Stroke and Hypertension

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Objectives

Epidemiology and natural history of hypertension based on some of the early hypertension clinical trials.

Review the risk factors of stroke.

Discuss some of the key clinical trials in hypertension.

Review the evidence of the ACC/AHA blood pressure guidelines in secondary prevention of stroke.

- *AJH–JANUARY 1998–VOL. 11, NO. 1, PART 1*

Commentary on The Sixth Report of The Joint National Committee (JNC-6)

Norman M. Kaplan

Since the measurement of blood pressure is likely the clinical procedure of greatest importance that is performed in the sloppiest manner, appropriate attention is given to office, ambulatory, and self-measurement, with emphasis on the need for out-of-the-office readings to compensate for the ''white-coat'' effect. The elements of an appropriate history, physical examination, and laboratory testing for the usual hypertensive patient are detailed, along with a brief mention of work-up for identifiable causes.

A healthcare provider will use a device that wraps around your upper arm and measures your blood pressure.

Before your blood pressure is checked you should make sure that you:

- Avoid caffeine, smoking, and exercise for at least 30 minutes
- Sit quietly for at least 5 minutes in a chair (not the examination table)

While your blood pressure is being measured:

- Sit with both of your feet flat on the floor (not with legs crossed)
- Make sure that the arm that is being measured is supported at heart level (by your chest) and stretched out
- Your back should be supported so you can rest comfortably
- Do not talk

Key Steps for Proper BP Measurements	Specific Instructions
Step 1: Properly prepare the patient	1. Have the patient relax, sitting in a chair (feet on floor, back supported) for >5 min.2. The patient should avoid caffeine, exercise, and smoking for at least 30 min before measurement.3. Ensure patient has emptied his/her bladder.4. Neither the patient nor the observer should talk during the rest period or during the measurement.5. Remove all clothing covering the location of cuff placement.6. Measurements made while the patient is sitting or lying on an examining table do not fulfill these criteria.
Step 2: Use proper technique for BP measurements	1. Use a BP measurement device that has been validated, and ensure that the device is calibrated periodically.*2. Support the patient's arm (eg, resting on a desk).3. Position the middle of the cuff on the patient's upper arm at the level of the right atrium (the midpoint of the sternum).4. Use the correct cuff size, such that the bladder encircles 80% of the arm, and note if a larger- or smaller-than-normal cuff size is used (Table 9).5. Either the stethoscope diaphragm or bell may be used for auscultatory readings.[S4.1-5,S4.1-6]
Step 3: Take the proper measurements needed for diagnosis and treatment of elevated BP/hypertension	1. At the first visit, record BP in both arms. Use the arm that gives the higher reading for subsequent readings.2. Separate repeated measurements by 1–2 min.3. For auscultatory determinations, use a palpated estimate of radial pulse obliteration pressure to estimate SBP. Inflate the cuff 20–30 mm Hg above this level for an auscultatory determination of the BP level.4. For auscultatory readings, deflate the cuff pressure 2 mm Hg per second, and listen for Korotkoff sounds.
Step 4: Properly document accurate BP readings	1. Record SBP and DBP. If using the auscultatory technique, record SBP and DBP as onset of the first Korotkoff sound and disappearance of all Korotkoff sounds, respectively, using the nearest even number.2. Note the time of most recent BP medication taken before measurements.
Step 5: Average the readings	Use an average of ≥2 readings obtained on ≥2 occasions to estimate the individual's level of BP.
Step 6: Provide BP readings to patient	Provide patients the SBP/DBP readings both verbally and in writing.

Hypertension Volume 71, Issue 6, June 2018; Pages e13-e115

Risk factors for stroke

- Hypertension
- Diabetes Mellitus
- Hypercholesterolemia
- Smoking
- Physical activity
- Alcohol intake

Hypertension is the major causal risk factor for stroke.

- ***Stroke*. 2020;51:719-728. DOI: 10.1161/STROKEAHA.119.024154.)**

Risk Factor	PAF of First Ischemic Stroke, %			
	32 Countries INTERSTROKE[12]	Sub-Saharan Africa SIREN[23]	Indonesia National Survey[20]	Rotterdam Cohort[18]
	13 447 Cases	2118 Cases	722 330 People	6844 People
	13 472 Controls	2118 Controls		610 Ischemic Strokes
	PAF (99% CI)	PAF (95% CI)	PAF (95% CI)	PAF (95% CI)
Hypertension	45.7 (42.4 to 49.0)	86.6 (81.6 to 91.6)	29.3 (25.1 to 33.0) M 37.3 (30.8 to 43.9) F	33 (20 to 49)
Baseline age >50 y		61.2 (48.6 to 73.9)		
Physical inactivity	33.4 (24.2 to 44.0)	2.5 (0.5 to 4.6)		
Dyslipidemia		37.6 (24.3 to 50.8)	10.1 (5.6 to 15.0) M 10.1 (0.4 to 19.9) F	3 (0 to 82)
Apo B/Apo A1 ratio: T3 vs T1	34.0 (29.0 to 39.3)			
Diet (mAHEI score)				
T3 vs T1	22.4 (17.0 to 29.0)			
Regular meat		27.7 (3.5 to 52.0)		
Low green vegetable		17.5 (12.2 to 22.9)		
Added salt at table		4.7 (2.6 to 6.8)		
Regular sugar		7.3 (−0.4 to 15.1)		
Waist-to-hip ratio				
T3 vs T1	20.4 (14.3 to 28.2)			
Elevated		30.4 (13.1 to 47.8)	10.6 (7.2 to 14.2) M 15.1 (7.7 to 22.2) F	
BMI >25 kg/m^2				12 (5 to 27)
Psychosocial factors	15.1 (10.3 to 21.5)			
Stress		11.4 (4.4 to 18.3)		
Smoking: current	15.1 (12.8 to 17.8)	1.5 (0.4 to 2.5)	25.1 (16.6 to 33.3) M 0.6 (0.1 to 1.3) F	16 (8 to 30)
Cardiac causes	9.1 (8.0 to 10.2)	7.4 (3.1 to 11.8)		
Atrial fibrillation				0 (0 to 16)
Coronary disease				3 (1 to 8)
Alcohol: high/heavy episodic	4.6 (2.0 to 10.0)			
Diabetes mellitus	7.5 (5.0 to 11.1)	26.2 (20.8 to 31.6)	5.3 (3.6 to 7.6) M 6.0 (1.2 to 12.7) F	3 (1 to 8)
Family history of CVD		10.1 (−0.9 to 21.0)		
Education: some vs none		23.8 (0.0 to 47.5)		
Income >$100 USD/mo		19.0 (7.1 to 30.9)		
Composite PAF	91.5 (89.4 to 93.2)	[illegible]		55 (41 to 68)

Screenshot

Hypertension is a major risk factor for cardiovascular disease and is present in

≈77% of patients with a first stroke

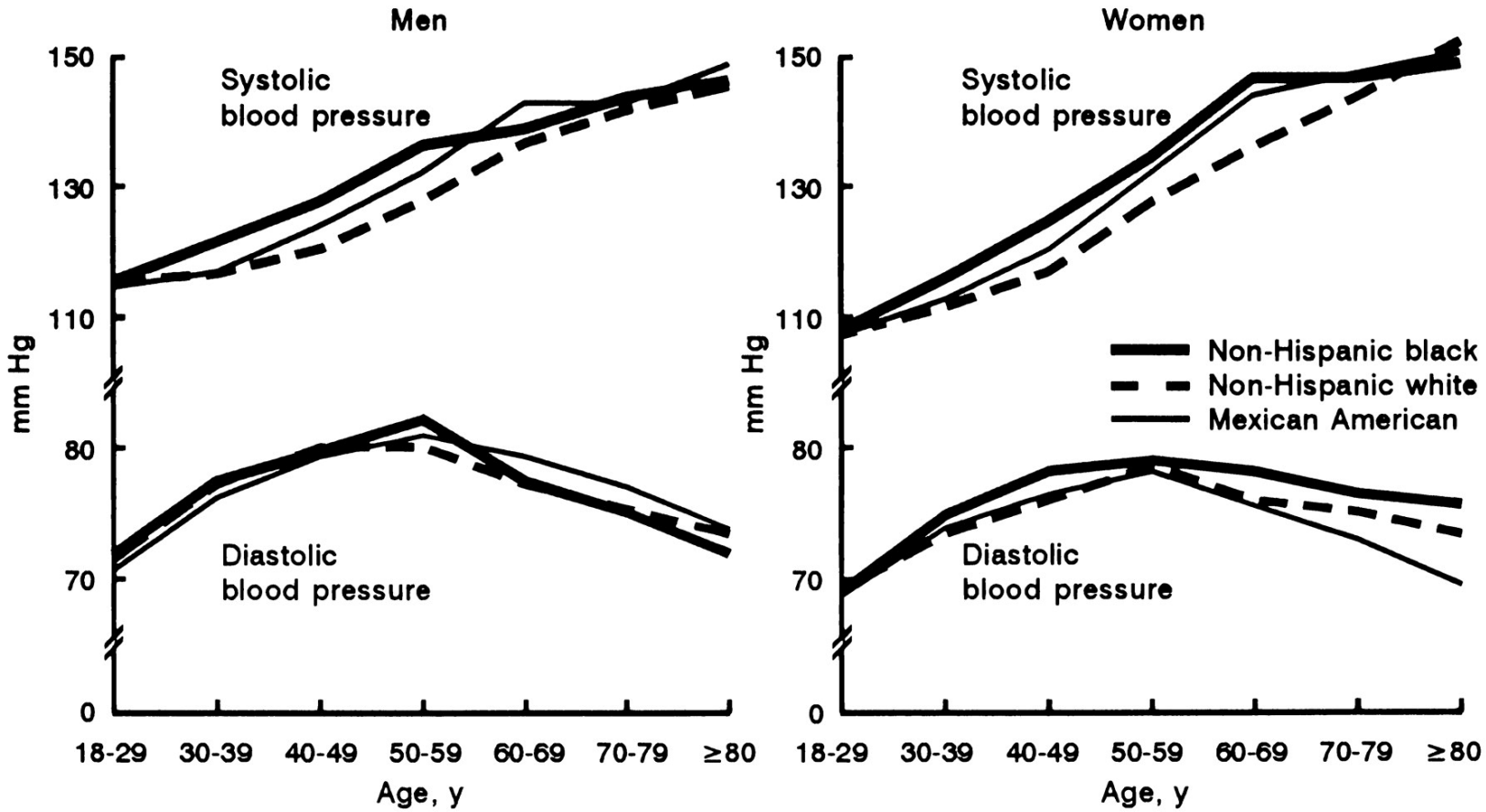
≈74% of patients with chronic heart failure

≈69% of patients with a first myocardial infarction

and in 60% of patients with peripheral arterial disease.

Hypertension. 2011;58:347–348

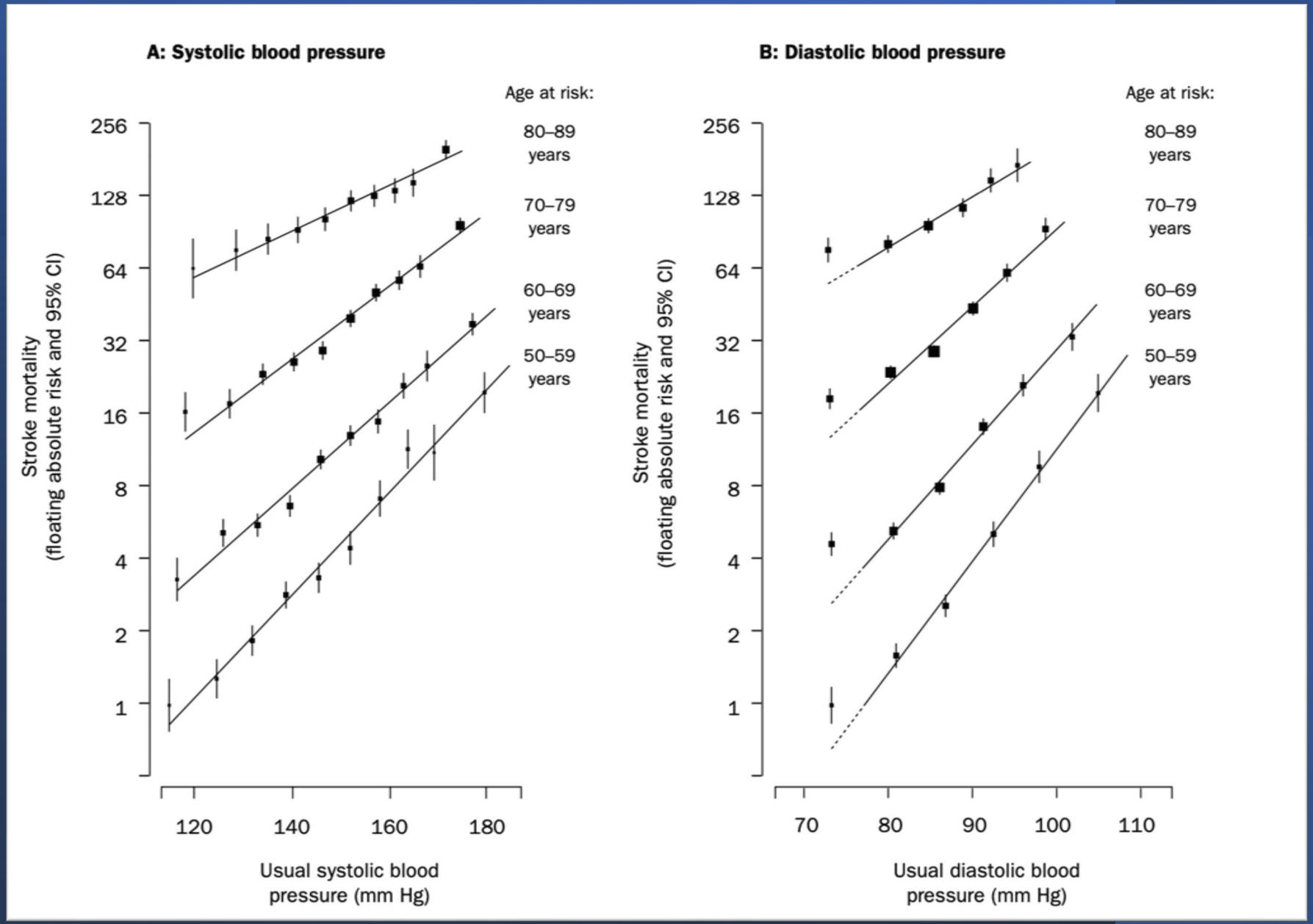
Mean systolic and diastolic blood pressures by age and race/ethnicity for men and women, US population 18 years of age and older.



Prevalence of Hypertension in the US Adult Population: Results From the Third National Health and Nutrition Examination Survey, 1988-1991.

Hypertension Issue: Volume 25(3), March 1995, pp 305-313

Stroke mortality rate in each decade of age versus usual blood pressure at the start of that decade



Lancet 2002; **360:** 1903–13

Does reduction of blood pressure reduce the incidence of stroke? What is the goal BP?

Categories of BP in Adults*

BP Category	SBP		DBP
Normal	<120 mm Hg	and	<80 mm Hg
Elevated	120–129 mm Hg	and	<80 mm Hg
Hypertension			
Stage 1	130–139 mm Hg	*or*	80–89 mm Hg
Stage 2	≥140 mm Hg	*or*	≥90 mm Hg

*Individuals with SBP and DBP in 2 categories should be designated to the higher BP category.

AMERICAN COLLEGE *of* CARDIOLOGY

Corresponding Values of Systolic BP/Diastolic BP for Clinic, Home (HBPM), Daytime, Nighttime, and 24-Hour Ambulatory (ABPM) Measurements.

Clinic	HBPM	Daytime ABPM	Nighttime ABPM	24-Hour ABPM
120/80	120/80	120/80	100/65	115/75
130/80	130/80	130/80	110/65	125/75
140/90	135/85	135/85	120/70	130/80
160/100	145/90	145/90	140/85	145/90

AMERICAN COLLEGE *of* CARDIOLOGY

Blood pressure control and reduction of CV and all cause mortality.

1. *VA Cooperative study 1-JAMA 1967*
2. *VA Cooperative study 2-JAMA 1970*
3. *Systolic Hypertension in the Elderly Program. JAMA 1991*
4. *SYSTolic Hypertension in EURope –Lancet 1997*
5. *HYpertension in the Very Elderly Trial –NEJM 2008*

Effects of Treatment on Morbidity in Hypertension

Results in Patients With Diastolic Blood Pressures Averaging 115 Through 129 mm Hg

Veterans Administration Cooperative Study Group on Antihypertensive Agents

- *Randomized double blind, placebo-controlled trial*
- *N=143,Caucasian =66,AA=77.*
- *Mean Age: 51.4 years (Range 30 – 73 years)*
- *Entry : DBP 115-129 mm of Hg (Ave clinic BP 185/121 – achieved BP -43/29 mm of Hg.*
- *Therapy drugs: HCTZ 50 mg BID*
- *Reserpine 0.2 mg*
- *Hydralazine 50 mg TID*
- *Study period :24 months – terminated early*.

JAMA Dec 11,1967 Vol 202 N0 11

Table 5.—Terminating Events

No. Placebo	Age	Race	Prerandomized Blood Pressure, mm Hg	Time in Randomized Trial, Months	Class of Events*	Nature of Terminating Event
1	57	W	185/126	16	A, D	Dissecting aortic aneurysm
2	59	W	214/120	6	A, D	Dissecting aortic aneurysm
3	55	N	177/117	2	B, D	Sudden death
4	65	W	230/127	2	B, D	Ruptured abdominal aortic aneurysm
5	65	N	211/121	4	A	Cerebral hemorrhage; bloody xanthrochromic spinal fluid
6	49	W	192/123	24	A	Fundi striate hemorrhage and papilledema
7	69	W	225/123	12	A	Fundi striate hemorrhage and papilledema
8	53	W	180/122	2	A	Fundi striate hemorrhage and soft exudates
9	68	W	214/117	12	A	Fundi striate hemorrhage and soft exudates
10	37	N	211/122	8	A	Fundi bilateral striate hemorrhage
11	45	N	200/121	2	A	Fundi bilateral striate hemorrhage and congestive heart failure
12	50	W	180/118	17	A	Fundi bilateral striate hemorrhage and congestive heart failure
13	67	N	215/120	2	A	Elevated BUN level to 71 mg/100 cc
14	55	W	186/125	5	A	Rehospitalization, basal diastolic pressure average 136 mm Hg
15	46	W	170/125	10	TF	Fundi single soft exudate
16	53	W	196/128	24	TF	Rehospitalization, basal diastolic pressure average 128 mm Hg
17	69	W	188/116	24	TF	Fundi hemorrhage and exudate but also diabetic
18	44	N	193/127	16	TF	Rehospitalization, basal diastolic pressure average 100 mm Hg
19	68	W	197/121	26	TF	Fundi hemorrhage and soft exudates plus BUN level 70 mg/100 cc but also diabetic
20	34	N	165/117	13	TF	Creatinine level increase 1.1 to 3 and BUN level 18 to 28 mg/100 cc in young patient
21	60	N	205/115	4	B, TF	Cerebrovascular accident, paralysis, and invalidism
Active 22	47	W	167/118	7	TF	Hyperglycemia, depression

*A = class A event, D = death, TF = treatment failure, and B = class B event.

Results

	Placebo n=70	Active Rx* n=73
Accelerated hypertension	12	0
Stroke	4	1
Coronary event	2	0
Congestive heart failure	2	0
Renal damage	2	0
Deaths	4	0
TOTAL	**26**	**1**

Effects of Treatment on Morbidity in Hypertension

II. Results in Patients With Diastolic Blood Pressure Averaging 90 Through 114 mm Hg

Veterans Administration Cooperative Study Group on Antihypertensive Agents

Design: Randomized ,double-blind placebo-controlled trial.
N=380 –Only Males
DBP 90-114 mm of Hg.
Median age P/I 49.2/48.1 years
Average age: P/I 52/50.5 years
AA 42%
Pre randomization BP: P/I 165.1/104.7 and 162.1/103.8
Intervention: HCTZ/RESEPRINE/HYDRALAZINE
Duration :3.2 years.

	Placebo n=194	Active Rx* n=186
Accelerated hypertension	4	0
Stroke	20	5
Total coronary event	13	11
Fatal coronary event	11	6
Congestive heart failure	11	0
Renal damage	3	0
Deaths	19	8
TOTAL	**81**	**30**

Table 8.—Incidence of Morbid Events With Respect to Level of Prerandomization Blood Pressure

	Control Group			Treated Group			
Prerandomization Blood Pressure, mm Hg	Patients Randomized	Patients With "Morbid Event" No.	Patients With "Morbid Event" %	Patients Randomized	Patients With "Morbid Event" No.	Patients With "Morbid Event" %	% Effectiveness
Systolic <165	98	15	15.3	108	10	9.3	40
Systolic 165+	96	41	42.7	78	12	15.4	64
Total	**194**	**56**		**186**	**22**		
Diastolic 90-104	84	21	25.0	86	14	16.3	35
Diastolic 105-114	110	35	31.8	100	8	8.0	75
Total	**194**	**56**		**186**	**22**		

Summary VA1/VA2

- *Compared to placebo antihypertensive medications reduced morbidity in males with DBP*

Prevention of Stroke by Antihypertensive Drug Treatment in Older Persons With Isolated Systolic Hypertension

SHEP Trial

Objective :to assess the ability of AHT drug Rx to reduce fatal and nonfatal stroke in ISH

Design: Multicenter randomized, double-blind placebo-controlled trial.

N=4736 Females:57% AA:14% Mean age :72 years. Average blood pressure 170/77.

Drugs:Cholrthalodine 12.5 or 25 mg and add Atenolol 25 mg or 50 mg.

IF SBP>180 mm hg – then reduce to less than 160 mm Hg

If SBP 160-179 MM Hg ,then reduce to at least 20 mm of Hg.

Primary end point: Non-fatal/fatal stroke

Secondary end point: CV and coronary morbidity/mortality and all cause mortality, QOL measures

Follow up 4.5 years

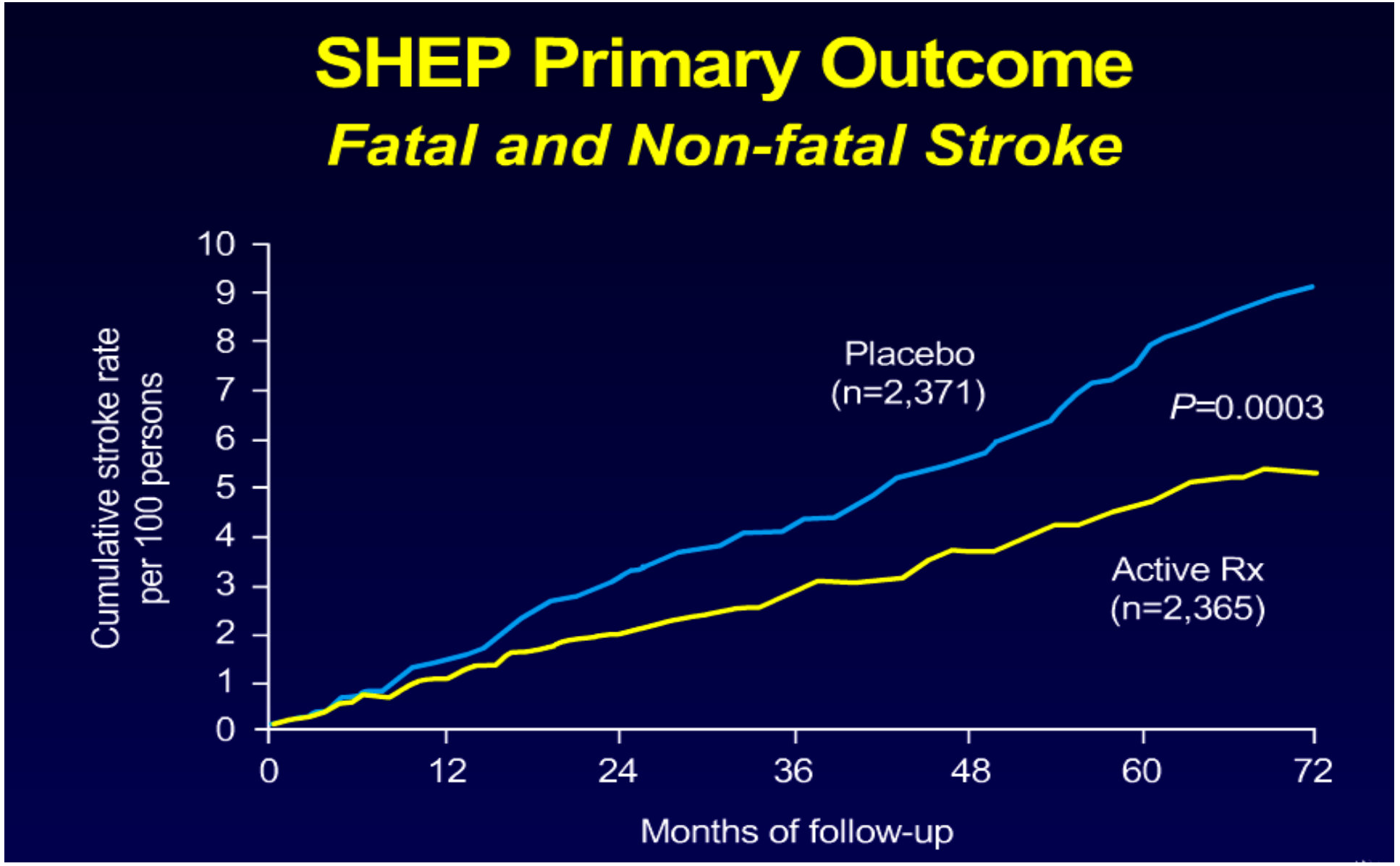
Achieved BP P/I :155/143.

SHEP trial is the first trial to test the efficacy of antihypertensive treatments on clinical end points in persons with Isolated systolic hypertension.

JAMA, June 26, 1991—Vol 265, No. 24

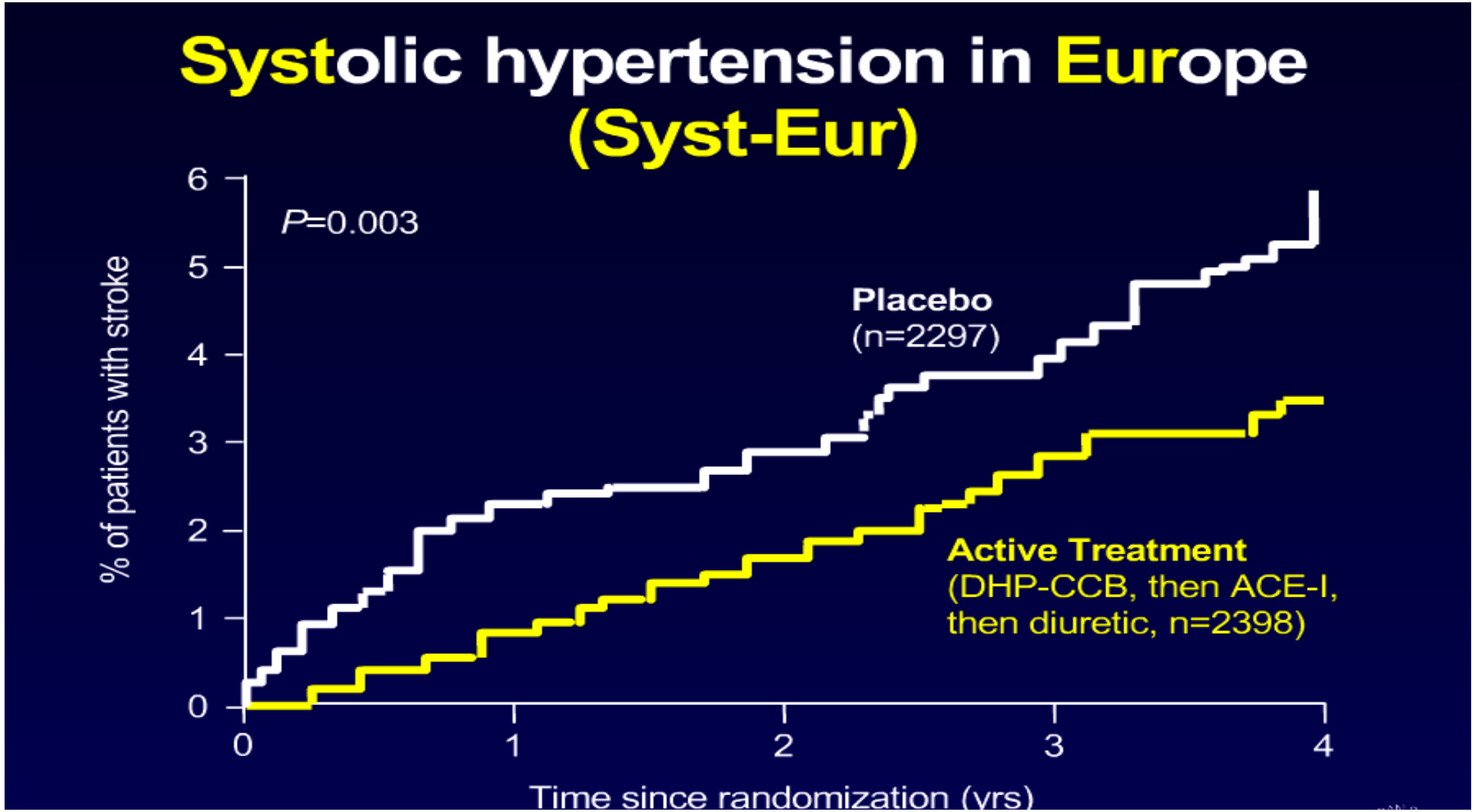
Table 3.—Mean Systolic and Diastolic Blood Pressures by Treatment Group and Year of Follow-up

Year	Blood Pressure, mm Hg*		
	Active Treatment Group	Placebo Group	Difference (Active-Placebo)
	Systolic Blood Pressure		
Baseline	170.5 (9.5)	170.1 (9.2)	+0.4
1	142.5 (15.7)	156.5 (17.3)	−14.0
2	141.8 (17.1)	154.4 (18.7)	−12.6
3	142.4 (17.2)	155.0 (20.0)	−12.6
4	143.1 (18.0)	154.6 (19.8)	−11.5
5	144.0 (19.3)	155.1 (20.9)	−11.1
	Diastolic Blood Pressure		
Baseline	76.7 (9.6)	76.4 (9.8)	+0.3
1	69.5 (9.9)	73.4 (12.1)	−3.9
2	68.2 (10.9)	72.3 (12.0)	−4.1
3	68.0 (10.6)	72.1 (12.3)	−4.1
4	67.2 (11.6)	71.2 (12.6)	−4.0
5	67.7 (10.2)	71.1 (12.8)	−3.4



Stroke reduction 36% and Nonfatal MI 27%.

Absolute benefit for stroke at 5 years was 30 events per 1000 patients treated at 5 years.



Aimed to reduce the sitting systolic blood pressure by at least 20 mm Hg to less than 150 mm Hg SBP Entry : P/I:173.9/173.8 BP redn:23/7 mm hg in active group.
Stroke redn:42% CV Mortality:26% no change in all cause mortality.

Treatment of Hypertension in Patients 80 Years of Age or Older: HYVET

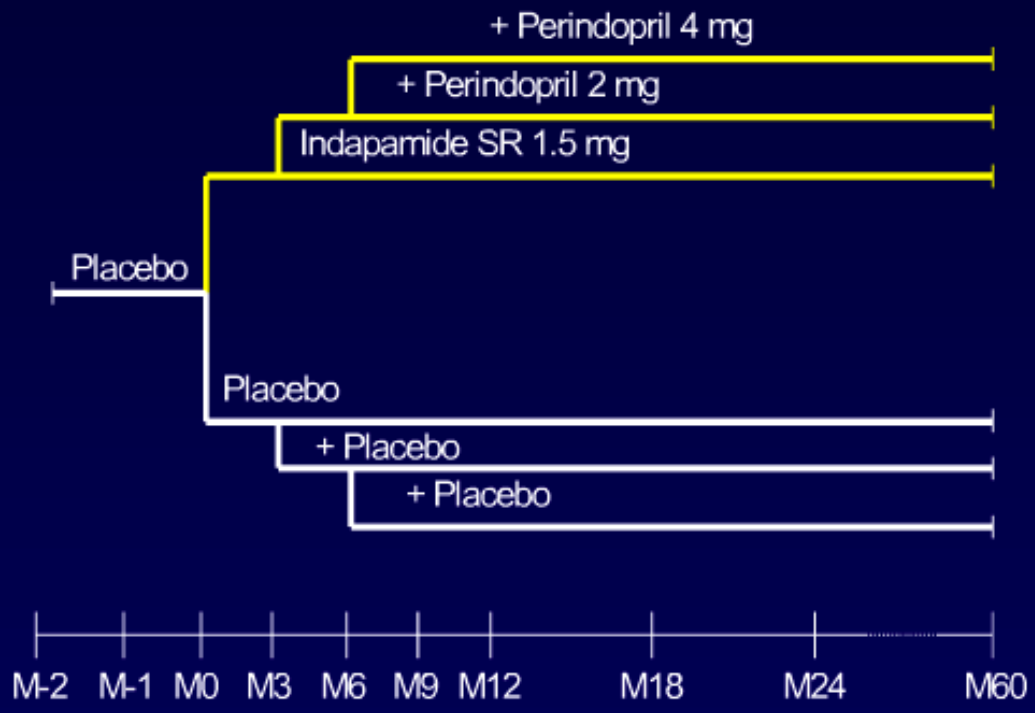
Inclusion Criteria

- Aged 80 or more
- Systolic BP; 160-199 mm Hg
- Diastolic BP; <110 mm Hg
- Informed consent

Exclusion Criteria

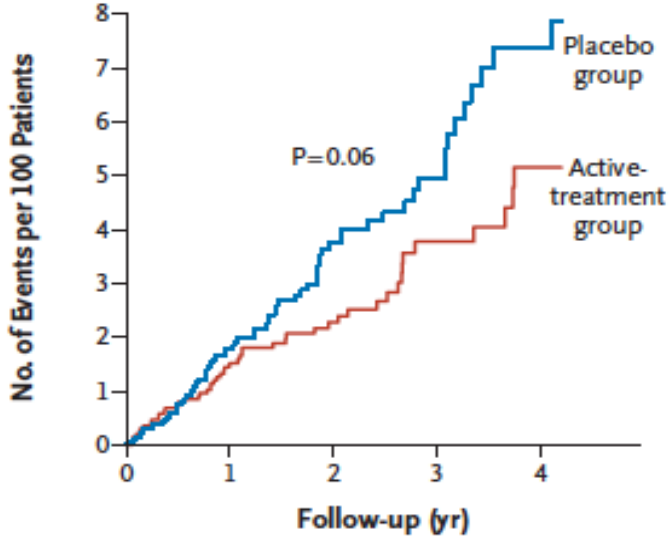
- Standing SBP <140 mm Hg
- Stroke in last 6 months
- Dementia
- Need daily nursing care

Primary Endpoint: All strokes (fatal and non-fatal)



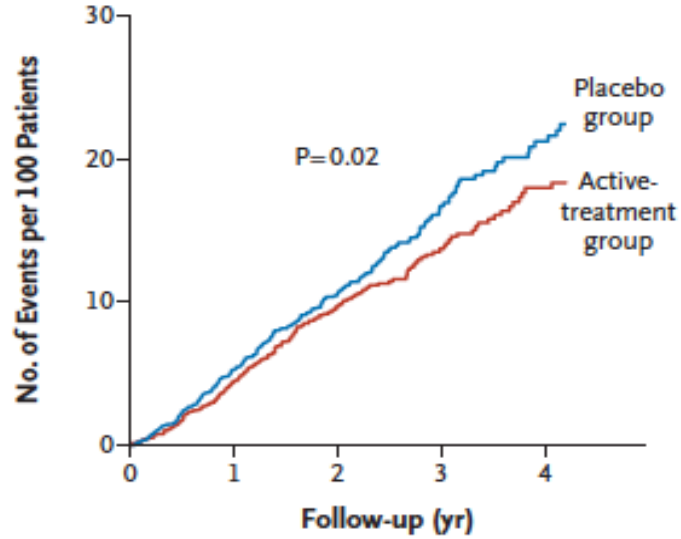
- N= 3845
- Target blood pressure: 150/80 mm Hg

A Fatal or Nonfatal Stroke



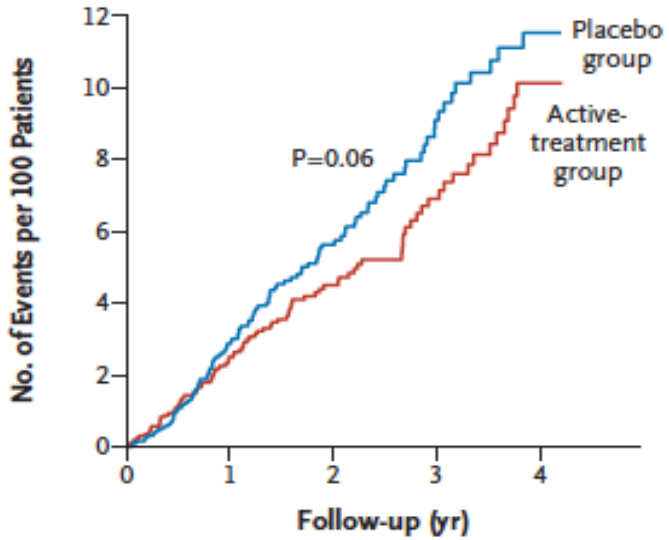
No. at Risk					
Placebo group	1912	1484	807	374	194
Active-treatment group	1933	1557	873	417	229

B Death from Any Cause



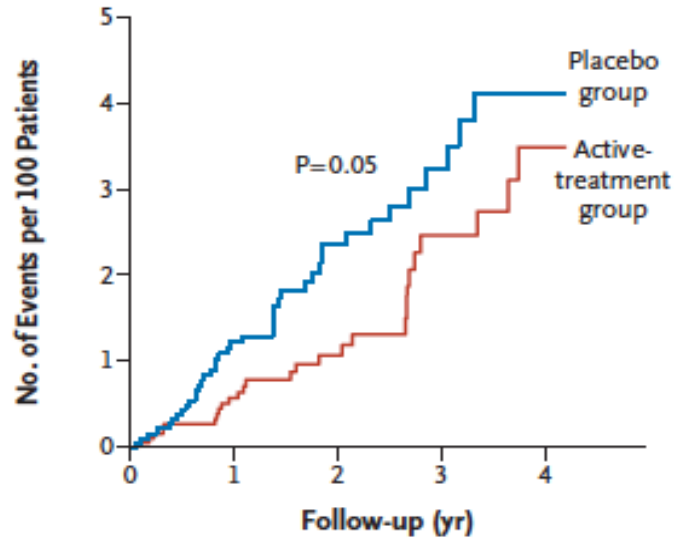
No. at Risk					
Placebo group	1912	1492	814	379	202
Active-treatment group	1933	1565	877	420	231

C Death from Cardiovascular Causes



No. at Risk					
Placebo group	1912	1492	814	379	202
Active-treatment group	1933	1565	877	420	231

D Death from Stroke



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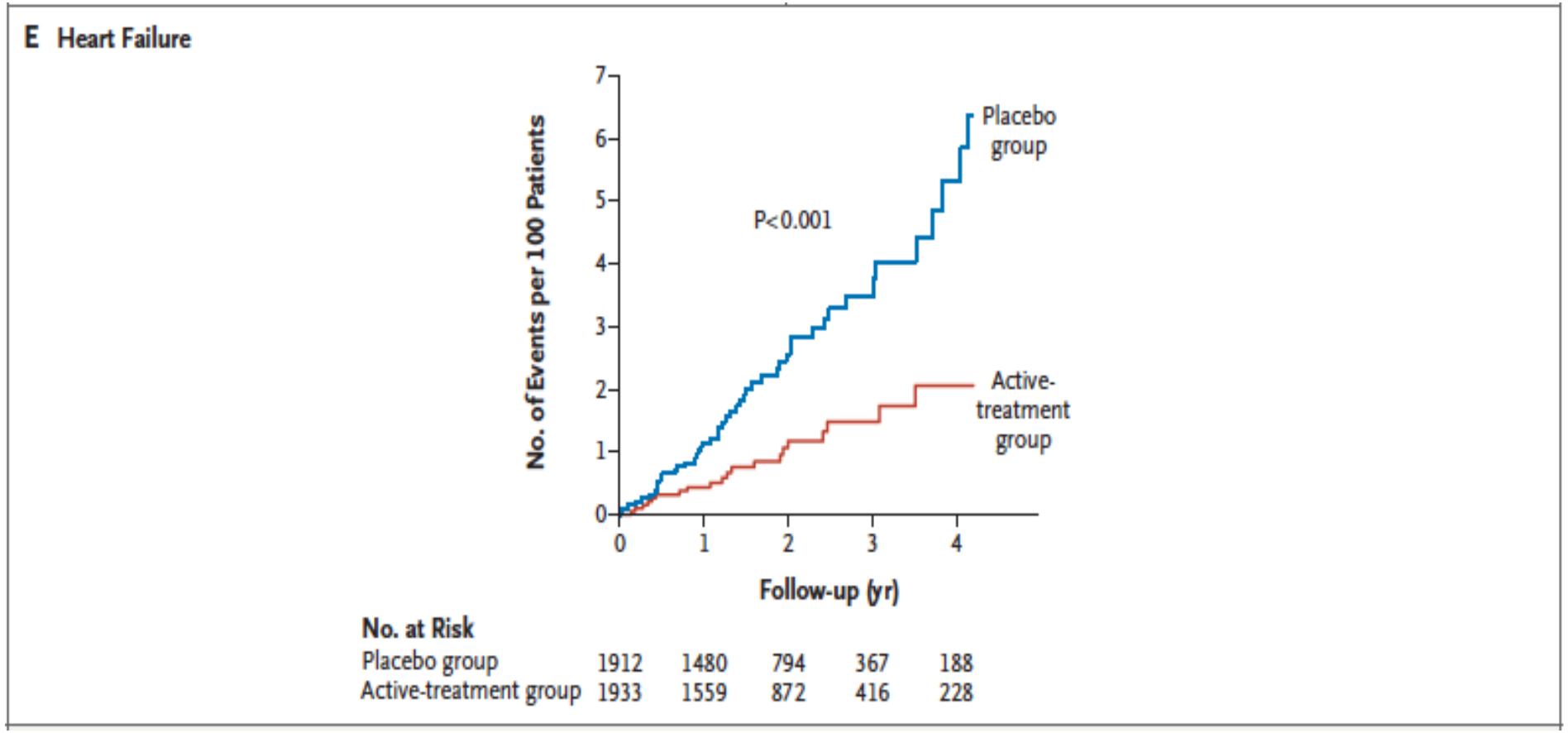
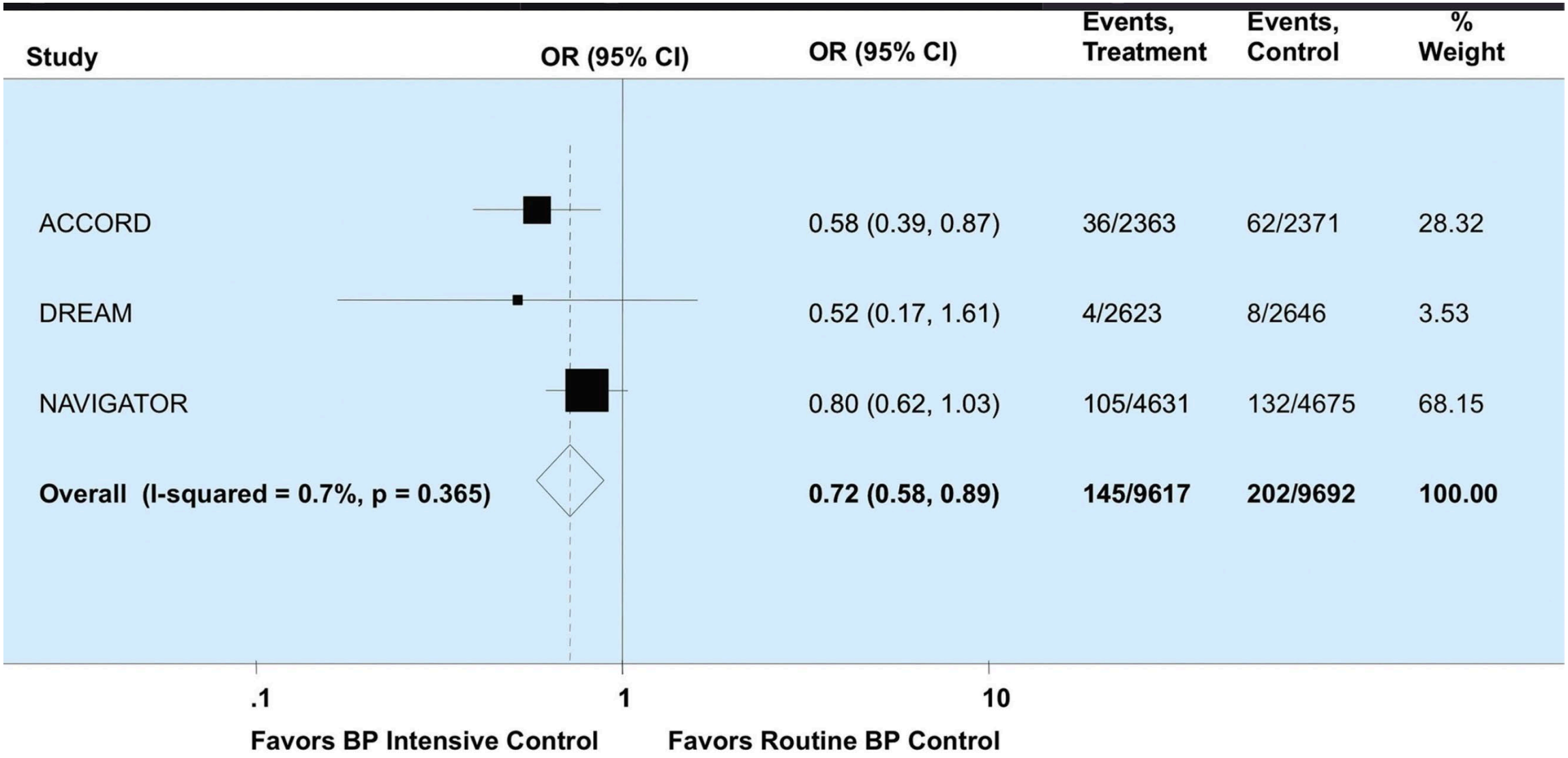


An unexpected finding of our trial is the reduction in the risk of death from any cause with active treatment, making HYVET one of the few individual studies of hypertension showing benefits of blood-pressure reduction on mortality

	SHEP	Syst-Eur	Syst China	HYVET
Subjects (n)	4736	4695	2394	3845
Inclusion BP criteria (mm Hg) Age	160-219/ <90 >60 Years	160-219/ <95 > 60 Years	160-2219/<95 >60 Years	160-190/<110 >80 Years
Mean Age	72 Years	70.2 Years	67 Years	83.5 Years 80-84 (73%) 85-89 (22.4%) >= 90(4.6%)
Women	56.8%	66.8%	35.6%	60.7%
First line Add-on	Thiazide BB/Reserpine	DHP ACEI/Thiazide	DHP ACEI/Thiazide	Indapamide Perindopril
Goal SBP (mm Hg)	<160 or ≥ 20 reduction	<150 or ≥ 20 reduction	<150 or ≥ 20 reduction	<150
Mean Achieved BP (mm Hg)	143/68	151/79		144/78
Follow up (y)	4.5 (mean)	2.0 (median)	3.0(median)	1.8 (mean)

Population studied	SHEP	Syst-Eur	HYVET
N	4736	4695	3845
Black Men Black Women White men White women	4.9 8.9 38.9 47.4		
Current Smokers Never smokers	12.6	7.1 74.2	6.4
MI Stroke DM	4.9 1.5 10.0	CV Complications 30.3	MI 3.1 Stroke 6.7 CHF 2.9 CVD 11.5 DM 6.8
BMI (M/F) No Limitations of ADL	27.5 Kg/m2 95.4	26.3/27.5 kg/m2	24.7 Kg/m2 Exclusions: NH/Clinical dementia Creatinine >=1.7



Franz H. Messerli et al. *J Am Coll Cardiol* 2010; 57:114-115.

CLASS (STRENGTH) OF RECOMMENDATION

CLASS I (STRONG) — **Benefit >>> Risk**

Suggested phrases for writing recommendations:
- Is recommended
- Is indicated/useful/effective/beneficial
- Should be performed/administered/other
- Comparative-Effectiveness Phrases†:
  - Treatment/strategy A is recommended/indicated in preference to treatment B
  - Treatment A should be chosen over treatment B

CLASS IIa (MODERATE) — **Benefit >> Risk**

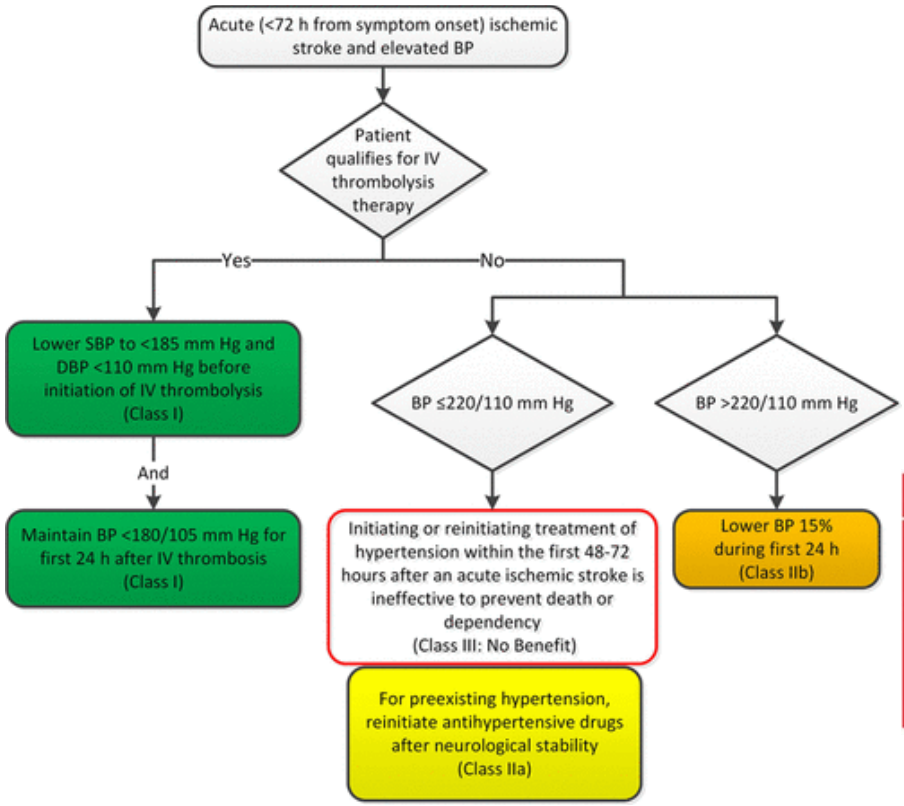
Suggested phrases for writing recommendations:
- Is reasonable
- Can be useful/effective/beneficial
- Comparative-Effectiveness Phrases†:
  - Treatment/strategy A is probably recommended/indicated in preference to treatment B
  - It is reasonable to choose treatment A over treatment B

CLASS IIb (WEAK) — **Benefit ≥ Risk**

Suggested phrases for writing recommendations:
- May/might be reasonable
- May/might be considered
- Usefulness/effectiveness is unknown/unclear/uncertain or not well established

CLASS III: No Benefit (MODERATE) — **Benefit = Risk**
(Generally, LOE A or B use only)

Suggested phrases for writing recommendations:
- Is not recommended
- Is not indicated/useful/effective/beneficial
- Should not be performed/administered/other



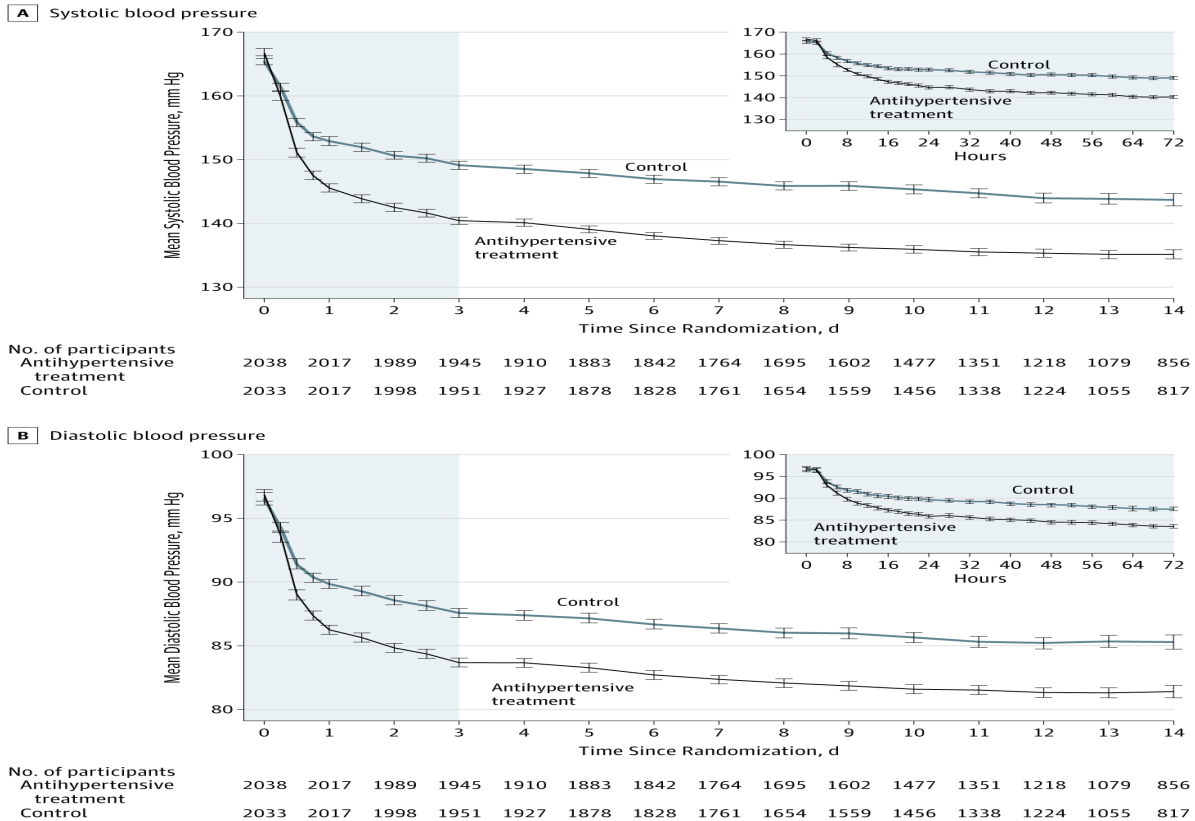
CLASS III: Harm (STRONG) — **Risk > Benefit**

Suggested phrases for writing recommendations:
- Potentially harmful
- Causes harm
- Associated with excess morbidity/mortality
- Should not be performed/administered/other

Paul K. Whelton. Hypertension. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines, Volume: 71, Issue: 6, Pages: e13-e115, DOI: (10.1161/HYP.0000000000000065)

Effects of Immediate Blood Pressure Reduction on Death and Major Disability in Patients With Acute Ischemic Stroke

The CATIS Randomized Clinical Trial

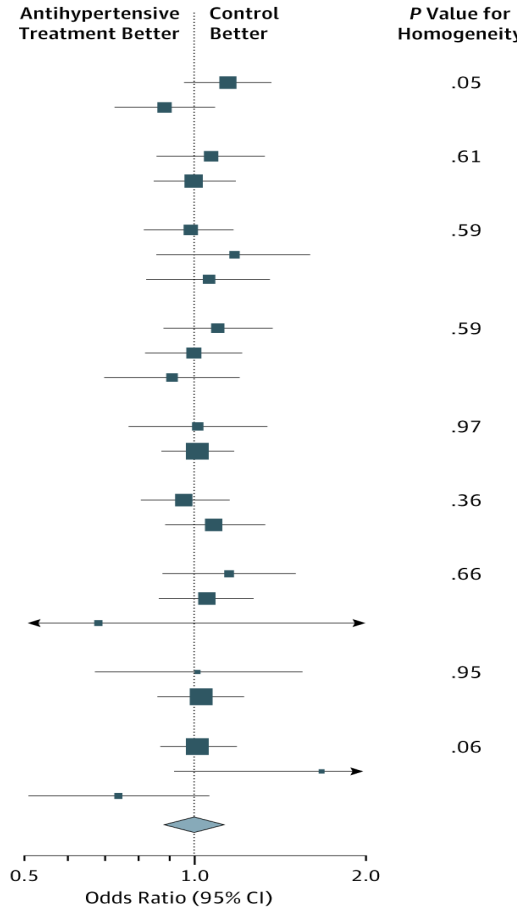


JAMA. 2014;311(5):479-489. doi:10.1001/jama.2013.282543

Effects of Immediate Blood Pressure Reduction on Death and Major Disability in Patients With Acute Ischemic Stroke: The CATIS Randomized Clinical Trial -14 days of hospital discharge.

JAMA. 2014;311(5):479-489. doi:10.1001/jama.2013.282543

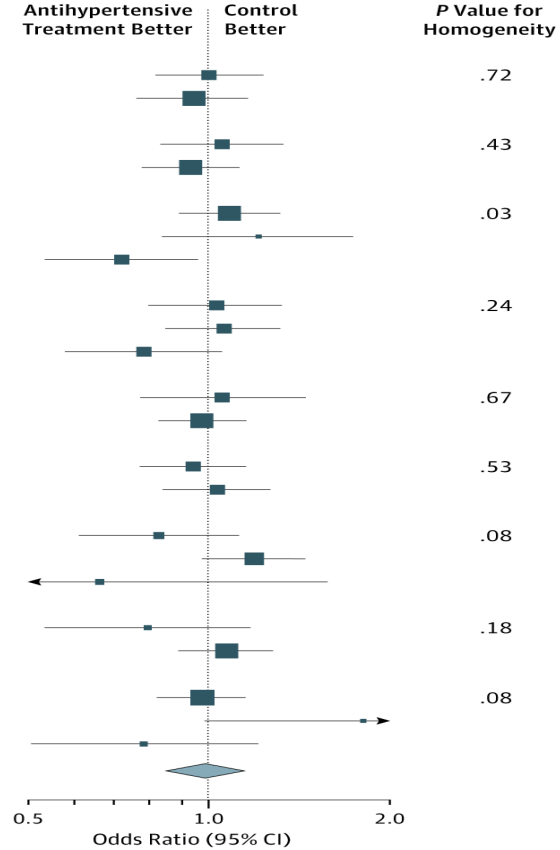
	Antihypertensive Treatment		Control		
Subgroup	Total, No.	Events, No. (%)	Total, No.	Events, No. (%)	Odds Ratio (95% CI)
Age, y					
<65	1198	352 (29.4)	1203	325 (27.0)	1.12 (0.94-1.34)
≥65	833	331 (39.7)	824	356 (43.2)	0.87 (0.71-1.05)
Sex					
Women	715	267 (37.3)	743	269 (36.2)	1.05 (0.85-1.30)
Men	1316	416 (31.6)	1284	412 (32.1)	0.98 (0.83-1.15)
Time to randomization, h					
<12	1015	376 (37.0)	1082	412 (38.1)	0.96 (0.80-1.14)
12-23	401	132 (32.9)	331	99 (29.9)	1.15 (0.84-1.57)
≥24	609	172 (28.2)	609	167 (27.4)	1.04 (0.81-1.34)
Baseline SBP, mm Hg					
<160	715	225 (31.5)	765	228 (29.8)	1.08 (0.87-1.35)
160-179	838	288 (34.4)	851	297 (34.9)	0.98 (0.80-1.19)
≥180	478	170 (35.6)	411	156 (38.0)	0.90 (0.69-1.19)
History of hypertension					
No	428	150 (35.0)	430	151 (35.1)	1.00 (0.75-1.32)
Yes	1603	533 (33.3)	1597	530 (33.2)	1.00 (0.87-1.16)
Use of antihypertension medications					
No	1022	354 (33.8)	1045	366 (35.0)	0.95 (0.79-1.13)
Yes	1009	338 (33.5)	982	315 (32.1)	1.07 (0.88-1.29)
Baseline NIHSS score					
0-4	1065	134 (12.6)	1009	113 (11.2)	1.14 (0.87-1.49)
5-15	871	460 (52.8)	923	479 (51.9)	1.04 (0.86-1.25)
≥16	95	89 (93.7)	93	89 (95.7)	0.67 (0.18-2.44)
Baseline Rankin score					
<3	914	47 (5.1)	900	46 (5.1)	1.01 (0.66-1.53)
≥3	1117	636 (56.9)	1125	635 (56.4)	1.02 (0.86-1.21)
Stroke subtype					
Thrombolic	1513	539 (35.6)	1540	544 (35.3)	1.01 (0.87-1.18)
Embolic	93	60 (64.5)	92	48 (52.2)	1.67 (0.92-3.01)
Lacunar	366	66 (18.0)	338	78 (23.1)	0.73 (0.51-1.06)
Overall	2031	683 (33.6)	2027	681 (33.6)	1.00 (0.88-1.14)



From: **Effects of Immediate Blood Pressure Reduction on Death and Major Disability in Patients With Acute Ischemic Stroke: The CATIS Randomized Clinical Trial – At 3 month**

JAMA. 2014;311(5):479-489. doi:10.1001/jama.2013.282543

Subgroup	Antihypertensive Treatment Total, No.	Antihypertensive Treatment Events, No. (%)	Control Total, No.	Control Events, No. (%)	Odds Ratio (95% CI)	*P* Value for Homogeneity
Age, y						
<65	1172	224 (19.1)	1182	223 (18.9)	1.02 (0.83-1.25)	.72
≥65	816	276 (33.8)	805	279 (34.7)	0.96 (0.78-1.18)	
Sex						
Women	701	196 (28.0)	726	193 (26.6)	1.07 (0.85-1.35)	.43
Men	1287	304 (23.6)	1261	309 (24.5)	0.95 (0.79-1.14)	
Time to randomization, h						
<12	993	298 (30.0)	1054	295 (28.0)	1.10 (0.91-1.34)	.03
12-23	392	92 (23.5)	328	66 (20.1)	1.22 (0.85-1.74)	
≥24	597	108 (18.1)	600	139 (23.2)	0.73 (0.55-0.97)	
Baseline SBP, mm Hg						
<160	702	155 (22.1)	754	162 (21.5)	1.04 (0.81-1.33)	.24
160-179	820	223 (27.2)	830	215 (25.9)	1.07 (0.86-1.33)	
≥180	466	122 (26.2)	403	125 (31.0)	0.79 (0.59-1.06)	
History of hypertension						
No	420	107 (25.5)	425	104 (24.5)	1.06 (0.77-1.44)	.67
Yes	1568	393 (25.1)	1562	398 (25.5)	0.98 (0.83-1.15)	
Use of antihypertension medications						
No	1004	256 (25.5)	1033	273 (26.4)	0.95 (0.78-1.16)	.53
Yes	984	244 (24.8)	954	229 (24.0)	1.04 (0.85-1.28)	
Baseline NIHSS score						
0-4	1050	89 (8.5)	993	100 (10.1)	0.83 (0.61-1.12)	.08
5-15	848	335 (39.5)	901	320 (35.5)	1.19 (0.98-1.44)	
≥16	90	76 (84.4)	92	82 (89.1)	0.66 (0.28-1.58)	
Baseline Rankin score						
<3	900	50 (5.6)	883	61 (6.9)	0.79 (0.54-1.17)	.18
≥3	1088	450 (41.4)	1103	441 (40.0)	1.06 (0.89-1.26)	
Stroke subtype						
Thrombolic	1482	392 (26.5)	1513	408 (27.0)	0.97 (0.83-1.15)	.08
Embolic	89	47 (52.8)	88	34 (38.6)	1.78 (0.98-3.23)	
Lacunar	362	48 (13.3)	329	54 (16.4)	0.78 (0.51-1.19)	
Total	1988	500 (25.2)	1987	502 (25.3)	0.99 (0.86-1.15)	



CLASS (STRENGTH) OF RECOMMENDATION

CLASS I (STRONG) — Benefit >>> Risk

Suggested phrases for writing recommendations:
- Is recommended
- Is indicated/useful/effective/beneficial
- Should be performed/administered/other
- Comparative-Effectiveness Phrases†:
  - Treatment/strategy A is recommended/indicated in preference to treatment B
  - Treatment A should be chosen over treatment B

CLASS IIa (MODERATE) — Benefit >> Risk

Suggested phrases for writing recommendations:
- Is reasonable
- Can be useful/effective/beneficial
- Comparative-Effectiveness Phrases†:
  - Treatment/strategy A is probably recommended/indicated in preference to treatment B
  - It is reasonable to choose treatment A over treatment B

CLASS IIb (WEAK) — Benefit ≥ Risk

Suggested phrases for writing recommendations:
- May/might be reasonable
- May/might be considered
- Usefulness/effectiveness is unknown/unclear/uncertain or not well established

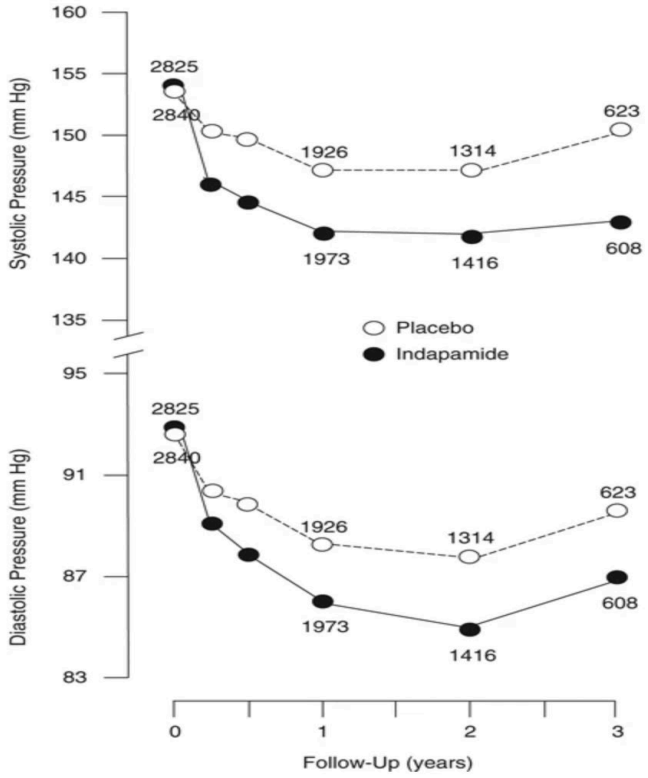
CLASS III: No Benefit (MODERATE) — Benefit = Risk
(Generally, LOE A or B use only)

Suggested phrases for writing recommendations:
- Is not recommended
- Is not indicated/useful/effective/beneficial
- Should not be performed/administered/other

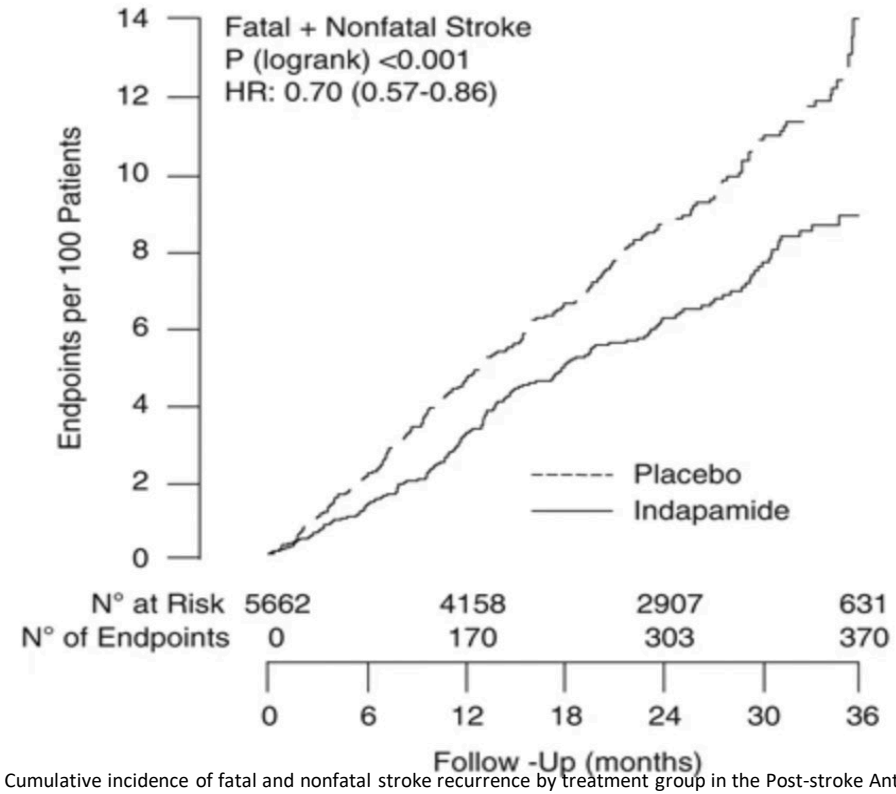
Paul K. Whelton. Hypertension. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines, Volume: 71, Issue: 6, Pages: e13-e115, DOI: (10.1161/HYP.0000000000000065)

Blood pressure reduction for the secondary prevention of stroke: a Chinese trial and a systematic review of the literature

Post-stroke Antihypertensive Treatment Study (PATS)



Average sitting systolic and diastolic blood pressures at randomization and during follow-up in the Post-stroke Antihypertensive Treatment Study.



Cumulative incidence of fatal and nonfatal stroke recurrence by treatment group in the Post-stroke Antihypertensive Treatment Study.

Hypertension Research (2009) 32, 1032–1040; doi:10.1038/hr.2009.139; published online 2 October 2009

- Accurate measurement of blood pressure is important to diagnose and treat hypertension.
- The risk of developing hypertension and stroke increases with age.
- Blood pressure is the most important modifiable risk factor for stoke.
- Studies show that BP reduction confers more benefit for prevention of strokes than for prevention of heart disease.
- The2017 ACC/AHA hypertension guideline recommends BP <130/80 mm Hg for secondary prevention of stroke (Class IIb).

Thank you!