

# Targeting Multivariable Risks: An Opportunity for Population High Blood Pressure Control

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Elevated blood pressure has been recognized since the early 20th century as an indicator of adverse cardiovascular risk and mortality, with increased rates of disease with higher systolic and diastolic blood pressure levels.<sup>1</sup> Results from early hypertension treatment studies from the Veterans Administration Cooperative Study Group on Antihypertensive Agents determined that treating and lowering blood pressure levels among patients with high blood pressure was associated with reduced cardiovascular disease and stroke risks.<sup>2</sup> These successful blood pressure reductions and adverse risk outcomes were demonstrated in the population as a whole, leading to strategies for hypertension control.<sup>3</sup> These strategies for population and clinical programs focused on the diagnosis, treatment, and control of hypertension are associated with the consistent lowering of systolic blood pressure distributions from 1960 to 2010 in the United States.<sup>4</sup> Further, the shifting in blood pressure distributions to the left was associated with the significant reduction in stroke mortality and stroke risks in the population.<sup>4</sup> Hypertension treatment and control was attributed as the greatest factor for population risk reduction and most effective in accelerated blood pressure reduction.<sup>4</sup> While the lowering of blood pressure levels has been recognized as one of the major public health successes of the past 50 years, optimal treatment and control has yet to be obtained.<sup>4</sup> Lloyd-Jones and colleagues, in this issue of the *Journal of the American Heart Association*, provide a valuable assessment of cardiovascular events and the level of blood pressure with implications for improved hypertension control and risk

reduction.<sup>5</sup> Specifically, the investigator team has advocated for a multiple risk factor assessment and profile for the treatment of elevated blood pressure to maximize cardiovascular disease risks.

This report is timely and contributes to the evidence gap essential in the development of strategies, clinical guidelines, and interventions for elevated blood pressure. In particular, the consideration and assessment of multiple risk factors has become a valuable clinical component in the management of high blood pressure.<sup>4,6</sup> Specifically, the risk of cardiovascular disease increase with the number of risk factors and comorbid conditions.<sup>6,7</sup> Likewise, treatment effects of from antihypertensive agents vary by the levels of risks and comorbid conditions. These differences in risks and benefits are associated with therapy regimens that are specific to multiple factors and comorbid conditions.<sup>8</sup> Complicating the recommendations of high blood pressure treatment based on risks is the variation in level of risks by population demographics including race, sex, age, and geography.<sup>9,10</sup> The significant differences in risk profiles for blood pressure levels by race has implications for target blood pressure levels, blood pressure treatment initiation levels, types of therapy, and treatment intensity.<sup>8,11</sup>

The incorporation of risk assessment in the hypertension treatment and control efforts has implications for the clinical treatment guidelines of high blood pressure. The evolution and modifications of the guidelines and recommendations for prevention, detection, treatment, and control of high blood pressure over the past 5 decades have been associated with lower blood pressure distributions and reduced cardiovascular disease risks.<sup>4</sup> The updates and modifications of the clinical guidelines have been based on ongoing study results and findings providing evidence for inclusion in recommendations.<sup>12</sup> Current hypertension guidelines have incorporated systematic reviews to produce evidence-based guidelines.<sup>12</sup> The evidence-grading process has become the major component and activity for the development of clinical guidelines for the management of hypertension, as seen in the recent recommendations.<sup>13</sup> However, there are significant evidence gaps in the risks associated with blood pressure levels with different populations, multiple risk factors, and comorbid conditions.<sup>4,6,7,9,10</sup> Such variations have led to guidelines

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specific to the risk differential addressing specific characteristics, such as those associated with the treatment of hypertension in patients with ischemic heart disease.<sup>14</sup> Current guidelines propose different blood pressure target levels, blood pressure values for initiating therapy, and different therapy regimens for the clinical management of hypertension based on the risks and comorbid conditions. However, the lack of clinical study evidence for the multiple stratifications of risks and corresponding treatment strategies have led to differences in recommendations.<sup>15</sup> The lack of information leads to confusion and lack of consistency in the management of high blood pressure and subsequent risk benefit.

As high blood pressure prevention, management, and control continue to emerge and develop globally, the issues of hypertension risk management will be a major consideration for clinicians throughout the world.<sup>16</sup> The World Hypertension League has identified the future needs and essential study evidence for the development of high blood pressure control strategies for the diverse populations with various risk levels.<sup>17</sup> The current article contributes to the evidence gap in refining the risks for elevated blood pressure and proposing a mechanism to improve hypertension management by supplementing risk assessment with blood pressure measurements.<sup>5</sup> These results provide a guide for future studies to provide evidence for the diverse hypertensive populations of the world.

## Disclosures

None.

## References

1. *Build and Blood Pressure Study*. Vol 1. Chicago, IL: Society of Actuaries; 1959.
2. Freis ED. The Veterans Administration cooperative study on antihypertensive agents: implications for stroke prevention. *Stroke*. 1974;5:76–77.
3. Stamler J, Stamler R, Neaton JD. Blood pressure, systolic and diastolic, and cardiovascular risks: US population data. *Arch Intern Med*. 1993;153:598–615.
4. Lackland DT, Roccella EJ, Deutsch AF, Fornage M, George MG, Howard G, Kissela BM, Kittner SJ, Lichtman JH, Lisabeth LD, Schwamm LH, Smith EE, Towfighi A. Factors influencing the decline in stroke mortality. *Stroke*. 2014;45:315–353.
5. Lloyd-Jones D, Karmali K, Ning H, Goff DC. Identifying individuals at risk for cardiovascular events across the spectrum of blood pressure levels. *J Am Heart Assoc*. 2015;4:e002126 doi: 10.1161/JAHA.115.002126.
6. Goff DC, Lloyd-Jones DM, Bennett G, Coady S, D'Agostino RB, Gibbons R, Greenland P, Lackland DT, Levy D, O'Donnell CJ, Robinson J, Schwartz JS,

Shero ST, Smith SC, Sorlie P, Stone NJ, Wilson PWF. 2013 ACC/AHA guideline on the assessment of cardiovascular risk: a report of the American College of Cardiology/American Heart Association Task Force on Practice. *Circulation*. 2014;29:S49–S73.

7. Lackland DT, Elkind MS, D'Agostino R Sr, Dharmoon MS, Goff DC Jr, Higashida RT, McClure LA, Mitchell PH, Sacco RL, Sila CA, Smith SC Jr, Tanne D, Tirschwell DL, Touze E, Wechsler LR; American Heart Association Stroke Council, Council on Epidemiology and Prevention, Council on Cardiovascular Radiology and Intervention, Council on Cardiovascular Nursing, Council on Peripheral Vascular Disease, and Council on Quality of Care and Outcomes Research. Inclusion of stroke in cardiovascular risk prediction instruments: a statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2012;43:1998–2027.
8. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, Jones DW, Materson BJ, Oparil S, Wright JT Jr, Roccella EJ. The seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. *JAMA*. 2003;289:2560–2572.
9. Gazes PC, Lackland DT, Mountford WK, Gilbert GE, Harley RA. Comparison of cardiovascular risk factors for high brachial pulse pressure in blacks versus whites (Charleston Heart Study, Evans County Study, NHANES I and II Studies). *Am J Cardiol*. 2008;102:1514–1517.
10. Howard G, Lackland DT, Kleindorfer DO, Kissela BM, Moy CS, Judd SE, Safford MM, Cushman M, Glasser SP, Howard VJ. Racial differences in the impact of elevated systolic blood pressure on stroke risk. *Arch Intern Med*. 2013;173:46–51.
11. Lackland DT. Racial differences in hypertension: implications for high blood pressure management. *Am J Med Sci*. 2014;348:135–138.
12. IOM (Institute of Medicine). *Clinical Practice Guidelines We Can Trust*. Washington, DC: The National Academies Press; 2011. Published March 23, 2011. Available at: <http://www.iom.edu/Reports/2011/Clinical-Practice-Guidelines-We-Can-Trust.aspx>. Accessed August 11, 2015.
13. James PA, Oparil S, Carter BL, Cushman WC, Himmelfarb CD, Handler J, Lackland DT, LeFevre ML, MacKenzie TD, Ogedegbe O, Smith SC, Svetkey LP, Taler SJ, Townsend RR, Wright JT, Narva AS, Ortiz E. 2014 evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). *JAMA*. 2014;311:507–520.
14. Rosendorff C, Lackland DT, Allison M, Aronow WS, Black HR, Blumenthal RS, Cannon CP, de Lemos JA, Elliott WJ, Findeiss L, Gersh BJ, Gore JM, Levy D, Long JB, O'Connor CM, O'Gara PT, Ogedegbe O, Oparil S, White WB; on behalf of the American Heart Association Councils on Clinical Cardiology; High Blood Pressure Research; Cardiovascular and Stroke Nursing; Cardiovascular Radiology and Intervention; Epidemiology and Prevention; Nutrition, Physical Activity, and Metabolism; Peripheral Vascular Disease; and the Stroke Council. Treatment of hypertension in patients with coronary artery disease: a scientific statement from the American Heart Association, American College of Cardiology Foundation, and American Society of Hypertension. *J Am Coll Cardiol*. 2015;65:1998–2038.
15. Wright JT, Fine LJ, Lackland DT, Ogedegbe G, Dennison Himmelfarb CR. Evidence supporting a systolic blood pressure goal of < 150 mmHg in patients ≥ 60 years: the minority view. *Ann Intern Med*. 2014;160:499–503.
16. Campbell NRC, Lackland DT, Liu L, Niebylski ML, Nilsson PM, Zhang XH. Using the Global Burden of Disease study to assist development of nation-specific fact sheets to promote prevention and control of hypertension and reduction in dietary salt: a resource from the World Hypertension League. *J Clin Hypertens*. 2015;17:165–167.
17. Campbell NRC, Lackland DT, Lisheng L, Zhang XH, Nilsson PM, Redburn KA, Niebylski ML. The World Hypertension League challenges hypertension and cardiovascular organizations to develop strategic plans for the prevention and control of hypertension. *J Clin Hypertens*. 2015;17:325–327.

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