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Ambulatory blood pressure monitoring enables hypertension to be diagnosed more accurately and rapidly

How should hypertension be diagnosed?

THE DIAGNOSIS OF HYPERTENSION HAS TRADITIONALLY BEEN BASED ON CLINIC BLOOD pressure (BP) but home and ambulatory measurements are better correlated with cardiovascular outcomes.[1]

A recent systematic review and cost-effectiveness study found that ambulatory blood pressure monitoring (ABPM) is more accurate than both clinic and home monitoring in diagnosing hypertension.[2]

A diagnostic strategy for hypertension using ABPM, following an initial raised clinic reading, would reduce misdiagnosis and be cost saving for the NHS. This has prompted NICE to update its guidance.[3]

Why is ABPM the method of choice?

MEASURING BP

The new NICE guideline, published in August 2011, recommends:

- If the BP reading taken in the clinic is ≥140/90 mmHg, a second measurement should be obtained during the consultation. If there is a marked difference between these two readings, then a third should be taken. The lower of the last two measurements should be used as the definitive result.
- If the first and second BP measurements taken during a consultation are both ≥140/90 mmHg, 24-hour ABPM should be used to confirm the diagnosis of hypertension.
- Home BP monitoring can be used to confirm the diagnosis of hypertension, if the patient cannot tolerate ABPM. Home BP monitoring should include two measurements twice daily (6 am-midday and 6 pm-midnight) for at least four days and preferably a week. The first day's readings should be discarded and a mean taken of the remaining 24 readings (assuming a week of monitoring).
- In cases of severe hypertension (clinic BP ≥180/110 mmHg) and evidence of target organ damage, antihypertensive drug treatment should be started immediately without waiting for the results of ABPM or home monitoring.

How will ABPM improve management?

ADVANTAGES OF ABPM

Initial management of hypertension has conventionally required a diagnosis based on several elevated clinic or office BP measurements.[4,5,6,7] However, ABPM estimates true mean BP more accurately than clinic »

measurement because multiple readings are taken. It has been shown to have better correlation with a range of cardiovascular outcomes and end organ damage.[8,9,10,11,12,13]

Furthermore, out-of-office methods can enable a diagnosis to be made more quickly: indeed, the previous NICE guidance on hypertension[4] recommended two readings taken on each of three separate occasions, at least a month apart, in order to classify a patient as being hypertensive. This could result in a protracted period of diagnostic uncertainty, especially if either the patient or clinician procrastinated, which could be much reduced by the timely use of home or ambulatory monitoring.

'ABPM is more accurate than clinic and home monitoring in diagnosing hypertension'

The new NICE guideline[3] proposes the routine use of ambulatory monitoring in the diagnosis of hypertension with the option of the patient self-monitoring at home where this is not feasible or cannot be tolerated.

The benefits of out-of-office techniques, in particular ABPM, include:

- the correct diagnosis of white coat hypertension
- improved diagnostic accuracy

Indeed, the weight of evidence suggests ABPM is the best prognostic indicator, followed by home then clinic monitoring. It follows from this, that ABPM is best able to predict those patients who require treatment.

This should result in both improved outcomes for patients and lower costs to the NHS through both reduced antihypertensive prescribing and better targeting resulting in fewer cardiovascular events.

In the modelling considered by NICE, these savings outweighed the additional cost of ambulatory monitors, within three years of commencing such a strategy.[2] Given these benefits, NICE concluded that all patients with a raised clinic BP need further monitoring outside the clinic to confirm the diagnosis.

EVIDENCE BASE

A systematic review of the worldwide literature compared the test performance for the diagnosis of hypertension of office measurement and home monitoring to that by ambulatory monitoring.[1] This review used a comprehensive search strategy in multiple databases and all languages.

In the nine studies using similar diagnostic thresholds that were included in the meta-analysis (two comparing home with ambulatory measurement only, six comparing clinic to ambulatory measurement only, and one study comparing all three methods), neither clinic nor home measurement had sufficient sensitivity or specificity to be unequivocally recommended as a single diagnostic test.

Compared with ABPM of 135/85 mmHg, clinic measurement >140/90 mmHg had a mean sensitivity of 74.6% (95% CI: 60.7-84.8) and specificity of 74.6% (95% CI: 47.9-90.4), whereas home measurement >135/85 mmHg had a mean sensitivity of 85.7% (95% CI: 78.0-91.0) and specificity of 62.4% (95% CI: 48.0-75.0). This would mean that if hypertension prevalence in a screened population was 30%, there would only be a 56% chance that a positive diagnosis using clinic measurement would be correct compared with using ambulatory measurement.

Clinic measurement, the current reference in most clinical work and guidelines, performed poorly in comparison with ambulatory measurement. Given that clinic measurements are also least predictive in terms of cardiovascular outcome,[8,9,10,14,15,16] this is not reassuring for daily practice and has profound implications for the diagnosis of hypertension, suggesting that ABPM is the diagnostic test of choice.

Home monitoring provided better sensitivity than clinic measurements, and might be suitable for ruling out hypertension given its ease of use and availability compared with ABPM.

In the subsequent modelling analysis, ABPM was the most cost-effective strategy for men and women of all ages: it was cost saving in all groups and resulted in improved health outcomes for male and female age groups over 50.

Based on the systematic review and modelling study, ABPM as a diagnostic strategy for hypertension after an initial raised reading in the clinic would reduce misdiagnosis and save costs, as additional costs from ambulatory monitoring are counterbalanced by cost savings from better targeted treatment. ABPM was therefore recommended by the new guideline for most patients before the start of antihypertensive drugs.

MANAGEMENT

As with previous guidelines, a differentiation is made between those at high cardiovascular risk and those with BP as a sole risk factor.

Stage 1

Initial clinic BP ≥ 140/90 mmHg, and subsequent ABPM daytime average or home monitoring average BP ≥ 135/85 mmHg. Patients should only be offered antihypertensives if they have increased cardiovascular risk due to concurrent diabetes, chronic kidney disease, established cardiovascular disease, target organ damage or a 10-year cardiovascular disease risk >20%.

Stage 2

Initial clinic BP ≥ 160/100 mmHg, and subsequent ABPM daytime or home monitoring average BP ≥ 150/95 mmHg. Patients should all be offered antihypertensives following ABPM or home monitoring, irrespective of their background cardiovascular risk.

Severe hypertension

Clinic BP ≥ 180/110 mmHg.
These patients should be offered antihypertensives immediately without waiting for the results of ABPM or home monitoring.

The systematic review did not consider the implications for clinical practice in terms of the best method of monitoring treatment effects, as it focused solely on diagnostic studies and current data from other studies were not sufficient to recommend home or ambulatory monitoring for the follow-up of patients on treatment. It is hoped that more evidence will be available regarding this for the next guideline update.

However, if the equipment is already available ABPM is a perfectly good option for monitoring patients on treatment, especially where there is resistance to treatment, irregular or diurnal variation, or concerns about variability and white coat effect. In most cases however, home monitoring is likely to be an easier option for ongoing management although the evidence base is small at present.

key points

SELECTED BY
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Ambulatory blood pressure monitoring (ABPM) is more accurate than both clinic and home monitoring in diagnosing hypertension. A diagnostic strategy for hypertension using ambulatory monitoring following an initial raised clinic reading would reduce misdiagnosis and cut NHS costs.

If the first and second blood pressure measurements taken during a consultation are both ≥140/90 mmHg, 24-hour ABPM should be used to confirm the diagnosis of hypertension. Home monitoring can be used to confirm the diagnosis if the patient cannot tolerate ABPM. In cases of severe hypertension (clinic BP ≥180/110 mmHg) and evidence of target organ damage, antihypertensive drug treatment should be started immediately without waiting for the results of ABPM or home monitoring.

ABPM estimates true mean BP more accurately than clinic measurement because multiple readings are taken. It has been shown to have better correlation with a range of cardiovascular outcomes and end organ damage. Out-of-office methods can enable a diagnosis to be made more quickly. The benefits of these techniques, in particular ABPM, include the correct diagnosis of white coat hypertension and improved diagnostic accuracy. The weight of evidence suggests ABPM is the best prognostic indicator, followed by home then clinic monitoring.

A differentiation is made between those at high cardiovascular risk and those with BP as a sole risk factor. Stage 1 patients should only be offered antihypertensives if they have increased cardiovascular risk due to concurrent diabetes, chronic kidney disease, established CVD, target organ damage or a 10-year CVD risk >20%. Stage 2 patients should all be offered antihypertensives following ABPM or home monitoring, irrespective of their background cardiovascular risk.

The systematic review did not consider the implications for clinical practice in terms of the best method of monitoring treatment effects. It is hoped that more evidence will be available regarding this for the next NICE guideline update.

Useful information

For healthcare professionals
British Hypertension Society
www.bhsoc.org

Primary Care Cardiovascular Society
www.pccs.org.uk

For patients
The Blood Pressure Association
www.bpassoc.org.uk/Home

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IMPROVING OUTCOMES

Implementation of a diagnostic strategy for hypertension using ambulatory monitoring following an initial raised clinic reading would reduce misdiagnosis and cut costs. This is because additional costs from ambulatory monitoring would be counter balanced by cost savings from better targeting of treatment. NICE predicts that although the NHS will need to invest around £2.5 million upfront to pay for new devices, after three years this money will be recouped through a reduction in prescriptions for antihypertensive drugs and in resources required for follow-up.

Furthermore, many people currently labelled as hypertensive may not have hypertension. This has significant implications when the adverse effects of labelling per se on otherwise healthy individuals are considered.[17, 18, 19, 20]

‘Many people currently labelled as hypertensive may not have hypertension’

BARRIERS TO IMPLEMENTATION

Currently only about one in every twenty diagnoses is made with an ABPM machine, and these are largely confined to larger GP practices and specialist units. The availability of machines is very limited at present, which could lead to long delays for patients if the guidelines were implemented immediately.

Equally critically, any ambulatory machine used should be validated by an appropriate protocol to ensure its accuracy.[21,22,23]

Questions remain over whether GPs will be convinced enough of the benefits to pay for the devices.

The change is therefore likely to be implemented over the next year or so to allow time for commissioners to design their services. It may prove to be an ideal way in which people can group together and work in consortia to share devices. Although this will be a major implementation challenge the long-term benefits, both for patients and the NHS, will be significant.

REFERENCES

1 Hodgkinson J, Mant J, Martin U et al. Relative effectiveness of clinic and home blood pressure monitoring compared to ambulatory blood pressure monitoring in the diagnosis of hypertension: a systematic review. *BMJ* 2011;342:d3621
2 Lovibond K, Jowett S, Barton P et al. Cost-effectiveness of options for the diagnosis of high blood pressure in primary care: a modelling study. *Lancet* 2011. published online. doi:10.1016/S0140-6736(11)61184-7
3 National Institute for Health and Clinical Excellence. CG127. Hypertension: management of hypertension in adults in primary care. NICE. London. 2011
4 National Institute for Health and Clinical Excellence. CG34.Management of hypertension in adults in primary care. NICE. London. 2006
5 Williams B, Poulter NR, Brown MJ et al. Guidelines for management of hypertension: report of the fourth working party of the British Hypertension Society, 2004-BHS IV. *J Hum Hypertens* 2004;18: 139-185
6 The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure - Complete Report. 2004. www.nhlbi.nih.gov/guidelines/hypertension/jnc7full.htm
7 National Collaborating Centre for Chronic Conditions. Hypertension: management in adults in primary care: pharmacological update. RCP. London. 2006
8 Ohkubo T, Hozawa A, Nagai K et al. Prediction of stroke by ambulatory blood pressure monitoring versus screening blood pressure measurements in a general population: the Ohasama study. *J Hypertens* 2000;18(7):847-854
9 Mancia G, Zanchetti A, Gabiti-Rosei E et al. Ambulatory blood pressure is superior to clinic blood pressure in predicting treatment-induced regression of left ventricular hypertrophy. SAMPLE Study Group. Study on Ambulatory Monitoring of Blood Pressure and Lisinopril Evaluation. *Circulation* 1997; 95(6):1464-1470
10 Verdecchia P. Prognostic value of ambulatory blood pressure: current evidence and clinical implications. *Hypertension* 2000;35(3):844-851
11 Staessen JA, Thijs L, Fagard RH et al. Predicting cardiovascular risk using conventional vs. ambulatory blood pressure in older patients with systolic hypertension. Systolic Hypertension in Europe Trial Investigators. *JAMA* 1999;282(6):539-546
12 Fagard RH, Staessen JA, Thijs L. Prediction of cardiac structure and function by repeated clinic and ambulatory blood pressure. *Hypertension* 1997;29(1 Pt 1):22-29
13 Imai Y, Ohkubo T, Sakuma M et al. Predictive power of screening blood pressure, ambulatory blood pressure and blood pressure measured at home for overall and cardiovascular mortality: a prospective observation in a cohort from Ohasama, northern Japan. *Blood Press Monit* 1996; 1(3):251-254
14 2003 World Health Organization (WHO)/ International Society of Hypertension (ISH) statement on management of hypertension. *J Hypertens* 2003;21:1983-1992
15 Verdecchia P. Reference values for ambulatory blood pressure and self-measured blood pressure based on prospective outcome data. *Blood Pressure Monit* 2001;6:323-7
16 Redon J, Campos C, Naciso ML et al. Prognostic value of ambulatory blood pressure monitoring in refractory hypertension: a prospective study. *Hypertension* 1998;31(2):712-8
17 Haynes RB, Sackett DL, Taylor DW et al. Increased absenteeism from work after detection and labelling of hypertensive patients. *N Eng J Med* 1978;299(14):741-4
18 Macdonald LA, Sackett DL, Haynes RB et al. Labelling in hypertension: a review of the behavioural and psychological consequences. *J Chronic Dis* 1984;37(12):933-42
19 Johnstone ME, Gibson ES, Terry CW et al. Effects of labelling on income work and social function among hypertensive employees. *J Chron Dis* 1984:37:417-23
20 Bloom JR, Monterossa S. Hypertension labelling and sense of well-being. *Am J Public Health* 1981;71(11):1228-32
21 O' Brien E, Petrie J, Littler W et al. British Hypertension Society Protocol for the Evaluation of Blood Pressure Measuring Devices. *J Hyperten* 1993;11(Suppl 2):S43-S62
22 O'Brien E, Atkins N, Stergiou GS et al. European Society of Hypertension International Protocol revision 2010 for the Validation of Blood Pressure Measuring Devices In Adults. *Blood Press Monit* 2010;15 (1):23-38
23 ISO/OCE 81060-2. International Standard: Non-invasive Sphygmomanometers - Part 2: Clinical validation of the automated measurement type. 2009. Report No 81060-2