

# Blood pressure variability: Prognostic implications in low-risk subjects

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Recently, increased blood pressure variability (BPV) has emerged as a strong risk factor for cardiovascular morbidity and mortality.<sup>1,2</sup> Importantly, this association is independent of isolated blood pressure measurements.<sup>1,2</sup> However, there are fewer data regarding the relationship between BPV and earlier stages of the development of cardiovascular disease (CVD), including subclinical atherosclerosis and target organ damage.<sup>3,4</sup> Moreover, most of the existing data regarding the predictive value of BPV are derived from patients with established CVD or with cardiovascular risk factors, particularly hypertension.<sup>1-4</sup> Fewer data are available regarding the prognostic significance of BPV in low-risk subjects or in the general population.<sup>5,6</sup>

In this context, the study by Zhang et al published in the current issue of the *Journal of Clinical Hypertension* adds valuable insights in the value of BPV measurement in a community setting.<sup>7</sup> Zhang et al prospectively studied 1,407 residents of a suburban community who were >40 years old and did not have a history of myocardial infarction or stroke.<sup>7</sup> Blood pressure was measured during three visits performed in 2008, 2009, and 2013, and arterial stiffness was assessed by measuring brachial-ankle pulse wave velocity (PWV) during the last two visits.<sup>7</sup> It was observed that the variability of both systolic blood pressure and pulse pressure across the three visits was associated with a deterioration of arterial elasticity and with incident arterial stiffness.<sup>7</sup> Notably, low-risk individuals, including females and normotensive and non-diabetic subjects, showed a stronger association between BPV and arterial stiffness than higher risk subjects (ie, males, hypertensive patients, and patients with diabetes mellitus).<sup>7</sup> These associations were independent of isolated blood pressure measurements.<sup>7</sup>

The findings of this elegant study by Zhang et al have several implications for cardiovascular risk stratification. First, they suggest that BPV is a useful tool for the early identification of arterial

stiffness, which in turn is a strong independent risk factor for cardiovascular morbidity in the general population.<sup>8,9</sup> In addition, BPV is easily measured, widely available and non-expensive in contrast with the evaluation of target organ damage, including arterial stiffness, endothelial dysfunction, or left ventricular hypertrophy, which is more costly, time-consuming and requires specialized equipment that is not universally available. Second, the study by Zhang et al supports the notion that measurement of BPV might be more useful in low-risk subjects, that is, without cardiovascular risk factors and without established CVD, than in higher risk patients. This finding is of major importance since it allows for earlier intervention and therefore more effective prevention of cardiovascular events. Notably, BPV also appears to be more strongly related to arterial stiffness in normotensive subjects than in patients with hypertension and should therefore be evaluated in all subjects and not only in the latter.

Despite its merits, the study of Zhang et al have some limitations. It was conducted in a Chinese population and its findings require validation in other ethnicities. Another potential source of bias is that Zhang et al evaluated arterial stiffness by measuring brachial-ankle PWV instead of carotid-femoral PWV, which represents the gold standard. However, some studies reported an acceptable correlation between these 2 indices of arterial stiffness.<sup>10,11</sup> In addition, measurement of brachial-ankle PWV might be more convenient than carotid-femoral PWV in primary care because it does not require the exposure of the femoral site.

In conclusion, the findings of the study of Zhang et al suggest that measurement of BPV might represent a useful tool for cardiovascular risk stratification in the general population, including subjects without cardiovascular risk factors. Given that this measurement is inexpensive and easy, it should be considered in everyday clinical practice.

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## REFERENCES

1. Stevens SL, Wood S, Koshiaris C, et al. Blood pressure variability and cardiovascular disease: systematic review and meta-analysis. *BMJ*. 2016;354:i4098.
2. Mehlum MH, Liestøl K, Kjeldsen SE, et al. Blood pressure variability and risk of cardiovascular events and death in patients with hypertension and different baseline risks. *Eur Heart J*. 2018;39:2243-2251.
3. DeBarmore B, Lin FC, Tuttle LA, et al. Association of ambulatory blood pressure variability with coronary artery calcium. *J Clin Hypertens (Greenwich)*. 2018;20:289-296.
4. Pucci G, Battista F, Anastasio F, Schillaci G. Morning pressor surge, blood pressure variability, and arterial stiffness in essential hypertension. *J Hypertens*. 2017;35:272-278.
5. Dai L, Song L, Li X, et al. Association of visit-to-visit blood pressure variability with the risk of all-cause mortality and cardiovascular events in general population. *J Clin Hypertens (Greenwich)*. 2018;20:280-288.
6. Basson MD, Klug MG, Hostetter JE, Wynne J. Visit-to-visit variability of blood pressure is associated with hospitalization and mortality in an unselected adult population. *Am J Hypertens*. 2018;31:1113-1119.
7. Zhang Y, Bie L, Li M, et al. Visit-to-visit blood pressure variability is associated with arterial stiffness in Chinese adults: a prospective analysis. *J Clin Hypertens*. 2020.
8. Willum-Hansen T, Staessen JA, Torp-Pedersen C, et al. Prognostic value of aortic pulse wave velocity as index of arterial stiffness in the general population. *Circulation*. 2006;113:664-670.
9. Sutton-Tyrrell K, Najjar SS, Boudreau RM, et al. Health ABC Study. Elevated aortic pulse wave velocity, a marker of arterial stiffness, predicts cardiovascular events in well-functioning older adults. *Circulation*. 2005;111:3384-3390.
10. Tanaka H, Munakata M, Kawano Y, et al. Comparison between carotid-femoral and brachial-ankle pulse wave velocity as measures of arterial stiffness. *J Hypertens*. 2009;27:2022-2027.
11. Cheng YB, Li Y, Sheng CS, et al. Quantification of the interrelationship between brachial-ankle and carotid-femoral pulse wave velocity in a workplace population. *Pulse (Basel)*. 2016;3:253-262.

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