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Hypertension in the Older Adult

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SYNOPSIS

Hypertension (HTN) is very common among adults and is associated with significant morbidity and mortality. HTN should be routinely screened and addressed in primary care practice. Optimal BP targets have evolved in the past decade with the release of large studies including older persons. However, controversy remains regarding the treatment of patients 80 years and older, and those who are frail. The relationship between blood pressure treatment and falls or cognitive impairment is still an area of concern and debate. Ultimately, a strategy to address HTN in older persons needs to consider an individual's fitness as well as the likelihood of adverse effects and worsening of conditions that adversely impact quality of life.

Keywords

Hypertension; Elderly Hypertension; Blood Pressure; Geriatric

INTRODUCTION

Approximately one in three adults have hypertension (HTN) with another 8% estimated to be undiagnosed, making it the most common reason after medication refills for adult primary care visits.[1] Currently 76.4 million adults have HTN in the U.S. alone.[2] This combined with HTN's association with aging physiology and the aging of the populous, makes HTN one of the most pressing current public health concerns.[3,4]

HTN is defined as isolated systolic elevation, isolated diastolic elevation or both.[5] While ongoing research has provided large scale data on both the measurement and treatment of

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HTN, practitioners have been left with the difficult task of assessing conflicting reports about who to treat, how low to drive pressures and how to balance the increasing concern of overtreatment. This is especially problematic in the treatment of older and more frail adults for whom adverse side effects and poor outcomes are more worrisome.

HTN DEFINED & MEASURED

Hypertension (HTN) has traditionally been defined as systolic blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mmHg taken as the average of three properly measured readings on two or more outpatient office visits.[6–8] While the basic tenants of this definition continue to stand today, additional research into the best methods for screening for HTN as well as the most appropriate numerical definitions has given rise to some confusion about how to define this common cardiovascular disease.

Blood pressure measurements in the outpatient office setting can miss elevations occurring at other times or incorrectly diagnose white coat HTN as primary essential HTN. More recent recommendations therefore are to utilize home ambulatory blood pressure monitoring as the preferred measurement for diagnosis. These ambulatory home measurements more closely correlate with daytime blood pressure readings and are more accurate.

Ambulatory readings averaging ≥ 130/80 over a 24-hour period would be diagnostic of HTN. If measuring daytime pressures only, HTN would be defined by >135/85 while nocturnal measures of 120/70 would constitute HTN diagnosis due to decreased pressures during nighttime sleep rhythms. If it is not possible to monitor patients at home in this manner, traditional one point in time measures would be acceptable. By this traditional method, HTN could be defined as ≥ 140/90 as noted above.

Appropriate measurement of blood pressures is important because HTN disease is associated with significant morbidity and mortality, including heart attack, stroke, chronic kidney disease and death. Accordingly, HTN remains the most important risk factor for many of these associated cardiovascular disorders. Effective treatment to reduce blood pressure to goal is the single most important modifiable intervention to improve both the length and quality of life for adults, especially older adults, who are disproportionately affected.

Pathology

HTN results from the body’s response to external stressors to maintain the blood pressure at effective ranges for perfusion of vital organs such as the brain and heart. When plasma volume or cardiac output are ineffective, common regulating pathways such as the Renin-angiotensin system and autonomic nervous system respond accordingly to increase blood pressure. Cardiac output volume and systemic vascular resistance result in measurable blood pressure (CO × SVR = BP). If the body cannot maintain perfusion to organs as needed at normal blood pressures, it will compensate by either increasing output volume or resistance, thereby increasing pressures.[5]

As changes occur in body position, baroreceptor medicated responses in the autonomic nervous system increase tone in veins and arteries while lower extremity and abdominal

muscular contractions increase blood return from the lower extremities. These instantaneous, automatic responses maintain blood pressure and therefore adequate cerebral perfusion with position changes.[9] If these mechanisms do not work correctly or work inefficiently, an acute drop in blood pressure can occur. A drop of >/= 20 mmHg in systolic or >/= 10 mmHg diastolic pressures occurring with changes in position is defined as orthostatic hypotension.[10]

Orthostatic hypotension is more common among elderly and frail patients, occurring in up to 40% of elderly with cardiovascular risk factors.[11,12] Normal aging changes combined with medication side effects and multi-morbidity make elders with cardiovascular risk factors more likely to have orthostatic hypotension. Practitioners should use caution in treating HTN while watching for orthostasis since hypo-perfusion not only causes significant morbidity in dizziness, falls and syncope, but has been implemented in long term cognitive impairment such as dementia as well as stroke.[13–15]

Vascular resistance increases with age as the vascular wall become less compliant. This change combined with common age associated conditions such as heart failure which reduce cardiac output results in the increased incidence of HTN among elders. While a more detailed discussion of the pathology of HTN is beyond the scope of this review, it should be noted that these recommendations generally apply to both primary (formerly known as essential HTN) and secondary HTN (resulting from the effects of medications or other disease pathology).

The elderly and frail are more likely to have medication side effects and age associated diseases such as chronic kidney disease (see Table 1). Therefore, ruling out secondary causes such as NSAID or steroid effects as well as common age associated diseases such as obstructive sleep apnea and chronic kidney disease is important in assessing older patients presenting with HTN. Appropriately distinguishing primary HTN from secondary causes not only avoid unnecessary prescribing and the polypharmacy cascade that follows, but improves reduction to goal, treatment adherence and long term outcomes.

Screening

As there are few risks of blood pressure measurement, most experts recommend screening all adults over the age of 18 at least once for HTN. Patients 18 to 39 years old with normal blood pressure readings and no risk factors for HTN, only need to be screened every 3 years. Patients over age 40 should be screened annually.

Regardless of age, patients with risks such as stressful lifestyle (type A personality), excessive alcohol intake, high sodium diet, diabetes or obesity should be screened more frequently at their provider’s discretion. Most providers choose to take blood pressure readings for these patients at each office visit. Recommendations are shown in Table 2.

TREATMENT

Treatment for hypertension to reduce blood pressure has consistently been shown to reduce cardiovascular morbidity and mortality.[6,16] Multiple studies have been conducted in older

persons to determine the optimal level at which to initiate treatment and the ideal blood pressure goals. There remains some disagreement regarding current recommendations for initiation and maintenance treatment. Furthermore, the minimal blood pressure, or lower threshold below which blood pressure should not be lowered, has not been adequately determined.

The blood pressure at which lifestyle changes or pharmacologic therapy should be initiated has evolved and been updated as more data from randomized controlled trials (RCTs) accumulates to support specific BP goals. Lifestyle modifications are recommended in adults with lower blood pressure levels, with SBP 120–139 or DBP 80–89 mm Hg. Recommendations include dietary sodium reduction, reducing alcohol consumption, aerobic exercise, weight loss or maintenance of a healthy weight, smoking cessation, and stress reduction. Lower sodium diets have been associated with decreased cardiovascular events in several studies.[17] The effect that lowered sodium has on blood pressure may be of greater magnitude in older rather than younger adults.[6] In addition, adequate potassium, calcium, and magnesium intake are recommended, although they should not be used in place of treatment when pharmacological treatment is appropriate. Finally, reducing or avoiding medications that can increase blood pressure – such as non-steroidal anti-inflammatory drugs, corticosteroids, some anti-rheumatic drugs, and sympathomimetic drugs – are other interventions that can be taken when possible.[6,17]

Table 3 shows selected hypertension treatment guidelines from professional societies. The Joint National Commission (JNC-8) recommends a general approach to initiate antihypertensive therapy in patients 60 and older when SBP is ≥150 mm Hg or DBP is ≥90 mmg Hg, with a goal of SBP <150 and DBP <90, which were grade A recommendations. If a lower BP is achieved and a patient is tolerating medication without side effects or a decrement in quality of life, the recommendation is to continue therapy without adjustment, which was a grade E recommendation based on expert consensus. In all adults with chronic kidney disease or with diabetes, initiation should occur at SBP ≥ 140 mm Hg or DBP ≥ 90 to treat to a goal of SBP <140 and DBP <90, both of which were grade E recommendations. While preferred initial therapy could include a thiazide, calcium channel blocker, angiotensin-converting enzyme inhibitor (ACEI), or angiotensin receptor blocker (ARB), patients with chronic kidney disease should receive an ACEI or ARB. Blacks without CKD, even patients with diabetes, should initiate treatment with a thiazide or calcium channel blocker.[8]

Guidelines from the National Institute for Health and Care Excellence (NICE) in the United Kingdom’s National Health Service specify recommendations based on age. In patients, younger than 80, the recommendation is to initiate medication when patients have a BP ≥ 140/90 and ambulatory daytime average or home monitoring ≥ 135/85 along with end organ damage, cardiovascular disease, chronic kidney disease, diabetes mellitus, or a 10-year cardiovascular risk ≥ 20%. Any patient with clinic blood pressure ≥ 160/100 mm Hg and average ambulatory monitoring or home measuring of ≥ 150/95 should receive medication. Patients 55 and older or of African or Caribbean descent should initiate therapy with a calcium channel blocker first, after which an ACEI or ARB could be added, followed by a thiazide diuretic.[18]

Treatment Targets in Older Patients

Despite the high prevalence of hypertension in patients 75 and older and particularly 80 and older, there are relatively few treatment trials that focus on patients of advanced age to determine optimal blood pressure targets, optimal levels at which treatment should be initiated, and optimal medication therapy regimens.[20] A 2009 Cochrane review evaluated treatment trials for hypertension in people 60 and older, including 15 trials.[16] Trials in the review and meta-analysis included the Systolic Hypertension in the Elderly Program (SHEP) and the Hypertension in the Very Elderly Trial (HYVET). The conclusion was that there was significant benefit in treating moderate to severe systolic or diastolic hypertension in adults older than 60 years in reducing cardiovascular and cerebrovascular morbidity and mortality. The benefit in terms of all-cause mortality was only seen in adults 60 to 80 years and was not seen in adults 80 and older. The number needed to treat (NNT) for cerebrovascular morbidity and mortality was 50 people, over a 4.5-year period, and the NNT for cardiovascular morbidity and mortality was 100. Most of the trials used step therapy to achieve a BP goal, with a thiazide diuretic being the first-line choice for most trials.

The ACCF/AHA Guideline developed by expert consensus was an update that intended to put the results of the HYVET trial into perspective into updated guidelines. Notably, the target BP in HYVET was SBP <150 or DBP <80.[16] While the ACCF/AHA consensus recommendation was that there are benefits of treating adults >80 years to lower BP targets, the conclusion was that it was unclear whether the goal SBP should be the same for people 65 to 79 years vs. 80 years and older.[6]

Most recently, BP targets in older people have been put into question again by the results of the Systolic Blood Pressure Intervention Trial (SPRINT) trial. In SPRINT, adults were randomized to intensive (systolic <120 mm Hg) vs. standard (systolic <140 mm Hg) blood pressure goals.[21] In a separate analysis of the participants 75 years and older, the more intensive group had significantly reduced cardiovascular morbidity and mortality.[22] Adverse events were higher but not statistically significantly different in the intensive treatment group, including hypotension, syncope, acute kidney injury, and electrolyte abnormalities. Despite the fact that patients with diabetes mellitus or with recent stroke had been excluded from the study, based on data from the National Health and Nutrition Examination Survey, 7.6% of the US adult population would meet eligibility criteria for the SPRINT study, with eligibility increasing with older age. This represents 8.6 million people with hypertension not being treated currently.[23]

Optimal targets and levels of control of hypertension in older people remain uncertain. Reflecting this lack of certainty, several international treatment guidelines in the US, Canada, Australia, Europe, Egypt, South America, and Taiwan, vary somewhat on which patients are considered “older” and the applicable treatment target for the population.[24] The older population is considered anywhere from 60 years to 80 years and older. Target BP ranges >140/90, generally for patients ≥65 years, to <150/90 for those ≥80 years.[24] The ESH/ESC Guidelines specifically highlighted that whether older patients with blood pressure between 140 and 160 mm Hg should be treated is still a significant gap in the literature.[19] As mentioned, other reviews and consensus panels have also specifically stated that the management of HTN in people 80 and older is still uncertain.

One challenge is the existing guidelines do not suggest the minimal level above which a blood pressure should be controlled, whether for systolic or diastolic pressure.[25] Studies have suggested a J-shaped or U-shaped curve in the associations between blood pressure and cardiovascular outcomes, with a nadir for risk at 135/75 mm Hg in people 70–79 and 140/70 for people ≥80 years.[6] However, concerns regarding this association between BP and risk include the methodological quality of studies showing the association and the lack of consideration of confounders like heart failure, age, and comorbidity. One suggestion is that wide pulse pressure and low DBP are more important risk predictors that may be related to the J-curve association.[26] Although some recommendations are to raise the goal SBP to <150 mm Hg for the older population to avoid harms, there is still a lack of definitive evidence and a lack of agreement among experts.[25] The evidence is particularly uncertain for higher risk groups, particularly with cardiovascular disease, multiple risk factors, and African Americans who may have a higher risk of morbidity and mortality using higher SBP targets and who may benefit from more aggressive treatment goals.[7]

UNIQUE ISSUES IN THE ELDERLY POPULATION

Frailty

Little is known about the treatment of hypertension in frail older persons. Other than studies in long-term care settings, studies of antihypertensive treatment have not specifically focused on frail individuals to test hypotheses about benefits and harms of overtreatment or undertreatment in the context of frailty.[27] The HYVET trial did include a 25-item frailty index, and a secondary study of participants for whom there was frailty data found no interaction between frailty and benefits or harms in the study.[28] Frail and fit participants both seemed to benefit from blood pressure reduction. In the SPRINT trial, frailty was characterized using a 36-item Frailty Index. For every 1% increase in the FI, there was a higher risk of injurious falls with a HR 1.035, and increased risk of all-cause hospitalizations with HR 1.038.[29]

However, findings regarding the harms of antihypertensive therapy in nursing home settings do raise concern for the potential for overtreatment in frail older persons. In the Predictive Values of Blood Pressure and Arterial Stiffness in Institutionalized Very Aged Population (PARTAGE) study, there was a higher risk of all-cause mortality in patients with SBP <130 mm Hg taking 2 or more antihypertensive medications. The authors recommended that people 80 and older who are considered robust by a rapid frailty assessment could be treated with a similar approach to patients aged 65–75 years, with a target SBP 130–150 mm Hg. For frail individuals, target SBP should be 150 mm Hg and HTN should be treated with monotherapy at low dose, with slow dosage increases, and with a reduction in therapy if patients have SBP <130 mm Hg or orthostatic hypotension.[30]

Cognition

The American Heart Association released a consensus statement in October 2016 that although there is a clear adverse effect of mid-life hypertension on late-life cognitive function, there is not enough evidence to make recommendations about late-life hypertension and late-life cognitive impairment. Furthermore, in the oldest patients, ≥ 85

years, there is even less evidence, with a suggestion that higher SBP was associated with better cognitive function, and other data suggesting that hypertension might be associated with other cognitive dysfunction but not with short-term memory loss.[31] A cohort study of patients 75 and older showed that higher SBP was associated with lower mortality in patients with cognitive and functional impairment.[32] However, discontinuing antihypertensive medications in patients 75 and older with mild cognitive impairment did not result in any improvements in cognitive, psychological, or functional ability.[33]

Stroke

HTN is the most important modifiable risk factor for both hemorrhagic and ischemic stroke in adults. Isolated systolic HTN and elevated pulse pressures are significantly more important estimations of elevated stroke risk compared to diastolic pressures.[34]

Diastolic pressures pushed low by attempts to treat isolated systolic HTN, were once thought to result in hypo-perfusion to the brain and increased stroke risk in older adults. While it has been shown that diastolic pressures ≤ 60 mm Hg can result in other cardiovascular events, it does not correlate to increased incidence of stroke.[35,36] This creates a therapeutic range in which to keep pressures, neither too high nor too low to maximize outcomes, including stroke.

SUMMARY/DISCUSSION

Hypertension remains a common problem among elderly patients. While much data has been accumulated in the past several years about both the measurement and treatment of HTN including elderly patients, confusion about whom to treat and how low to drive pressures has continued to be a difficulty for providers.

The basic principles, however, remain the same for elderly patients. For older community living younger elders (< 80 years of age), treatment should follow that of other adults. These younger, more functional geriatric patients can often be driven to goal blood pressure reductions to maximize their outcomes. As physiological reserve declines and patients become frail, these patients are not able to compensate for lower reductions in blood pressures. This can result in hypo-perfusion of the heart and brain and subsequent increased incidence of heart attack and stroke. Additionally, medications used to lower blood pressures as well as the low pressures themselves have a significant effect on patient’s quality of life causing dizziness, falls and fatigue.

Focusing on individual patient goals and tolerability is important in the treatment of all patients, but is crucial to the treatment of older and/or frail patients. Providers should focus on goals of care discussions and quality of life before starting medications or other aggressive interventions in frail and elderly patients. When medications are initiated, patients should be started on low doses taking care to choose medications less likely to cause excessive lowering of blood pressure or orthostatic hypotension. Patients should be advised of possible side effects and should follow up with practitioners routinely.

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KEY POINTS

- Hypertension is very common among elderly patients and with projected population aging is anticipated to be an ever-increasing public health problem.
- Hypertension is associated with significant cardiovascular risk for heart attack, stroke and chronic kidney disease and remains the most common reason adults to see their primary care provider aside from routine medication refill visits.
- Confusion still exists in treatment of elders, specifically who to treat and how low to push blood pressures.
- Quality of life, adverse treatment effects and goals of care should be central to the treatment of hypertension in older and frail adults.

Table 1

Common factors associated with and causes of HTN by type.

Primary HTN	**Secondary HTN**
primary disease resulting from genetic & environmental effect	*results from underlying effects of other disease*
Common Factors related to Primary HTN: • Age • Obesity • Race (Black) • Genetics/Family History • Reduced Nephron Number • Physical Inactivity • High sodium and/or alcohol intake • Personality type/traits (type A) • Cardiovascular risks (diabetes, hyperlipidemia)	Common Causes of Secondary HTN: • Primary Renal Disease • Primary Hyperaldosteronism • Pheochromocytoma • Obstructive Sleep Apnea • Cushing's Disease • Coarctation of the Aorta • Prescription or Over the Counter Medications NSAIDS Decongestants Erythropoietin Glucocorticoids Cyclosporine Stimulants (amphetamines) Antidepressants (Tricyclic and Serotonin Reuptake Inhibitors)

Table 2

Screening Recommendations for Adults

Age	Screening Recommendation
18 years old	One time screen
18 – 39 years	Every 3 years *If risk factors such as obesity, diabetes or high alcohol intake, more frequent screening is recommended at provider's discretion.*
>40 years old	Annually
>80 years old	Annually or at provider discretion

Table 3

Selected Professional Society Guidelines with Specific Recommendations for the Treatment of Hypertension in Older Adults

Guideline	When to Initiate Therapy	Goal	Preferred Medications
JNC-8[8]	SBP ≥ 150 mm Hg OR DBP ≥90 mm Hg	SBP < 150 mm Hg AND DBP <90 mm Hg	Thiazide, CCB, or ACEI/ARB Blacks without CKD: thiazide or CCB CKD: ACEI or ARB
NICE[18]	Any patient with BP ≥ 160/100 mm Hg and avg home measure of ≥150/95 mm Hg Age <80 and organ damage, CVD, CKD, DM, or 10 yr risk ≥20% : BP ≥ 140/90 mm Hg or home avg ≥135/85 mm Hg	BP <140/90 mm Hg in people <80 years BP <150/90 mm Hg in people ≥80 years	CCB, then ACE/ARB, then thiazide
ACCF/AHA[6]	SBP ≥140 or DBP ≥90	<140/90 mm Hg if uncomplicated HTN <120/80 mm Hg if LV dysfunction <130/80 mm Hg if DM, CAD, CKD, PAD avoid SBP <135 mm Hg or DBP <65 mm Hg in those 80 and older SBP 140–145 mm Hg is acceptable in 80 +	thiazides first-line, also CCBs and ACEI/ARBs BB if CAD or CHF
ESH/ESC[19]	SBP ≥140 mm Hg for younger SBP ≥160 mm Hg if ≥ 80 years	SBP between 150 and 140 mm Hg, and <140 mmHg in fit older people If ≥80 years, between 150 and 140 mm Hg if in good physical and mental condition DBP <90, or <85 mm Hg if DM is present	diuretics, BB, CCBs, ACEIs, ARBs as monotherapy or combination therapy (in the absence of compelling indications) thiazides and CCBs preferred in the elderly with isolated systolic hypertension

Abbreviations: SBP, systolic blood pressure; DBP, diastolic blood pressure; DM, diabetes mellitus; CAD, coronary artery disease; CKD, chronic kidney disease; PAD, peripheral arterial disease; CHF, congestive heart failure; BB, beta blocker; ACEI, angiotensin-converting enzyme inhibitor; ARB, angiotensin receptor blocker; CCB, calcium channel blocker.

Data from Refs 6, 8, 18, 19.