ESC Council on Hypertension

Guidelines Implementation Workshop

What is optimal blood pressure control? Comparison with the American guidelines

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Sophia Antipolis, 21 January 2020

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Declaration / conflict of interest / Disclosures

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Noting to disclose

Topic of dispute

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Systolic Blood Pressure Intervention Trial (SPRINT) goal

Randomized Controlled Trial with target systolic BP by a near-pragmatic design

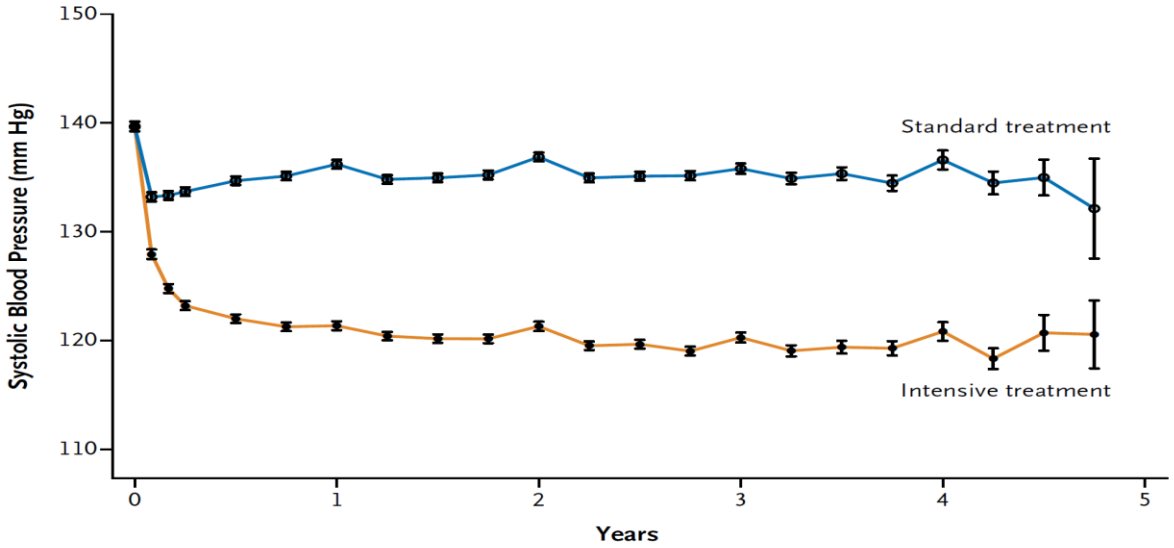
Does intensive versus standard SBP treatment reduce CVD composite event rate?

Intensive Treatment
Goal SBP < 120 mm Hg

Standard Treatment
Goal SBP < 140 mm Hg

ClinicalTrials.gov (NCT01206062)
Ambrosius WT et al. Clin. Trials. 2014;11:532-546.

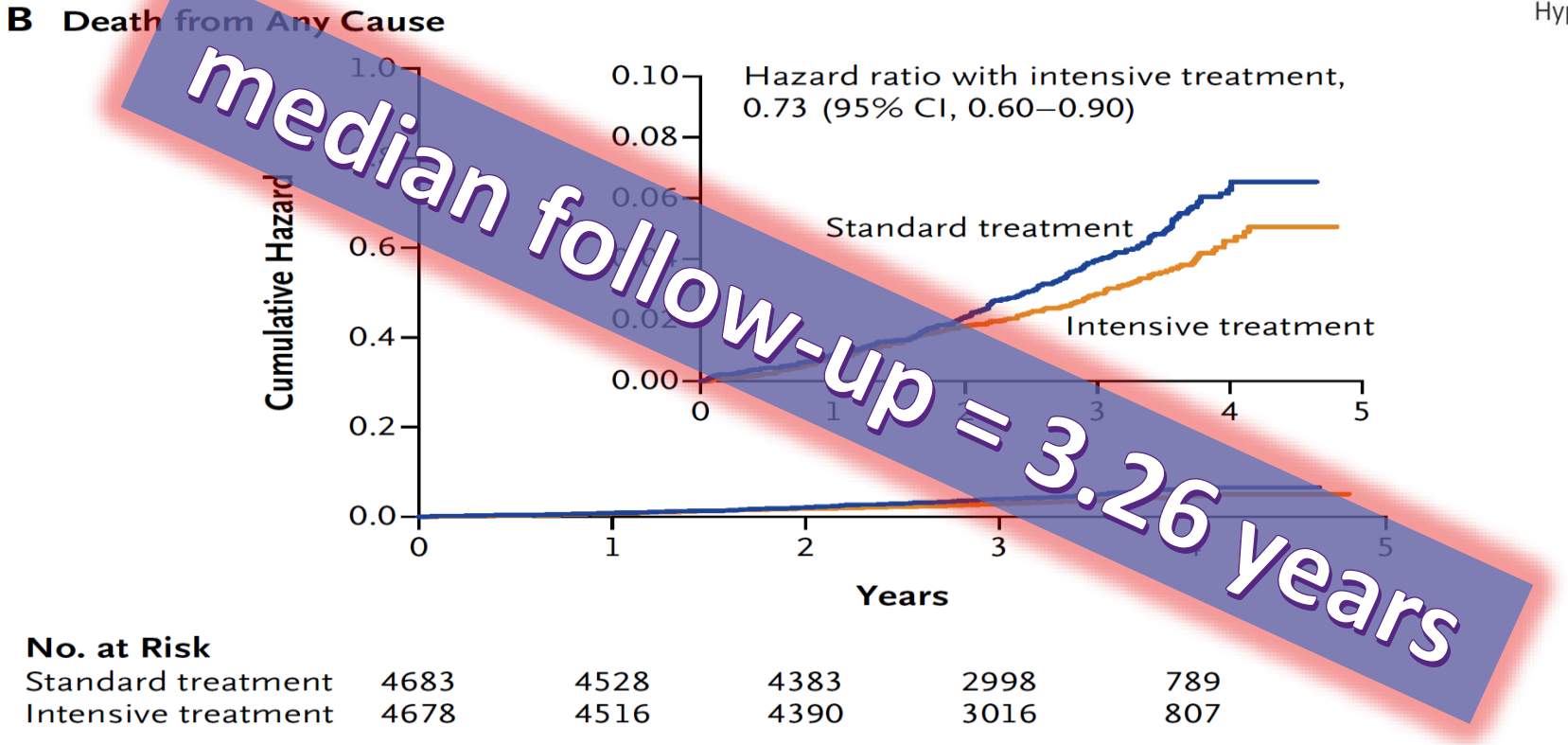
Systolic Blood Pressure over the Course of the Trial.



No. with Data										
Standard treatment	4683	4345	4222	4092	3997	3904	3115	1974	1000	274
Intensive treatment	4678	4375	4231	4091	4029	3920	3204	2035	1048	286
Mean No. of Medications										
Standard treatment	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
Intensive treatment	2.3	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.0

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

Primary Outcome and Death from Any Cause.



median follow-up = 3.26 years

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

SPRINT Inclusion/Exclusion Criteria

Include:

- Age: ≥50 years, including ≥ 75 years
- BP: systolic BP: 130–180 mm Hg (treated or untreated)
- Additional cardiovascular disease (CVD) risk
- Clinical or subclinical CVD (excluding stroke)
- Chronic kidney disease (CKD), defined as eGFR 20–59 ml/min/1.73m^2
- Framingham Risk Score for 10-year CVD risk ≥ 15%

Exclude:

- Stroke, Diabetes mellitus, Polycystic kidney disease, IF
- Proteinuria >1g/d
- CKD with eGFR <20 mL/min/1.73m2 (MDRD)
- Adherence concerns
- Residing in nursing home or dementia Dx

High CV risk

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High CV risk

Clin. Trials. 2014;11:532-546
N Engl J Med. 2015;373:2103-16

Unattended vs attended BP measurement

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Brief Review

Unattended Blood Pressure Measurements in the Systolic Blood Pressure Intervention Trial

Implications for Entry and Achieved Blood Pressure Values Compared With Other Trials

Sverre E. Kjeldsen, Per Lund-Johansen, Peter M. Nilsson, Giuseppe Mancia

…for generalization, the number of mmHg that should be added (*to unattended BP measurements, n.f.r*) must be clarified; suggestions vary from 5 to 10 mmHg up to 10–20 mmHg and a recent study indicates 16 mmHg.

Hypertension. 2016;67:808-812.

Primary and All-Cause Mortality Outcomes Stratified by Treatment Group and BP Technique

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Outcome	Intensive Arm			Standard Arm			Intensive vs Standard HR		Interaction
BP Technique	n	Events	Per y, %	n	Events	Per y, %	HR	95% CI	*P* Value
Primary									0.005
AA	2037	101	1.5	2045	159	2.5	0.62	0.51–0.76	
NA	1123	68	1.9	1124	103	3.0	0.64	0.46–0.91	
AR	875	50	1.8	871	51	1.9	0.98	0.76–1.25	
ABM	283	20	2.1	287	15	1.5	1.39	0.78–2.49	
All death									0.28
AA	2037	64	1.0	2045	98	1.5	0.65	0.47–0.88	
NA	1123	46	1.3	1124	60	1.7	0.76	0.53–1.11	
AR	875	19	0.7	871	32	1.1	0.59	0.37–0.94	
ABM	283	10	1.0	287	7	0.7	1.48	0.63–3.05	

AA indicates always alone; ABM, alone for blood pressure measurement; AR, alone for rest; BP, blood pressure; CI, confidence interval; HR, hazard ratio; and NA, never alone.

Johnson KJ et al. Hypertension. 2018;71:848-857

Serious Adverse Events, Conditions of Interest, and Monitored Clinical Events.

Variable	Intensive Treatment (N=4678)	Standard Treatment (N=4683)	Hazard Ratio	P Value
	no. of patients (%)			
Conditions of interest				
Emergency department visit or serious adverse event				
Hypotension	158 (3.4)	93 (2.0)	1.70	<0.001
Syncope	163 (3.5)	113 (2.4)	1.44	0.003
Bradycardia	[illegible]	83 (1.8)	1.25	0.13
Electrolyte abnormality	177 (3.8)	129 (2.8)	1.38	0.006
Injurious fall†	334 (7.1)	333 (7.1)	1.00	0.97
Acute kidney injury or acute renal failure‡	[illegible]	120 (2.6)	[illegible]	<0.001
Monitored clinical events				
Adverse laboratory measure§				
Serum sodium <130 mmol/liter	180 (3.8)	100 (2.1)	1.76	<0.001
Serum sodium >150 mmol/liter	6 (0.1)	0		0.02
Serum potassium <3.0 mmol/liter	114 (2.4)	74 (1.6)	1.50	0.006
Serum potassium >5.5 mmol/liter	176 (3.8)	171 (3.7)	1.00	0.97

4 serious adverse events for each saved life

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

Impact of SPRINT on guidelines

BP thresholds for antihypertensive therapy

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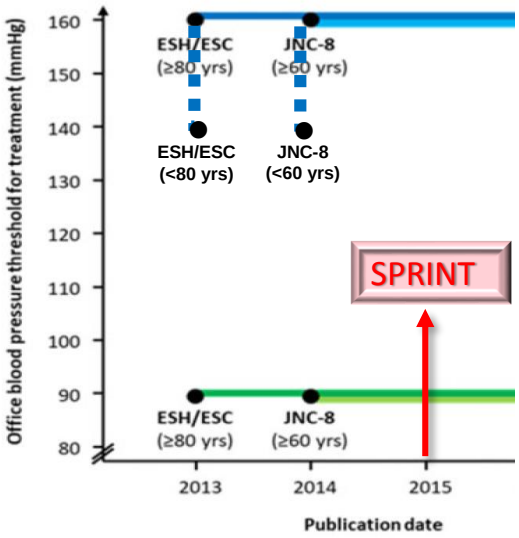

Take home figure Development of blood pressure thresholds for the initiation of antihypertensive therapy in elderly patients with hypertension. The blue (systolic blood pressure) and green (diastolic blood pressure) lines depict the changes in thresholds for the initiation of antihypertensive therapy in the elderly since 2013. Shown are the limits of the guidelines of the European Society of Cardiology and the European Society of Hypertension, the American Heart Association and the American College of Cardiology, and the American College of Physicians and the American Academy of Family Physicians. The respective age groups are provided in years. AAFP, American Academy of Family Physicians; ACC, American College of Cardiology; ACP, American College of Physicians; AHA, American Heart Association; ESC, European Society of Cardiology; ESH, European Society of Hypertension; JNC-8, Eighth Joint National Committee (JNC 8) Guidelines for the Management of Hypertension in Adults.

Modified from: Ewen S et al. Eur Heart J 2019;40:2029–2031

US vs EU guidelines: definition (1)

Category	2017 ACC/AHA/AAPA/ABC/ACPM/ AGS/APhA/ASH/ASPC/NMA/PCNA			2018 ESC-ESH		
	Systolic BP (mmHg)		Diastolic BP (mmHg)	Systolic BP (mmHg)		Diastolic BP (mmHg)
Optimal	-	-		<120	and	<80
Normal	<120	and	<80	120-129	and/or	80-84
High-normal	-	-	-	130-139	and/or	85-89
Elevated	120-129	and	<80	-	-	-
Hypertension Stage/Grade*						
1	130-139	or	80-89	140-159	and/or	90-99
2	≥140	or	≥90	160-179	and/or	100-109
3	-	-	-	≥ 180	and/or	≥ 110
ISH	-	-	-	≥ 140	and	< 90

'Stage' for US; 'Grade' for EU;
ISH=Isolated systolic hypertension

Whelton PK et al. Hypertension 2018;71:e13-e115
Williams B et al. Eur Heart J 2018;39(33):3021-3104

BP thresholds for starting antihypertensive therapy

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Hypertension disease staging	Other risk factors, HMOD, or disease	BP (mmHg) grading			
		High normal SBP 130–139 DBP 85–89	Grade 1 SBP 140–159 DBP 90–99	Grade 2 SBP 160–179 DBP 100–109	Grade 3 SBP ≥180 or DBP ≥110
Stage 1 (uncomplicated)	No other risk factors	Low risk	Low risk	Moderate risk	High risk
	1 or 2 risk factors	Low risk	Moderate risk	Moderate to high risk	High risk
	≥3 risk factors	Low to Moderate risk	Moderate to high risk	High Risk	High risk
Stage 2 (asymptomatic disease)	HMOD, CKD grade 3, or diabetes mellitus without organ damage	Moderate to high risk	High risk	High risk	High to very high risk
Stage 3 (established disease)	Established CVD, CKD grade ≥4, or diabetes mellitus with organ damage	Very high risk	Very high risk	Very high risk	Very high risk

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High normal BP
BP 130-139/85-89 mmHg

Lifestyle advice

Consider drug treatment in very high risk patients with CVD, espacially CAD

Stage 1 hypertension
(BP 130-139/80-89 mm Hg)

Clinical ASCVD or estimated 10-y CVD risk ≥10%*

No

Yes

Nonpharmacological therapy (Class I)

Nonpharmacological therapy and BP-lowering medication (Class I)

BP thresholds for starting antihypertensive therapy

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Grade 2 Hypertension
BP 160-179/100-109 mmHg

Lifestyle advice

Immediate drug treatment in all patients

Aim for BP control within 3 months

Grade 3 Hypertension
BP ≥180/110 mmHg

Lifestyle advice

Immediate drug treatment in all patients

Aim for BP control within 3 months

intervention if BP not controlled

Stage 2 hypertension
(BP ≥140/90 mm Hg)

Nonpharmacological therapy and BP-lowering medication† (Class I)

How low should we lower BP ?

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"The combination of epidemiological data showing a graded relationship between BP and outcomes, particularly above a BP of 120/80 mm Hg, and the results of the SPRINT trial showing benefit of more comprehensive treatment to a target BP of <120/80 mm Hg, suggests that a lifelong BP below that level will substantially lower CVD and CKD incidence."

Whelton PK et al. JACC 2018;71:e77

Office blood pressure target (mmHg) for treated hypertension

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≥130/80	≥140/90
BP Target Range **<130/80** for: Clinical CVD or 10-year ASCVD risk ≥10%	**BP Target Range** **<130/80** for: No clinical CVD and 10-year ASCVD risk <10%

…the results of the SPRINT trial showing benefit of **more comprehensive treatment to a target BP of <120/80 mm Hg**, suggests that a lifelong BP below that level will substantially lower CVD and CKD incidence. This is especially the case for younger individuals, those with DM, and those with high lifetime CVD risk based on the presence of multiple risk factors, including high BP.

Office blood pressure target (mmHg) for treated hypertension

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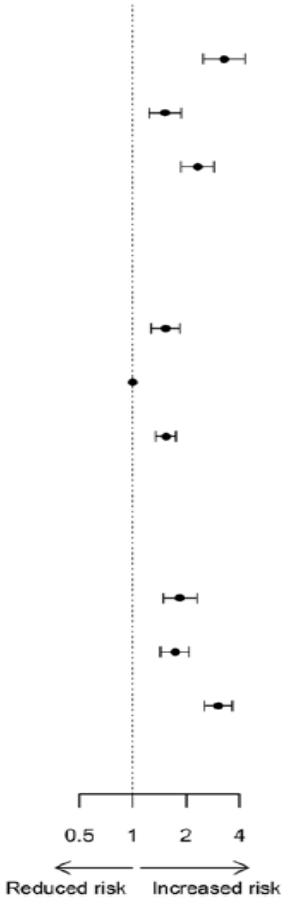
Aged 18–65yrs

BP Target Range
First <140/90
Aim for 130/80
or lower if tolerated
But
SBP not usually <120
I A

J-shape for diastolic pressure in CAD

PP <45 mm Hg	No.events / No. patients (%)	HR (95% CI); P Value
DBP <70 mm Hg	63 / 336 (18.8%)	3.26 (2.48-4.27); p < 0.001
DBP 70-79 mm Hg	115 / 1506 (7.6%)	1.52 (1.23-1.88); p < 0.001
DBP ≥ 80 mm Hg	110 / 1240 (8.9%)	2.32 (1.87-2.88); p < 0.001
PP 45 - 64 mm Hg		
DBP <70 mm Hg	169 / 1803 (9.4%)	1.53 (1.27-1.83); p < 0.001
DBP 70-79 mm Hg	406 / 7756 (5.2%)	1.00 (-)
DBP ≥ 80 mm Hg	439 / 6342 (6.9%)	1.54 (1.34-1.75); p < 0.001
PP ≥ 65 mm Hg		
DBP <70 mm Hg	110 / 905 (12.2%)	1.84 (1.48-2.29); p < 0.001
DBP 70-79 mm Hg	160 / 1577 (10.1%)	1.73 (1.43-2.08); p < 0.001
DBP ≥ 80 mm Hg	173 / 1174 (14.7%)	3.04 (2.54-3.64); p < 0.001

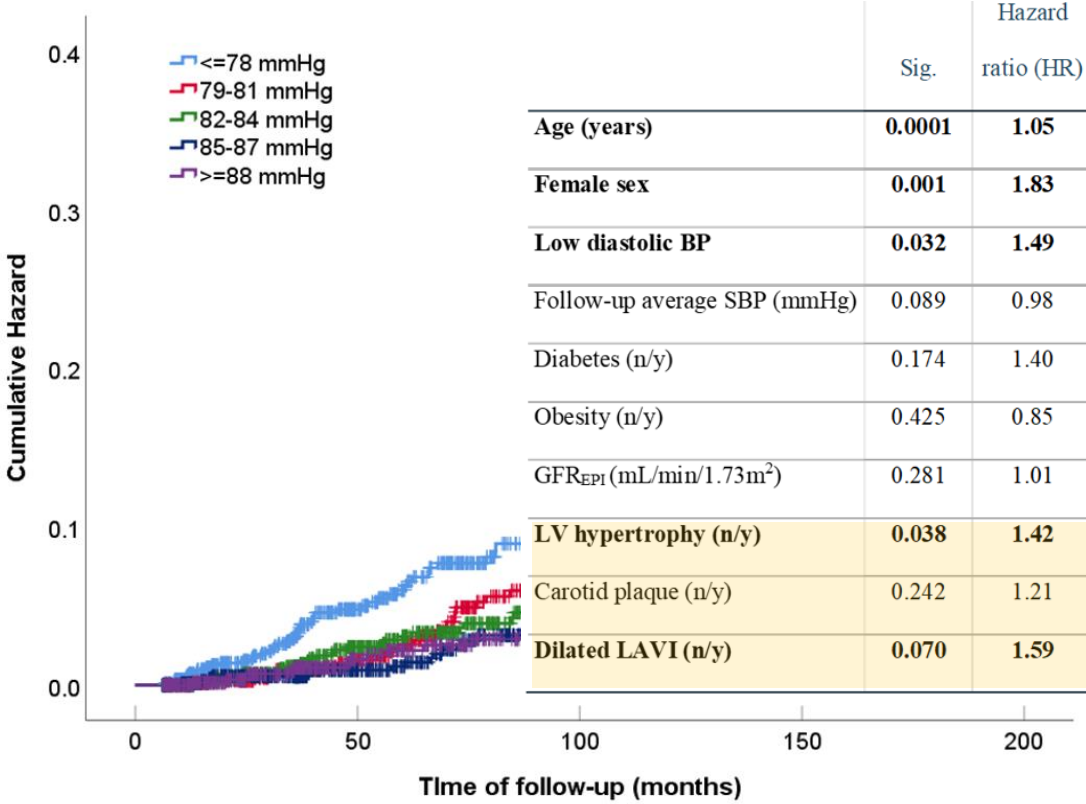


Primary outcome: CV death or AMI

Vidal-Patiot E et al: *Hypertension*. 2018;71:168-176

Incident composite CV event for quintiles of DBP

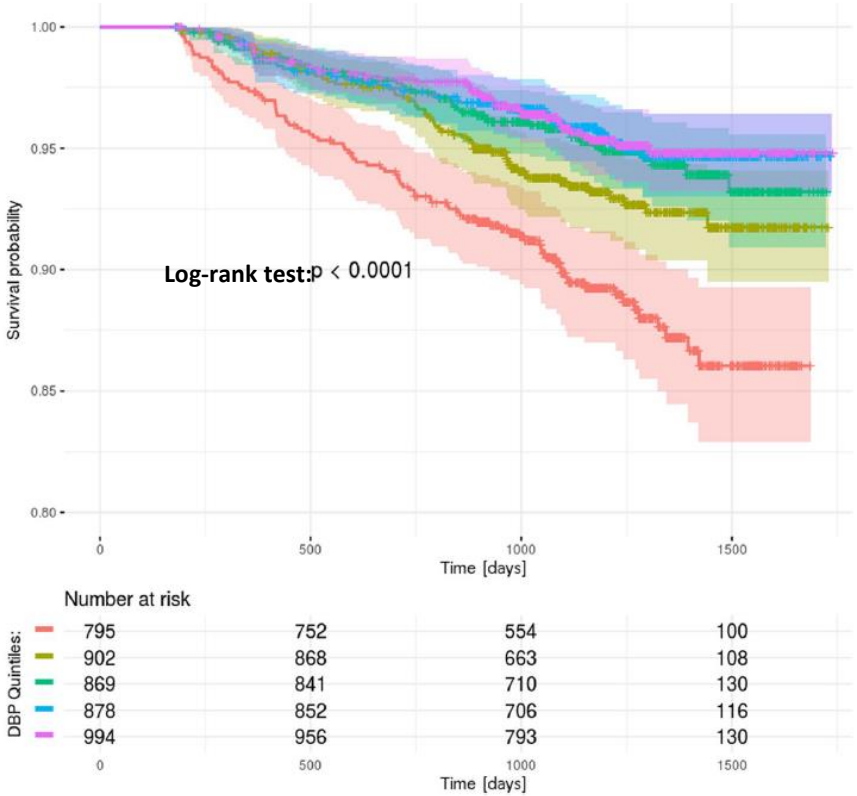
(n=4005,with SBP<140 mmHg / at least 6 months follow-up)



	Sig.	Hazard ratio (HR)	95.0% CI for HR
Age (years)	**0.0001**	**1.05**	**1.03-1.07**
Female sex	**0.001**	**1.83**	**1.28-2.62**
Low diastolic BP	**0.032**	**1.49**	**1.03-2.15**
Follow-up average SBP (mmHg)	0.089	0.98	0.96-1.00
Diabetes (n/y)	0.174	1.40	0.86-2.29
Obesity (n/y)	0.425	0.85	0.58-1.26
GFR_{EPI} (mL/min/1.73m^2)	0.281	1.01	0.99-1.02
LV hypertrophy (n/y)	**0.038**	**1.42**	**1.02-1.96**
Carotid plaque (n/y)	0.242	1.21	0.88-1.67
Dilated LAVI (n/y)	**0.070**	**1.59**	**0.96-2.64**

Izzo R et al. J Hypertens 2019;37:1889–1897

Kaplan-Meier curves with 95% confidence intervals in standard treatment (<140 mmHg)



1st quintile: 44–67 mmHg,
2nd quintile: 67–73 mmHg,
3rd quintile: 73–78 mmHg,
4th quintile: 78–83 mmHg,
5th quintile: 83–113 mmHg.

Sobieraj P et al. Scientific Reports (2019) 9:13070