Published in final edited form as:

Home Healthc Nurse. 2014 ; 32(10): 603–609. doi:10.1097/NHH.0000000000000163.

Research Briefs: Hypertension Management Guidelines Update and Research on the Importance of Blood Pressure Control

LaToya Sealy, RN, FNP-BC and

Practice Team Supervisor/Nurse Practitioner, ESPRIT Medical Care, Affiliate of the Visiting Nurse Service of New York

Arthur Oliva, MSN, ANP-BC

Practice Team Supervisor/Nurse Practitioner, ESPRIT Medical Care, Affiliate of the Visiting Nurse Service of New York

According to the Centers for Disease Control and Prevention (CDC), over 65 million adults in America have hypertension (HTN) and less than half of those 65 million people have their blood pressure under control. More than 1000 deaths occur each day related to HTN and Americans are at an increased risk of complications related to uncontrolled blood pressure such as heart failure, stroke, myocardial infarction and kidney disease (CDC, 2014). Data from the National Home and Hospice Survey, which is conducted by the Centers for Disease Control, indicate that 41% of home care patients have HTN (Caffrey et al., 2011). This research brief column profiles four recently published articles on HTN. The first discusses the most recent guidelines for managing high blood pressure, which were released in early 2014. The second article describes the success of an intensive structured HTN medication management and management protocol. The third and fourth briefs describe studies investigating the ongoing risk of high blood pressure post-stroke.

This evidence-based report makes recommendations to be used along with the primary health care provider's clinical judgment for the management of HTN. The article describes the process of how a panel of experts identified and reviewed evidence-based studies to reflect on and refresh previously published guidelines.

The Panel and History of Joint National Committee Guidelines

In 2008 the National Heart, Lung, and Blood Institute (NHLBI) appointed a multi-disciplinary 48-member panel after consideration of over 400 candidates. The panel included physicians, pharmacists, nurses, scientists, and researchers. Initially, the panel constituted the Eighth Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 8) but in June 2013, prior to the completion of the committee's work, NHLBI announced its decision to discontinue being directly involved in guideline development. The published guidelines are from the effort of the committee but are not officially sanctioned by NHLBI or considered JNC 8 guidelines.

Address correspondence to: Margaret V. McDonald, Center for Home Care Policy and Research, Visiting Nurse Service of New York, 5 Penn Plaza, 12th floor, New York, NY 10001, margaret.mcdonald@vnsny.org.

The authors declare no conflict of interest.

Objectives

The panel of experts sought to address three questions that were the highest ranked after an iterative qualitative selection process was completed:

1. In adults with HTN, does initiating antihypertensive pharmacologic therapy at specific blood pressure (BP) thresholds improve health outcomes?
2. In adults with HTN, does treatment with antihypertensive pharmacologic therapy to a specified BP goal lead to improvements in health outcomes?
3. In adults with HTN, do various antihypertensive drugs or drug classes differ in comparative benefits and harms on specific health outcomes?

Method

The panel gathered evidence through a systematic search of randomized control trials of hypertensive adults that reported on important health outcomes, such as, mortality (overall or cardiovascular specific), heart failure, stroke, coronary revascularization, or end-stage renal disease. To be included, the study needed a sample size of at least 100 participants and medical follow up of at least one year. Initially the search was for original studies published from 1996 to 2009. A supplemental search was completed prior to guideline publication to include possible studies from 2009-2013; in addition to the initial inclusion criteria this search focused on major studies with at least 2000 participants with HTN conducted over multiple sites. Studies were included if they were rated good or fair using a standardized quality rating tool. An external team summarized the data and created evidence tables, which were then provided to the 48-member panel. Next the panel drafted evidence statements and then clinical recommendations. To be accepted, the recommendation needed a two-thirds majority or a 75% majority if the recommendation was based on expert opinion. Once the guidelines were completed they were peer reviewed by five federal agencies and by over a dozen reviewers with proficiency in HTN. The panel revised the document based on feedback received.

Results

The panel ultimately made nine recommendations with varying levels of the strength of recommendation. Strength of recommendation grades was developed by NHLBI with grades of A through E. Grade-A indicates strong evidence, grade-B indicates moderate evidence, and grade-C indicates weak evidence and so fourth. Grade E indicates insufficient evidence so is based on the panel's expert opinion. Four recommendations yielded grades A-C, the other five were Grade E. Below are selected recommendations that may have particular interest to the home care professional serving hypertensive patients:

- **Recommendation #1 (grade A):** In the general population aged 60 years or older, initiate pharmacologic treatment to lower BP at systolic blood pressure (SBP) of 150 mm Hg or higher or diastolic blood pressure (DBP) of 90 mm Hg or higher and treat to a goal SBP lower than 150 mm Hg and goal DBP lower than 90 mm Hg. Previous recommendations indicated a goal of SBP 140 mm Hg or lower and a goal of DBP of 90 mm Hg or lower for the general population. This is a

significant change in the standard of care for all health care providers since the other threshold were in place for so long.

- **Recommendation #2:** In the general population < 60 years, initiate pharmacologic treatment to lower BP at DBP 90 mm Hg and treat to a goal DBP < 90 mm Hg. Strength of recommendation: for ages 30-59 years, grade A; for ages 18-29 years, grade E.
- **Recommendations #6 (grade B):** In the general nonblack population, including those with diabetes, initial hypertensive treatment should include a thiazide-type diuretic, calcium channel blocker (CCB), angiotensin-converting enzyme inhibitor (ACEI), or angiotensin receptor blocker (ARB). These medication classes are recommended above using Beta Blockers or Alpha Blockers for initial treatment.
- **Recommendation #7:** In the general black population, including those with diabetes, initial antihypertensive treatment should include a thiazide-type diuretic or CCB. Strength of recommendation: for general population - grade B; for those with diabetes, grade C. This recommendation specifically for the black population was largely influenced by the national ALLHAT study.

Discussion

Several post-publication commentaries have been written about the guidelines. Peterson, Gaziano and Greenland (2014) discussed the likely controversy of recommendation #1, changing the BP target from 140 to 150 for the general population 60 years of age and older. They comment on the fact the recommendation is based more on the lack of evidence than the presence of evidence since research results in this area are limited. These authors recommended stronger randomized controlled trials to identify different BP thresholds for diverse patient populations.

Implications for Home Health Practice

As home care nurses we play a vital role in helping our patients obtain the appropriate care, in addition we advocate for optimal interventions from our patient's primary care providers. Familiarity with the most up-to-date guidelines will help us in that role. In addition, home care nurses are in a unique position to observe challenges patients may have with adhering to recommended medication and lifestyle recommendation and provide interventions to help patients address the challenges.

HTN is the leading cause of preventable cardiovascular disease. Primary care providers (PCPs) are currently the frontline fighters in the war against HTN. Even with effective BP lowering medications, HTN still remains poorly controlled worldwide. Stewart et al. examine protocol adherence to structured intensive management in the Valsartan Intensified Primary care Reduction of Blood Pressure (VIPER-BP) trial. They aimed to understand the relationships between BP control, and the role of the PCP in adjusting antihypertensive medications at a predetermined interval. The study looks at the effectiveness of intensive structured care on helping patients in primary care to reach their targeted BP. It also looks at the potential barriers to achieving BP control in the primary care setting.

Methods

VIPER-BP study was a multicenter randomized control trial. Initially 2,185 individuals were consented from 119 primary care clinics and over 250 family physicians throughout Australia. Participants of the study were at least 18 years old and had a history of HTN. Individuals were excluded from the study, if their mean initial sitting SBP was at least 180 mmHg, on 3 or more BP medications, if they had severe renal disease, and/or contraindications to an angiotensin receptor blocker, calcium channel blocker or a thiazide diuretic. The study's primary endpoint was BP control during a 26-week follow-up. Three BP control thresholds were established: 125/75, for those with proteinuria; 130/80, for those with diabetes or other forms of end-organ damage; 140/90, for all others. During the pre-trial phase of the study, participants started on Valsartan 80mg/day for 14 to 18 days; 19% of participants attained their target BP and were excluded from the randomization process.

VIPER-BP ultimately randomized 1,562 participants:

- Of those, 524 individuals were given enhanced routine management. Physicians were asked to treat participants as they normally would over a 26-week period. Participants had mandatory follow up at 6 weeks and 26 weeks.
- Another 1,038 participants were randomized into two intervention groups: valsartan monotherapy or valsartan combination therapy (with either valsartan and hydrochlorothiazide or amlodipine). The study protocol required that physicians provide meticulous follow up and stepwise titrate of medications based on a computerized algorithm tool in order to achieve goal BP. Participants in the intervention groups had mandatory follow up visits, at weeks 6, 10, 14, 18 and 26, postrandomization. Protocol adherence was scored on a scale of 0 to 5 for each participant (least to most adherent) and 4 to 5 was considered to be acceptable per protocol management.

Statistical Analyses

This study analyzed the data to examine independent predictors of protocol adherence and participants' goals of controlling BP. Individual profiling data including age, sex, and ethnicity were used to analyze the study's hypothesis. Key characteristics of primary care facilities were also examined, including location of practice, size and presence of a practice nurse.

Results

- Pattern of clinic visits: Participation of study individuals in mandatory clinical declined as VIPER-BP trial progressed from 91% at week one to 83% at week 26. Participants who followed up with a clinic managed by a practice nurse, were more likely to attend schedule visits.
- Adherence to treatment up titration schedule: The study found that participants with uncontrolled HTN fell from 76% to 60% between week 6 and week 18. Adherence

to treatment protocol declined by 8.9% from week 6 to week 18; 49 participants needed to be on alternative antihypertensives by week 26 secondary due to adverse events.

- Overall per protocol adherence: 49% of participants randomized to VIPER-BP intervention achieved a protocol adherence score of 4 or 5. This study found that having a practice nurse involved in participant care and ethnicity (mainly white) was related to an increase in adherence to protocol. Randomization to the monotherapy group was found to have a lower probability of protocol adherence.
- Impact of protocol adherence of blood pressure control: During the 26 week trial period it was observed that participants in the intervention groups had progressively better BP control. Individuals who achieved their goal BP were more likely to continue to adhere to study protocols and have BP readings within target at follow up visits. Alternatively, those who experienced an adverse event had higher BPs at subsequent visits. Men in the VIPER-BP trial were more likely to attain their individual goal BP than women. Participants with higher BMI were less likely to meet their individualized BP targets. Clinics that were a part of large networks were less likely to get participants to attain BP target. Most importantly the study found that increasing per protocol adherence was significant in achieving individual BP control.
- Comparison of per protocol treatment versus usual care: Participants in intervention groups were 1.5 fold more likely to achieve their goal BP. Seventy percent of participants in the usual care group did not have antihypertensive medication titrated up from the initial dose of Valsartan 80 mg at week 26, even though BP was elevated.

Discussion

In contrast to usual care in a primary care setting, VIPER-BP trial emphasized the benefits of intensive and aggressive management of HTN based on structured protocols. The data from this study strengthen the case for individualized BP management in a structured care approach to promote sustained optimal BP control. The study did find resistance to titrating up antihypertensive drugs by some physicians, even when clinically indicated. Individual BP control is influenced by level of adherence to study protocol and target BP control.

Of interest in the VIPER-BP trial is the significance of the practice nurse. The study highlighted that clinics with practice nurses were more likely to successfully apply study interventions. Participants in clinics with practice nurses were likely to achieve target BP. The reason for these notable results with clinic practice was not explored in the VIPER-BP trial.

Generalizability of the study findings should take into account two factors. The study recruited physician volunteers who may be more likely to be interested in HTN management than non-participants. Also, the study was facilitated by the Australian healthcare system, with health subsidies and copays to the participants.

Implications on Home Care

The study underscores the importance of rigorous and structured management of titration of antihypertensive drugs in achieving and maintaining targeted BP control. Home care clinicians and PCPs can work together to optimize and manage patients' BP. When PCPs do not follow HTN guidelines, it is the responsibility of the home care clinician to call the PCP and advocate for the patient. Home care clinicians are also able to educate patients on the importance of goal BP and the need to follow up with their PCP for medication titration. Home care clinicians are able to reach patients in familiar setting, where they are comfortable and willing to learn. Achieving optimal BP control is a team effort.

Stroke is the leading cause of disability and the fourth most common cause of death in the United States, HTN is the leading modifiable risk factor in stroke prevention. Individuals who have had a stroke in the past are at increased risk of suffering a recurrent stroke. This research article focused on the impact of consistent blood pressure (BP) after an ischemic stroke, examining the relationship between rigid BP control and vascular events including stroke, myocardial infarction (MI) or vascular death.

Methods

The investigators analyzed data from the Vitamin Intervention for Stroke Prevention (VISP) trial after the study had concluded. VISP was a double blind, randomized, controlled trial looking at whether the best medical therapy and high dose folic acid decreased recurrent stroke in patients who had a stroke in the preceding 120 days. VISP enrolled 3,680 recent ischemic stroke patients, 35 years old and older, from September 1996 to May 2003. The trial defined an ischemic stroke as a blockage to an artery going to the brain characterized by sudden onset of neurologic deficits lasting 24 or more hours, or evident on computed tomography (CT) or magnetic resonance imaging (MRI). Participants were from centers across the United States, Canada and Scotland. Patients followed up for evaluation at 1 month, 6 months, and then every 6 months thereafter, up to 24 months post randomization. VISP failed to prove its hypothesis.

Statistical Analysis

For the purpose of this study a controlled BP was defined as SBP less than 140 mm Hg and DBP of less than 90 mm Hg. Participants were divided into four groups depending on the number of visits BP was controlled (< 25%, 25% to 49%, 50% to 74% and $\geq$ 75%). Primary outcome was length of time to recurrent stroke. Secondary outcome was length of time to a stroke, MI or vascular death. The authors controlled for age, sex, and history of previous stroke, congestive heart failure, coronary heart disease, and diabetes mellitus (DM). The investigators also controlled for history of HTN and endarterectomy, alcohol use in previous years, current smoking, stroke severity, medication use, race and lower body mass index (BMI).

Results

Of the 3,680 participants:

- 30% were able to maintain consistent BP control greater than or equal to 75 percent of the time. Individuals with more consistent BP control were more likely to be younger, had a history of MI, use statin and antithrombotics, BMI, lower lipid levels. They were less likely to be black or to have a history of DM or HTN.
- 35% of participants were only able to maintain consistent BP control less than 25 percent of the time. Blacks were less likely to have consistent BP control.
- Individuals who had an MI in the past were more likely to maintain consistent BP control throughout the trial than other participants.
- The relationship between consistent BP control at different levels of baseline BP was examined. There was a stronger association between participants with consistently controlled BP and lower rate of adverse vascular events for baseline SBP above 132. They yield the best outcomes and had significantly lower vascular events (including stroke and MI). Consistency of BP control did not influence outcomes of individuals with baseline SBP below 132.
- Participants who had consistency in BP control had a lower risk of another stroke, MI or vascular death.

Discussion

The study found less than one third of participants had consistent BP control for greater than 75 percent of the time. With that said, it emphasized the importance of maintaining consistent BP control to lower an individual's risk of stroke, MI and other vascular events. The study highlighted the importance of rigid BP control post stroke in participants with elevated SBP greater than 132 mm Hg. These participants saw significantly better outcomes when SBP was consistently controlled. It emphasized the need for more rigorous post stroke BP management. Of note, in this study, participants with a history of MI had better consistently controlled BP. The reason for this outcome is unclear. Perhaps people with history of MI and their healthcare providers are more diligent, because they understand the importance of consistent BP control to prevent a recurrent MI.

With such low percentages of participants able to maintain consistent BP control in a clinical trial setting; consistent BP control after an ischemic stroke in the real world is much more likely to be inconsistent. This study reinforced that blacks were less likely to have consistency of BP control. HTN is more prevalent in blacks and more difficult to manage and treat.

The authors mention several study limitations including: the study only assessed BP every 6 months, the follow up of only 24 months potentially precluding ability for analysis of future outcomes, and participants with consistent BP controlled greater than 75 percent of the time were in better cardiovascular health than those with less controlled BP. Also, this is a post hoc analysis of a clinical trial and participants may not be representative of the overall stroke population.

Implications for Home Care

The finding of this trial emphasizes the need to focus on consistent BP control post ischemic stroke. Home care clinicians are in a unique position to help patients develop strategies and promote optimal levels of wellbeing post stroke. In the study less than 30% of participants were able to maintain BP control post stroke in the clinic setting. This highlights the need for a more holistic approach to the management BP control. Patients may benefit from more consistent surveillance of BP in the home incorporated with closer follow up with primary care practitioners to titrate BP medications. Tele-health may be an ideal tool in the monitoring of BP control.

Clinicians in and out of the home must impress upon patients the importance of consistent BP control in reducing the risk factors for stroke, and recurrent stroke, MI and vascular death. Home care clinicians are tasked with developing ways to help patients become self-motivated and proactive to want to make changes in their lives to improve health outcomes. Patients will ultimately have to be responsible for maintaining their own health; however, home care clinicians have the power to change lives.

HTN affects a significant percentage of Americans, but black Americans are affected at a higher rate. This article outlines a prospective cohort study that explored racial differences and predictors in BP control after an intracerebral hemorrhage (ICH).

Methods

This cohort study was part of a larger observational study, which looked at racial variances in ICH with a focus on imaging findings. Participants were recruited from five hospitals in the District of Columbia region. In order for individuals to participate in the study, they had to be at least 18 years old, suffered an ICH not caused by an injury within the last 30 days, not be pregnant, have no history of a brain neoplasm, be free of meningitis and other related issues which increases intracranial pressure and not be on anticoagulant therapy.

Data Collection

At baseline the researchers collected information from medical records and interviews. Information included the status of the participant prior to the ICH including education, occupation, marital status, medications, drug use, alcohol use and smoking. Other information included co-morbidities, HTN medications, body mass index and documented results using the Glasgow Coma Scale, a reliable tool that determines level of consciousness. Baseline BP measurement was obtained from emergency department records and a CT scan determined ICH.

Study participants were re-assessed at 30 days and then again at 1 year and were broken into two groups; participant living at home or living in a facility. Qualified staff obtained BP readings using a reliable BP monitor with the appropriate algorithm to reduce reading discrepancies from the two readings taken a couple of minutes apart. Mean arterial pressure was used. There were no study-related medical interventions.

Results

Initially, there were 806 patients screened who experience an ICH with 198 people enrolled. Included in the analysis for this article, were 162 who had 30 day or 1 year follow up date. The study population was 53% male, had a mean age of 58.9, and were 77% black. Eighty-five percent had a history of HTN prior to their ICH. Black participants were younger than the white participants, were likely to be smokers and less likely to be married. BP findings include:

- At the time participants presented in the emergency room post-ICH, blacks had an average mean arterial BP approximately 9.6 mm HG higher than whites.
- BP control at 30 day follow up was extremely low with fewer than 20% with a normal BP.
- At 30 days and at 1 year after experiencing an ICH, blacks had higher BP than whites with statistically significant higher diastolic BP readings at 1 year.
- At 30 days, blacks were on a higher number of different classes of antihypertensive medications than whites, but at one year there was no notable differences.
- Married participants and those living in a facility had lower BP.

Discussion

A major study limitation was the small number of white participants assessed at 1 year, limiting the team's ability for full multivariate adjustments and predictive modeling. Despite this limitation, the study found suboptimal BP control at 30 days and 1 year in the largely black study population and demonstrated the need for further investigation.

Implications for Home Care

The role of nurses is always to advocate for better outcomes for their patients. Prevention of complications related to elevated BP is an ongoing challenge for home care nurses. ICH is one of those complications, which can have a long-term negative effect on the quality of life for patients. Striving for BP control is important for all populations, but needs increased attention with the black population in order to reducing ongoing disparities in health outcomes

Acknowledgment

Preparation of this research brief was partially supported by the National Institute of Neurological Disorders and Stroke under award number U54NS081765 and the Beatrice Renfield Foundation. The content is solely the responsibility of the authors.

References

1. James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J, Ortiz E. 2014 Evidenced-Based Guidelines for Management of High Blood Pressure in Adults. Report from the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). Journal of the American Medical Association. 2014; 311(5):507–20. [PubMed: 24352797]

2. Stewart S, Stocks N, Burrell L, de Looze F, Esterman A, Harris M, Carrington M. More rigorous protocol adherence to intensive structured management improves blood pressure control in primary care: results from the Valsartan Intensified Primary care Reduction of Blood Pressure study. *Journal of Hypertension*. 2014; 32(6):1342–50. [PubMed: 24759125]
3. Towfighi A, Markovic D, Ovbiagele B. Consistency of blood pressure control after ischemic stroke: prevalence and prognosis. *Stroke*. 2014; 45(5):1313–1317. [PubMed: 24676779]
4. Zahuranec DB, Wing JJ, Edwards DF, Menon RS, Fernandez SJ, Burgess RE, Kidwell CS. Poor long-term blood pressure control after intracerebral hemorrhage. *Stroke*. 2012; 43(10):2580–2585. [PubMed: 22903494]