Intensive blood pressure control for patients over age 60: a pooled analysis of the SPRINT, STEP, and ACCORD BP randomized controlled trials

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Abstract

Abstract Aim: Blood pressure-lowering treatment is beneficial for preventing cardiovascular disease risk among elderly patients. However, the most appropriate BP targets for elderly patients are controversial. Methods: We extracted the individual-level data of participants over 60 years from the SPRINT study and ACCORD study first and then conducted a meta-analysis of major adverse cardiovascular events (MACEs) and adverse events (hypotension and syncope) and renal outcomes across the SPRINT, STEP, and ACCORD BP trials, which included 18,806 participants over 60. Participants were randomized to receive standard BP treatment or intensive BP treatment. Results: In this meta-analysis, intensive treatment exhibited a nominal trend toward decreases in all-cause death (hazard ratio [HR]: 0.98; 95% confidence interval [CI]: 0.76-1.26; p=0.87) and cardiovascular mortality (HR: 0.77; 95%CI: 0.54-1.08; p=0.13). The incidence of MACEs (HR: 0.83; 95%CI: 0.74-0.94; p=0.003) and stroke (HR: 0.70; 95% CI: 0.56-0.88; p=0.002) was reduced. Intensive treatment had an inconspicuous effect on coronary disease (HR: 0.87; 95% CI: 0.69-1.10; p=0.24) and heart failure (HR: 0.70; 95%CI: 0.40-1.22; p=0.21). Intensive treatment increased the risk of hypotension (HR: 1.46; 95%CI: 1.12-1.91; p=0.006) and syncope (HR: 1.43; 95%CI: 1.06-1.93; p=0.02). Intensive treatment did not increase the risk of either impaired kidney function among patients with chronic kidney disease (CKD) (HR: 0.98; 95% CI: 0.41-2.34; p=0.96) or without CKD (HR: 1.77; 95%CI: 0.48-6.56; p=0.40) at baseline. Conclusions: Intensive BP goals reduced the incidence of MACEs and increased the risk of adverse events without significant mortality or renal outcome changes.

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			Hazard Ratio	Hazard Ratio						
Study or Subgroup	log[Hazard Ratio] SE	Weight	IV, Random, 95% CI	IV. Random. 95% Cl						
A Cardiovascular events										
ACCORD BP 2015	z-0.1165 0.0608	60.4%	0.89 [0.79, 1.00]							
SPRINT 2015	-0.2485 0.1691	12.3%	0.78 [0.56, 1.09]							
STEP 2021	-0.3011 0.107	27.2%	0.74 [0.60, 0.91]	_ _						
Subtotal (95% CI)		100.0%	0.83 [0.74, 0.94]	\bullet						
Heterogeneity: Tau ² =	0.00 [.] Chi ² = 2.49 df = 2 (P = 1) 29)· 12 =	20%							
Test for overall effect:	Z = 2.95 (P = 0.003)		2070							
B Stroke										
ACCORD BP 2015	-0.5798 0.2546	21.1%	0.56 [0.34, 0.92]							
SPRINT 2015	-0.1863 0.1917	37.2%	0.83 [0.57, 1.21]							
STEP 2021	-0.4005 0.1809	41.7%	0.67 [0.47, 0.96]							
Subtotal (95% CI)		100.0%	0.70 [0.56, 0.88]							
Heterogeneity: Tau ² =	0.00; Chi ² = 1.62, df = 2 (P =	0.45); l² =	0%							
Test for overall effect: 2	Z = 3.07 (P = 0.002)									
C Overall mortality										
ACCORD BP 2015	0.1222 0.1334	34.9%	1.13 [0.87, 1.47]							
SPRINT 2015	-0.2357 0.1155	38.5%	0.79 [0.63, 0.99]							
STEP 2021	0.1044 0.18	26.6%	1.11 [0.78, 1.58]							
Subtotal (95% CI)		100.0%	0.98 [0.76, 1.26]	-						
Heterogeneitv: Tau ² = 0.03: Chi ² = 4.99. df = 2 (P = 0.08); l ² = 60%										
Test for overall effect:	Z = 0.16 (P = 0.87)	,,								
D Cardiovascular mo	rtality									
ACCORD BP 2015	0.01 0.2094	39.8%	1.01 [0.67, 1.52]							
SPRINT 2015	-0.5276 0.2245	36.7%	0.59 [0.38, 0.92]	_						
STEP 2021	-0.3285 0.3128	23.5%	0.72 [0.39, 1.33]							
Subtotal (95% CI)		100.0%	0.77 [0.54, 1.08]							
Heterogeneity: Tau ² =	0.03: Chi ² = 3.13. df = 2 (P = 1	0.21); l ² =	36%							
Test for overall effect:	Z = 1.52 (P = 0.13)									
E Coronary disease										
ACCORD BP 2015	-0.0726 0.103	52.3%	0.93 [0.76, 1.14]							
SPRINT 2015	0.0677 0.2465	18.6%	1 07 [0 66 1 73]							
STEP 2021	-0.4005 0.1809	29.1%	0 67 10 47, 0 961	_						
Subtotal (95% CI)		100.0%	0.87 [0.69, 1.10]	\bullet						
Heterogeneity: Tau ² =	0.02: Chi ² = 3.19. df = 2 (P = 1) 20): l ² =	37%							
Test for overall effect: 2	Z = 1.18 (P = 0.24)									
F Heart failure										
ACCORD BP 2015	0.077 0.1793	42.3%	1.08 [0.76, 1.53]							
SPRINT 2015	-0.462 0 1717	42.9%	0.63 [0.45, 0.88]							
STEP 2021	-1.3093 0.6206	14.9%	0.27 [0.08, 0.91]	·						
Subtotal (95% CI)		100.0%	0.70 [0.40, 1.22]							
Heterogeneity: Tau ² =	0 16: Chi ² = 7 76 df = 2 (P = 1	$(02) \cdot ^2 =$	74%							
Test for overall effect: $Z = 1.27$ (P = 0.21)										
				0.5 0.7 1 1.5 2						
				extensive treatment standard treatment						
Test for subgroup differ	ences: Chi ² = 4.55. df = 5 (P =	0.47). l² =	0%							

	Experim	ental	Cont	rol		Risk Ratio	Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% Cl	M-H. Random. 95% Cl
A Hypotension							
SPRINT 2015	94	3691	55	3707	41.6%	1.72 [1.23, 2.39]	
STEP 2021	146	4243	113	4268	58.4%	1.30 [1.02, 1.66]	
Subtotal (95% CI)		7934		7975	100.0%	1.46 [1.12, 1.91]	\bullet
Total events	240		168				
Heterogeneity: Tau ² =	0.02; Chi2 :	= 1.78, c	if = 1 (P	= 0.18);	$ ^2 = 44\%$		
Test for overall effect:	Z = 2.75 (F	= 0.006	5)	,			
B Syncope							
SPRINT 2015	97	3691	70	3707	96.5%	1.39 [1.03, 1.89]	
STEP 2021	6	4243	2	4268	3.5%	3.02 [0.61, 14.94]	
Subtotal (95% CI)		7934		7975	100.0%	1.43 [1.06, 1.93]	◆
Total events	103		72				
Heterogeneity: Tau ² =	0.00; Chi ² =	= 0.87, d	f = 1 (P =	= 0.35);	$ ^2 = 0\%$		
Test for overall effect:	Z = 2.35 (F	= 0.02)		,.			
		,					
C ≥50% reduction in	patients v	with chr	onic kid	ney dis	ease at b	aseline	
SPRINT 2015	. 9	1196	9	1168	90.0%	0.98 [0.39, 2.45]	
STEP 2021	1	99	1	97	10.0%	0.98 [0.06, 15,44]	•
Subtotal (95% CI)		1295		1265	100.0%	0.98 [0.41, 2.34]	
Total events	10		10				
Heterogeneity: Tau ² =	0.00: Chi ²	= 0.00. c	f = 1 (P	= 1.00);	$l^2 = 0\%$		
Test for overall effect:	Z = 0.05 (P	= 0.96)	· ·	,.			
		,					
D ≥30% reduction to	o <60ml/m	nin/1.73	m2 in pa	tients v	without ch	ronic kidney disease at baseline	Co.
SPRINT 2015	102	2481	30	2519	49.8%	3.45 [2.31, 5.17]	
STEP 2021	55	4081	61	4117	50.2%	0.91 [0.63, 1.31]	
Subtotal (95% CI)		6562		6636	100.0%	1.77 [0.48, 6.56]	
Total events	157		91				
Heterogeneity: Tau ² =	0.86: Chi ²	= 23.45.	df = 1 (F	< 0.00	001): ² = !	96%	
Test for overall effect:	Z = 0.85 (P	= 0.40)			<i>,.</i>		
		,					
							0.2 0.5 1 2 5
Tool for out and all					12 - 00/		intensive treatment standard treatment

Test for subgroup differences: Chi² = 0.85. df = 3 (P= 0.84). $|^2$ = 0%

