



## EDITORIAL COMMENT

# Circadian patterns on ambulatory blood pressure monitoring: Do they really matter in daily clinical practice?☆



## O perfil circadiário de descida noturna da pressão arterial na MAPA é realmente importante na prática clínica diária?

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Cardiovascular disease is the leading cause of morbidity and mortality worldwide and hypertension is one of its main risk factors.<sup>1,2</sup> Measurement of blood pressure (BP) is central to the diagnosis, treatment and follow-up of hypertension, and so a reliable and accurate method of measuring BP is vital.<sup>3</sup>

The development of the first sphygmomanometers by Riva-Rocci and the standardization of Korotkoff's auscultatory method in the early 20th century formed the basis of the techniques of office BP measurement, the importance of which in the Framingham studies contributed greatly to the widespread use of this valuable parameter in daily clinical practice. This technique, now over a hundred years old, is by far the most common both in clinical practice and in research, particularly epidemiological studies.<sup>4,5</sup>

The realization that BP is a hemodynamic variable influenced by multiple factors, including exertion, emotional state, food intake, smoking and weather conditions, confirmed by invasive intra-arterial BP measurements, led to a search for ways to monitor this variable non-invasively.

The first non-invasive ambulatory blood pressure monitoring (ABPM) devices appeared in the 1960s, initially for experimental use only,<sup>4,5</sup> and the first paper on the technique, by Kain et al.,<sup>6</sup> was published in the journal *Circulation* in 1964.

The progressive miniaturization of components, complete automation of the equipment, the increasing reliability of measurements and the ability to combine assessment of other clinical parameters such as heart rate, together with lower costs, led to ABPM becoming increasingly widespread in the 1990s and 2000s. It is now considered an essential part of standard clinical practice, both for diagnosis and for assessing response to therapy,<sup>7</sup> and its use in clinical practice is expected to expand.<sup>8</sup>

Various studies have shown the advantages of ABPM over office BP measurement, especially the fact that it provides a large number of readings taken in the patient's daily environment (including during sleep), and can help to identify white coat and masked hypertension, two clinical entities that are now recognized to have prognostic significance and clear implications for decision-making. It is also used for assessing response to therapy (pharmacological and non-pharmacological) and 24-h BP variability, as well as for other purposes.<sup>9–12</sup>

In addition, mean BP on ABPM has been amply demonstrated to have superior prognostic value to office BP for subclinical target organ damage and cardiovascular

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morbidity and mortality in both the general population and in subgroups including men, women, the elderly, the young, and treated and untreated patients.<sup>13-17</sup>

As well as mean 24-h BP, several components of the ABPM recording have been studied, including BP variability, morning BP surge, BP load, and various indices derived from these. The most extensively assessed and commonly used are mean systolic and/or diastolic daytime (waking) and nighttime (sleeping) BP and the ratio between them, the circadian BP pattern. As different definitions and terms have been used for the concepts involved, the European Hypertension Society Working Group on Blood Pressure Monitoring recently proposed standard definitions for the different circadian BP patterns on ABPM, classifying the major patterns as nondipping and rising (night/day BP ratio  $\geq 1$ ), reduced dipping (ratio  $<1$  and  $>0.9$ ), dipping (ratio  $<0.9$  and  $>0.8$ ), and extreme dipping (ratio  $<0.8$ ).<sup>8</sup>

In view of the variation in definitions, it is not surprising that the literature contains conflicting data on the prognostic value of different circadian patterns on ABPM. Moreover, daytime and nighttime periods are not consistently defined, with the patient's diary being used in some cases and predefined times being used in others. All of the above limitations reduce the value that some authors place on different circadian patterns on ABPM as an aid to therapeutic decision-making, particularly when prescribing specific drugs and/or the times when they should be taken.<sup>18-20</sup>

With the elegance and methodological rigor that we have come to expect from this group, the article by Monte et al. in this issue of the *Journal*,<sup>21</sup> in a large sample of Portuguese subjects at low to moderate cardiovascular risk, confirms the high reproducibility of mean 24-h BP by ABPM in the context of daily clinical practice. This is in agreement with most similar studies and underscores the value of this exam. It also demonstrates that the reproducibility of circadian patterns is low and that they should therefore not be given undue weight in clinical decisions in these patients.

Besides the limitations mentioned by the authors, it should also be borne in mind that the individuals in the study population were not hypertensive, as can be seen by their mean office BP and ABPM levels, and were at low or moderate cardiovascular risk. Hence, although it may be that the study's findings also apply to hypertensives, this remains to be proven. Another important limitation, and incidentally an indication of the large size of the group's patient database, is that the study population would appear not to be representative of patients that we see in daily clinical practice; it is not usual for patients with these office BP levels, even with low to moderate cardiovascular risk, to undergo two ABPM recordings in less than a year. Another minor point is that the definitions of circadian BP patterns used by the authors, while familiar to us all and therefore easy to understand, do not match those proposed in the European Hypertension Society's position paper cited above.<sup>8</sup>

In conclusion, the study confirms the importance of ABPM as an essential tool in daily clinical practice in a wide variety of patients,<sup>13</sup> providing reliable data that are extremely useful for therapeutic decision-making. It also emphasizes that these data need to be used with caution, and in particular that the importance of circadian patterns identified by ABPM should not be overestimated.

## Conflicts of interest

The author has no conflicts of interest to declare.

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