



**COMMUNITY  
HEALTH CARE  
ASSOCIATION  
of New York State**

# **Hypertension Care for Special Patient Populations – A Focus on Hypertension in the Elderly and Chronic Kidney Disease**

**Hypertension Care & Management Webinar Series  
Part Three  
June 17<sup>th</sup>, 2022**

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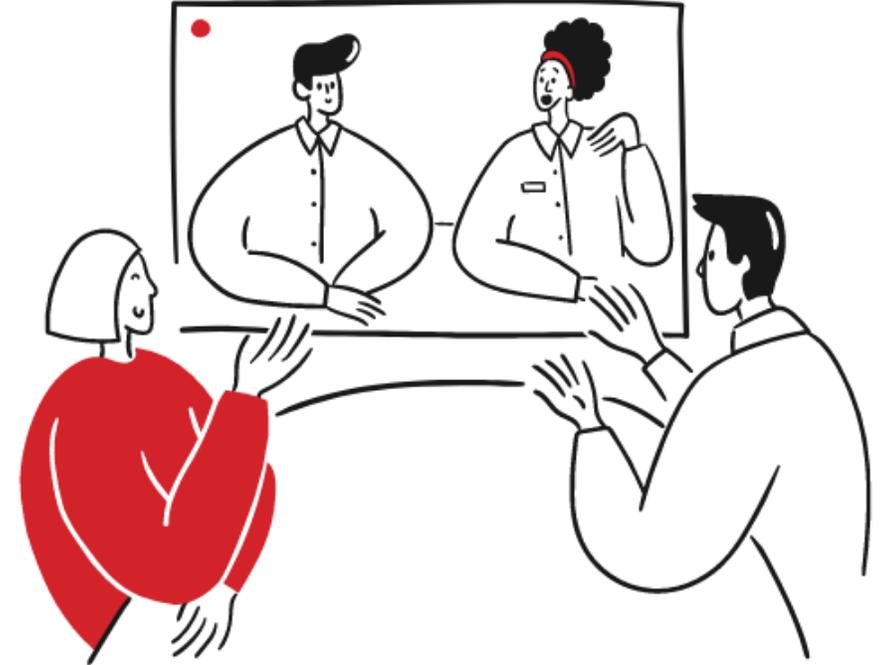
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# Housekeeping

- Phones have been muted to prevent background noise.
- Use the chat box to type questions during the webinar.
- This webinar is being recorded and will soon be available to all participants.
- A webinar evaluation will be shared with participants at the end of the meeting. Please provide us with feedback! We need your input to continue to support events like these.



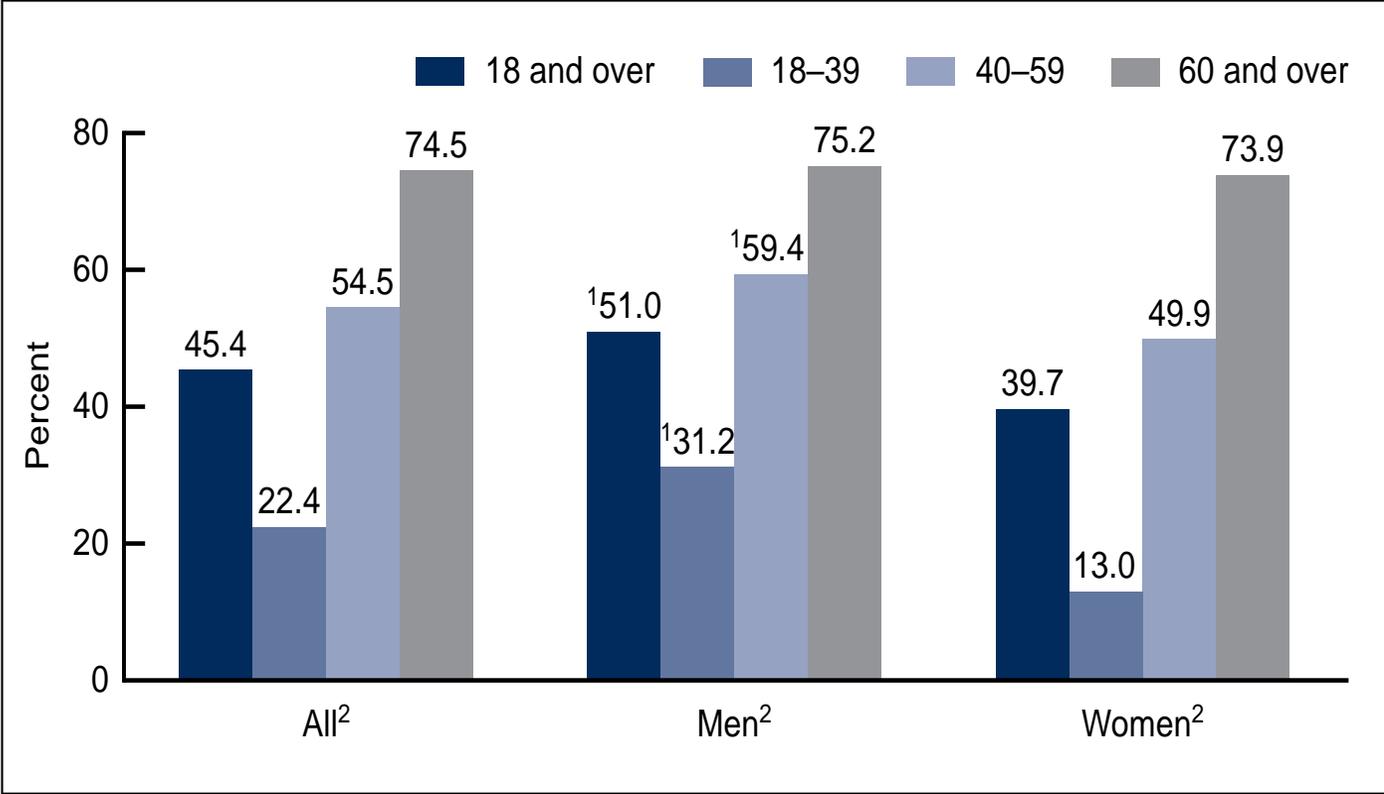
# Objectives

1. Understand the epidemiology of hypertension in the elderly and the risks and benefits of lowering blood pressure
2. Identify blood pressure treatment targets for patients with CKD and recommended first line medications

# The prevalence of HTN in older patients

- HTN increases with age, with its prevalence 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 blood pressure (BP) at age 55 years eventually 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.
- By the year 2060, the projected number of people living age 65 years or older will comprise 25% of the United States (US).

# Prevalence of HTN by age and gender United States adults 2017-18



Age-related rise in HTN prevalence

- 22.4% ages 18-39 years
- 74.5% ≥ 60 years

HTN prevalence increases with age

<sup>1</sup>Significantly different from women within the same age group.

<sup>2</sup>Significant increasing trend by age.

Data from the National Health and Nutrition Survey 2017-2018

# Residual lifetime risk for developing HTN

Will you live long enough to develop hypertension?

Time (years)	Women age 55 % (95% confidence interval)	Women age 65 % (95% confidence interval)
10	52 (46-58)	64 (60-69)
15	72 (68-76)	81 (77-84)
20	83 (80-86)	89 (86-92)
25	91 (89-93)	—

In MESA (Multi-Ethnic Study of Atherosclerosis), the percentage of the population developing hypertension over their lifetimes was higher for African Americans and Hispanics than for whites and Asians.

For an adult 45 years of age without hypertension, the 40-year risk for developing hypertension is 93% for African Americans, 92% for Hispanics, 86% for whites, and 84% for Chinese adults.

90% lifetime risk of HTN: In the Framingham Heart Study, approximately 90% of adults free of HTN at age 55 or 65 years developed hypertension during their lifetimes.

## Definition: Who is Old?

- Definitions vary
- Heterogeneous population
- Aging is a continuous process
- Most use definition of  $\geq 65y$  as old
  - Young old (65-74y)
  - Older-old (75-84y)
  - Oldest-old ( $\geq 85y$ )



Fauja Singh (106)  
AFP Photo/Laurent Fievet



Betty White (96)  
Soucre: WireImage/Lester Cohen

How frail is the person?

# Goal Blood pressures

	Younger ← ← AGE → → Older	
JNC 7 2003	<140/90 (Adults ≥18 years old)	
JNC 8 2013	<140/90 (<60 years old)	<150/90 (≥60 years old)
AHA/ACC 2017	<130/80	<130 (≥65 years old)
ASH/ISH 2014	<140/90 (<80 years old )	<150/90 (≥80 years old)
ESH/ESC 2013	<140/90 (<80 years old )	<150/90 (≥80 years old)
NICE 2011	<140/90 (<80 years old )	<150/90 (≥80 years old)

**JNC:** Joint National Committee; **AHA/ACC:** American Heart Association/American College of Cardiology;  
**ASH/ISH:** American Society of Hypertension/International Society of Hypertension; **ESH/ESC:** European Society of Hypertension/European Society of Cardiology; **NICE:** National Institute for Health and Clinical Excellence

## 2017 Guideline for the Prevention, Detection, Evaluation and Management of High Blood Pressure in Adults

### BP Classification (JNC 7 and ACC/AHA Guidelines)

SBP		DBP	JNC 7	2017 ACC/AHA
<120	and	<80	Normal BP	Normal BP
120–129	and	<80	Prehypertension	Elevated BP
130–139	or	80–89	Prehypertension	Stage 1 hypertension
140–159	or	90–99	Stage 1 hypertension	Stage 2 hypertension
≥160	or	≥100	Stage 2 hypertension	Stage 2 hypertension

- Blood Pressure should be based on an average of  $\geq 2$  careful readings on  $\geq 2$  occasions
- Adults being treated with antihypertensive medication designated as having hypertension

# PATHOPHYSIOLOGY AND COMPLICATIONS OF HYPERTENSION IN OLDER ADULTS

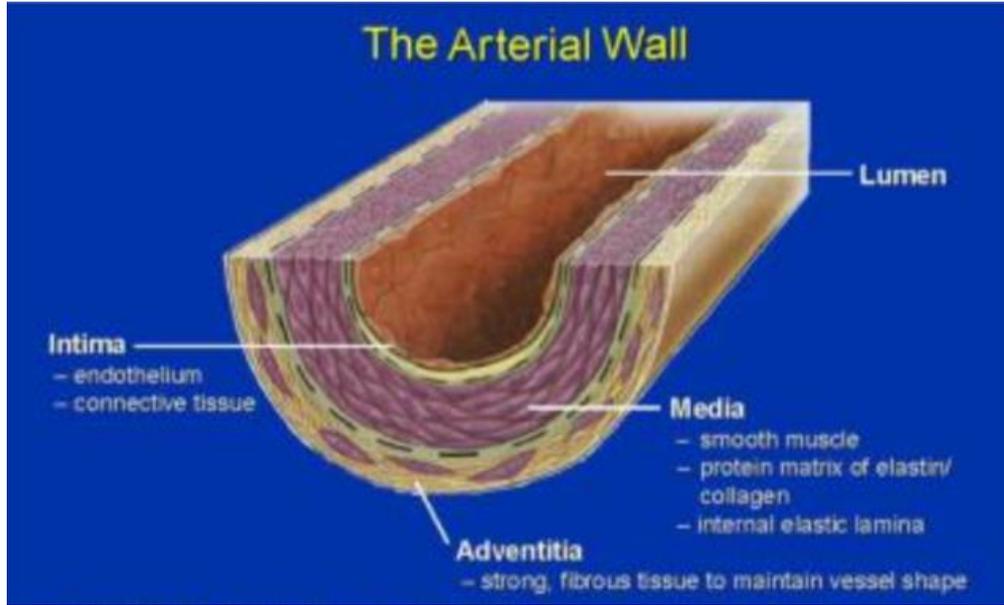
## Aging: Vascular changes

Increased thickness of intima and media

### Matrix

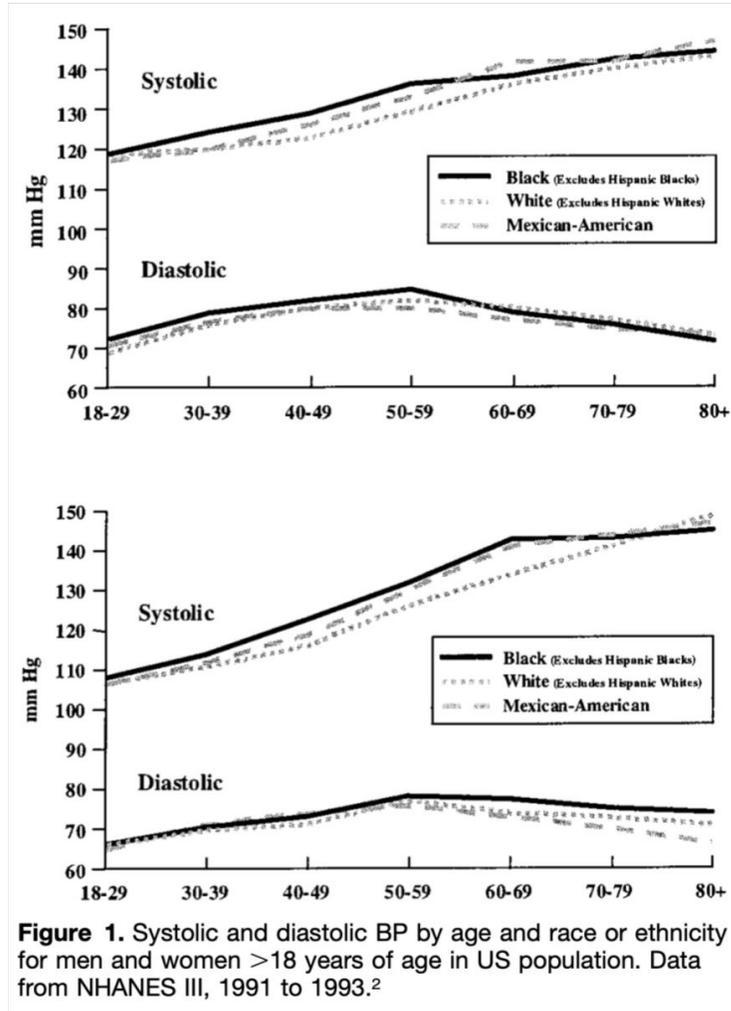
- collagen deposition
- increased fibronectin
- reduced elastin content
- crosslinking (advanced glycosylation end-products)

- Flow mediated arterial dilation declines with aging.
- Increased systolic BP with age.
- Older hypertensives are characterized by increased plasma norepinephrine, low renin, and low aldosterone levels.



**Net result is increased vascular stiffness**

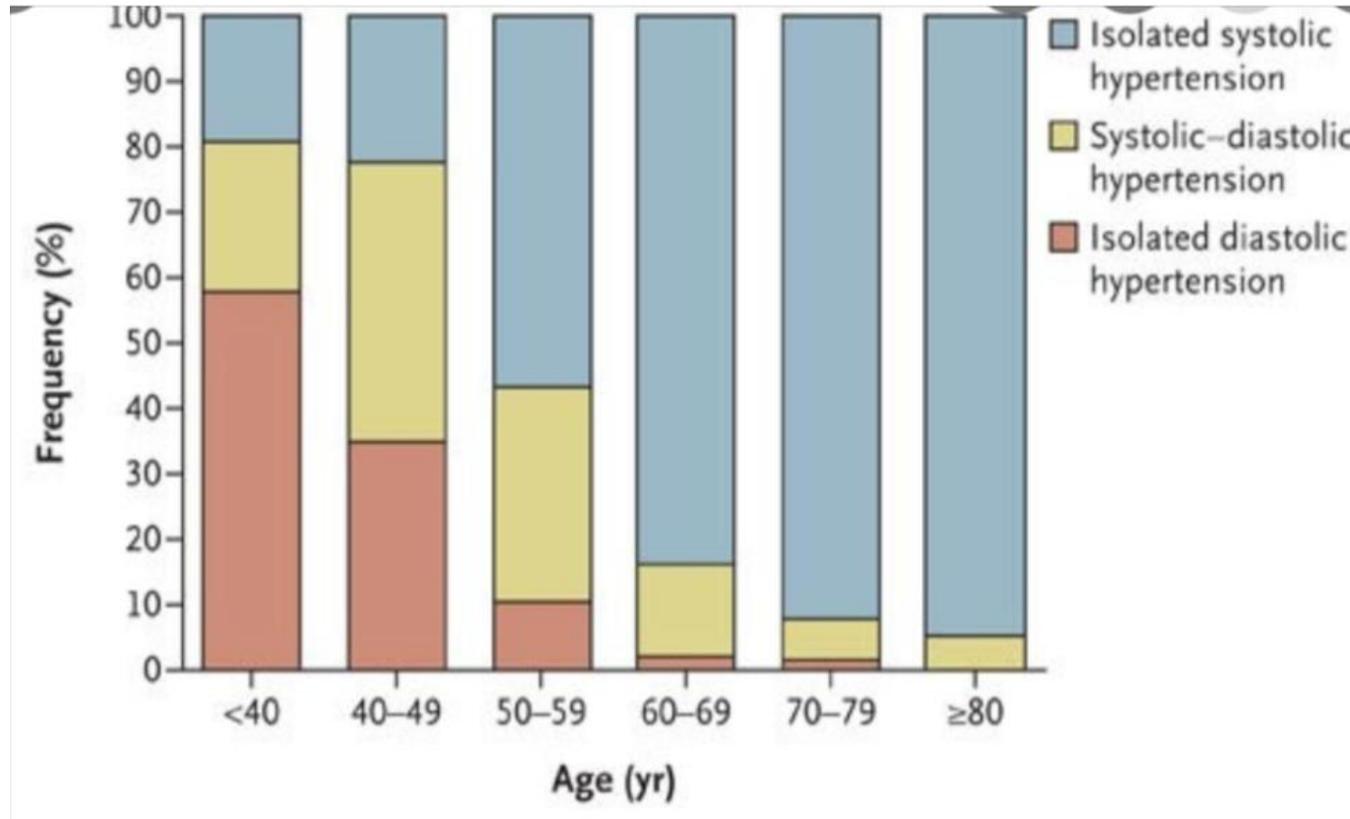
# Age associated arterial stiffening results in an increase in SBP and decrease in DBP. Pulse pressure widens with age.



Many so-called “normal aging changes” in arterial structure and function are blunted/absent in populations eating low sodium, / low calorie diets, engaging in physical activity, and low rates of obesity.

Hypertension 2000; 35: 1021-24.

# Isolated systolic Hypertension in the elderly



Isolated systolic HTN is the most common form of hypertension in the elderly (likely a result of an increase in arterial stiffness or impairment of nitric oxide-mediated vasodilation).

After age of 50 years , SBP is more important risk factor for CV events than DBP.

ISH is associated with a 2-to 4- fold increase of the risk of stroke, myocardial infarction (MI), or cardiovascular (CV) mortality.

NEJM 2007 by AV Chobanian; 357; 789-96

## HTN in elderly

- Systolic BP and pulse pressure are closely related independent cardiovascular disease risk factors.
- Elevated blood pressure is common in persons 80 years of age and older.
- Increasing age is a major predictor of death from stroke.
- Stroke is also a major contributor to disability in older patients.
- BP reduction has been shown to prevent vascular events such as a stroke.
- Heart failure is very common in people older than 70 years of age and HTN is a major risk factor for heart failure.
- In the past, there has been no conclusive results suggesting benefit in treating patients with HTN over age of 80.

## SHEP trial

- The SHEP (Systolic Hypertension in the Elderly Program) study, a placebo-controlled, double-blind, randomized trial, investigated the value of thiazide diuretic-based treatment in 4736 individuals > 60 years of age with isolated systolic hypertension (initial BP values > 160 mm Hg systolic and > 90 mm Hg diastolic).
- Patients were randomly assigned to receive treatment with 12.5 mg of chlorthalidone (step 1); either 25 mg/d of atenolol or 0.05 mg of reserpine (step 2) could be added (n= 2365); or placebo (n=2371).
- SHEP goal (20 mm Hg decrease in SBP to <160 mm Hg), SBP below 160 mm Hg, and SBP decrease of 10 mm Hg.

JAMA 2000; 284:465-471

## Major Trials in Isolated Systolic Hypertension

	n	Age	Entry BP	Relative Risk Reduction, %			
				Stroke	CAD	CHF	All CVD
SHEP	4736	≥60	171/77	-33	-27	-55	-32
Syst-EUR	4695	≥60	174/86	-42	-26	-29	-31

SHEP indicates Systolic Hypertension in the Elderly Program<sup>22</sup>; Syst-EUR, European Trial in Systolic Hypertension<sup>7</sup>; CAD, coronary artery disease; CHF, congestive heart failure; and CVD, cardiovascular disease.

Compared with placebo, those randomized to diuretic treatment had marked reductions in the rates of myocardial infarction (- 27%), heart failure (- 55%), and stroke (- 37%) as well as exhibiting trends toward improvement in depression and dementia scores.

RCTs have clearly demonstrated that BP lowering in isolated systolic hypertension (defined as SBP ≥160 mm Hg with variable DBP ≤90, ≤95, or ≤110 mm Hg) is effective in reducing the risk of fatal and nonfatal stroke (primary outcome), cardiovascular events, and death.

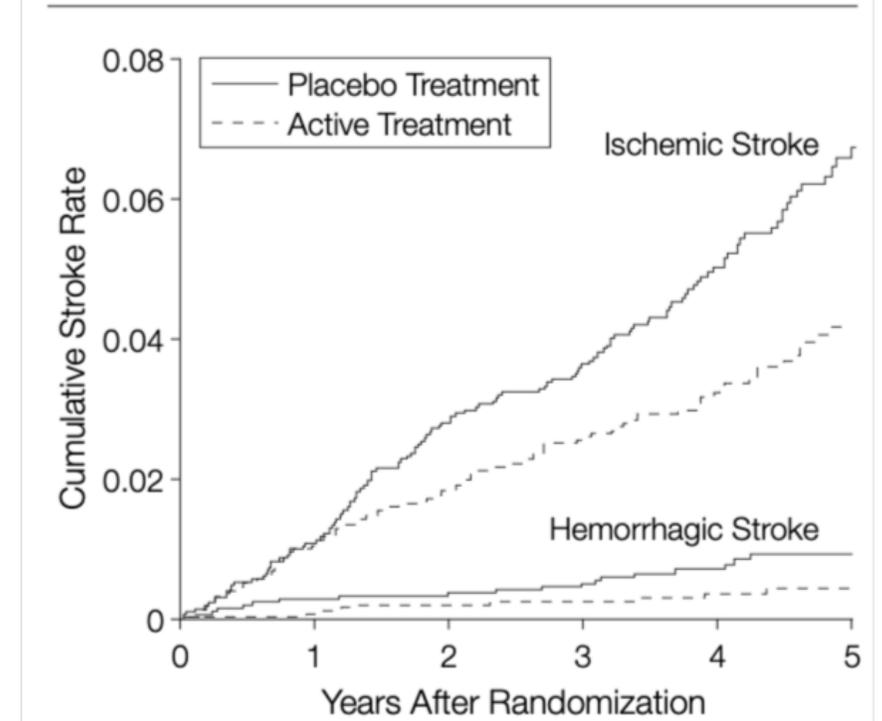
# SHEP trial-

SHEP trial showed, that treatment of HTN caused a significant reduction in the incidence of all strokes (both hemorrhagic and ischemic (including lacunar) strokes in elderly patients with isolated systolic hypertension.

SHEP and Syst-EUR demonstrated that lowering systolic BP to <160 mm Hg is markedly beneficial.

JAMA 2000; 284:465-471

**Figure.** Kaplan-Meier Event Curves for Ischemic and Hemorrhagic Strokes by Treatment Group



# Hypertension in the Very Elderly Trial (HYVET)

Is the treatment of patients with hypertension who are 80 years of age or older is beneficial?

- Subjects were > 80 yo (mean age 83 yo)
- Baseline: SBP > 160 mmHg (mean = 173/91)
- Treatment medications were indapamide and perindopril.

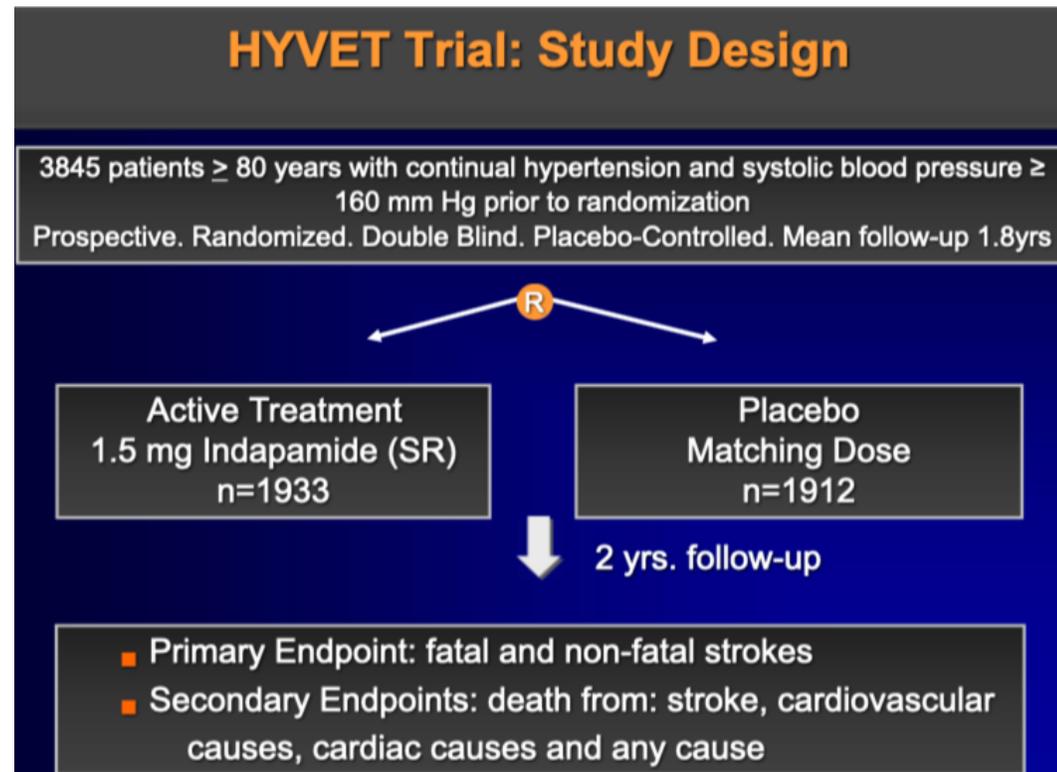
Goal BP was 150/80 mmHg

The results of HYVET indicate that antihypertensive treatment based on indapamide (sustained release, 1.5 mg), with or without 2 to 4 mg of perindopril, significantly reduced the risks of death from stroke and death from any cause in very elderly patients.

NEJM 2008; 358; 1887-98

# The Hypertension in the Very Elderly Trial (HYVET)

HYVETs goal was to evaluate the benefits and risks of providing medical care to very elderly patients presenting with HTN



# Risk reduction with HTN treatment in elderly- Medical treatment of HTN in older adults reduces cardiovascular morbidity and mortality.

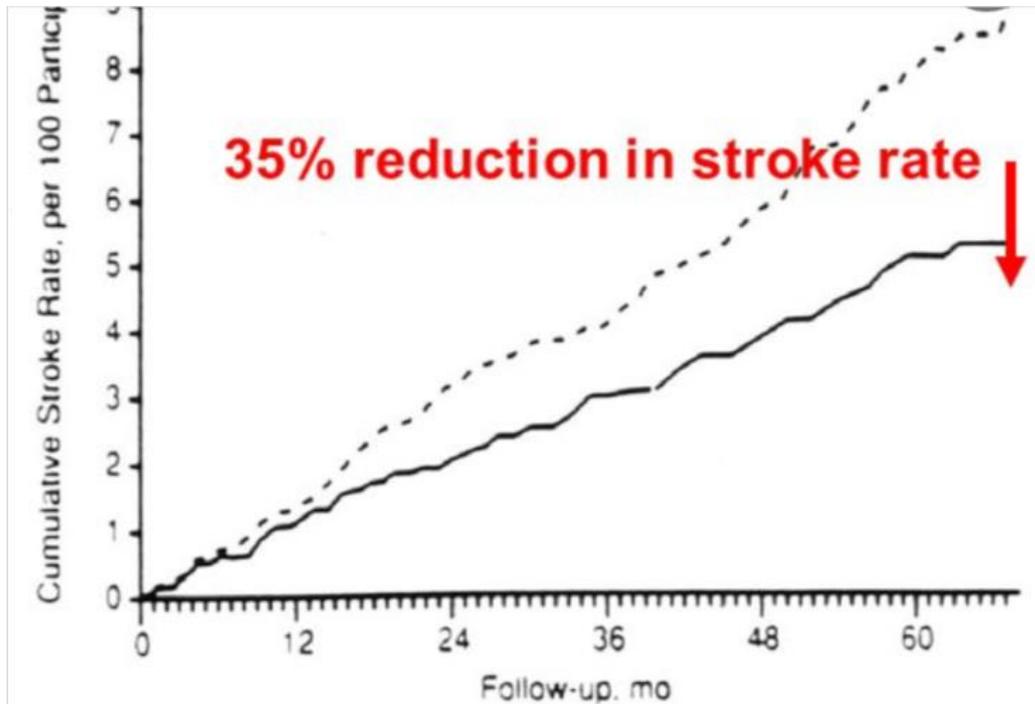


Fig 2.—Cumulative fatal plus nonfatal stroke rate per 100 participants in the active treatment (solid line) and placebo (broken line) groups during the Systolic Hypertension in the Elderly Program.

Ave Age 73

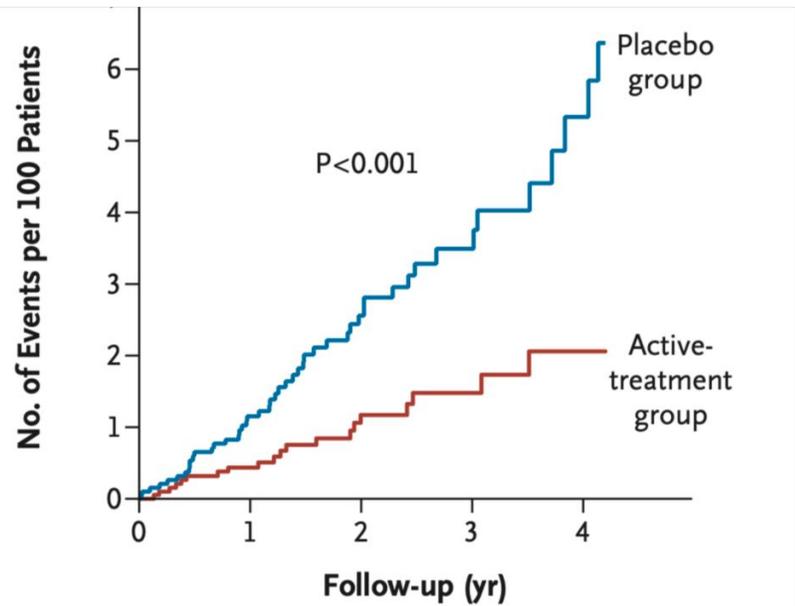
## HYVET trail results

- Lowering the blood pressure of hypertensive patients over the age of 80 is associated with reductions in total mortality and rate of cardiovascular events.

**Stroke is a leading cause of death, disability, and dementia.**

# Heart failure

Heart failure is common in people older than 70 years of age, and hypertension is a major risk factor for heart failure.



No. at Risk	
Placebo group	1912    1480    794    367    188
Active-treatment group	1933    1559    872    416    228

Kaplan–Meier Estimates of the Rate of End Points, According to Study Group.

The significant reduction in the risk of heart failure in HYVET trial- 64% reduction in the rate of HF. (95% CI, 42 to 78;  $p < 0.001$ ).

HYVET trial. NEJM 2008; 358; 1887-98

## SPRINT trial:

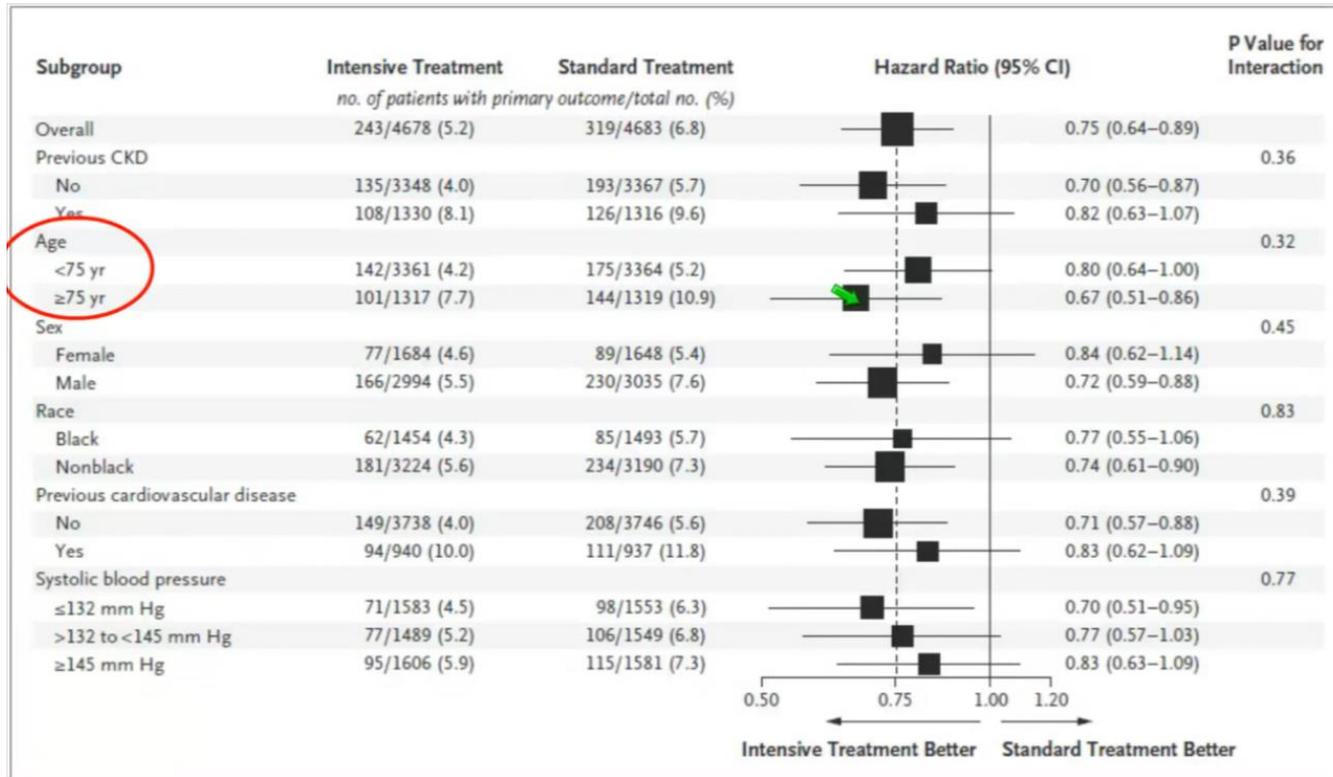
RCT- 9361 participants, over age of 50, with SBP 130 to 180 mmHg, high CVD risk (clinical or subclinical CVS (excluding stroke), CKD defined as eGFR 20- < 60 ml/min/1.73 m<sup>2</sup>, Framingham Risk score for 10 year CVD risk >15%, or age >75 years (28.4% in intensive group and 28.1% in standard group).

### Exclusion criteria

- History of stroke, diabetes mellitus, symptomatic HF w/in past 6 months, LVEF < 35%
- Life expectancy less than 3 years
- Unable to obtain consent
- Any factors judged to likely limit adherence
  - h/o poor compliance
  - residence in a nursing home
  - dementia or cognitively unable to follow protocol
  - residence too far from the study clinic site

N Engl J Med 2015; 373:2103-2116

# SPRINT primary outcome:



**Figure 4.** Forest Plot of Primary Outcome According to Subgroups.

The dashed vertical line represents the hazard ratio for the overall study population. The box sizes are proportional to the precision of the estimates (with larger boxes indicating a greater degree of precision). The subgroup of no previous chronic kidney disease (CKD) includes some participants with unknown CKD status at baseline. Black race includes Hispanic black and black as part of a multiracial identification.

SPRINT showed that among adults with hypertension but without diabetes, lowering systolic blood pressure to a target goal of less than 120 mm Hg, as compared with the standard goal of less than 140 mm Hg, resulted in significantly lower rates of fatal and nonfatal cardiovascular events and death from any cause.

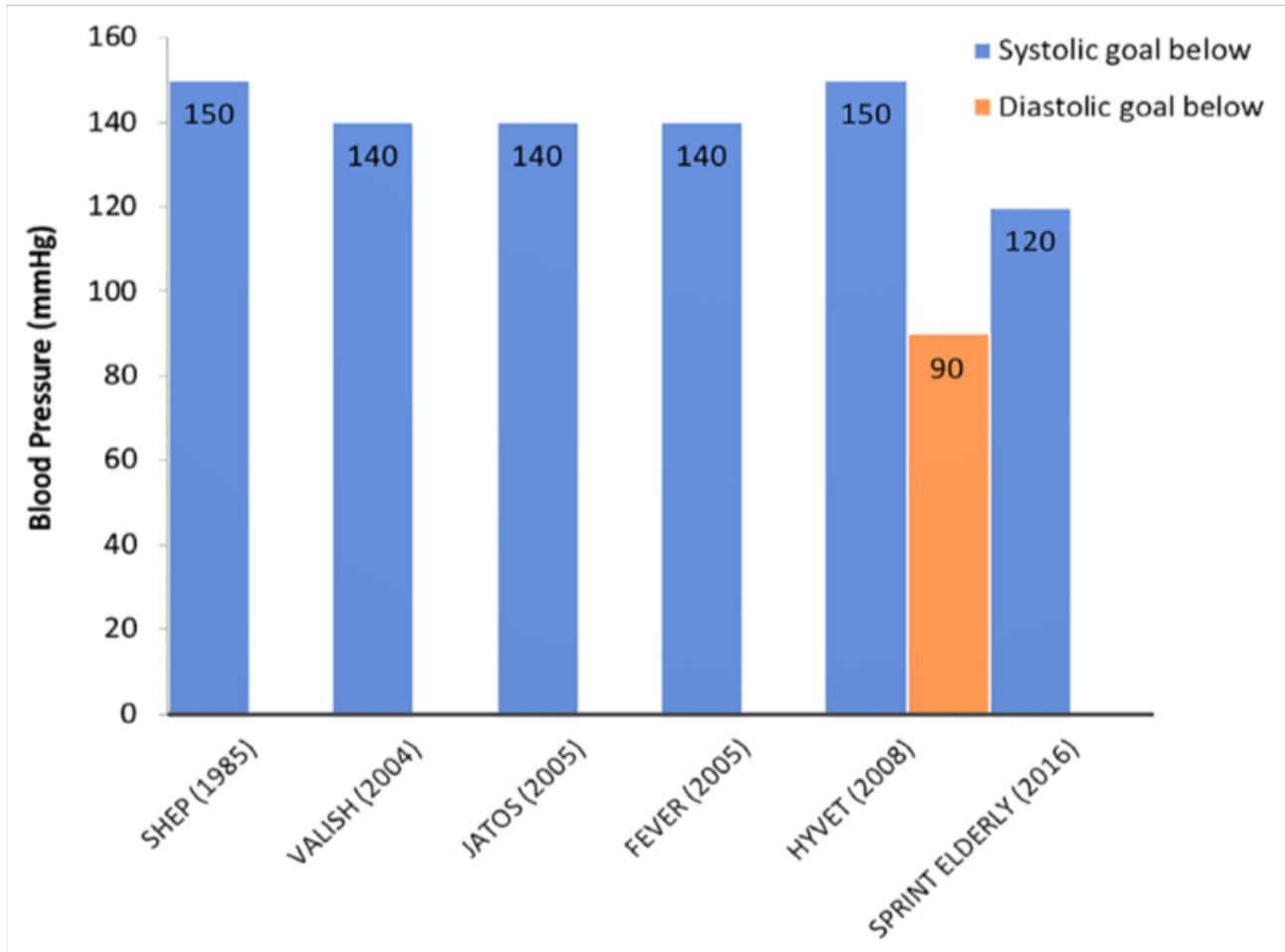
Study was stopped at 2.3 years (30-35 % lower risk of stroke, CHF and MI).

There was no increased risk of falls in older adults in this trial.

HTN is very prevalent in the older adults (>75 years).

SPRINT trial. NEJM 2015; 373; 2103-16

# Pivotal trials in HTN



Blood pressure goals in pivotal clinical trials: demonstrated in chronologic order from 1985 to 2016 the systolic and diastolic blood pressure goals in mmHg. We are able to appreciate a remarkable difference in SPRINT ELDERLY compared to prior.

NEJM 2007

## Blood Pressure Treatment RCTs in Older Adults

	SHEP	Syst-Eur	Syst-China	HYVET	SPRINT
Mean age	71	70	67	83	68
Entry SBP	170	174	171	173	140
Goal SBP	-20mmHg	<150	<150	<150	<120
Achieved SBP: Interv.	144	151	151	144	122
Achieved SBP: Placebo	155	161	160	159	135
Diabetes (%)	10	10	4	7	0
CAD (%)	5	16	9	3	20
CVA (%)	1	3	1	7	0
Median F/U	4.5y	2 years	3 years	1.8 years	3.26 years
N	4,736	4,695	2,394	3,845	9,361

Systolic Hypertension in the Elderly Program (SHEP). *JAMA* 1991; 265: 3255-3264 & *JAMA* 1997; 278: 212-216

Systolic Hypertension in Europe (Sys-Eur) Trial. *Lancet* 1997; 350: 757-64.

Systolic Hypertension in China (Sys-China) Trial. *J Hypertens* 1998; 16: 1823-1829.

Hypertension in the Very Elderly Trial (HYVET). *N Engl J Med* 2008; 358: 1887-98

A Randomized Trial of Intensive versus Standard Blood-Pressure Control. *N Engl J Med* 2015; 373: 2103-16.

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# Blood Pressure Treatment RCTs in Older Adults

	SHEP	Syst-Eur	Syst-China	HYVET	SPRINT
Outcomes	% Relative Risk Reduction				
CVA (non-fatal and fatal)	36*	42*	38*	30	11
MI	25*	30	33	NR	17
→ Hospitalization for CHF	50*	29	38	64*	38*
Total CVD (or All CV events)	32*	31*	37*	34*	25*
All-Cause Mortality	13	14	39*	21*	27*
CV Mortality	20	27	39*	23	43*

\* Statistically significant

NR: Not reported

SHEP trial. *JAMA* 1991; 265: 3255-3264 & *JAMA* 1997; 278: 212-216

Syst-Eur Trial. *Lancet* 1997; 350: 757-64.

Syst-China Trial. *J Hypertens* 1998; 16: 1823-1829.

HYVET. *N Engl J Med* 2008; 358: 1887-98

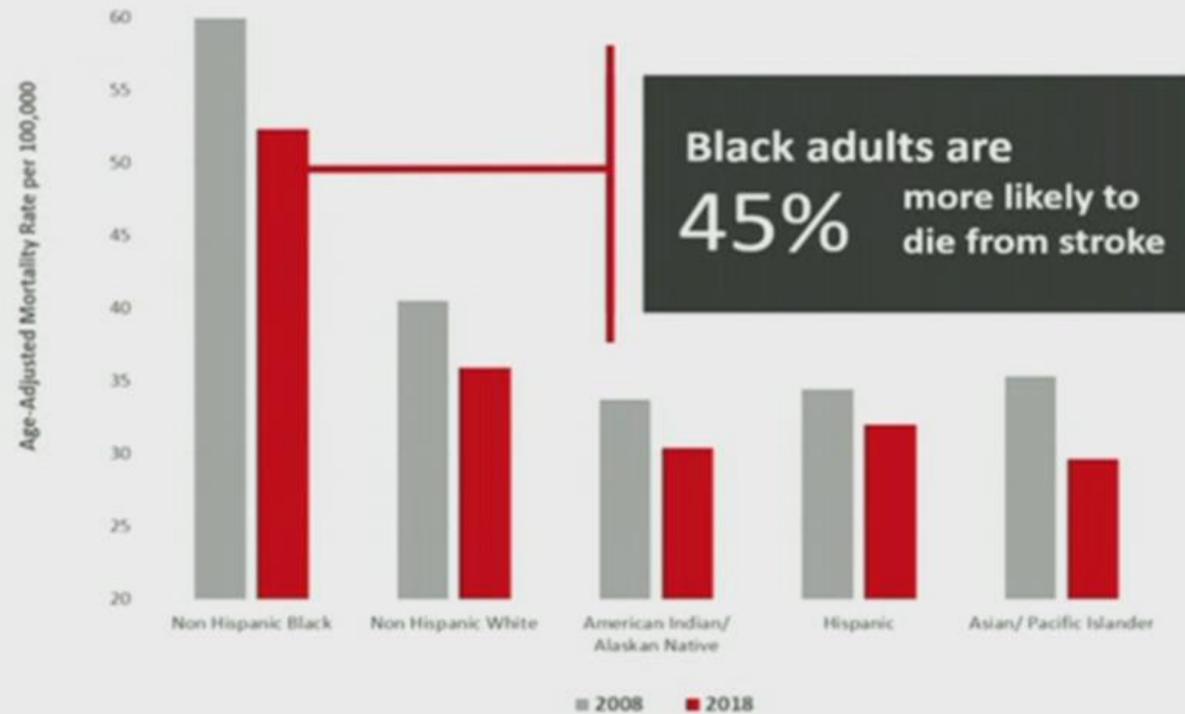
SPRINT. *N Engl J Med* 2015; 373: 2103-16.



The overall death rate due to stroke has also decreased.

But disparities among races and ethnicities remain.

## AGE-ADJUSTED TOTAL STROKE MORTALITY RATES by Race/Ethnicity



# HTN is a significant contributor to CVD morbidity and mortality

Clinical trials have shown that treatment of hypertension reduces the risk of cardiovascular disease outcomes:



# HTN and cognitive function

Dementia incidence reduced by 14-50% with BP treatment

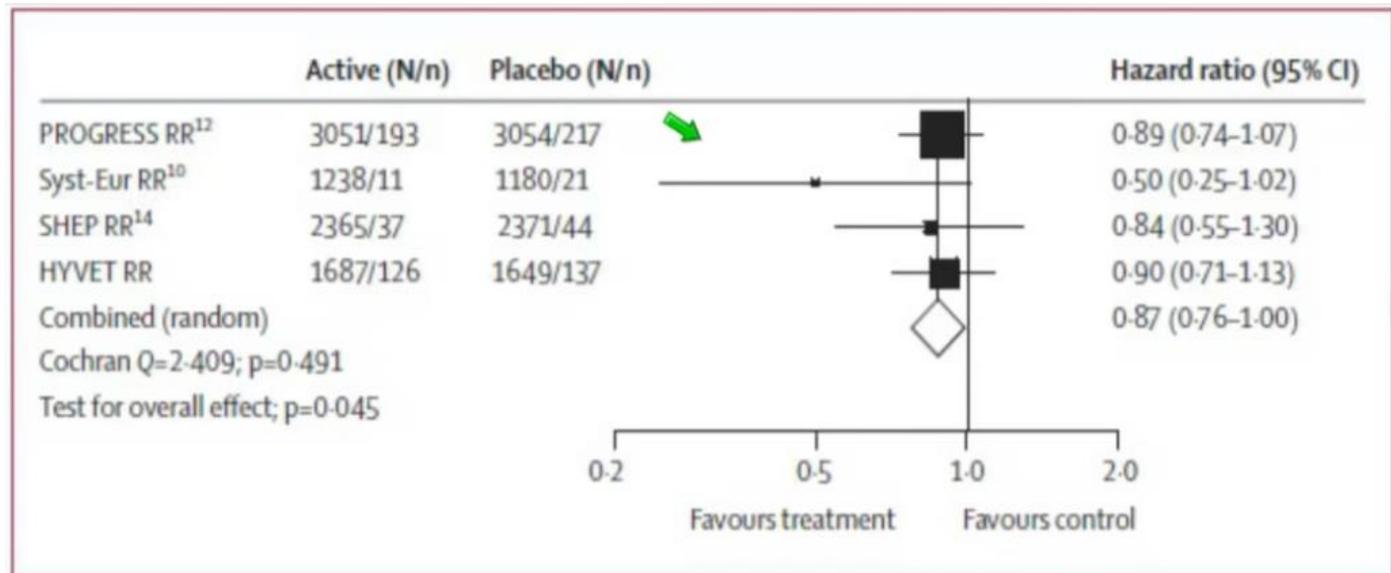


Figure 3: Forest plot of placebo-controlled trials of antihypertensive treatment that assessed incident dementia

N=total participants. n=number with dementia.

Lancet Neurology 2008; 7: 683-89

Incident dementia and BP lowering in the HTN in the very elderly trail cognitive function assessment (HYVET-COG):

a double blind, placebo controlled trial.

## Recommendations for Treatment of Hypertension in Older Persons

References that support recommendations are summarized in **Online Data Supplement 54**.

COR	LOE	Recommendations
I	A	1. Treatment of hypertension with a SBP treatment goal of less than 130 mm Hg is recommended for noninstitutionalized ambulatory community-dwelling adults ( $\geq 65$ years of age) with an average SBP of 130 mm Hg or higher. <sup>S10.3.1-1</sup>
Ia	C-E0	2. For older adults ( $\geq 65$ years of age) with hypertension and a high burden of comorbidity and limited life expectancy, clinical judgment, patient preference, and a team-based approach to assess risk/benefit is reasonable for decisions regarding intensity of BP lowering and choice of antihypertensive drugs.

# Goals of treatment

## **American Heart Association (2017)**

- Keep blood pressure < 130/80 mmHg
- w/ DM, CKD, HF, CAD, CVA: < 130/80 mmHg

Among elderly (>80 years) less than 140/90 mmHg is acceptable to avoid too low diastolic pressure and/or polypharmacy.

Continuous association exists between higher BP and increased CVD risk

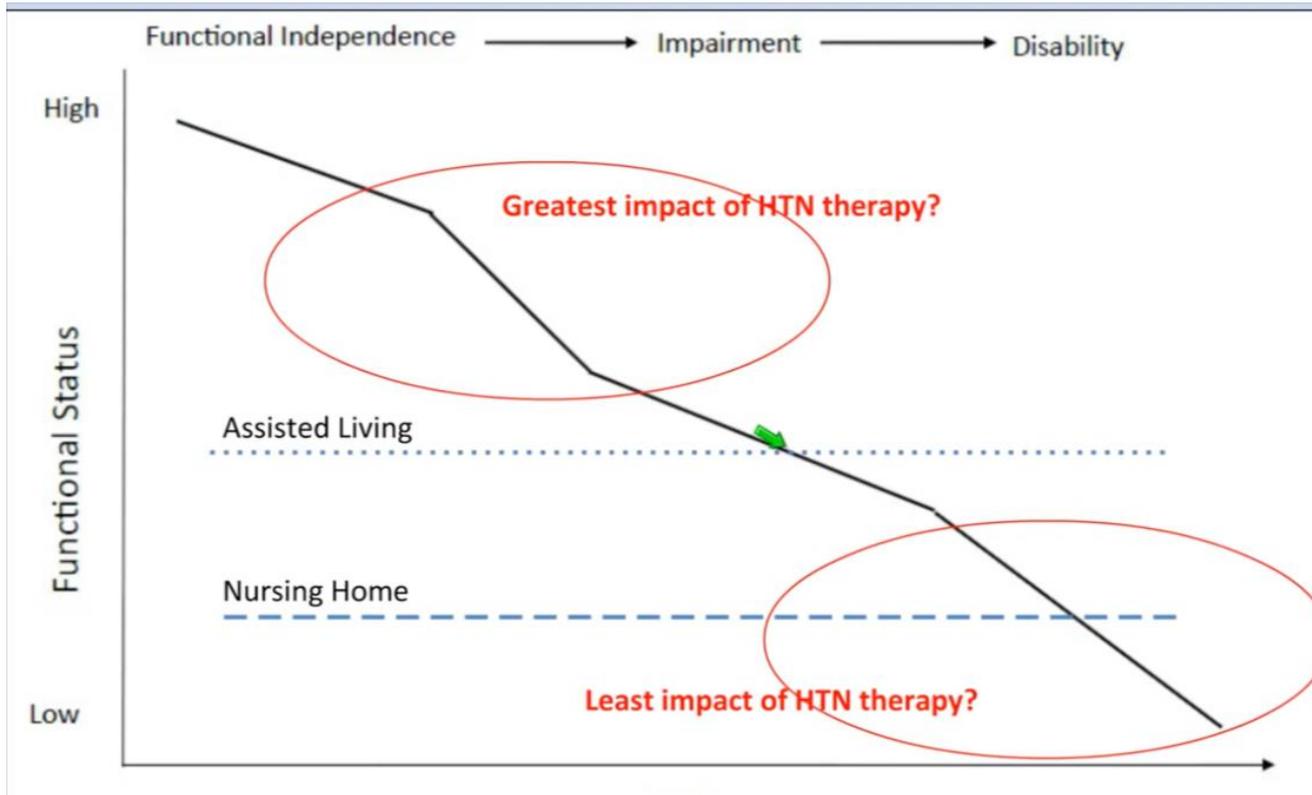
## Goal: Reduce Cardiovascular Events

- Heart Failure exacerbations
- Myocardial demand or ischemia
- Strokes

## Maximize function

- Minimize orthostatic hypotension
- Prevention of falls
- Reduce the incidence of cognitive decline and dementia.

# Areas of uncertainty



- Treatment decisions should be based on function.
- Most older adult patients will require 2-3 medications to meet goal.
- Diuretics should be part of regimen
  - chlorthalidone, HCTZ, indapamide, furosemide
- ↓CV risk likely more related to ↓ BP rather than type of antihypertensive.

Aggressive treatment of SH in frail older adults may be harmful

JACC 2011

# Orthostatic Hypotension is common in Older Adults

Elderly persons are at increased risk for developing OH, a potentially dangerous drop in BP during positional change from supine to standing position, increasing the risk for syncope, falls and injuries.

## Orthostatic hypotension (OH)

- ↓ SBP >20mmHg *or* DBP >10mmHg

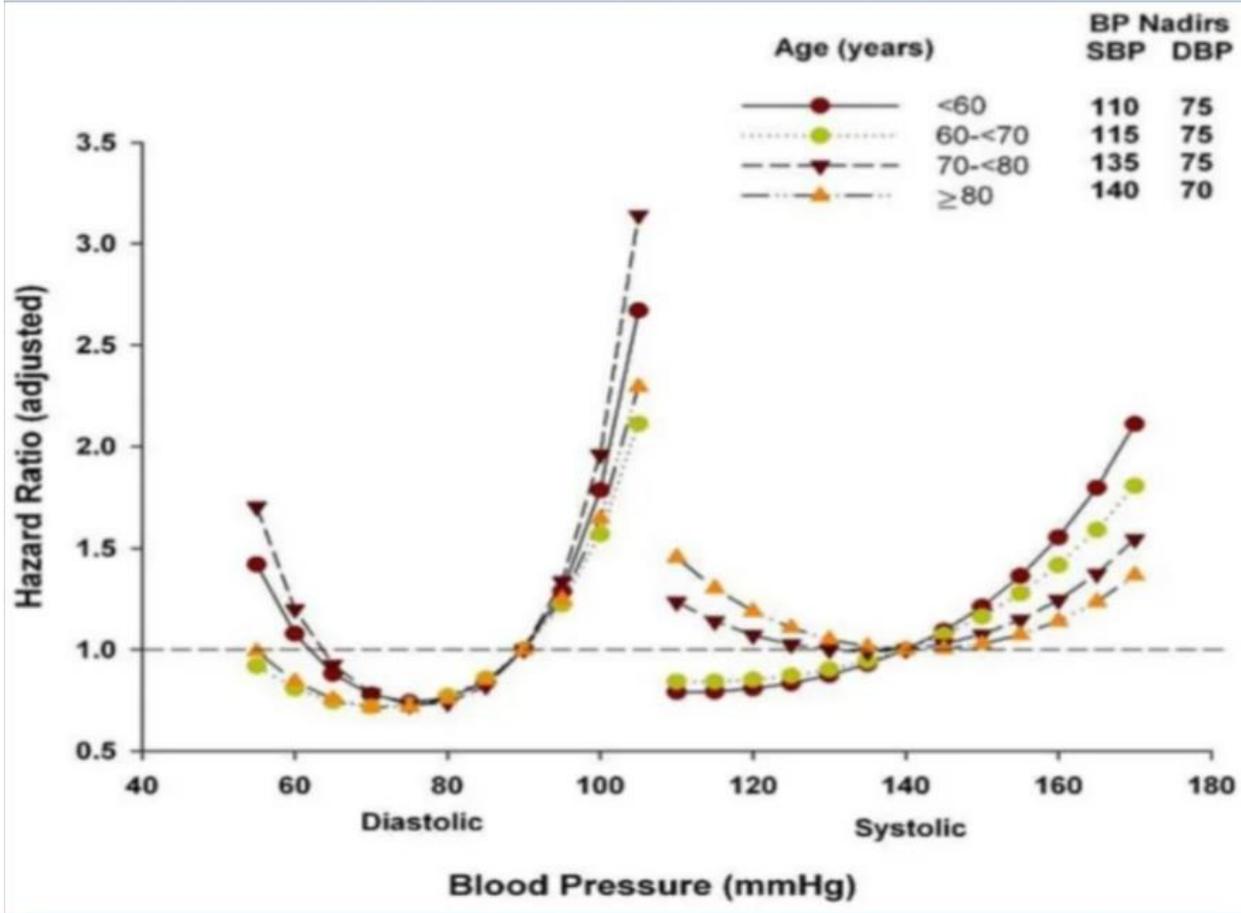
Prevalence: 5-30% [Ooi WL 1997, Aronow WS 1988]

## Process

- ↓ SBP >20mmHg *or* DBP >10mmHg
- Supine: BP taken after 5 minutes [Frohlich D 1988]
- Standing: 1<sup>st</sup> & 3<sup>rd</sup> minute most useful [Carlson JE 1999]

Risk of falls and dizziness in elderly may be a bigger risk than HTN.

# Risk of adverse Outcomes among elderly CAD patients by Age and BP



Myocardial perfusion occurs mainly during diastole. An excessive drop in diastolic BP may increase the risk of cardiovascular disease and death.

The J curve is often attributed to reduced myocardial perfusion from critically low coronary filling pressure during diastole.

J curve is more pronounced in DBP

Am J Med 2010; 123 (8): 719- 726

## Some other considerations in elderly

Comorbidities such as osteoarthritis, or chronic pain are common among elderly persons. Medications commonly used to treat these conditions, such as NSAIDs and corticosteroids, can increase BP.

Polypharmacy, the concomitant use of variety of prescription and over-the counter drugs is common among elderly.

Depression is prevalent in elderly patients. Psychotropic medications have diverse effects on BP.

The prevalence of OSA in the elderly is three times higher than in the middle aged individuals. OSA is a strong and independent risk factor for development and progression of HTN.

Chronic kidney disease (CKD) is common in the elderly people and is associated with HTN.

### Medications that can elevate blood pressure

Nonsteroidal anti-inflammatory agents
Corticosteroids
Anabolic steroids
Serotonin reuptake inhibitors
Serotonin-norepinephrine reuptake inhibitors
Tricyclic antidepressants
Monoamine oxidase inhibitors
Cyclosporine
Tacrolimus
Erythropoietin
Methylphenidate
Amphetamines
Decongestants
Oral contraceptives

# Recommendations: Non-pharmacologic treatment options

MODIFICATION	RECOMMENDATION	APPROXIMATE SBP REDUCTION (RANGE)†
Weight reduction	Maintain normal body weight (body mass index 18.5–24.9 kg/m <sup>2</sup> ).	5–20 mmHg/10kg <sup>92,93</sup>
Adopt DASH eating plan	Consume a diet rich in fruits, vegetables, and lowfat dairy products with a reduced content of saturated and total fat.	8–14 mmHg <sup>94,95</sup>
 Dietary sodium reduction	Reduce dietary sodium intake to no more than 100 mmol per day (2.4 g sodium or 6 g sodium chloride).	2–8 mmHg <sup>94,96</sup>
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 min per day, most days of the week).	4–9 mmHg <sup>97,98</sup>
Moderation of alcohol consumption	Limit consumption to no more than 2 drinks (e.g., 24 oz beer, 10 oz wine, or 3 oz 80-proof whiskey) per day in most men, and to no more than 1 drink per day in women and lighter weight persons.	2–4 mmHg <sup>99</sup>

The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure

Elderly persons are more sensitive to salt intake compared with a younger population.

A recent ACC/AHA statement suggests that lifestyle modifications may be all that is needed to treat milder form of HTN in elderly patients.

## Recommendations: Treatment

- Treatment decisions should be based on function.
- Most older adult patients will require 2-3 medications to meet goal.
- Diuretics should be part of regimen.
- - chlorthalidone, HCTZ, indapamide, furosemide
- Decrease of CV risk likely more related to decrease of BP rather than type of antihypertensive.

# No clear evidence exists to support recommendations for the use of particular drug classes in older adults.

**TABLE 81-3**

**Advantages and Disadvantages of Antihypertensive Medication Classes Specific to Older Patients**

ANTIHYPERTENSIVE CLASS	POTENTIAL ADVANTAGES	POTENTIAL DISADVANTAGES	CLINICAL SITUATIONS TO RECOMMEND USE	CLINICAL SITUATIONS TO RECOMMEND AGAINST USE, OR WHICH REQUIRE MONITORING
Thiazide-type diuretics	<ul style="list-style-type: none"> <li>• Documented benefit in clinical trials</li> <li>• Produce greater reduction in systolic than diastolic blood pressure</li> <li>• Improve bone mineral density</li> <li>• Inexpensive</li> </ul>	<ul style="list-style-type: none"> <li>• Metabolic abnormalities (e.g., hypokalemia)</li> <li>• Urinary frequency</li> </ul>	<ul style="list-style-type: none"> <li>• Systolic hypertension</li> </ul>	<ul style="list-style-type: none"> <li>• Hyponatremia</li> <li>• Gout</li> </ul>
ACE inhibitors and angiotensin receptor blockers	<ul style="list-style-type: none"> <li>• Absence of CNS effects</li> <li>• Preservation of renal function</li> <li>• Decrease proteinuria</li> </ul>	<ul style="list-style-type: none"> <li>• Hyperkalemia, cough</li> </ul>	<ul style="list-style-type: none"> <li>• CHF, type 2 diabetes</li> </ul>	<ul style="list-style-type: none"> <li>• Renal insufficiency or renal artery stenosis</li> </ul>
Calcium channel antagonists	<ul style="list-style-type: none"> <li>• Benefit documented in clinical trials</li> <li>• Absence of CNS or metabolic effects</li> </ul>	<ul style="list-style-type: none"> <li>• Peripheral edema, constipation, heart block</li> </ul>	<ul style="list-style-type: none"> <li>• Systolic hypertension</li> <li>• Coronary artery disease</li> </ul>	<ul style="list-style-type: none"> <li>• Left ventricular dysfunction</li> </ul>
Beta-adrenergic receptor antagonists	<ul style="list-style-type: none"> <li>• None. Not recommended as monotherapy</li> </ul>	<ul style="list-style-type: none"> <li>• May increase peripheral vascular resistance</li> <li>• Metabolic abnormalities</li> <li>• CNS effects</li> </ul>	<ul style="list-style-type: none"> <li>• Postmyocardial infarction</li> </ul>	<ul style="list-style-type: none"> <li>• COPD, peripheral vascular disease, heart block, glucose intolerance, type 2 diabetes, hyperlipidemia, depression</li> </ul>
Alpha-adrenergic receptor antagonists	<ul style="list-style-type: none"> <li>• Improve urinary symptoms in BPH</li> </ul>	<ul style="list-style-type: none"> <li>• Increased rate of CHF hospitalizations as monotherapy relative to thiazide-type diuretics</li> </ul>	<ul style="list-style-type: none"> <li>• Prostatism</li> </ul>	<ul style="list-style-type: none"> <li>• Left ventricular dysfunction</li> </ul>

ACE, angiotensin converting enzyme; COPD, chronic obstructive pulmonary disease; CHF, congestive heart failure; CNS, central nervous system; BPH, benign prostatic hypertrophy.

## HTN treatment in elderly women

Elderly persons, particularly elderly women, tend to have more-severe HTN and lower rates of BP control than middle aged and young adults (JAMA 2005; 294: 466-472).

For example in Framingham Heart Study, only 23% of women aged >80 years (compared to 38% of men) had BP controlled to < 140/90 mmHg.

It is unclear if the age-related decline in BP control among women is related to true treatment resistance owing to biological factors, inadequate intensity of, or adherence to treatment, or inappropriate drug choices.

Nat Rev Cardiol 2012; 9: 286-296

# Importance of HTN in elderly

Older population is the fastest growing

Because of its extremely high prevalence in older adults, hypertension is not only a leading cause of preventable morbidity and mortality but, perhaps more importantly, is underrecognized as a major contributor to premature disability and institutionalization.

Several issues make managing of HTN in the elderly very unique:

- Frequently systolic HTN
- More likely to present with comorbidities
- Many clinical trials in HTN have excluded these patients (especially those 80 years and older).
- Elderly patients are more susceptible to certain adverse effects (e.g.) orthostatic hypotension

# MANAGEMENT OF HYPERTENSION IN KIDNEY DISEASE

# Hypertension in Kidney Disease

**CKD** = eGFR < 60 ml/min/1.72 m<sup>2</sup> or albuminuria ≥ 300 mg/d for 3 months duration

Prevalence of resistant hypertension is 2-3x higher in CKD than in the general hypertensive population

Masked hypertension is more common in CKD than in the general population

Hypertension is a leading cause of CKD/ESRD and a risk factor for CKD progression, irrespective of the cause of CKD

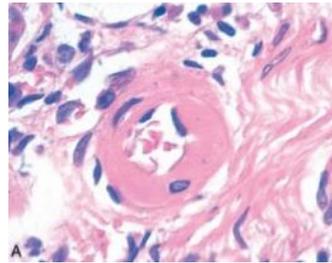
**Lowering BP** can slow eGFR decline (in patients with albuminuria), delay progression to ESRD, and reduce the incidence of CVD in patients with CKD

# Pathogenesis of HTN-associated CKD

Identified as the **second** most common cause of ESRD (second to DM nephropathy), although the pathogenesis of hypertensive renal disease remains unclear

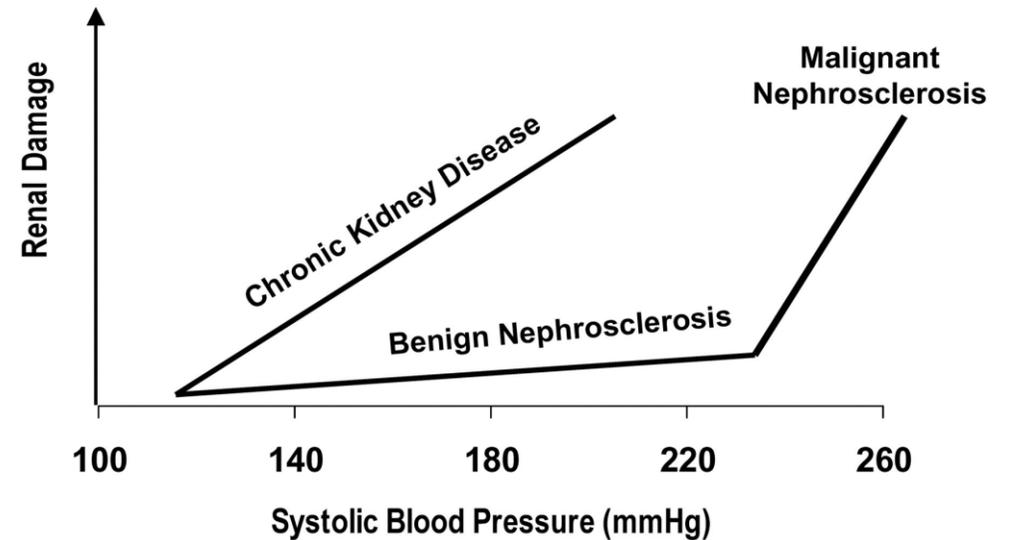
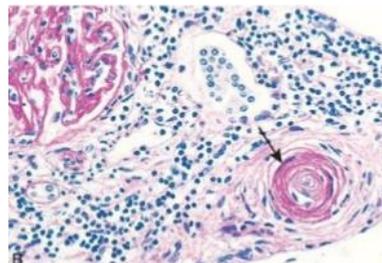
## “Essential” Hypertension →

hyaline arteriosclerosis  
and ischemic injury



## Malignant Hypertension →

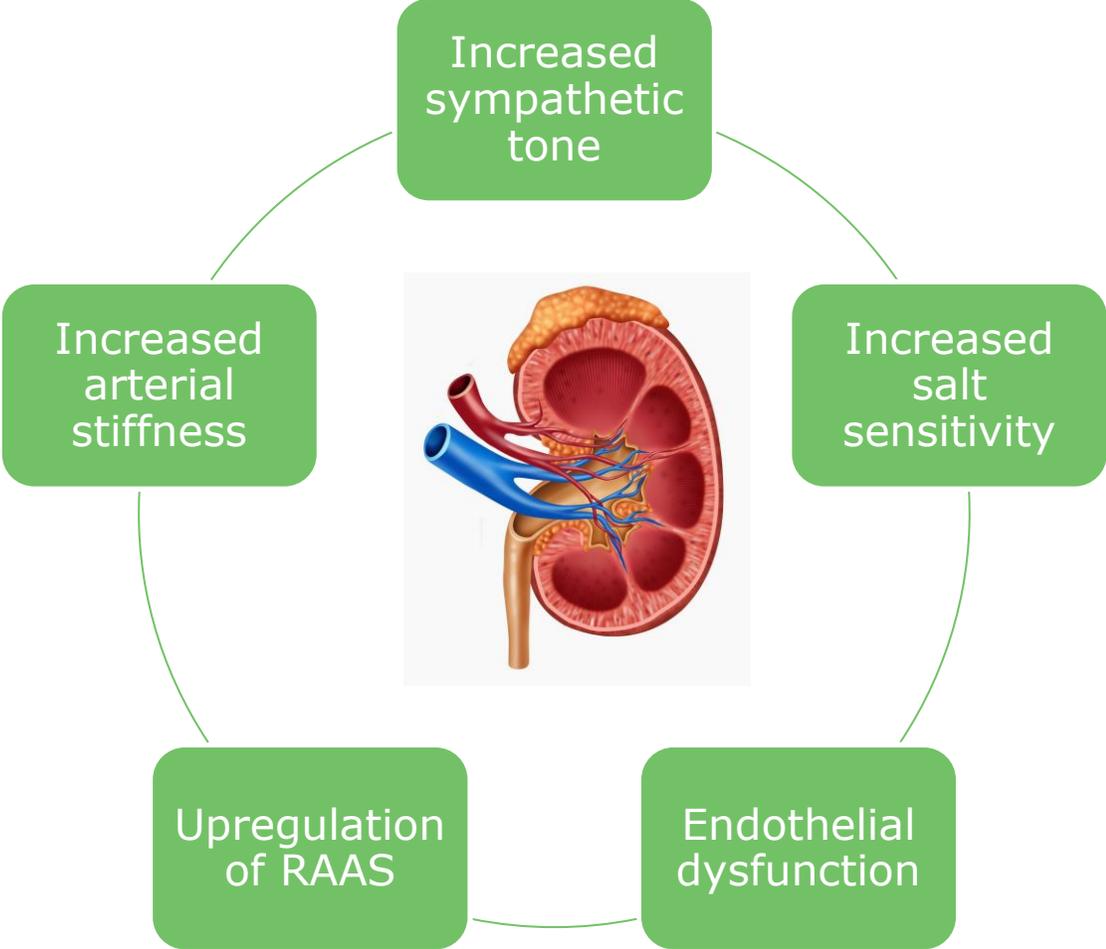
acute vascular and glomerular injury  
with fibrinoid necrosis and thrombosis



Bidani AK and Griffin KA. Hypertension. 2004.

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# Mechanisms of the development of HTN in CKD



# CKD/ESRD due to hypertension is significantly greater for Blacks than for other racial/ethnic groups

Blood pressure in adulthood appears to have a **greater association** with eGFR and incident CKD in Blacks compared to Whites

Some of the excess risk of kidney disease in Blacks is due to the **APOL1 gene**, which is highly prevalent in persons of recent African ancestry (~40% heterozygous, ~12% homozygous)

- Inheriting 2 copies of the APOL1 risk alleles confers a 2-30x higher risk of kidney disease (due to FSGS, HIV, and HTN-associated CKD)

However, genetics play a relatively minor role in the excess risk of kidney disease in Blacks compared to White Americans, compared to **social determinants of health** and **racism**

Yan Y et al. Am J Hypertens. 2018  
Foster MC et al. JASN 2013.

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# Blood pressure targets in CKD

## 2017 ACC/AHA Hypertension Guidelines

Adults with HTN and CKD should be treated to a BP goal of < 130/80 mm Hg

## 2018 ESC/ESH Hypertension Guidelines

In patients with DM or non-DM CKD, lower BP to a target SBP 130-139 mm Hg and DBP 70-79 mm Hg

## 2021 KDIGO Hypertension Guidelines

We suggest that adults with high BP and CKD be treated with a target systolic blood pressure (SBP) of <120 mm Hg, when tolerated, using standardized office BP measurement (2B)

## Drugs for HTN in CKD: RAAS Inhibitors

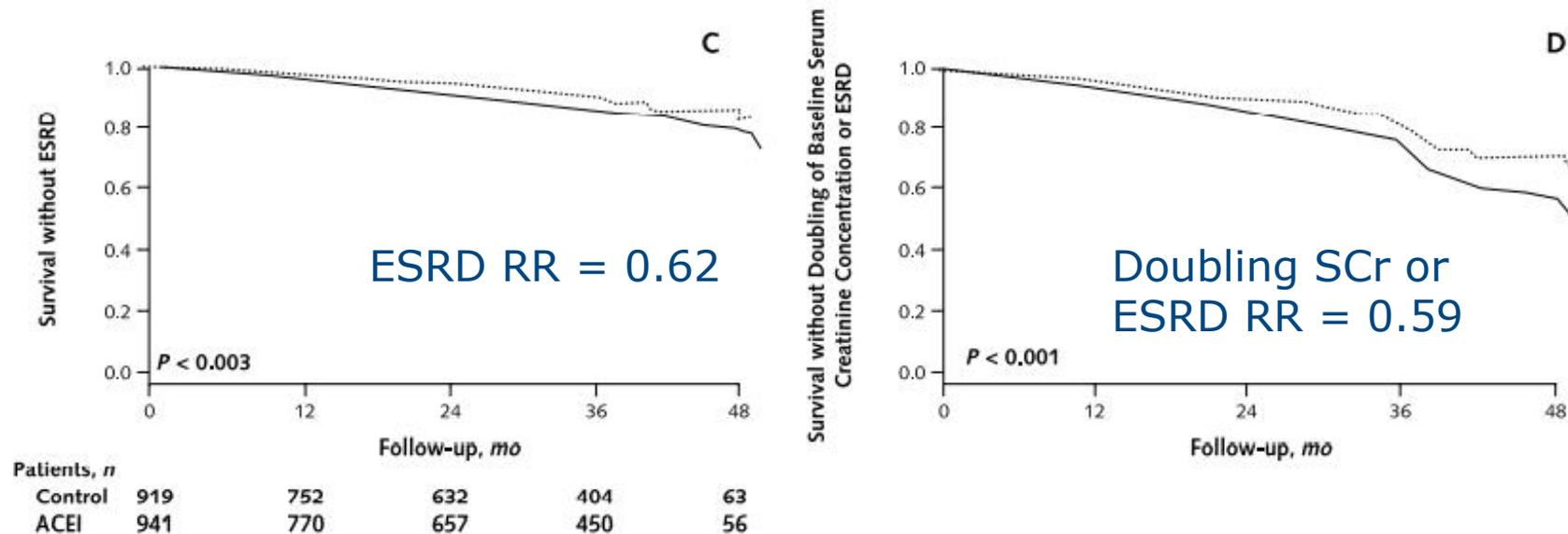
**ESC/ESH** recommends a combination of RAS blocker with a CCB or a diuretic as initial therapy

**ACC/AHA** recommends with CKD and albuminuria  $\geq 300$  mg/d, treatment with an ACEi or ARB is reasonable to slow kidney disease progression

# Angiotensin-Converting Enzyme Inhibitors and Progression of Nondiabetic Renal Disease

## A Meta-Analysis of Patient-Level Data

Tazeen H. Jafar, MD, MPH; Christopher H. Schmid, PhD; Marcia Landa, MA; Ioannis Giatras, MD; Robert Toto, MD; Giuseppe Remuzzi, MD; Giuseppe Maschio, MD; Barry M. Brenner, MD; Annelise Kamper, MD; Pietro Zucchelli, MD; Gavin Becker, MD; Andres Himmelmann, MD; Kym Bannister, MD; Paul Landais, MD; Shahnaz Shahinfar, MD; Paul E. de Jong, MD, PhD; Dick de Zeeuw, MD; Joseph Lau, MD; and Andrew S. Levey, MD, for the ACE Inhibition in Progressive Renal Disease Study Group\*

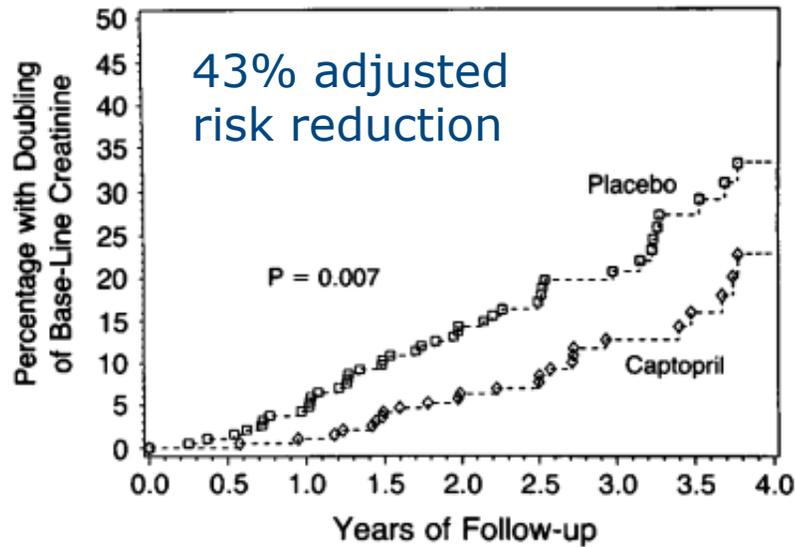


ACEi proven to slow progression of non-DM proteinuric ( $U_{pr} > 0.5$  g/d) CKD, and therefore the best option for HTN treatment in this population

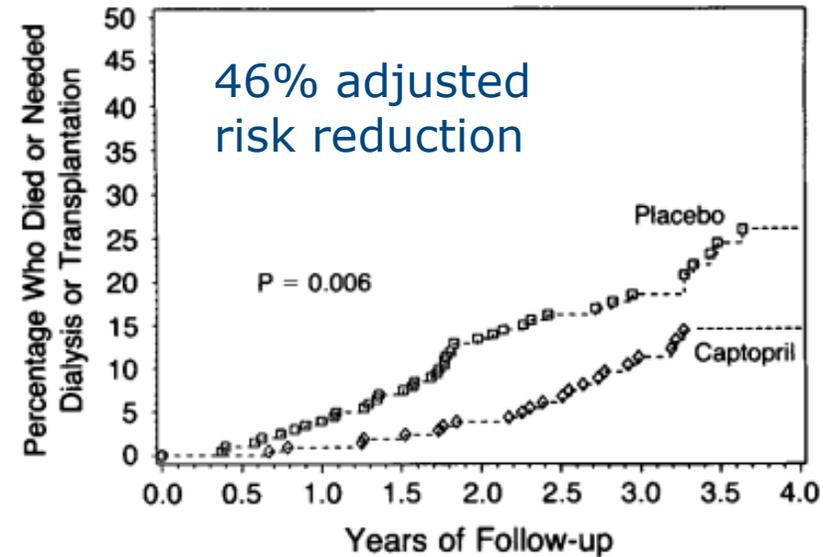
Jafar TH et al Annals of Intern Med 2001

## THE EFFECT OF ANGIOTENSIN-CONVERTING-ENZYME INHIBITION ON DIABETIC NEPHROPATHY

EDMUND J. LEWIS, M.D., LAWRENCE G. HUNSICKER, M.D., RAYMOND P. BAIN, PH.D.,  
AND RICHARD D. ROHDE, B.S., FOR THE COLLABORATIVE STUDY GROUP\*



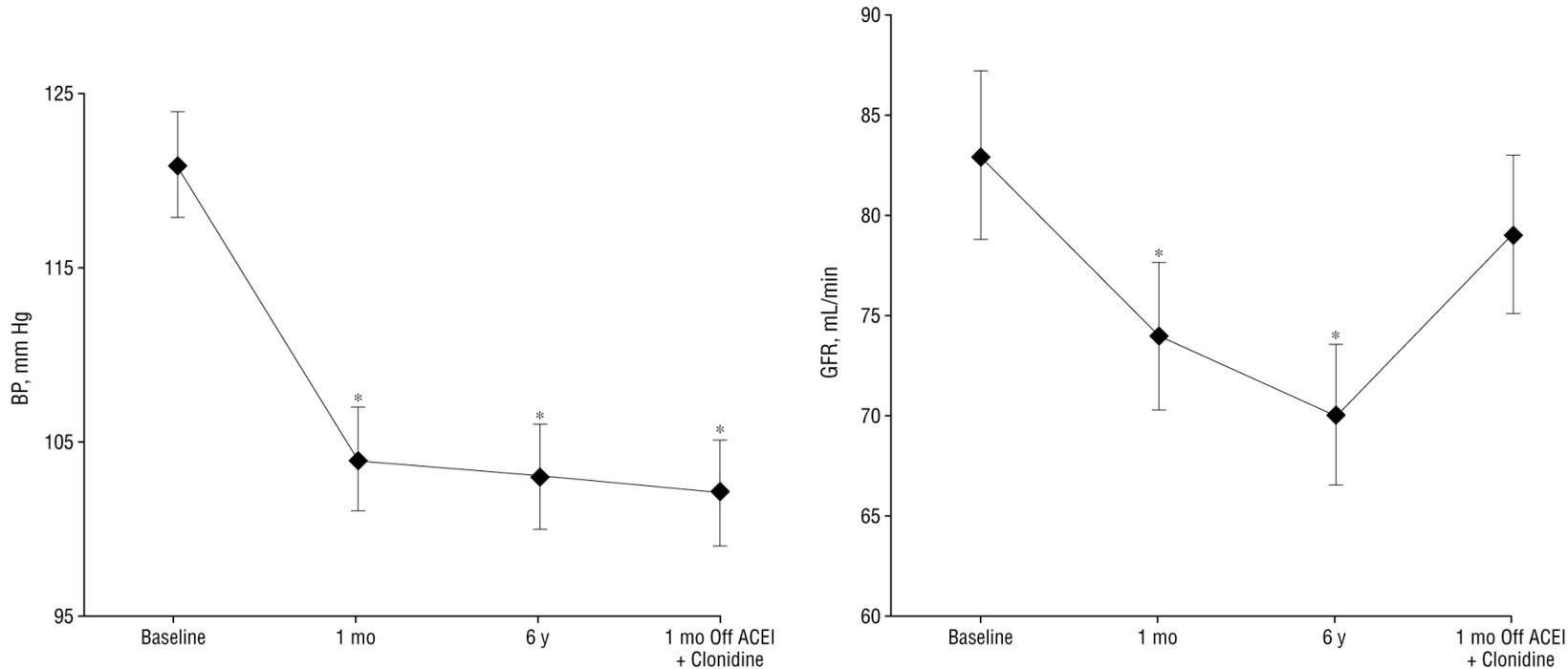
Placebo	202	184	173	161	142	99	75	45	22
Captopril	207	199	190	180	167	120	82	50	24



Placebo	202	198	192	186	171	121	100	59	26
Captopril	207	207	204	201	195	140	103	64	37

ACEi are reno-protective in Type 1 DM beyond control of BP

# Do not stop RAS inhibitors when CKD progresses



Effects of an ACEi on creatinine clearance in 23 patients with T2DM who received therapy for an average of 5.6 years

There is a strong association between acute increase in SCr of up to 30% that stabilize within the first 2 months of ACEi therapy and long-term preservation of renal function.

Withdrawal of ACEi should only occur when the initial rise in SCr exceeds 30%, hyperkalemia develops, or temporarily in acute kidney injury

Bakris G and Weir M Arch Intern Med 2000;160:685-693

# Diuretics

Individuals with CKD are often salt sensitive, and volume overload contributes to hypertension, even if not overt

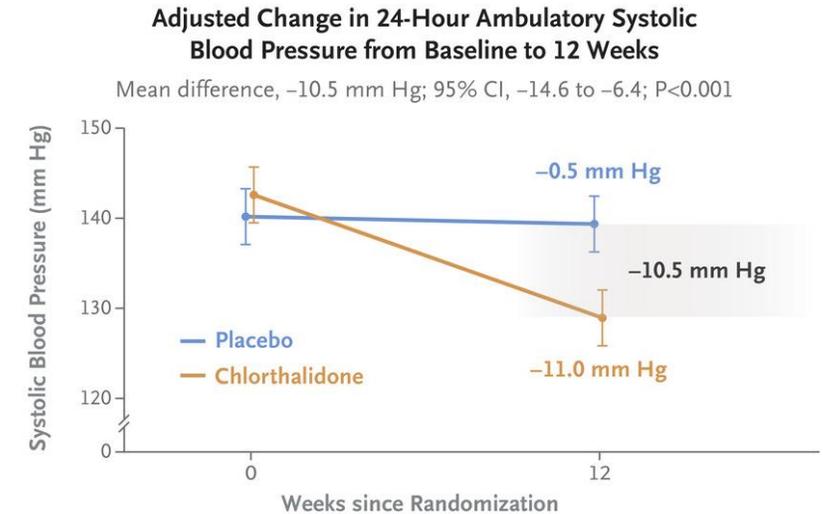
Thiazide-like diuretics (chlorthalidone or indapamide) are effective

Guidelines typically recommend adding or changing to a loop diuretic when GFR < 30

## Chlorthalidone for Hypertension in Advanced Chronic Kidney Disease

Agarwal R et al. DOI: 10.1056/NEJMoa2110730

Chlorthalidone can lower BP even in advanced CKD  
(mean eGFR 23.2 ml/min/1.72 m<sup>2</sup>)



# Summary of Hypertension Management in CKD

- Hypertension is a leading cause and consequence of CKD
- The effects of hypertension appear to have a greater association with CKD and GFR decline in Blacks compared to other racial/ethnic groups (only minimally related to genetic ancestry)
- Aggressive control of BP slows progression of CKD
- ACEi and ARB are first line especially for proteinuric CKD, 30% rise in Cr within the first 2 months of starting is expected and hemodynamic
- Diuretics are cornerstone of HTN management in CKD
- CKD is more prevalent in the elderly, and possible conflicting BP targets, goal is for prevention of significant morbidity and preservation of functional status
- Creatinine overestimated eGFR in frail elderly, start medications low and titrate low

## For the next webinar in summer

Will discuss Maternal Health and Hypertensive disorders in pregnancy.

# Hypertensive disorders of pregnancy

- Hypertension in pregnancy is a condition affecting 5%–10% of pregnancies worldwide.
- The prevalence of hypertension in reproductive-aged women is estimated to be 7.7%.
- Hypertensive disorders of pregnancy include preexisting and gestational hypertension, preeclampsia, and eclampsia, complicate up to 10% of pregnancies and represent a significant cause of maternal and perinatal morbidity and mortality.
- The definition of hypertension in pregnancy has not always been standardized, but following the “National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy” recommendation is currently a systolic blood pressure (SBP)  $\geq$  140 mmHg and/or a diastolic blood pressure (DBP)  $\geq$  90 mmHg

# Hypertensive disorders of pregnancy

- **Preexisting hypertension:** Starts before pregnancy or <20 weeks of gestation, and lasts >6 weeks postpartum with proteinuria.
- **Gestational hypertension:** Starts >20 weeks of gestation, and lasts <6 weeks postpartum.
- **Preexisting hypertension plus superimposed gestational hypertension** with proteinuria.
- **Preeclampsia:** Hypertension with proteinuria (>300 mg/24 h or ACR >30 mg/mmol [265 mg/g]). Predisposing factors are preexisting hypertension, hypertensive disease during previous pregnancy, diabetes, renal disease, first- or multiple pregnancy, autoimmune disease (SLE). Risks are fetal growth restriction, preterm birth.
- **Eclampsia:** Hypertension in pregnancy with seizures, severe headaches, visual disturbance, abdominal pain, nausea and vomiting, low urinary output: Immediate treatment and delivery required.
- **HELLP (hemolysis, elevated liver enzymes, low platelets) syndrome:** Immediate treatment and delivery required.

Hypertension 2022; 79:e21-e41

# Questions?

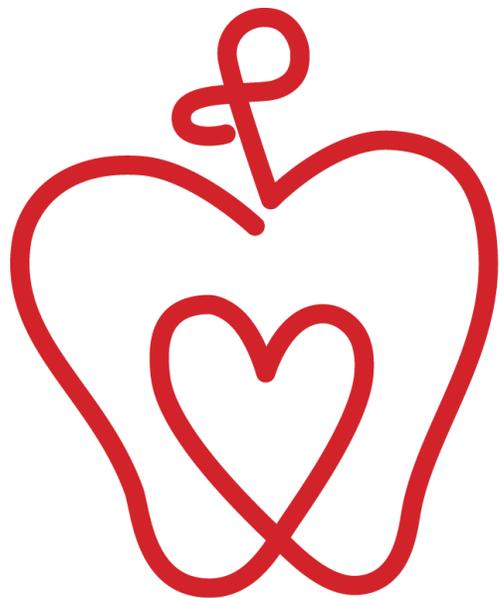


# Please fill out our survey!

Please find the survey link in the chat/ you will receive a survey in a follow up email/ go here for survey

Completing your survey helps us to provide relevant and helpful information. Thank you in advance!





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