

Meta-Analysis the Quality of General Practitioners Management for Elderly Patients with Hypertension in China

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Abstract

Background: Among Chinese adults aged 35 - 75 years, nearly half have hypertension and the prevalence of hypertension is increased with age. But older patients with high systolic pressure and high pulse pressure could not be cured, and will have greater cardiovascular morbidity. This study aims to evaluate the effectiveness of general practitioners (GP) management for Chinese elderly hypertension, and explore reasonable and effective blood pressure management pattern. **Methods:** We searched the published literature for randomized controlled trials designed to improve blood pressure with community care management delivered by general practitioners or nurses, compared with usual care. Major outcome measures were systolic and diastolic blood pressure; the percentage of patients whose blood pressures are under control with community care management and Revman 5.3 was used in this study. **Results:** Pooled data from all 13 researches showed a lower outcome diastolic blood pressure (SMD = -0.95, 95% CI (-1.23, -0.67)) and systolic blood pressure (SMD = -1.17, 95% CI (-1.52, -0.81)) respectively in favor of community management. Pooled data from all 11 researches showed a higher percentage of patients with blood pressure under control in favor of community management (OR = 3.85, 95% CI (1.58, 9.37)) and the difference between treatment group and control group on blood pressure control ratio had statistical significance (Z = 2.97, P < 0.01). No obvious difference was found among the sub-groups. **Conclusions:** General practitioners' management in Chinese elderly hypertension is effective, and complies with the advanced hypertension management guidelines. The multi-patterns are supposed to adopt community blood pressure monitoring and team-based general practitioners.

Keywords

Chinese Elderly Hypertension, General Practitioners (GP),
Community Management, Meta-Analysis

1. Background

Hypertension is the biggest single contributor to the global disease burden and to global mortality. The amount of people affected and the prevalence of hypertension worldwide are expected to increase during the next decade [1]. As a major risk factor of cardiovascular and cerebrovascular diseases, approximately 54% of stroke and 47% of coronary heart disease worldwide were attributable to hypertension [2]. In fact, hypertension is also a very common disease and the life time risk of hypertension is about 90% in Asian countries [3]. The age-adjusted prevalence rate of hypertension is around 20% - 30%, similar to that in the Western developed countries [4].

As the improving of our living standard and changing of dietary structure, the morbidity of hypertension in China is rising year by year, especially in recent years. Among Chinese adults aged 35 - 75 years, nearly half have hypertension and the prevalence of hypertension is increased with age for both male and female [5]. But older patients with high systolic pressure and high pulse pressure could not be cured, and will have greater cardiovascular morbidity [6]. It was declared that hypertension in elderly patients needs effective blood pressure (BP) management in a long time.

The communities and primary health service institutions are the key to realizing long term management for chronic diseases. General practitioners (GP) management is not only beneficial for out-of-office BP readings but also effective for BP control, the 2017 Clinical Practice Guideline for high blood pressure also emphasizes contemporary strategies to improve BP control, including ways to successfully implement and sustain non-pharmacological interventions, improve medication adherence, use a structured team-based approach to care, and take advantage of health information technology [7]. These are all practicable with the help of general practitioner management in community health care. However, there are no large sample data to demonstrate the effectiveness of general practitioners management for elderly patients with hypertension in China. Meta-analysis is a systematic approach for introduction, evaluation, synthesis and unifying results in relation to studying research questions. It also produces the strongest evidence for intervention [8]. This study aims to evaluate general practitioners (GP) management for Chinese elderly hypertension, and explore reasonable and effective blood pressure management pattern.

2. Methods

We searched the published literature for randomized controlled trials designed

to improve blood pressure with community care management delivered by general practitioners or nurses, compared with usual care. Major outcome measures were systolic and diastolic blood pressure extracted from the studies, percentage of patients that blood pressure are under control with community care management. The standards of blood pressure and measuring method were accorded to the latest guidelines, as well as each study took a slightly different approach.

2.1. Data Sources and Extraction

We searched CKNI, ChinaInfo, Vip database, PubMed and the papers of related academic conferences with the keywords: community management, elderly Hypertension, general practitioner and primary care both in Chinese and English language for literature published between January 1990 and December 2018. The population of interest was hypertensive aged 60 or over with or without other diseases and the research object was the primary care consequence of the elderly hypertension by general practitioner.

YZ screened the citations, extracted data and evaluated the quality of literatures. Another group of investigators including ZD, HZ, YS also independently performed the study selection, data extraction and quality assessment. Divergences were resolved by consensus, or by consulting with the senior investigator (DS).

2.2. Analysis

Forest plots were depicted to assess the effect sizes and 95% confidence intervals (CIs) visually across the studies. Heterogeneity across studies was assessed by I^2 statistic (ranging from 0% to 100%) with a small value indicating less heterogeneity. P values were also tested. Sensitivity analyses were performed by subgroup analysis. The publication bias was detected by Begg's test and Egger's Test. If significant publication bias was indicated, the Duval and Tweedie's trim and fill method was used to generate the "unbiased" estimates by adding hypothesized studies to make the funnel plot symmetrical [9].

3. Results

1109 potential literatures were firstly identified by searching the keywords, including 803 English literatures and 306 Chinese ones. After excluding the repeating ones, 513 literatures were searched for full text. By screening abstracts and full text, the authors excluded 65 literature reviews, 62 non-randomized controlled trials, 73 studies that different designs were used in the forward and back, 212 studies that research objects were not elder patients and 78 studies other patients. Finally 23 studies were brought into the meta-analysis. The screening flow is shown as **Figure 1**.

3.1. Quality Evaluation of Studies

The Newcastle-Ottawa (NOS) quality evaluation result of 23 included RCT studies is shown in **Table 1**.

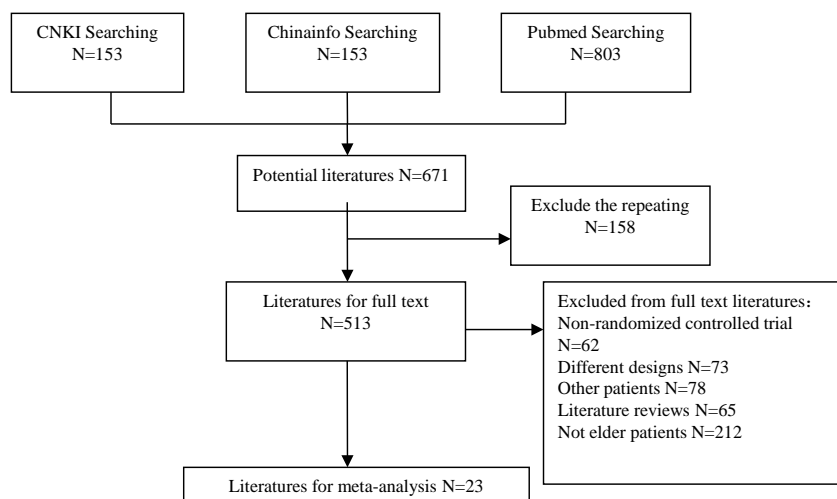


Figure 1. Flowchart of literature screening.

Table 1. Quality evaluation sheet of studies.

Quality items	No. of studies
Randomization sequence generation	
-Adequate	15
-Inadequate (quasi-RCT)	5
-Unclear	2
-Cluster design	1
Allocation concealment	
-Unclear	23
Sample representativeness	
-Very likely	13
-Somewhat likely	6
-Unlikely or cannot tell	4
Sample size calculated	
-Yes	15
-Unclear or no	8
Comparability between groups	
-No significant differences	13
-Some difference or could not tell	10
Loss to follow up	
-Reported	18
-No reported	5
Outcomes reported	
-Blood pressure	13
-Adequate hypertension control	11

3.2. Effect of Community Management on Diastolic Blood Pressure (DBP)

The included researches had studied the change of DBP with community management on elderly hypertensive patients. The treatment group includes 2037 patients and control group includes 1955 patients. There were statistical heterogeneity ($P < 0.01$, $I^2 = 94\%$) between the included researches and random effects model was used in the analysis (**Figure 2**). Pooled data from all researches showed a lower outcome DBP in favor of community management (SMD = -0.95 , 95% CI (-1.23 , -0.67)) and the difference between treatment group and control group on DBP had statistical significance ($Z = 6.70$, $P < 0.01$). The results of publication bias tests for DBP change among the studies suggested no evidence of publication bias (Begg's test, $P = 0.31$; Egger's Test, $P = 0.32$).

3.3. Effect of Community Management on Systolic Blood Pressure (SBP)

The included researches had studied the change of SBP with community management on elderly hypertensive patients. The treatment group includes 2107 patients and control group includes 2120 patients. There were statistical heterogeneity ($P < 0.01$, $I^2 = 96\%$) between the 13 included researches and random effects model was used in the analysis (**Figure 3**). Pooled data from all 13 researches showed a lower outcome SBP in favor of community management (SMD = -1.17 , 95% CI (-1.52 , -0.81)) and the difference between treatment group control group on SBP had significance ($Z = 6.41$, $P < 0.01$). The results of publication bias tests for SBP change among the studies suggested no evidence of publication bias (Begg's test, $P = 0.19$; Egger's Test, $P = 0.01$).

3.4. Ratio of Patients with BP under Control

11 of the included researches had studied the ratio of patients with BP under control with community management. In 11 included researches, the ratio of treatment group is higher than control group. Results of researches by Ji and Liu had no statistical significance (**Figure 4**, 95% CI (0.88, 3.00) and (0.60, 17.18)). There were statistical heterogeneity ($P < 0.01$, $I^2 = 97\%$) between the 11 included researches and random effects model was used in the analysis. Pooled data from all 11 researches showed a higher percentage of patients with BP under control in favor of community management (OR = 3.85, 95% CI (1.58, 9.37)) and the difference between treatment group and control group on BP control ratio had statistical significance ($Z = 2.97$, $P < 0.01$). The results of publication bias tests among the studies suggested no evidence of publication bias (Begg's test, $P = 0.31$; Egger's Test, $P = 0.32$).

3.5. Subgroup Analysis

Based on the different type of treatment provider, the included researches were divided into Community nurse group, Community doctor group and Community nurse and doctor group to make meta-analysis (**Table 2** and **Table 3**). Ac-

According to the results, statistical heterogeneity was not eliminated in the Sub-group analysis and the type of treatment provider had no significant influence on effect of DBP and SBP control.

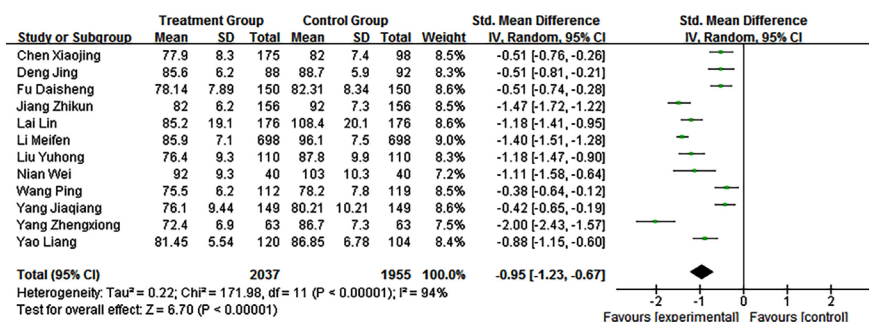


Figure 2. Comparison of community manage group and control group on diastolic blood pressure.

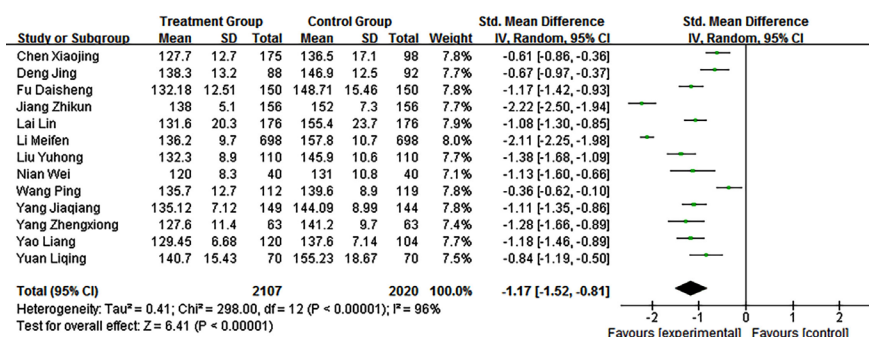


Figure 3. Comparison of community manage group and control group on systolic blood pressure.

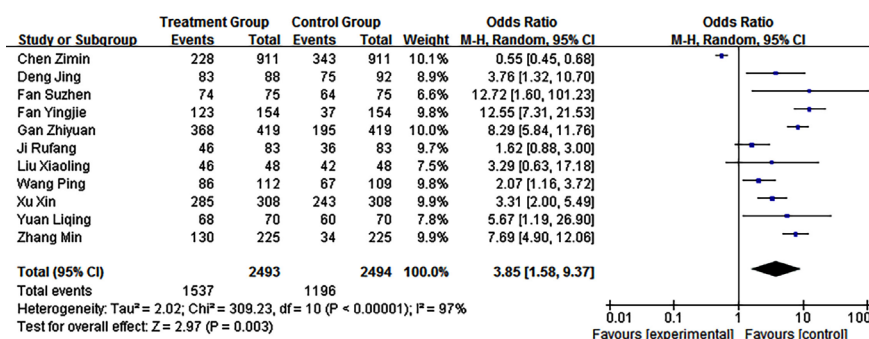


Figure 4. Comparison of community manage group and control group on blood pressure control ratio.

Table 2. Meta-analysis of different intervener (diastolic blood pressure).

Intervener	Number	SMD (95% CI)	I ²
Community nurse	2	-1.12 (-1.37, -0.86)	88.60%
Community doctors	6	-1.28 (-1.81, -0.76)	96.50%
Both	3	-0.77 (-1.28, -0.27)	89.80%

Table 3. Meta-analysis of different intervener (systolic blood pressure).

Intervener	Number	SMD (95% CI)	I ²
Community nurse	2	-1.12 (-1.37, -0.86)	88.60%
Community doctors	6	-1.28 (-1.81, -0.76)	96.50%
Both	2	-0.58 (-1.08, -0.07)	81.60%

4. Discussions

The control of elder blood pressure is a significant process indicator reflecting the change of residents' health status. In China, nearly half of elder residents have hypertension. However, the awareness, control and treatment rate are generally low. The same problem also occurs in the United States that it was estimated that 53% of all hypertensive people and 40% of treated hypertensive people had uncontrolled BP in 2009-2010 [10]. What is worse, uncontrolled morning hypertension is common even in patients with controlled clinic BP, and morning blood pressure surge may be particularly relevant to the occurrence of cardiovascular events [11]. For prevention and control on chronic disease is the major working content of community health service institutions, general practitioners treat most elderly hypertensive patients and their practice in blood pressure management is therefore of great importance [12] [13]. Innovative interventions to improve BP control are therefore needed in primary care, where management of hypertension takes place.

The result of meta-analysis in this paper shows that the DBP and SBP between treatment group and control group have statistical difference. This means the community hypertension management could control BP of patients effectively. The result also shows that the type of treatment provider has no significant influence. Hypertension has complex pathogenesis that is closely related to lifestyle, long disease course and serious complications so that it needs timely detection and intervention [14] [15]. The 2017 Clinical Practice Guideline for high blood pressure also highlights the increasingly important role of out-of-office BP readings [7]. Although ambulatory BP monitoring (ABPM) is generally accepted as the best out-of-office measurement method, home BP monitoring (HBPM) is often a practical approach in clinical practice [7]. Besides, morning home SBP (MHSBP) compared with clinic SBP (CSBP) has better prognostic significance in predicting cardiovascular events because MHSBP is less affected by number of time points and has higher accuracy to guess "true" BP for predicting cardiovascular risk than CSBP [11] [16]. It is generally believed that the effect of BP control management is equivalent to drug mono-therapy. Plentiful RCTs had demonstrate that changing of lifestyle such as losing weight, changing the diet and increasing exercise could lower BP effectively and reduce the incidence of cardiovascular events [17] [18]. Therefore, after the definite diagnosis of hypertension by specialist, patients need long-term observation and community health-care [19]. Although result of meta-analysis could not be the criterion of ultimately outcome measure and rigorous controlled clinical research is necessary,

the result could be used as guidance to further experimental study.

The major significances of analyzing community management for elderly patients with hypertension are as follow: 1) Providing professional BP monitoring, normalizing the use of blood pressure monitor and especially correcting wrong BP measure methods of elderly patients. Patients in community management groups reported statistically significant decreases in the difficulty of measuring BP at home, compared to patients in usual care [20]. Besides, community management monitoring of BP is closer to HBPM compared with clinic BP monitoring (CBPM), which indicates a more accurate prognostic significance in cardiovascular events. 2) Hypertension Patients may have different pathogenic factors. Community health workers compared with clinicians are closer to patients and beneficial to guide the individualized chemotherapy program of elderly hypertensive patients. What is more, hypertension is best controlled with multiple drugs therapy and community health workers could make patients understand dangerousness of nonstandard medication to increase the obedience of therapy [21] [22] [23]. 3) As propagating and educational work of therapeutic process is explained to patients and their relatives, they can raise their health self-management and change unhealthy living habit step by step. 4) Increase the doctor-patient trust to make therapeutic process of patients coherent and complete. 5) It is beneficial to observe hypertension fluctuations and treat early complications.

However, a few important limitations of our study need to be considered. First, the heterogeneity of our study is large and the reasons might be related with the various published time of articles and the different characteristics of objects in each study. However, we found the data still had clinical meanings, so we used random model and sub-group analysis to analyze the data. Second, our study only brought into the published literatures, which might be responsible for the publication bias, and we used funnel plots to prove the result had no publication bias overall (Figure S1). Selection bias is important in meta-analysis. Third, the literatures brought into our study mainly belong to early researches of community care management for hypertension delivered by general practitioners, and further researches are needed to prove our study.

Hypertension management in community relies on self-care ability and cognition degree of elder patients. In China, this management method is becoming mature in large and medium size cities. However, it lacks effective practice in remote areas with low levels of education. In practical working, we can strengthen community health management by volunteer outreach clinic, establishing training base of general practitioner and spreading health education [24] [25] [26].

Hypertension management in community could not only improve the therapy effects, but also lower health care costs of the country. China, with a large population, is lacking of medical resources so that hypertension management in community could greatly relieve the medical burden of patients and the country. The key of increasing community chronic disease therapeutic effect is improving

of medical services. We can learn from the private doctor and family doctor services in western country to realize door-to-door health service, safeguard the patients' rights and interests and so on, aiming at special group like elder hypertensive patients. In a word, the hypertension management in community of elder patients has demonstrated the transformation of chronic disease management mode and the service and standardization need to be further enhanced.

5. Conclusion

GP management is effective in Chinese elderly hypertension, and complies with the advanced hypertension management guidelines. The multi-patterns are supposed to adopt community BP monitoring and team-based GP.

Availability of Data and Materials

The Chinese elderly blood pressure data that support the findings of this study are available from <http://www.ncbi.nlm.nih.gov/pubmed/>, <http://epub.cnki.net/kns/default.htm>.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

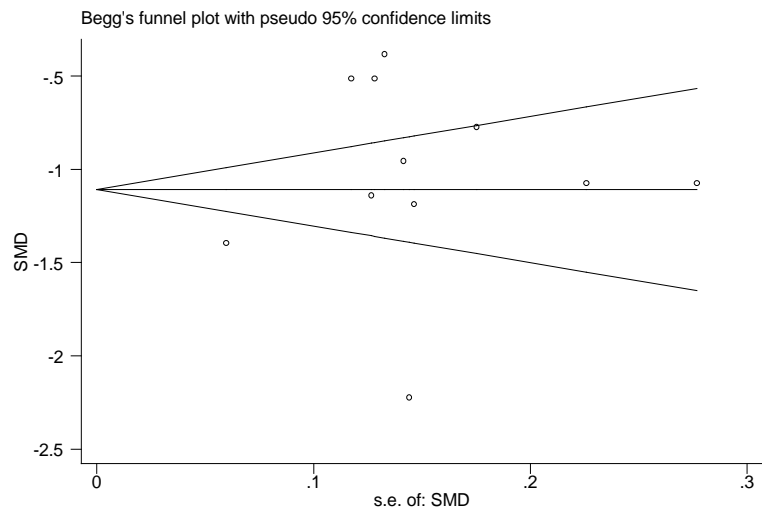
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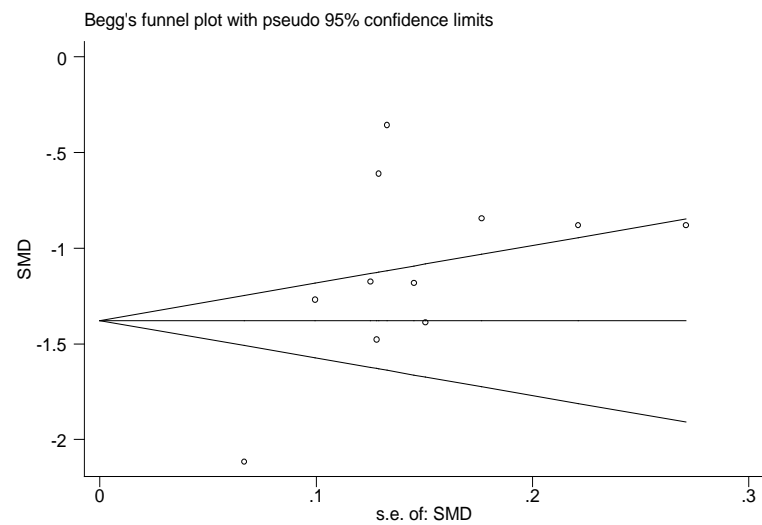
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Supplement



(a)



(b)

Figure S1. Funnel plots of blood pressure. (a) Diastolic blood pressure; (b) Systolic blood pressure.

Abbreviations

GP, general practitioners; BP, blood pressure; SBP, systolic blood pressure; DBP, diastolic blood pressure; ABPM, ambulatory BP monitoring; HBPM, home BP monitoring; MHSBP, morning home SBP; CSBP, clinic SBP; CBPM, clinic BP monitoring.