Clinical Utility of Ambulatory Blood Pressure Monitoring to Define Phenotypes of Hypertension

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**Abstract**

Blood pressure (BP) is one of the vital markers of health and high BP (hypertension) continues to be a major health burden, with high systolic BP the leading preventable risk factor for cardiovascular disease. Early detection and management require accurate measurement of BP, with clinical practice guidelines now universally recommending out-of-clinic ambulatory or home BP monitoring to confirm the diagnosis of hypertension. Ambulatory BP monitoring (ABPM) provides detailed information of the pattern and fluctuations of BP throughout a 24 h period. This brief review provides a summary of several of these different patterns which indicate specific BP phenotypes and how these may guide better prognosis of cardiovascular risk as well as efficacy of treatment of hypertension. Although patient awareness and acceptance are important for reliable AMBP measurements, there are limited reports and the results of a pilot survey assessing patient satisfaction are presented.

**Key words:** Ambulatory blood pressure, hypertension management, hypertension phenotypes

**Introduction**

Clinic blood pressure (BP) remains the measurement for initial screening and management of hypertension, although there are recognized limiting factors, including accuracy of the measurement and the “white coat effect.” Introduction of automated office BP overcomes these factors,\(^1\) although the importance of out-of-clinic measurement with either home or ambulatory BP monitoring (ABPM) for confirming diagnosis of hypertension is recommended by clinical practice guidelines for Australia,\(^2\) Europe,\(^3\) the America,\(^4\) and Canada.\(^5\) The advantage of ABPM is that it allows multiple measurements of BP over 24 h period without patient intervention, ambulant, and during sleep and reveals variations in circadian BP profile which would have been missed with clinic alone. This brief review provides a summary of several of these different patterns which indicate specific BP phenotypes of hypertension, such as nocturnal hypertension and masked hypertension. Although there is specific guidance for physicians/health professionals for the measurement of ABPM,\(^6,7\) patient satisfaction in wearing the equipment also needs to be considered\(^8\) for reliability of the measures but also for engagement in their health and adherence to treatment. While ABPM is increasing in use in Australia, there are no reports on patient satisfaction and the results of a pilot survey are presented.

**Nocturnal BP**

Ambulatory BP is a stronger predictor of cardiovascular risk than clinic BP,\(^12,13\) as well as provides the pattern/profile of BP changes throughout the 24 h period to assess variability, especially during sleep (nocturnal) and early morning. Lack of a decrease in BP of at least 10% during sleep is often referred to as non-dipping\(^14\) and when it rises compared to daytime, it is reverse dipping pattern, which has been shown to be a marker of cardiovascular dysautonomia in Parkinson disease.\(^15\) Adjusting for this dipping and daytime BP, Yang et al. (2019)\(^16\) found that higher 24 h and nocturnal BP were associated with greater risk of

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cardiovascular outcomes. Interestingly, variability in nocturnal BP is also an independent predictor of all-cause mortality and cardiovascular events.\(^{[17]}\)

**Masked Hypertension**

The clinical utility of ABPM for diagnosis of hypertension and treatment is particularly evident with identifying masked hypertension which is normal clinic BP with elevated ambulatory or home BP. When there is treatment initiated and BP is elevated away from the clinic but is assumed to be controlled during the clinic visit, it is labeled “masked uncontrolled hypertension (MUCH). Both masked hypertension and MUCH are associated with increased cardiovascular risk almost equivalent to sustained hypertension.\(^{[18]}\) A recent meta-analysis\(^{[19]}\) found that while the prevalence of masked hypertension was comparable when determined by ABPM (11%) compared to home BP monitoring (13%); ABPM had greater sensitivity to identify patients with masked hypertension/MUCH when both methods were compared in the same patients.

**Patient Satisfaction with AMBP**

While ABPM is recommended for out-of-clinic BP measurement by clinical practice guidelines, the patient perspective needs to be considered since it is not often assessed but may influence treatment adherence and engagement in their health. Consecutive patients who had ABPM were asked their satisfaction in wearing the monitoring equipment once the 24 h monitoring was completed. The question was “how did they feel about wearing the monitoring equipment” and there were three options to select: 1 – “didn’t mind,” 2 was “uncomfortable but necessary,” and 3 was “disliked and not for repeat.” Of the 59 patients asked for this pilot survey, 32/59 (54%) did not mind having the 24 h monitoring, while 26/59 (44%) found it uncomfortable but necessary and only 2/59 (0.11%) could not tolerate. The higher acceptance by patients may have resulted from the communication of the need testing by AMBP and also how BP is measured during monitoring. This pilot study is supported with similar findings by Ernst and Bergus (2014)\(^{[20]}\) who found that ABPM was well accepted by patients even though they reported to have disturbed sleep and discomfort.

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