# Should Clinic or 24hr Ambulatory BP Monitoring Guide Physicians?

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## Summary

There is increasing evidence that average ambulatory blood pressure levels improve on prognostication of morbidity and mortality over clinic measures. Ambulatory blood pressure monitoring (ABPM) provides a more valid and reliable measure of arterial pressure throughout the day and night-time hours. Hence it is not surprising that ABPM has been approved for reimbursement and that it is being used increasingly in clinical practice. Both the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High BP in the United States[1] and the European Society of Hypertension[2] have recently included in their guidelines recommendations concerning the use and interpretation of ABPM in clinical practice. So with apparent world-wide acceptance of the technique, it is timely to review these recommendations, and to reappraise the reasons why ABPM has at last become an indispensable technique for the management of hypertension.

## What Is the Evidence that ABPM Has Advantages Over CBPM in the Diagnosis of Hypertension and in the Evaluation of Cardiovascular Risk?

There is no doubt that higher conventional blood pressure measurements (CBPM), predict future morbidity and mortality from coronary heart disease, stroke, heart failure, and renal disease.[3] This positive continuous relationship between blood pressure and cardiovascular events has been identified in both men and women, in younger and older adults, in different racial and ethnic groups, and in those with and without coronary heart disease.[4] However there is now increasing evi-

dence that ABPM may provide even better prediction of outcome than CBPM.

As far back as 1983 Perloff and colleagues provided data that suggested that daytime ABPM predicted excess cardiovascular morbidity and mortality independently of CBP.[5] Many cross-sectional studies have shown superior associations between average ABPM pressures and hypertensive target organ damage, such as left ventricular hypertrophy, microalbuminuria, silent cerebral infarction and common carotid artery wall thickness, than between clinic blood pressure (CBP) and such organ damage.[6] However it is only relatively recently that several large prospective studies have confirmed Perloff's original findings – that baseline untreated ambulatory measurements of BP predict cardiovascular events even after adjustment for CBPM in a wide range of patient groups, in young and old patients, in isolated systolic hypertension as well as combined systolic and diastolic hypertension, and in treated and untreated patients.[7-10]

## Why Does ABPM Provide Improved Predictive Value?

With ambulatory monitoring, BP is measured throughout the day and night rather than merely providing a snapshot of BP behaviour in a clinic room.[11] ABPM provides a profile of blood pressure away from the medical environment, thereby allowing identification of individuals with a white coat response – individuals who appear hypertensive when BP is measured in the clinic, but when ABPM is used, pressures are entirely normal.[12] White coat hypertension is common and such individuals appear to be at only slighter greater cardiovascular risk than those with normal clinic and ambulatory pressures.[13]

In those on antihypertensive treatment, ABPM can demonstrate the efficacy of antihypertensive medication over a 24-hour period – treatment decisions can then be based on a comprehensive profile rather than on a few CBPMs confined to a short period of the diurnal cycle.[14] ABPM is little affected by placebo.[14] Through use of ABPM a significant number of individuals with apparently resistant hypertension can be shown to suffer from a white coat effect. Periods of hypotension secondary to excessive therapy can be demonstrated.

The technique can also demonstrate a number of patterns of blood pressure behaviour which may be associated with excess cardiovascular risk—non-dipping,[15] extreme dipping,[16] nocturnal hypertension,[17] and masked hypertension.[18]

Because ambulatory measures of BP are the average of a number of repeated readings, they are more reproducible and reliable than CBPM.[19] In clinical trials this enhanced reproducibility provides increased power to detect BP lowering effects of therapy with the same or smaller sample size. From the practising clinician's viewpoint, the increased precision of assessment certainly contributes to the improved prediction of

ABPM of heart attacks and strokes.

## Normal ABPM Values

More than 30 years ago, Jeffrey Rose offered this definition of hypertension; "that blood pressure level above which investigation and treatment do more good than harm".[20] As some high risk patients may gain from BP lowering even when the baseline pressure is not very elevated, the threshold for the diagnosis of hypertension and for the initiation of treatment varies with an individual's total cardiovascular risk. However, for the purposes of simplicity and practicality, as for conventional BP measurement, it is useful to have some numerical definitions. Currently, an average daytime ABPM of less than 135 mm Hg systolic and 85 mm Hg diastolic is generally considered normal, but lower levels (130/80 mm Hg) are being advocated in high risk groups, such as diabetic patients.[21,22]

## Clinical Indications for ABPM

Both the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High BP in the United States[1] and the European Society of Hypertension[2] are in agreement that the strongest indication for ABPM is where whitecoat hypertension is suspected. Certainly ABPM should be performed where high office blood pressures are measured in a subject who is otherwise at low global cardiovascular risk, i.e. young patients with no target organ damage and no other risk factors. However it is difficult to outrule white coat hypertension in any patient with elevated clinic readings without performing ABPM. Other patients who warrant ABPM include patients with apparent drug resistance, hypotensive symptoms with antihypertensive treatment, episodic hypertension, and autonomic dysfunction.

The role of ABPM in guiding drug treatment has not yet been fully established. In a well controlled study by Staessen and colleagues, adjustment of antihypertensive treatment based on either ABPM or CBPM resulted in less intensive drug treatment in the ABPM group despite comparable blood pressure control in both groups; importantly, patients in the ABPM group, who received less drug treatment, were not disadvantaged as judged by left ventricular mass on echocardiography.[23] However there is a clear need for further studies, with morbidity and mortality, as end-points to determine whether ABPM should be added to the standard care of patients with treated hypertension.

## Financial Considerations

ABPM is more expensive than CBPM but the benefits to patients may justify that additional expense. Subjects with white coat hyperten-

sion, which is present in about a quarter of people, may be spared years of unnecessary and expensive drug treatment. Likewise, ABPM may spare patients with white coat hypertension being penalised for insurance or employment by having the diagnosis of "hypertension" misapplied.

It has been shown that when ABPM is used as the basis for prescribing rather than clinic blood pressure, significantly less antihypertensive medication is prescribed.[23] The financial saving from less drug prescribing has been analysed in a cost–benefit comparison of ABPM with CBPM in Switzerland; over a 10 year period 2 million Swiss francs could be saved if therapeutic decisions were based on ABPM rather than CBPM.[24]

## Which ABPM Devices and What Software Should Be Used?

The most important consideration in choosing which device to use is

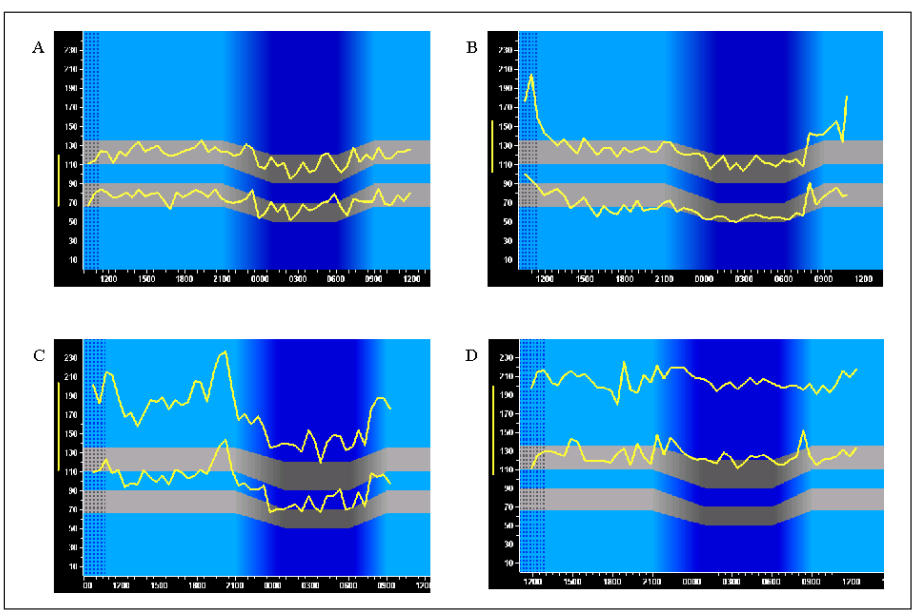


*Figure 1: (A) Normal ABPM pattern. The ABPM suggests normal 24 hour systolic and diastolic BP (128/78 mm Hg daytime, 110/62 mm Hg night time). (B) White coat hypertension. The ABPM suggests white coat hypertension (175/95 mm Hg) with otherwise normal 24 hour systolic and diastolic blood pressure (133/71 mm Hg daytime, 119/59 mm Hg night time). (C) Severe systo-diastolic hypertension. The ABPM suggests severe daytime systolic and diastolic hypertension (184/112 mm Hg), and moderate night time systolic and diastolic hypertension (147/90 mm Hg), (D) Hypertensive non-dipper. The ABPM suggests severe 24-hour systolic and diastolic hypertension (210/134 mm Hg daytime, 205/130 mm Hg night time).*

to ensure the device selected is accurate - independent validation with the results published in peer reviewed journals is mandatary.[25, 26]

The use of ABPM in clinical practice could be greatly facilitated by two developments. Firstly, if the graphic presentation of ABPM data was standardised, the presentation of data would be independent of the type of ABPM monitor used and the user would not have to become familiar with a variety of programs. Secondly, if ABPM software programs could provide a printed report of the ABPM data, doctors and nurses unfamiliar with the technique would be assisted in learning the variety of patterns generated by ABPM. The dabl® ABPM Program (ECF Medical Ltd, Blackrock, Co Dublin, Ireland, www.ecfmedical.com) has been designed to provide such a standardised graphic display and automated reporting (Figure 1).

## Conclusion

After a long gestational period in research ABPM has now become an indispensable technique in the management of hypertension. This being so, there is a need to encourage the use of ABPM in general practice rather than restricting its availability to specialist hospital centres as has tended to be the case so far. Standardisation of data handling and presentation, and computer generated reports are steps that should make the technique easier to use and interpret so that its manifest advantages can be utilised to improve the management of hypertension, which remains so abysmally poor.

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