What should the target blood pressure goals be?

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Recent guidelines for treating hypertension have been discussed [1, 2]. A consensus document on the management of hypertension in the elderly was published in 2011 by the American College of Cardiology (ACC)/American Heart Association (AHA) 2011 [3]. Based on the strength of both clinical trial data and observational data, this document recommended that the blood pressure should be lowered to less than 140/90 mm Hg in persons aged 60–79 years and to 140–145/< 90 mm Hg if tolerated in persons aged 80 years and older [3]. These recommendations were strongly supported by clinical trial data, especially from the Systolic Hypertension in the Elderly trial [4–6] and from the Hypertension in the Very Elderly trial [7]. The European Society of Hypertension/European Society of Cardiology 2013 guidelines for management of hypertension recommended lowering the blood pressure to less than 140/90 mm Hg in persons aged 60 to 79 years [8]. In persons aged 80 years and older with a systolic blood pressure of 160 mm Hg or higher, the blood pressure should be lowered to 140–150/< 90 mm Hg provided they are in good physical and mental condition [8].

The 2013 Eighth Joint National Committee (JNC 8) guidelines for management of hypertension recommended lowering the blood pressure in persons aged 60 years or older to less than 150/90 mm Hg if they do not have diabetes mellitus or chronic kidney disease and to less than 140/90 mm Hg if they have diabetes mellitus or chronic kidney disease [9]. The minority view from JNC 8 recommended that the blood pressure goal in persons aged 60 to 79 years with hypertension without diabetes mellitus or chronic kidney disease should be lowered to less than 140/90 mm Hg [10].

The 2013 Canadian Hypertension Education Program guidelines recommended lowering the blood pressure to less than 140/90 mm Hg in elderly persons younger than 80 years of age [11]. These guidelines recommended lowering the blood pressure to less than 150/90 mm Hg in persons aged 80 years and older [11]. The 2011 United Kingdom guidelines also supported lowering the blood pressure to less than 140/90 mm Hg in elderly persons younger than 80 years [12].

The 2014 American Society of Hypertension (ASH)/International Society of Hypertension guidelines recommended lowering the blood pressure to less than 140/90 mm Hg in elderly persons 80 years and younger [13]. These guidelines recommended reducing the blood pressure in persons older than 80 years of age with a blood pressure of 150/90 mm Hg or higher to less than 150/90 mm Hg unless these persons have diabetes mellitus or chronic kidney disease, when a target goal of less than 140/90 mm Hg should be considered [13].

The Association of Black Cardiologists (ABC) and the Working Group on Women's Cardiovascular Health 2014 recommendations supported a blood pressure goal of less than 140/90 mm Hg in persons aged 60 years and older and of less than 150 mm Hg in debilitated or frail persons aged 80 years and older [14]. The ABC recommendations stated that the JNC 8 recommendations may endanger the more than 36 million Americans with hypertension who are aged 60 years and older with a disproportionate negative effect on blacks and those with chronic kidney disease and cerebrovascular disease [14]. The Working Group on Women's Cardiovascular Health 2014 recommendations stated that hypertension is the major modifiable risk factor causing coronary heart disease, heart failure, stroke, atrial fibrillation, diabetes mellitus, and chronic kidney disease in women. They stated that the JNC 8 guidelines do not recognize that the hypertensive population is primarily women, that older women generally have poor control of hypertension, and that approximately 40% of those with poor blood pressure control are black women, who have the highest risk for stroke, heart failure, and chronic kidney disease [14].

If the JNC 8 panel recommendations are used, 6 million adults in the United States aged 60 years and older would be ineligible for treatment with antihypertensive drugs, and treatment intensity would be decreased for an additional 13.5 million older persons [15], leading to increased incidence of coronary events, stroke, heart failure, cardiovascular mortality, and other adverse events associated with inadequate control of hypertension. The AHA/ACC/ASH 2015 guidelines on treatment of hypertension in patients with coronary artery disease stated that the optimal blood pressure in patients with coronary artery disease should be less than 140/90 mm Hg [16].

The REasons for Geographic and Racial Differences in Stroke (REGARDS) study is an observational study of the incidence of stroke in persons living in the stroke belt and stroke buckle regions of the United States [17]. This study included 4,181 persons aged 55–64 years, 3,737 persons aged 65–74 years, and 1,839 patients aged 75 years and older (mean age: 79.3 years) on antihypertensive drug therapy. Data from this study also support a blood pressure goal of less than 140/90 mm Hg in elderly persons [17].

Randomized clinical trial studies on treatment of hypertension in frail elderly persons have not yet been reported [18]. The Predictive Values of Blood Pressure and Arterial Stiffness in Institutionalized Very Aged Population (PARTAGE) study was a longitudinal study performed in 1130 frail persons aged 80 years and older (mean age 88 years) living in nursing homes in Italy and France [19]. This study found a 78% increase in mortality in frail elderly persons with a systolic blood pressure below 130 mm Hg receiving 2 or more antihypertensive drugs (32.2%) compared with frail elderly persons with a systolic blood pressure below 130 mm Hg treated with 0–1 antihypertensive drugs (19.7%) ($p < 0.001$) [19]. Overtreatment of hypertension as well as inadequate control of hypertension may cause adverse clinical outcomes in frail elderly persons [18].

The ACC/AHA 2016 guidelines for the management of patients with hypertension will be strongly influenced by the results from the Systolic Blood Pressure Intervention Trial (SPRINT) [20]. SPRINT randomized 9,361 patients with a systolic blood pressure (SBP) of 130–180 mm Hg and an increased cardiovascular risk but without diabetes mellitus, history of stroke, symptomatic heart failure within the past 6 months, a left ventricular ejection fraction of less than 35%, and an estimated glomerular filtration rate less than 20 ml/min/1.73 m^2 to an systolic blood pressure (SBP) target of less than 120 mm Hg or to an SBP target of less than 140 mm Hg [20]. The patients were aged 50 years and older with a mean age of 67.9 years. Of the 9,361 patients, 2,636 (28.2%) were aged 75 years and older, 3,332 (35.6%) were women, 5,399 (57.7%) were non-Hispanic white, 2,947 (31.5%) were black, and 984 (10.6%) were Hispanic. Cardiovascular disease was present in 1,877 (20.1%) patients, and the Framingham 10-year cardiovascular disease risk score was ≥ 15% in 5,737 (61.3%) patients.

Blood pressure was measured by use of an automated measurement system (Model 907, Omron Healthcare). At 1 year, the mean SBP was 121.4 mm Hg in the intensive treatment group (mean number of antihypertensive drugs was 2.8) and 136.2 mm Hg in the standard treatment group (mean number of antihypertensive drugs was 1.8). The intervention was stopped early after a median follow-up of 3.26 years [20].

The primary composite outcome was myocardial infarction, other acute coronary syndrome, stroke, heart failure, or death from cardiovascular causes and was decreased 25% ($p < 0.001$) by intensive blood pressure treatment [20]. All-cause mortality was decreased 27% ($p = 0.003$) by intensive blood pressure treatment. Heart failure was decreased 38% ($p = 0.002$) by intensive blood pressure treatment. Death from cardiovascular causes was decreased 43% ($p = 0.005$) by intensive blood pressure treatment. The primary composite outcome or death was decreased 22% ($p < 0.001$) by intensive blood pressure treatment. Intensive blood pressure treatment insignificantly decreased myocardial infarction by 17%, caused the same incidence of other acute coronary syndromes, and insignificantly reduced stroke by 11%. The composite renal outcome in patients with chronic kidney disease (CKD) at baseline was insignificantly reduced 11% by intensive blood pressure treatment [20].

Intensive blood pressure treatment insignificantly decreased the primary outcome by 18% in patients with prior CKD and significantly decreased the primary outcome by 30% in patients without prior CKD [20]. Intensive blood pressure treatment significantly decreased the primary outcome by 33% in patients aged 75 years and older and significantly decreased the primary outcome by 20% in patients aged 50 to 74 years. Intensive blood pressure treatment insignificantly decreased the primary outcome by 16% in women and significantly decreased the primary outcome by 28% in men. Intensive blood pressure treatment insignificantly decreased the primary outcome by 23% in blacks and significantly decreased the primary outcome by 26% in nonblacks. Intensive blood pressure treatment insignificantly decreased the primary outcome by 17% in patients with prior cardiovascular disease and significantly decreased the primary outcome by 29% in patients without prior cardiovascular disease. Intensive blood pressure treatment insignificantly decreased the primary outcome by 17% in patients with an SBP ≥ 145 mm Hg, insignificantly decreased the primary outcome by 23% in patients with an SBP of 133 to 144 mm Hg, and significantly decreased the primary outcome by 30% in patients with an SBP of ≤ 132 mm Hg [20].

Serious adverse events were similar in both treatment groups [20]. However, intensive blood pressure treatment caused more hypotension (2.4% vs. 1.4%, p = 0.001), more syncope (2.3% vs. 1.7%, p = 0.05), more electrolyte abnormality (3.1% vs. 2.3%, p = 0.02), and more acute kidney injury or acute renal failure (4.1% vs. 2.5%, p < 0.001). The incidence of bradycardia, injurious falls, and orthostatic hypotension with dizziness was similar in both treatment groups [20].

The effects of intensive blood pressure treatment on renal function, dementia, and cognitive function cannot be interpreted until analysis of these end points have been completed. Data on the association between diastolic blood pressure achieved and clinical outcomes and serious adverse events also need to be reported. What are the data if the diastolic blood pressure is reduced below 70 mm Hg, below 65 mm Hg, and below 60 mm Hg? Since hypertension is a powerful risk factor for development of heart failure, especially heart failure with a preserved ejection fraction (HFpEF), what percentage of the patients who developed heart failure in SPRINT developed HFpEF? The data on optimal blood pressure for the frail elderly will also be reported.

The ACC/AHA 2016 guidelines will have to answer on the basis of expert medical opinion many questions not answered by SPRINT. What should the target blood pressure in diabetics be? In The ACTION to Control Cardiovascular Risk in Diabetes Blood Pressure (ACCORD BP) trial, reducing the SBP to less than 120 mm Hg in 4,733 patients insignificantly lowered the composite primary outcome of myocardial infarction, stroke, or cardiovascular death by 12% but significantly lowered the incidence of stroke (a prespecified secondary outcome) by 41% (p = 0.01) [21]. The sample size was much larger in SPRINT than in ACCORD BP, and there were methodological differences between the trials [22]. A post-hoc analysis of the results from ACCORD showed that the primary cardiovascular disease outcome was 26% lower in patients randomized to intensive blood pressure treatment and standard glycemia goals than in patients randomized to standard blood pressure treatment and standard glycemia goals [23].

What should the target blood pressure be in patients with prior stroke or transient ischemic attack, in patients younger than 50 years, in patients with heart failure and a reduced ejection fraction (HFrEF) and in patients with HFpEF? Although patients in SPRINT treated with intensive blood pressure control had a 38% significant decrease in development of heart failure, SPRINT excluded patients with recent heart failure and patients with a left ventricular ejection fraction less than 35%. In a propensity score analysis of 7,785 patients with mild to moderate HFrEF and HFpEF, at 5-year follow-up, a baseline SBP ≤ 120 mm Hg was associated with increased cardiovascular and heart failure mortality and all-cause, cardiovascular, and heart failure hospitalizations, independently of other baseline characteristics [24].

SPRINT did not enroll patients living in nursing homes or in assisted-living facilities. However, its data on the optimal blood pressure in the frail elderly will be the first randomized clinical trial data in this increasing group of patients.

How should SPRINT affect the recommendations regarding office versus out-of-office blood pressure measurements? Should SPRINT change the definitions of normal blood pressure, prehypertension, and hypertension? What should the threshold and goals be for untreated SBP between 120 and 140 mm Hg? Finally, because of a higher incidence of hypotension, syncope, electrolyte abnormalities, and acute kidney injury or failure in patients treated to an SBP less than 120 mm Hg, these patients will require more intensive monitoring for serious adverse events, with an increased cost of care.

Conflict of interest

The author declares no conflict of interest.

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