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Improving the Blood Pressure Control With the ProActive Attitude of Hypertensive Patients Seeking Follow-up Services

Evidence From China

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Abstract: Proactive attitude of hypertensive patients seeking follow-up services (FUS) lies at the core of self-efficacy. However, few evidence have shown the activeness of seeking FUS in the context of blood pressure control among hypertensive patients. Improvements in follow-up visits may not just by services itself cause better control of blood pressure among hypertensive patients, rather due to the patient's pro-active attitude of the patient in seeking FUS.

A cross-sectional study was carried out in selected rural regions of China to explore the association between blood pressure control and sociodemographic and economic variables and activeness of hypertensive patients in seeking FUS. The primary clinical outcome for this study was blood pressure control (systolic blood pressure <140 mmHg or diastolic blood pressure <90 mmHg)

Out of the total 2321 participants with hypertension aged 35 years or older participated in this survey. Number of proactive FUS seekers were 3.17 times greater than those of passive seekers (odds ratio [OR] = 3.17, 95% confidence interval [CI] = 2.56–3.93, $P < 0.001$). In all subgroups, hypertensive patients who were seeking FUS actively were more likely to control blood pressure better than those seeking FUS passively.

Proactive attitude of seeking follow-up services can improve blood pressure control among hypertensive patients.

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Abbreviations: CI = Confidence Interval, FUS = follow up services, HDI = Human Development Index, OR = Odds Ratio, QR = quantile regression, RMB = Ren Min Bi.

INTRODUCTION

Hypertension is the major contributing risk factor for kidney disease,^{1,2} stroke,³ preterm birth,⁴ heart failure,⁵

and cardiovascular diseases.^{6,7} It is also the most important preventable part cause of mortality^{8,9} and morbidity.¹⁰ A successful blood pressure control has a paramount role in the improvement of cardiovascular outcomes,¹¹ and the reduction of mortality and morbidity rates.¹² Therefore, blood pressure control is regarded as an important indicator to assess the effect of health services.¹³ Although mortality and disability from cardiovascular disease decrease with treating hypertension, most of them remain inadequately controlled. As previous study reported, there are 1 billion hypertensive patients worldwide in 2011 and it results in 4 million deaths each year.¹⁴ Especially, the population residing in developing countries or regions are affected greatly.¹⁵ Over 80% of hypertension's attributable disease burden occurs in middle-income and low-income countries.¹⁶

The prevalence of hypertension in China, a developing and middle-income country, significantly increased in last decade.¹⁷ In 2009, the Chinese government launched the New Health Care System Reform and promised that primary health services will cover management services for chronic disease patients. Following the new Health Care System Reform, Hypertension control was included in the basic public health services provided for Chinese residents. The National Basic Public Health Service Standards updated in 2011, and it gave emphasis on the primary health care institutions in responding the hypertensive patients screening, and management and follow-up visit free of cost. The follow-up services (FUS), as continuing management provided for residents who were diagnosed with hypertension, mainly include a review of patient's health status in terms of having symptoms under control through physical examination, blood pressure measurement, instructions for medication, and health-related behaviors as well as disease prevention knowledge.¹⁸ Simultaneously, the impact of FUS on effective management of noncommunicable diseases was confirmed by other studies in China^{17,19} and Mozambique.²⁰

In this study, we hypothesize that improvements in blood pressure control were not only caused by follow-up service itself, but by the hypertensive patient's attitude in seeking FUS. Activeness is an important element of self-efficacy, which is known as one of the most important components of social cognitive theory. Self-efficacy refers to the motivation of individuals to carry out specific task with the purpose of producing a desired outcome, which may lead to the improvements in health-related behaviors and medication compliance.²¹ Although self-efficacy had significant improvements in indices of health status, as confirmed 10 years before,²² limited studies have shown the evidence in activeness of seeking FUS related to blood pressure control. The main purpose of this study is to examine the association between the activeness of hypertensive patients seeking FUS and their blood pressure control.

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METHODS

Study Design and Participants

The cross-sectional survey was carried out between July 2011 and March 2014. Stratified multiple-stage sampling across 5 levels including province/municipality, county, township, village, and participants was conducted in rural China.²³ First, all of the 31 provinces or municipalities in China were divided into 2 groups based on the Human Development Index (HDI) average level (0.693) in the China HDI report 2010²⁴ and 2013,²⁵ and 4 provinces were randomly selected from each group. Zhejiang, Inner Mongolia, Hubei, and Shanxi provinces were selected as group I whose HDI score was >0.693. Chongqing, Henan, Xinjiang, and Qinghai provinces were selected as group II. Second, all counties from these 8 provinces were divided into 2 parts based on their regional economic status, and 1 county was randomly chosen from each part in rural areas (ie, $8 \times 2 = 16$ counties). Third, 1 township was randomly selected from each of the 3 groups that were divided by the township economic status again, and 48 townships were included. Fourth, 1 village was randomly selected from each of the 3 subgroups, which were divided classified by the distance between villages and township hospital, and 144 villages were included. Finally, 20 participants with hypertension who had registered for resident health records were randomly selected from each of the 144 villages. A total of 559 chronic patients were excluded because of missing or implausible data. Finally, a total of 2231 participants were involved in the study.

Trained medical students from Tongji medical college, Huazhong University of Science and Technology, were responsible for interviewing participants. And the information mainly included sociodemographic characteristics and the conditions in FUS utilization were collected via face-to-face interview before the health examination. Every interview took about 15 to 20 minutes.

Assessment of Blood Pressure and Activeness in Seeking FUS among Hypertensive Patients

Blood pressure was measured on the spot by the trained doctors (from village clinics or township hospitals) under the direction of Chinese Guideline of Hypertension Management. The primary clinic outcome from this study was blood pressure control (systolic blood pressure <140 mmHg or diastolic blood pressure <90 mmHg for individual was defined as normal, "normal" group hereafter).^{26–30} Otherwise, it was considered as abnormal ("abnormal" group hereafter).

The variable of activeness in seeking follow-up service was a binary variable and was measured by the actual use of FUS by an individual patient. It is quite similar to our previous study.²³ Patients were considered as proactive in seeking follow-up service if they went to village clinics or township hospitals voluntarily and without any reminder ("proactive group" hereafter). However, if they sought follow-up after reminders from doctors, or a door-to-door service provided by doctors (from village clinics or township hospitals), then they were coded as passive in seeking follow-up service ("passive group" hereafter).

Other Variables and Covariates

Sociodemographic characteristics and economic status were included in the analysis and have been shown to be important contributors to health behaviors among chronic

patients. The variables were: sociodemographic and economic characteristics including age (<60, 60–70, >70), sex, educational level (un schooled, <7 years, 7–9 years, >9 years), occupation (farmer or herdsman, self-employed or migrant worker, retired or unemployed), number of people in the household (<5, 5–6, >6), annual disposable household income level (<RMB 10 000, RMB10,000- RMB 29 999, RMB30 000 and above), self-reported household income level (low, middle, high); accessibility of health care services included time (<10, 10–20, >20 minutes) and distance (<1, 1–2, >2 km) to reach the nearest medical institution.

Statistical Analysis

The 10 variables were summarized using descriptive statistics, and then χ^2 tests were used to compare the covariates of interest between normal and abnormal groups and to explore the significant differences in variables for regression further. Binary logistic regression analysis was implemented to examine the probability of hypertensive patients in blood pressure control. The dependent variable indicated whether the patient's health status was normal or not. And the independent variables included activeness in seeking FUS, sociodemographic characteristics, and economic status. Moreover, the homogeneity of the interaction between the group assignment rate and the normal health status rates across the subgroups was estimated with the application of the Cochran-Mantel-Haenszel test.¹⁸ Within every subgroup, the rates of normal health status in the 2 activeness groups were compared by means of χ^2 tests.

All the cross-sectional data were coded and then double entered by 2 members of research team through EpiData 3.1. Statistical analysis was performed using SPSS 13.0 (SPSS Inc, Chicago, IL) with 2-sided, and the statistical significance test level was set at 0.05.

Ethics Statement

Information collected through this study was confidential and anonymous. Ethical approval for this study was granted by Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology (IORG No: IORG0003571). Written consent form was obtained from all participants before interview and was clarified that participating in the study was fully voluntary.

RESULTS

Sample Characteristics and Differences in Blood Pressure Control

In this study, more than half of these 2321 chronic disease patients were elderly with the mean age of 62.2 years (ranged from 35 to 93). As shown in Table 1, most respondents were farmers or herders (79.36%), and half of them were the un schooled, which reach consensus on our previous study that shown the lower literacy ability in rural China. In terms of accessibility of health care services, most of the participants live quite close to the health facility (village clinic or township hospital) with <1-km radius or 10-minute driving or walking distance; it showed that with efforts of Chinese government, the current distance accessibility of health care services in rural China was better than before. Besides, with the appearance of basic public services in 2009, more and more chronic patients focused on their health management. In this survey, 61.53% of survey participants were proactive to seek FUS.

TABLE 1. Univariate Analyses Examining Factors Associated With Blood Pressure Control Among Patients With Chronic Diseases in Rural China

Characteristics	In Total (n = 2321)	Percentage (%)	Whose Blood Pressure Is Abnormal		Whose Blood Pressure Is Normal		χ^2	P
			N	%	N	%		
Sociodemographic characteristics								
Age, y							34.10	<0.001
<60	971	41.84	735	45.17	236	34.00		
60–70	735	31.67	511	31.41	224	32.28		
>70	615	26.50	381	23.42	234	33.72		
Sex							1.01	0.315
Male	1050	45.24	725	44.56	325	46.83		
Female	1271	54.76	902	55.44	369	53.17		
Education level							2.16	0.541
Unschooling	1181	50.88	820	50.40	361	52.02		
<7 years	743	32.01	532	32.70	211	30.40		
7–9 years' study	299	12.88	211	12.97	88	12.68		
>9 years' study	98	4.22	64	4.93	34	4.90		
Occupation							9.62	0.008
Farmer or herdsman	1842	79.36	1318	81.00	524	75.50		
Self-employed or migrant worker	153	6.59	95	5.85	58	8.36		
Retired or non-work	326	14.05	214	13.15	112	16.14		
Number of household							12.89	0.002
<5	1102	47.48	754	46.34	348	50.14		
5–6	1002	43.17	737	45.30	265	38.19		
>6	217	9.35	136	8.36	81	11.67		
Accessibility of healthcare services								
Distance to reach medical institutions, km							4.51	0.105
<1	1753	75.53	1219	74.92	534	76.94		
1–2	273	11.76	186	11.43	87	12.54		
>2	295	12.71	222	13.65	73	10.52		
Time required to reach nearest medical institutions, min							2.06	0.357
<10	2098	90.39	1480	90.96	618	89.05		
10–20	165	7.11	109	6.70	56	8.07		
>20	58	2.50	38	2.34	20	2.88		
Economic status								
Annual disposable household income							13.51	0.001
¥¥<CNY 10,000	824	35.50	616	37.86	208	29.97		
¥¥CNY10,000- CNY 29,999	720	31.02	491	30.18	229	33.00		
¥¥CNY30,000 and above	777	33.48	520	31.96	257	37.03		
Self-assessment of household income level							8.09	0.018
Low	804	34.64	571	35.10	233	33.57		
Middle	1077	46.40	772	47.45	305	43.95		
High	440	18.96	284	17.45	156	22.48		
Activeness of seeking follow-up services							140.09	<0.001
Passive	893	38.47	753	46.28	140	20.17		
Active	1428	61.53	874	53.72	554	79.83		

Of the total participants, about 70.1% (1627/2321) of them had abnormal blood pressure after the measuring. Age, occupation, number of household, economic status, and activeness of seeking FUS were significantly different between abnormal and

normal groups. Compared with these 2 groups, patients in normal group of health status seemed more likely to be proactive FUS seekers, and this difference was statistically significant (see Table 1).

TABLE 2. Multivariable Analyses Examining Factors Associated With Blood Pressure Control Among Patients With Chronic Diseases in Rural China

Characteristics	Reference	B	P	OR	95% CI	
					Lower	Upper
Age, y	<60					
60–70		0.28	0.018	1.32	1.05	1.66
>70		0.49	0.000	1.63	1.28	2.08
Sex	Male					
Female		–0.08	0.422	0.92	0.76	1.12
Education level	Unschooling					
<7 years		–0.03	0.768	0.97	0.77	1.21
7–9 years' study		–0.06	0.726	0.95	0.69	1.29
>9 years' study		0.28	0.258	1.32	0.82	2.15
Occupation	Farmer or herdsman					
Self-employed or migrant worker		0.52	0.005	1.69	1.17	2.44
Retired or non-work		0.11	0.414	1.12	0.85	1.47
Number of household	<5					
5–6		–0.18	0.077	0.83	0.68	1.02
>6		0.23	0.163	1.26	0.91	1.74
Distance to reach medical institutions, km	<1					
1–2		–0.13	0.388	0.88	0.66	1.18
>2		–0.31	0.044	0.73	0.54	0.99
Time required to reach medical institutions, min	<10					
10–20		0.21	0.243	1.24	0.87	1.76
>20		0.49	0.108	1.63	0.90	2.94
Annual disposable household income	<CNY 10,000					
CNY10,000- CNY 29,999		0.29	0.032	1.34	1.02	1.74
CNY30,000 and above		0.32	0.019	1.37	1.05	1.78
Self-assessment of household income level	Low					
Middle		–0.18	0.148	0.84	0.66	1.06
High		–0.04	0.798	0.96	0.71	1.31
Activeness of seeking FUS	Passive					
Active		1.15	0.000	3.17	2.56	3.93

CI = confidence interval, FUS = follow-up services.

Association Between Activeness in Seeking FUS and Blood Pressure Control

Differences were discovered in the 6 variables above, and then binary logistic regression model was performed to seek the relationship between independent variables and blood pressure control. As shown in Table 2, the most noteworthy was that the odds of proactive FUS seeker were 3.17 times greater than passive seekers (odds ratio = 3.17, 95% confidence interval = 2.56–3.93, $P < 0.001$). Besides, compared with patients younger than 60 years, those who were older had more normal blood pressures. And the blood pressures of self-employed or migrant workers were more likely to be normal than farmers or herders.

After considering the relationship between the rates of blood pressure under control and the group assignment rate, this interaction was assessed through Cochran and Mantel-Haenszel test and comparison of the rates of normal blood pressure among each hierarchical subgroup is shown in Table 3. Almost all the subgroups of proactive seekers had higher rate than those of passive seekers. And there was none interaction in this population. However, a consistent effect of activeness across various characteristics groups was showed in the observed patterns.

DISCUSSION

Main Findings

As reported in our previous findings, no disparity was observed among hypertensive patients in the utilization of seeking follow-up services.³¹ The purpose of this study was then to examine the relationship between activeness of seeking follow-up service and the blood pressure control of hypertensive patients in rural China. We found that the activeness of hypertensive patients seeking FUS was positively associated with their blood pressure control. After discovering the difference of blood pressure between proactive and passive group and with other socio-demographic groups, the binary logistic regression model was used to examine the impact of predictors on blood pressure control and the result reported that activeness of patient seeking FUS affected the outcome greatly. From the terms of the rate of normal on the proactive and passive seekers, the rate of blood pressure under control among proactive seekers was higher and it was distributed among almost all hierarchical subgroups.

Implications

This study indicated a positive association between the pro-active attitude of hypertensive patients in seeking FUS and

TABLE 3. Health Status Control Rates of Passive and Active Subgroups Seeking FUS

Characteristics	Passive Group Seeking FUS		Active Group Seeking FUS		OR	95% CI	
	No. Whose Blood Pressure Is Normal/Total No.	%	No. Whose Blood Pressure Is Normal/Total No.	%		Lower	Upper
Age							
<60	43/438	9.82	193/533	36.21	5.21	3.63	7.48
60–70	47/284	16.55	177/451	39.25	3.26	2.26	4.70
>70	50/171	29.24	184/444	41.44	1.71	1.17	2.50
Sex							
Male	81/426	19.01	244/624	39.10	2.73	2.05	3.66
Female	59/467	12.63	310/804	38.56	4.34	3.19	5.90
Education level							
Unschooling	69/447	15.44	292/734	39.78	3.62	2.69	4.87
Less than 7 years	42/300	14.00	169/443	38.15	3.79	2.60	5.53
7–9 years' study	13/98	13.27	75/201	37.31	3.89	2.03	7.45
More than 9 years study	16/48	33.33	18/50	36.00	1.13	0.49	2.59
Occupation							
Farmer or herdsman	101/726	13.91	423/1116	37.90	3.78	2.96	4.81
Self-employed or migrant worker	17/54	31.48	41/99	41.41	1.54	0.76	3.10
Retired or non-work	22/113	19.47	90/213	42.25	3.03	1.77	5.19
Number of household							
<5	77/394	19.54	271/708	38.28	2.55	1.91	3.42
5–6	55/429	12.82	210/573	36.65	3.93	2.83	5.47
>6	8/70	11.43	73/147	49.66	7.65	3.42	17.09
Distance to reach medical institutions, km							
<1	117/709	16.50	417/1044	39.94	3.37	2.66	4.25
1–2	9/70	12.86	78/203	38.42	4.23	1.99	9.00
>2	14/114	12.28	59/181	32.60	3.45	1.82	6.55
Time required to reach medical institutions, min							
<10	118/813	14.51	500/1285	38.91	3.75	3.00	4.70
10–19	16/55	29.09	40/110	36.36	1.39	0.69	2.80
>20	6/25	24.00	14/33	42.42	2.33	0.74	7.36
Annul disposable household income							
<CNY 10,000	47/377	12.47	161/447	36.02	3.95	2.75	5.67
CNY10,000- CNY 29,999	45/254	17.72	184/466	39.48	3.03	2.09	4.40
CNY30,000 and above	48/262	18.32	209/515	40.58	3.05	2.13	4.36
Self-assessment of household income level							
Low	54/336	16.07	179/468	38.25	3.23	2.29	4.57
Middle	60/415	14.46	245/662	37.01	3.48	2.53	4.77
High	26/142	18.31	130/298	43.62	3.45	2.13	5.60

CI = confidence interval, FUS = follow-up service, OR = odds ratio.

positive outcome of the blood pressure control, but the causality is not clear. Previous researches have shown that few residents were aware of that they were suffering from raised blood pressure because of insufficient of self-screening or nonphysician³² and inappropriate follow-up management.¹⁷ However, the patients who were already diagnosed as having hypertension and accepted the same FUS, the proactive seekers have better blood pressure control status. What could be the cause?.

It might be explained by that proactive attitude may relate with self-efficacy and self-regulation. As the growing evidence reported about self-management, it has played a great role in keeping hypertensive conditions under control.³³ That means a proactive attitude toward seeking medical attention might come along with other healthy conducts such as having a healthier diet and exercising regularly and coming for not only a periodic

check-up. Besides, individuals with well-regulated health-related behavior are capable of coping with sources of listlessness, and achieve a psychological basis for better defense and competence against disease conditions.³⁴ In addition, it may also benefit from the active attitude associated with the long-term adherence to medications in self-monitoring procedure, especially to the elderly.³⁵

Limitations

We believe that this study has several limitations. First, based on the research results of Powers Benjamin J. that the correct classification of blood pressure control of hypertensive patients should use the average of several measurements (clinic or home measurement),³⁶ but limited measurement (just a single clinic measurement) in our study may misclassify a proportion

of hypertensive patients. Second, as this is a cross-sectional survey, the result of blood pressure control cannot represent the long-term effect, and occasionally in the outcome may be occurred. Third, this study was designed to find the association between activeness of hypertensive patients seeking FUS and blood pressure control, it does not consider the impact of other independent variables. However, our findings have valuable and significant implications for researchers and services providers.

CONCLUSIONS

In rural China, an improvement of blood pressure control is positively associated with proactive attitude of hypertensive patients in seeking follow-up services. It suggest that health services workers should not only just provide the professional diagnosis to screen hypertension and follow up services to control blood pressure, but also pay attention to the activeness of hypertensive patients seeking FUS and give a full responsibility and instructions to their self-efficacy to improve the efficiency and effect of blood pressure control. In addition, because causality is unclear, further study to explore the causality between activeness and blood pressure control is needed.

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