

# HYPERTENSION IN THE ELDERLY

## SPECIAL CONSIDERATIONS

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# Introduction

- Hypertension in older adults is related to adverse cardiovascular outcomes, such as HF, stroke, MI , and death.
- The global burden of Htn is increasing due to an aging population and increasing prevalence of obesity , and is estimated to affect 1/3 of the world's population by 2025.
- Adverse outcomes in older adults are compounded by mechanical hemodynamic changes, arterial stiffness, neurohormonal and autonomic dysregulation, and declining renal function.
- Management strategies for Htn in older adults must consider the degree of frailty, increasingly complex medical comorbidities, and psycho-social factors, and must therefore be individualized.
- Non-pharmacological lifestyle interventions should be encouraged to mitigate the risk of developing hypertension, and as an adjunctive therapy to reduce the need for medications.
- Pharmacological therapy with diuretics, RASS blockers, and CCBs have all shown benefit on CV outcomes in older patients. Given the economic and public health burden of Htn .
- In USA and globally, it is critical to address lifestyle modifications in younger generations to prevent hypertension with age.

# Prevalence

- As with many conditions, HTN increases with age, increasing from 27% in patients aged younger than 60 years to 74% in those aged older than 80 years.
- The Framingham Heart Study showed that more than 90% of the participants with a normal BP at age 55 years , develop HTN.
- Approximately 60% of the population has HTN by 60 years of age and about 65% of men and 75% of women develop high BP by 70 years.

## PATHOPHYSIOLOGY AND COMPLICATIONS OF HYPERTENSION IN OLDER ADULTS

- Mechanisms of HTN in older persons include mechanical hemodynamic changes, arterial stiffness, neurohormonal and autonomic dysregulation, and the aging kidney.
- Arterial stiffening results in decreased capacitance and limited recoil, leading to difficulty to accommodate volume changes, with increase SBP and DBP.
- Central arterial stiffness predominates after age of 60, and as a consequence, SBP continues to rise while the DBP declines thereafter, resulting in isolated systolic HTN and a widened pulse pressure.
- The change in arterial structure causes an increase in the reflected pressure waves added to the forward pressure waves in the ascending aorta that further augments the central SBP.
- Endothelial dysfunction occurs overtime, inducing an elevation in endothelin-1 and decreasing bioavailability of nitric oxide, which affects arterial dilation.

## PATHOPHYSIOLOGY AND COMPLICATIONS OF HYPERTENSION IN OLDER ADULTS

- Also , there is a decline in the renin-angiotensin aldosterone system, with plasma renin levels by age 60 declining to 40% to 60% of younger individuals.
- Likewise , decreased aldosterone levels predisposes individuals to drug-related hyperkalemia.
- As a result of reduction in beta-adrenergic receptors there is compensatory Increase in peripheral plasma norepinephrine activity .
- Reduced baroreflex sensitivity with age and loss of artery compliance causes orthostatic hypotension (falls , CV effects ).
- Studies showed that beta-blockers were associated with increased likelihood of developing orthostatic hypotension.

## PATHOPHYSIOLOGY AND COMPLICATIONS OF HYPERTENSION IN OLDER ADULTS

- To achieve postural hemostasis , older adults rely on an increased COP by increasing HR , as opposed to changes in their stiff arteries .
- Postprandial hypotension in geriatric patients is an under recognized cause of syncope. The mechanism is unclear, but it appears to be related to reduced sympathetic response to a meal.
- The aging changes in the kidney are increased salt sensitivity , which prompts vasoconstriction and vascular resistance.
- Lastly, HTN in the elderly is also associated with increased risk of ischemic and hemorrhagic strokes , vascular dementia, Alzheimer's disease, CAD , AF , chronic kidney disease and retinal diseases.

## Diagnosis of hypertension

- Measurement of BP in the proper environment under optimum conditions.
- Patient be relaxed in a chair for at least 5 minutes with the arm resting.
- In order to establish diagnosis,  $\geq 2$  readings of elevated BP on  $\geq 2$  occasions are needed.
- White coat Htn is more common among elderly patients possibly related to increasing arterial stiffness .
- Ambulatory or out-of-office blood pressure readings is important in the subgroup of patients with mildly elevated in-office BP readings.
- The 2017 ACC has set a blood pressure reading above  $\geq 130/80$  mmHg to be considered hypertensive while the ESC Hypertension guidelines 2018 have maintained a blood pressure reading of  $\geq 140/90$  mmHg to be considered to be hypertensive.

## CURRENT EVIDENCE AND GUIDELINES

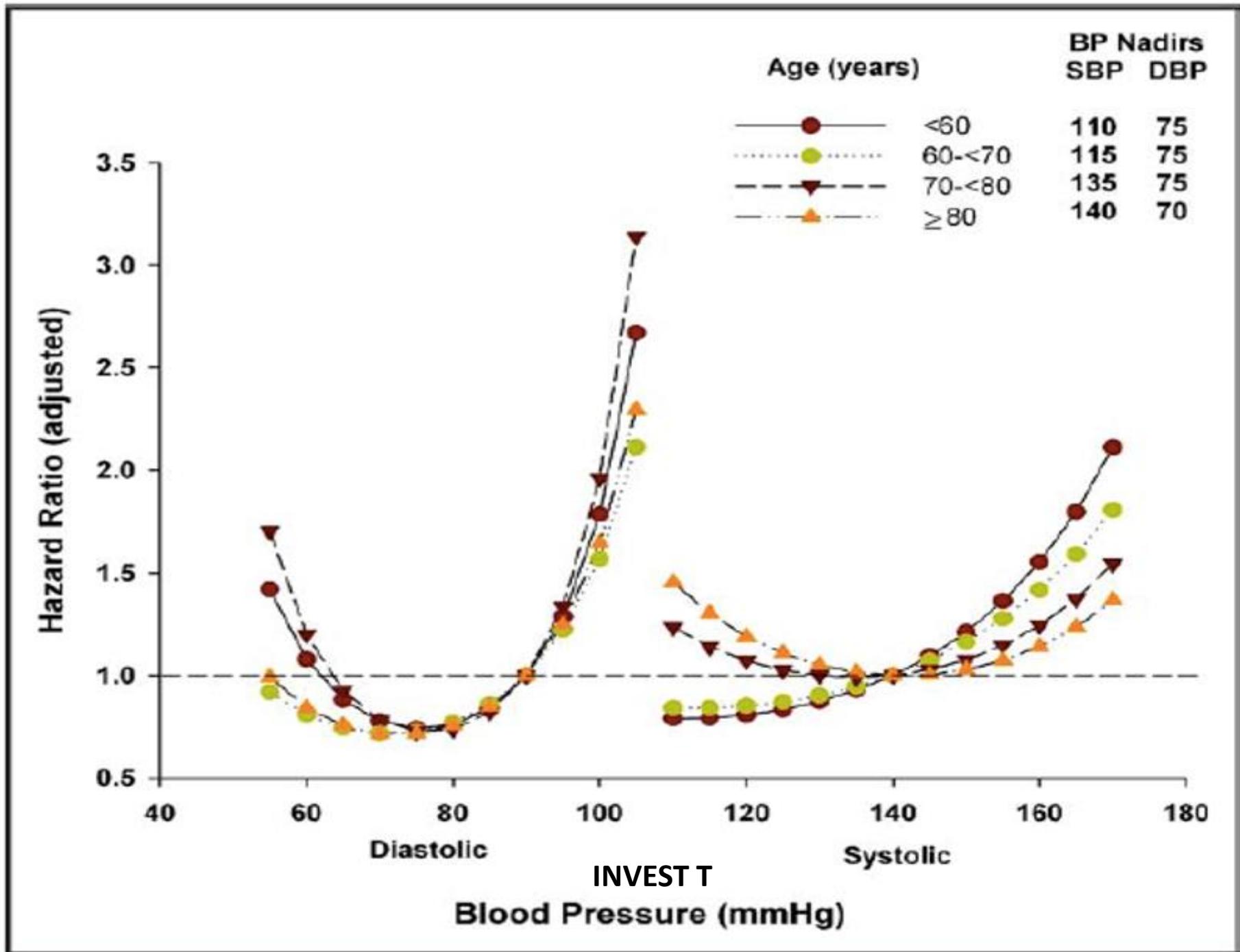
- Treatment of ISH in older adults was somewhat unclear until SHEP trial , Syst-Eur , and HYVET , showed significant CV benefits on lowering SBP in patients with ISH. All these trials defined ISH as SBP  $\geq 160$  and DBP  $< 90$  mmHg.
- Based mainly on HYVET study, the 2013 ESH/ ESC Guidelines for the management of HTN stated that there is evidence for benefits of lowering the SBP to  $< 150$  mmHg in older adults with initial SBP of  $> 160$  mmHg.
- Despite this convincing evidence of the benefit of antihypertensive ttt in older adults with HTN, the optimal BP target has remained unclear in this population , as older adults may develop complications from the ttt , such as orthostasis , falls and renal dysfunction due to their burden of comorbidities, advanced age and frailty.
- The 2017 ACC/AHA guidelines recommend that a BP  $< 130/80$  mm Hg should be targeted after the age of 65 years. However, more recently, the 2018 ESC/ESH guidelines proposed a BP goal of  $< 140/90$  mm Hg for individuals older than 65 years.
- The 2017 American College of Physicians/American Association of Family Physicians guidelines propose to target a BP  $< 150/90$  mm Hg.
- Based on these different recommendations regarding the target BP in older adults, it seems clear that there is still debate on optimal BP targets.

## CURRENT EVIDENCE AND GUIDELINES

- Overall, choosing a target in older adults with hypertension requires discussion between physician and the patient taking into consideration several factors such as the burden of comorbidity, life expectancy, clinical judgment, and patient preference.
- While the SPRINT and HYVET studies support BP control even in frail individuals, analysis of NHANES suggest that impaired walking speed (a surrogate for frailty) may assist in risk stratifying frail seniors. In slower walkers (<0.8 m/s), elevated SBP and DBP ( $\geq 140/90$ ) were not associated with increased mortality.
- Data from NHANES II and SHEP trial showed that in the elderly, there is a linear relationship between CVD risk, specifically in stroke, and increasing SBP .
- The HYVET trial enrolled individuals age  $\geq 80$  with a SBP of at 160 mmHg to receive indapamide or placebo, and demonstrated a 21% relative reduction in all-cause mortality and a 23% relative reduction in CVD mortality after a median of 1.8 years under treatment.
- Until SPRINT ,most guidelines favored a goal of <140/90 mmHg in patients with chronic kidney disease (CKD). Interestingly, observational studies of CKD cohorts have shown increased mortality at lower SBP and a flat relationship of SBP to event risk in older patients with CKD, which supports the concern of intensive BP management.

## CURRENT EVIDENCE AND GUIDELINES

- In the INVES T sub-study, the adjusted hazard ratio for 1ry outcomes showed a J-shaped relationship between each age group with on-treatment SBP and DBP.
- The SBP at the hazard ratio nadir increased with aging, highest for the elderly (140 mmHg). Nevertheless, DBP at the hazard ratio nadir was slightly decreased for the very old (70 mmHg).
- Current recommendation from the ACP and the American Association of Family Practitioners recommend a systolic blood pressure of less than 150 mmHg despite the findings from SPRINT, which represents a 20-mmHg difference from other societies.
- Differences like this truly represent a challenge for clinicians. The ACC/AHA guidelines emphasize individualized CV risk assessment with the use of the ASCVD risk calculator, Therefore, an individual with an ASCVD risk calculator score of >10% 10-year risk will receive more aggressive treatment.
- While the ESC/ESH guidelines uses instead the SCORE system (Systemic Coronary Risk Evaluation) coupled with risk modifiers and assessment of HTN mediated organ damage . A patient with >10% 10-year CV risk will require more aggressive therapy.



**Table 1: A Comparison of Blood Pressure Thresholds and Targets between ACC/AHA, ACP/AAFP, and ESC/ESH Guidelines**

	<b>ACC/AHA 2017</b>	<b>ACP/AAFP 2017</b>	<b>ESC/ESH 2018</b>
<b>Definition of Older Patients</b>	≥65 years	≥60 years	Elderly 65-79 years Very Old ≥80 years
<b>BP Threshold for Initiation of Pharmacotherapy</b>	≥130/80 mmHg	SBP ≥150 mmHg	Elderly ≥140/90 mmHg Very Old ≥160/90 mmHg
<b>Blood Pressure Target</b>	<130/80 mmHg	SBP <150 mmHg	SBP 130-139 mmHg DBP 70-79mmHg

In November 2017, the American College of Cardiology/American Heart Association (ACC/AHA) hypertension guideline introduced new definitions for BP management (**Table 1**).

# HYPERTENSION MANAGEMENT IN THE ELDERLY

## Non-pharmacologic interventions

- Non-pharmacologic lifestyle interventions should be encouraged as preventive care for the development of HTN and as adjunctive therapy for established HTN.
- Current recommendations advocate for regular physical activity, weight control, smoking cessation, stress reduction, and avoidance of excessive alcohol intake.
- A heart healthy diet, such as DASH diet, low carbohydrate, vegetarian, plant-based and Mediterranean diet. As well as low sodium intake, potassium supplementation (1500 to >3000 mg), calcium or magnesium supplements, consumption of probiotics, fiber, flaxseed, increased protein intake, consumption of garlic, dark chocolate, tea, coffee, and fish oil.
- Behavioral therapies including transcendental meditation, yoga and biofeedback have known effect in decreasing BP.

## Non-pharmacologic interventions

- Contributing co-morbidities such as sleep apnea, renal artery stenosis, prostatism, primary aldosteronism should also be addressed.
- Review the patients medications to ensure they are not on any medications such as nonsteroidal anti-inflammatory drugs, steroids, angiogenesis inhibitors etc which can cause HTN.
- Reduction in sodium intake and weight loss constitute effective and safe ways to improve BP, as seen in the Trial of Nonpharmacologic Interventions in the Elderly
- The recommended physical activity recommended are aerobic exercise (90-150 minutes per week with achievement of 65% to 75% of HR reserve), dynamic resistance (90-150 minutes) per week .

# Pharmacologic interventions

- When medications are needed to manage older adults with uncontrolled HTN, several factors should be considered
- These include comorbidities, frailty of the patient, ability to follow instructions, complexity of the current regimen, supporting care (ie, spouses and family) and lastly electrolytes and renal function.
- Thiazide diuretics, ACEI, ARB, and CCB, have all shown benefit on CVD outcomes in older age patients.
- Unless clinically indicated for comorbidities, beta blockers should not be used as first line medications because they may worsen CVD outcomes in those over 60 years of age. Loop diuretics and alpha-blockers should also be avoided given their association with falls.
- In patients with isolated HTN, the ESH/ESC guidelines recommends a CCBs or diuretic in the elderly patients. This is supported by evidence from the ALLHAT and ASCOT-BPLA which showed significant overall mortality benefit in subjects aged >60 years when given a combination of CCB and ACE-I.

# Pharmacologic interventions

- Commonly BP remains uncontrolled on monotherapy and a combination of different agents is needed to achieve adequate BP control. Any of the four first line BP medications can be combined, however based on multiple RCTs RAAS blockers and CCB/thiazide is the preferred combination.
- SPC can be utilized with the added benefit of improving medication compliance. The medications should then be up titrated, with additional medications added as needed to achieve BP targets.
- Initiation of any medication should be done with assessment of orthostatic hypotension and gradual titration according to tolerance.
- Renal function should be assessed to detect possible increases in serum creatinine and reductions in GFR as a result of BP-related reductions in renal perfusion. Hypokalemia is also an important side effects of diuretics which needs to be monitored.
- The medical team needs to recognize treatment related side effects which may occur more frequently than reported in clinical trials.

# CONCLUSIONS

- As people are living longer, there will be an increasing burden of HTN in the growing population of elderly patients. While lifestyle changes have the potential to mitigate this.
- Education and awareness programs in community centers, places of worship , and businesses, will continue to have impact.
- Screening for BP elevation, improving access to care, and adoption of guideline driven management are keys to reducing the impact of HTN in our elderly patients.
- Further research is needed in this population, since most clinical trials include a small proportion of persons over age 85 years old.
- Such trial can help solidify the current recommendations to use  $>130/80$  after lifestyle intervention as the threshold for initiation of therapy and  $<130/80$  as the target of therapy.

*Thank You*