals of basic health services organizations regularly visit and improve patient health files, timely solve general problems, transfer difficult problems to superior support hospitals, and provide first treatment and referral service [20]. The purpose is to use the community as a carrier and patients as target, providing timely, reasonable, accurate, and effective health services. At present, it has been popularized and applied in some densely populated areas, achieving relatively significant application results [21, 22]. The need for accurate, standardized, and timely blood pressure control guidance is the key to treatment of hypertension outside the hospital. Therefore, contracted services are even more prominent when applied to patients with hypertension in the community. Comparing differences between routine blood pressure control community services and contracted services for patients with hypertension in the community, this study aimed to prove the value of family doctor contract service in the treatment of patients with hypertension outside of hospitals.

Results showed that the contract group, using family doctor contract service, had significantly better blood pressure, after service, than the routine group using conventional blood pressure control services. This suggests that contracted services are more effective in improving blood pressure control in hypertensive patients. It has been speculated that the causes of hypertension may be an improper diet, lack of exercise, incorrect medication, and mental stress, especially when patients with hypertension are treated outside the hospital [23]. Due to a lack of disease knowledge, patients cannot avoid the impact of these risk factors in life, making it more difficult to control blood pressure. With family doctor contract service, patients can get timely knowledge about the disease and accurate rehabilitation

guidance. Patients need to strictly follow the plan formulated by doctors. Family member communication can effectively supervise recovering patients. Hypertension knowledge and self-care awareness will be effectively improved, greatly increasing the effectiveness of blood pressure control. These results are in accord with the research results of Fung et al. [24]. Comparing blood lipid function of the two groups of patients, there were no significant differences in TG and TC. LDL-C levels of the contract group were lower than those of the routine group, after service. HDL-C levels were higher than those of the routine group, possibly due to fewer subjects and shorter investigation times. Hypertension is one of the leading causes of cardiovascular disease. Comparing biochemical indicators between the two groups, results suggest that application of family doctor contract service can effectively improve the blood lipid function of patients. The same was true for Nicolucci et al. [25] in their study of contracted services in the community of diabetes patients. Comparing treatment adherence scores and quality of life scores of the two groups, the contract group was superior to the routine group. Results suggest that family doctor contract service can greatly improve patient treatment compliance and patient quality of life. It has been speculated that the reason for contracted service was to change traditional doctor consultation mode to door-to-door consultations, which is deeper into the patient group than traditional diagnosis and treatment modes. Since the relationship between patients and doctors is closer, patient trust towards doctors is obviously increased. Thus, they are more willing to cooperate with the medical staff's treatment arrangement. Patient treatment compliance also increases, greatly improving the effectiveness of the treatment and quality of life.

The current study compared the value of family doctor contract service with traditional blood pressure control services in patients with hypertension in the community. There were some deficiencies due to limited experimental conditions. For example, the number of subjects was small, follow-up times were short, and the classification of patients was not fine enough. There may have been differences in blood pressure control between low-risk, intermediate-risk, and high-risk patients. The survey on life quality and treatment compliance was

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based on self-assessment of patients, lacking certain objectivity. Longer-term follow-up surveys of the subjects of this study will be conducted, continuously improving and perfecting experiments to obtain the best experimental results.

In summary, family doctor contract service can effectively improve blood pressure control of patients with hypertension in the community, improving quality of life. Therefore, it is worthy of promotion in clinical practice.

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Disclosure of conflict of interest

None.

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References

- [1] Iadecola C, Yaffe K, Biller J, Bratzke LC, Faraci FM, Gorelick PB, Gulati M, Kamel H, Knopman DS, Launer LJ, Sacczynski JS, Seshadri S, Zeki Al Hazzouri A; American Heart Association Council on Hypertension; Council on Clinical Cardiology; Council on Cardiovascular Disease in the Young; Council on Cardiovascular and Stroke Nursing; Council on Quality of Care and Outcomes Research; Stroke Council. Impact of hypertension on cognitive function: a scientific statement from the American Heart Association. *Hypertension* 2016; 68: e67-e94.
- [2] Hajjar I, Goldstein FC, Martin GS and Quyyumi AA. Roles of arterial stiffness and blood pressure in hypertension-associated cognitive decline in healthy adults. *Hypertension* 2016; 67: 171-175.
- [3] MacIsaac RL, Salatzki J, Higgins P, Walters MR, Padmanabhan S, Dominiczak AF, Touyz RM and Dawson J. Allopurinol and cardiovascular outcomes in adults with hypertension. *Hypertension* 2016; 67: 535-540.
- [4] Leung AA, Nerenberg K, Daskalopoulou SS, McBrien K, Zarnke KB, Dasgupta K, Cloutier L, Gelfer M, Lamarre-Cliche M, Milot A, Bolli P, Tremblay G, McLean D, Tobe SW, Ruzicka M, Burns KD, Vallee M, Prasad GV, Lebel M, Feldman RD, Selby P, Pipe A, Schiffrin EL, McFarlane PA, Oh P, Hegele RA, Khara M, Wilson TW, Penner SB, Burgess E, Herman RJ, Bacon SL, Rabkin SW, Gilbert RE, Campbell TS, Grover S, Honos G, Lindsay P, Hill MD, Coutts SB, Gubitza G, Campbell NR, Moe GW, Howlett JG, Boulanger JM, Prebtani A, Laroche P, Leiter LA, Jones C, Ogilvie RI, Woo V, Kaczorowski J, Trudeau L, Petrella RJ, Hiremath S, Drouin D, Lavoie KL, Hamet P, Fodor G, Gregoire JC, Lewanczuk R, Dresser GK, Sharma M, Reid D, Lear SA, Moullec G, Gupta M, Magee LA, Logan AG, Harris KC, Dionne J, Fournier A, Benoit G, Feber J, Poirier L, Padwal RS, Rabi DM; CHEP Guidelines Task Force. Hypertension Canada's 2016 Canadian Hypertension education program guidelines for blood pressure measurement, diagnosis, assessment of risk, prevention, and treatment of hypertension. *Can J Cardiol* 2016; 32: 569-588.
- [5] Guzik TJ and Touyz RM. Oxidative stress, inflammation, and vascular aging in hypertension. *Hypertension* 2017; 70: 660-667.
- [6] Lurbe E, Agabiti-Rosei E, Cruickshank JK, Dominiczak A, Erdine S, Hirth A, Invitti C, Litwin M, Mancia G, Pall D, Rascher W, Redon J, Schaefer F, Seeman T, Sinha M, Stabouli S, Webb NJ, Wuhl E and Zanchetti A. 2016 European Society of Hypertension guidelines for the management of high blood pressure in children and adolescents. *J Hypertens* 2016; 34: 1887-1920.
- [7] Lizio M, Deviatiiarov R, Nagai H, Galan L, Arner E, Itoh M, Lassmann T, Kasukawa T, Hasegawa A, Ros MA, Hayashizaki Y, Carninci P, Forrest ARR, Kawaji H, Gusev O and Sheng G. Systematic analysis of transcription start sites in avian development. *PLoS Biol* 2017; 15: e2002887.
- [8] Deng S, Yang N, Li S, Wang W, Yan H and Li H. Doctors' job satisfaction and its relationships with doctor-patient relationship and work-family conflict in china: a structural equation modeling. *Inquiry* 2018; 55: 46958018790831.
- [9] Ong JB, Chen MI, Cook AR, Lee HC, Lee VJ, Lin RT, Tambyah PA and Goh LG. Real-time epidemic monitoring and forecasting of H1N1-2009 using influenza-like illness from general practice and family doctor clinics in Singapore. *PLoS One* 2010; 5: e10036.
- [10] Chopei IV, Rosul MM, Hechko MM, Chubirko KI, Korabel'shchikova MO and Ivan'o NV. [Cardiovascular continuum: the role of the family doctor in prevention of cardiovascular diseases]. *Wiad Lek* 2014; 67: 243-247.
- [11] Gabb GM, Mangoni AA, Anderson CS, Cowley D, Dowden JS, Gollidge J, Hankey GJ, Howes FS, Leckie L, Perkovic V, Schlaich M, Zwar NA, Medley TL and Arnolda L. Guideline for the di-

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- agnosis and management of hypertension in adults - 2016. *Med J Aust* 2016; 205: 85-89.
- [12] Xie X, Atkins E, Lv J, Bennett A, Neal B, Ninomiya T, Woodward M, MacMahon S, Turnbull F, Hillis GS, Chalmers J, Mant J, Salam A, Rahimi K, Perkovic V and Rodgers A. Effects of intensive blood pressure lowering on cardiovascular and renal outcomes: updated systematic review and meta-analysis. *Lancet* 2016; 387: 435-443.
- [13] Lins L and Carvalho FM. SF-36 total score as a single measure of health-related quality of life: scoping review. *SAGE Open Med* 2016; 4: 2050312116671725.
- [14] Padwal RS, Bienek A, McAlister FA, Campbell NR; Outcomes Research Task Force of the Canadian Hypertension Education Program. Epidemiology of hypertension in Canada: an update. *Can J Cardiol* 2016; 32: 687-694.
- [15] Kansagara D, Wilt TJ, Frost J and Qaseem A. Pharmacologic treatment of hypertension in adults aged 60 years or older. *Ann Intern Med* 2017; 167: 291-292.
- [16] Li W, Gu H, Teo KK, Bo J, Wang Y, Yang J, Wang X, Zhang H, Sun Y, Jia X, He X, Zhao X, Cheng X, Li J, Rangarajan S, Chen C, Yusuf S, Liu L; PURE China Investigators. Hypertension prevalence, awareness, treatment, and control in 115 rural and urban communities involving 47 000 people from China. *J Hypertens* 2016; 34: 39-46.
- [17] Marques FZ, Nelson E, Chu PY, Horlock D, Fiedler A, Ziemann M, Tan JK, Kuruppu S, Rajapakse NW, El-Osta A, Mackay CR and Kaye DM. High-Fiber diet and acetate supplementation change the gut microbiota and prevent the development of hypertension and heart failure in hypertensive mice. *Circulation* 2017; 135: 964-977.
- [18] Yoon SS, Carroll MD and Fryar CD. Hypertension prevalence and control among adults: United States, 2011-2014. *NCHS Data Brief* 2015; 1-8.
- [19] Zhou H, Zhang W, Zhang S, Wang F, Zhong Y, Gu L, Qu Z, Liang X, Sa Z, Wang X and Tian D. Health providers' perspectives on delivering public health services under the contract service policy in rural China: evidence from Xinjian County. *BMC Health Serv Res* 2015; 15: 75.
- [20] Zhou H, Zhang S, Zhang W, Wang F, Zhong Y, Gu L, Qu Z and Tian D. Evaluation and mechanism for outcomes exploration of providing public health care in contract service in rural China: a multiple-case study with complex adaptive systems design. *BMC Public Health* 2015; 15: 199.
- [21] Han JW and Han S. Type of chemotherapy-induced peripheral neuropathy, influencing factors, and functional status. *Iran J Public Health* 2015; 44: 1701-1703.
- [22] Yin D, Wong ST, Chen W, Xin Q, Wang L, Cui M, Yin T, Li R, Zheng X, Yang H, Yu J, Chen B and Yang W. A model to estimate the cost of the national essential public health services package in Beijing, China. *BMC Health Serv Res* 2015; 15: 222.
- [23] McEvoy JW, Chen Y, Rawlings A, Hoogeveen RC, Ballantyne CM, Blumenthal RS, Coresh J and Selvin E. Diastolic blood pressure, subclinical myocardial damage, and cardiac events: Implications for blood pressure control. *J Am Coll Cardiol* 2016; 68: 1713-1722.
- [24] Fung CS, Wong CK, Fong DY, Lee A and Lam CL. Having a family doctor was associated with lower utilization of hospital-based health services. *BMC Health Serv Res* 2015; 15: 42.
- [25] Nicolucci A, Cercone S, Chiriatti A, Muscas F and Gensini G. A randomized trial on home telemonitoring for the management of metabolic and cardiovascular risk in patients with Type 2 Diabetes. *Diabetes Technol Ther* 2015; 17: 563-570.