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**EDITORIAL**

# Masked hypertension—what lies ahead?

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Clinic blood pressure (BP) may differ substantially from BP measured outside of the clinic using ambulatory BP monitoring (ABPM) or home BP monitoring (HBPM).[1,2] White coat hypertension is a well-recognised phenomenon, describing individuals with elevated clinic BP but non-elevated out-of-clinic BP.[3] What Pickering *et al.* coined in 2002 as masked hypertension is the opposite phenomenon, non-elevated clinic BP but elevated out-of-clinic BP.[1] As compared to white coat hypertension, masked hypertension remains a generally unrecognised and under-diagnosed clinical problem. This is true despite the consistent evidence that there is an increased risk of cardiovascular disease (CVD) and target organ damage associated with masked hypertension.[1,3–6] To better understand and affect the clinical impact of masked hypertension, we must overcome many of the knowledge gaps regarding its diagnosis and management.

Pickering first defined masked hypertension as having non-elevated clinic BP and elevated daytime BP on ABPM.[1,3] Over the subsequent decade, the definition of masked hypertension has expanded. In addition to elevated daytime BP, the 2013 European Society of Hypertension position paper also includes the use of elevated 24-h BP or elevated nighttime BP which may each be used to diagnose masked hypertension.[3] However, the presence of multiple approaches to diagnose masked hypertension poses new challenges. It is unclear what is the true prevalence of masked hypertension in the population. The prevalence of masked hypertension among adults with non-elevated clinic BP has been reported to be 10–17% using daytime measurements.[6] However, the estimate of masked hypertension prevalence reaches as high as 52% when using daytime, 24-h and nighttime BP measurements.[7] It is also unknown which measurements should be used to define masked hypertension in clinical practice. When interpreting ABPM for diagnosing masked hypertension, should clinicians concern themselves about a specific definition of masked hypertension? Do particular measurements (that is, daytime, 24-h, or nighttime) best correlate with outcomes among those with non-elevated clinic BP?

How to best measure out-of-clinic BP to diagnose masked hypertension is also unclear. There are currently two well-accepted approaches for obtaining out-of-clinic BP measurements: ABPM and HBPM. However, it has yet to be determined which, if either, may be the better tool to diagnose masked hypertension. As compared to HBPM, ABPM has the advantage of measuring nighttime BP measurements and assessing diurnal patterns. On the other hand, HBPM may be more practical as it is less cumbersome for the patient and more widely available.[2,8,9] Although guidelines, scientific statements and position papers commonly recommend ABPM over HBPM for assessing out-of-clinic BP, the data supporting one modality over the other for predicting CVD events is inconclusive. A recent systematic review examined studies using both ABPM and HBPM to determine whether either method was more strongly associated with CVD events and mortality.[9] While ABPM and HBPM were each associated with outcomes, the authors concluded that there was insufficient evidence to consider either modality to be superior. Further, a study by Stergiou *et al.*[10] found substantial disagreement between ABPM and HBPM when used to identify masked hypertension. Only 44% of participants had masked hypertension on both modalities. It is unclear whether individuals with masked hypertension on ABPM but not HBPM have a higher risk of CVD events than individuals with masked hypertension on HBPM but not ABPM. Clarifying the optimal strategy to measure out-of-clinic BP for identifying masked hypertension is crucial if we hope to translate masked hypertension to clinical practice.

Further, who should be screened for masked hypertension is unknown and major society guidelines and position papers have not offered specific direction.[6,11] Screening all individuals with non-elevated clinic BP is impractical. Booth *et al.*[12] demonstrated that such an approach would require 118.6 million adults in the US to undergo out-of-clinic BP measurement. A more practical strategy may be the use of targeted screening, specifically restricting ABPM or HBPM use to those individuals with one or more risk factors for masked hypertension. Several studies have shown that prehypertension (clinic BP 120–139/80–89 mm Hg) is associated with a higher prevalence of masked hypertension.[13] Booth *et al.*[12] found that limiting screening to only those individuals in the pre-hypertensive range would still require 59.3 million US adults to undergo ABPM. An alternative approach could be to screen a smaller number of individuals who have multiple risk factors for masked hypertension such as elevated clinic BP, older age, male sex, smoking and diabetes.[2] Without empiric evidence regarding best screening practices for masked hypertension, it is unlikely that ABPM or HBPM will be routinely incorporated into decisions regarding the diagnosis and management of masked hypertension.

The final and possibly most important hurdle is to determine the role for treatment of masked hypertension. Prior randomised controlled trials examining the effect of antihypertensive medication on CVD outcomes rely on clinic BP measurements to make decisions about study eligibility and to determine whether BP goals are being met.[6,14] The 2013 European Society of Hypertension/European Society of Cardiology guidelines gave IIa recommendation that lifestyle and antihypertensive medication therapy should be considered for individuals with masked hypertension,[6] suggesting that clinicians should also focus on out-of-clinic BP for treating hypertension. These recommendations were supported by level C evidence—based primarily on consensus opinion, small registries and cohort studies. To date there have been no randomised trials examining the effects of treating masked hypertension either by lifestyle modification or antihypertension medication on CVD events. Such trials must get underway if we are to determine the clinical impact of treating masked hypertension.

White coat hypertension has been recognised in current clinical guidelines. Recently, the US Preventive Services Task Force guidelines recommended that out-of-clinic BP measurement be undertaken to confirm the diagnosis of hypertension and exclude white coat hypertension.[15] Currently, masked hypertension, which has important predictive value for CVD events, has been less integrated in hypertension guidelines and clinical practice compared with white coat hypertension. To further develop our understanding of masked hypertension, the next steps are clear. Addressing knowledge gaps are achievable goals and, given the high prevalence and associated risks of masked hypertension, it is imperative that we start to pursue them.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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