Editorial Commentary

Interpretation of Ambulatory Blood Pressure Profile for Risk Stratification

Keep It Simple

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See related article, pp 925–933

A solid body of evidence supports the contention that cardiovascular morbidity and mortality are better predicted by ambulatory blood pressure (BP) than by BP measured in the physician’s office.1 Compared with office BP, the main advantage of ambulatory BP monitoring (ABPM) is the number of readings obtained throughout a 24-hour period. Frequent readings during wakefulness and sleep enable clinicians to obtain a more precise estimation of a patient’s BP, to assess BP levels in the outpatient setting, and to study BP variability and circadian profile.

However, the clinical use of ABPM to refine cardiovascular risk stratification seems not so simple and immediate. Many numeric techniques exist for describing the features of ambulatory readings, and several ABPM-derived measures have been assessed as potential prognostic factors.1 These include average 24-hour, daytime (awake) and night-time (asleep) BP, dipping pattern, morning surge, pulse pressure, ambulatory arterial stiffness index, BP variability, and BP load.1

Despite the large number of studies addressing the prognostic value of these measures, some conclusions are based on samples with short follow-up duration, narrow age range, and insufficient power. Thus, controversy exists as to which components do have independent prognostic significance.1

In such a context, the new analysis of the International Database on Ambulatory BP in relation to Cardiovascular Outcomes (IDACO) study published in the current issue of Hypertension2 critically evaluated the role of BP load. The primary aim of this analysis was to explore whether BP load was associated with a worse prognosis and whether such association had incremental predictive value after accounting for average ambulatory BP levels.

Overall, a large sample of 8711 subjects recruited from 10 populations of Europe, Asia, and South America was included. The prevalence of hypertension was 44.1% on conventional BP measurement and 44.6% on 24-hour ABPM. During a median follow-up of 10.7 years, 1284 participants died and 1109 experienced a fatal or nonfatal cardiovascular event.2 BP load was defined as percentage of systolic/diastolic readings ≥135/85 and ≥120/70 mm Hg during day and night, respectively, or as the area under the BP curve (mm Hg×hour) using the same ceiling values.

In multivariable-adjusted models, the risk of cardiovascular complications gradually increased across deciles of BP load, but this index (either expressed as percentage or as area under the curve) did not substantially refine risk prediction based on 24-hour systolic or diastolic BP level in the whole study population and in the subgroup of untreated participants with 24-hour ambulatory normotension.2

BP load was first introduced by Zachariah et al in 1988 and White et al in 1989. Generally, BP load is a concept developed to evaluate how often a patient’s BP remains above a particular threshold, and it has been suggested as a clinically useful parameter complementing the quantification of corresponding average ambulatory BP levels. In the last years, several articles have discussed the clinical relevance of BP load. Nevertheless, some studies have reported significant associations between BP load, end-organ damage, and cardiovascular events, whereas others failed to demonstrate the ability of BP load to refine the risk of developing target organ damage and cardiovascular disease. In patients with sustained BP elevation for 24 hours, the calculation of BP load was shown to be of limited relevance (being by definition close to 100%), whereas its assessment in patients with normal or high-normal BP levels seemed to be of much greater interest. In this context, the new analysis of the IDACO study has the merit to demonstrate that BP load is not associated with an additional predictive value in patients with a wide spectrum of BP levels (ie, normal, high-normal, and elevated BP values) and in both treated or untreated subjects.

The evidence that BP load does not substantially refine risk profiling over and beyond the BP level emphasizes the notion that average ambulatory BPs are the predominant risk factors modifiable by lifestyle measures and antihypertensive drug treatment. Historically, mean 24-hour, daytime, and nighttime BP levels have been the fundamental components of the ambulatory BP profile to be investigated as prognostic determinants. One of the first studies that addressed the prognostic value of ambulatory BP as a continuous variable was a report from the Ohasama study. In this general population study conducted in a Japanese rural area, after adjustment for several confounders, the mortality risk during a follow-up period of 5 years was increased in the highest quintile of the distribution of average 24-hour systolic BP, whereas no independent

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association was detected between office BP and mortality rates. Ten years after this landmark study, a meta-analysis of 7030 subjects confirmed that average daytime ambulatory rates. Ten years after this landmark study, a meta-analysis of association was detected between office BP and mortality risk. PP indicates pulse pressure.

Antihypertensive drug treatment for increased cardiovascular (CV) monitoring that identify candidates for commencing Components of ambulatory blood pressure (BP) monitoring that identify candidates for commencing antihypertensive drug treatment for increased cardiovascular (CV) risk. PP indicates pulse pressure.

In conclusion, ABPM offers information not only on average BP levels, but also on fluctuations during the recording period. Numerous investigators studied the prognostic value of other components of ABPM over and beyond level of average ambulatory BP. However, current evidence supports the notion that only a blunted nocturnal fall in BP, ambulatory pulse pressure, and night-time BP variability are independent markers of added cardiovascular risk (Figure). The computation of other ambulatory indices (including BP load) does not seem to substantially refine risk profiling over and beyond the BP level and other established risk factors. Although no consensus exists on the summary measures of ABPM to be reported for clinical decision making, we share the opinion by Li et al that clinicians should concentrate on the components of ABPM that demonstrated additive prognostic value in multiple independent studies. From an operational standpoint (Figure), mean ambulatory BP should remain the first-line procedure to identify subjects needing antihypertensive drug treatment. In addition, a nondipping pattern, an elevated 24-hour pulse pressure, as well as an increased night-time systolic BP variability are independent markers of added cardiovascular risk.

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**References**

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