DIAGNOSTIC TESTS

Home monitoring of blood pressure

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SUMMARY

Home blood pressure monitoring is the self-measurement of blood pressure by patients. In the diagnosis and management of high blood pressure it is complementary to 24-hour ambulatory blood pressure monitoring and clinic blood pressure measurements. Home monitoring can also help to identify white-coat and masked hypertension.

Home monitoring has good reproducibility, is well tolerated and relatively inexpensive. It is superior to blood pressure taken in the clinic in predicting cardiovascular events and mortality.

Twice-daily measurements are recommended, usually in the morning and evening for a minimum of five days. The threshold for defining hypertension is an average home blood pressure of 135/85 mmHg or above.

Patients are engaged with their management when they monitor their own blood pressure. This results in increased adherence to therapy and lower blood pressure.

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Introduction

Blood pressure measurements taken by a doctor are often higher than the patient's usual blood pressure. Uncertainty surrounding a patient's blood pressure outside the doctor's office is a recognised barrier to treating hypertension in Australian general practice.[1] This uncertainty can be alleviated by using 24-hour ambulatory blood pressure monitoring.[2,3] An alternative is to instruct the patient to measure their own blood pressure for several days. This home blood pressure monitoring is more likely to reflect the patient's underlying blood pressure, than measurements in the clinic.

Rationale for home monitoring

An Australian consensus statement has promoted 24-hour ambulatory blood pressure monitoring as the reference standard for optimal care in uncomplicated hypertension.[2] However, home blood pressure monitoring has better reproducibility.[4-6] Compared with 24-hour ambulatory blood pressure monitoring, home monitoring is less expensive, much more widely available and provides information about the day-to-day variability of blood pressure.[7]

An advantage of 24-hour ambulatory blood pressure monitoring is the detection of nocturnal hypertension or 'non-dipping' blood pressure patterns, which are associated with a worse prognosis.[8] However, newer devices for home blood pressure monitoring may enable nocturnal measurements. At this stage the two methods should be considered as complementary clinical tools.

Compared to clinic measurements, home measurements are more reproducible, more strongly predict hypertensive end-organ disease,[9-12] and are stronger predictors for cardiovascular events and mortality.[13-16] Several international guidelines recommend using home blood pressure monitoring for hypertension diagnosis, evaluation of suspected white-coat hypertension and masked hypertension, and for guiding management.[7,17-19] Substantial evidence for the benefits of home blood pressure monitoring comes from studies in Japan.[19]

Method

The blood pressure measurements are recorded by the patient using a validated, automated blood pressure device. Devices with a storage memory have advantages over self-recording for ensuring the validity of measurements.

Home blood pressure is optimal when the patient takes readings while seated, around the same time each morning and evening. Monitoring is usually over a period of one week, with a five day minimum. Standing blood pressures can also be measured if needed to assess postural changes in blood pressure.

The patient should sit quietly (no talking or distractions such as television) for five minutes in a comfortable ambient temperature. The blood pressure cuff selected should be appropriate for body size. Feet should be flat on the floor, legs uncrossed, upper arm bare, back and arm supported with the cuff at heart level. Readings should not be taken if the patient feels uncomfortable, stressed or in pain. Smoking or caffeine drinks are to be avoided for 30 minutes before the measurement. Readings should be done before eating or taking medication. Two readings are taken one minute apart with the

second reading being recorded in a diary or electronic spreadsheet. The average measurement over the monitoring period is used to determine the patient's underlying blood pressure. An average weekly home blood pressure above 135/85 mmHg is considered to be the cut point for hypertension.

White-coat hypertension

White-coat hypertension is defined as a blood pressure of at least 140/90 mmHg measured at the doctor's office on at least three occasions, but with a normal blood pressure measured outside the office. An average weekly home blood pressure below 135/85 mmHg or two 24-hour ambulatory blood pressure recordings with daytime ambulatory blood pressure below 135/85 mmHg would rule out the diagnosis of hypertension.

The population prevalence of white-coat hypertension is approximately 15%.[20] It is more common in women and non-smokers and is associated with increased waist circumference, glucose intolerance, and increased left ventricular mass.[20,21] White-coat hypertension is a risk factor for sustained hypertension[22] with 36% of patients progressing to established hypertension within five years. Those who progress are more likely to have a higher waist circumference, a higher plasma glucose two hours post-loading and an increased resting aorto-femoral pulse wave velocity.

Patients with white-coat hypertension have a significantly increased risk of developing type 2 diabetes.[23-25] This highlights the importance of monitoring and managing the cardiovascular risk in white-coat hypertension, particularly glucose intolerance and obesity, and not just the blood pressure alone.

Masked hypertension

Masked hypertension is defined as a blood pressure in the clinic below 140/90 mmHg, but high blood pressure elsewhere, for example a blood pressure of 135/85 mmHg or more on home monitoring.

The population prevalence is 10–17%,[7] but may be up to 29% in untreated patients with diabetes.[26] These patients commonly have subclinical cardiovascular disease and the risk for incident cardiovascular events is similar to that of sustained hypertension.[27-29] A particular at-risk group are patients with obstructive sleep apnoea.

Thorough assessment of cardiovascular risk is key to managing masked hypertension. In addition to home monitoring, management will require 24-hour ambulatory blood pressure monitoring if there is nocturnal hypertension or non-dipping.

Blood pressure variability

Home blood pressure monitoring is a good method for assessing long-term variability in blood pressure. Increased variability and episodic hypertension have been shown to have adverse consequences in patients with stroke or transient cerebral ischaemia.[30,31] Moreover, different drug classes may have different effects on variability. This is an important area for further research.

Assessing treatment

Home blood pressure monitoring provides a reliable estimate of the effectiveness of antihypertensive treatment,[32] and the measurements are relatively unaffected by placebo.[33] Therapy guided by home blood pressure monitoring compared with usual care can lead to better blood pressure control and higher patient satisfaction with medical care.[33,34] Additional support for the patient such as educational materials or counselling increases the benefit.[35] Home blood pressure monitoring can also be used to assess the duration of the antihypertensive effect and identify hypertension that is resistant to treatment.[36]

Adherence

Home blood pressure monitoring engages the patient in their management and increases adherence to therapy.[37-40] This can lead to a lower blood pressure than standard care.[37,38] However, home blood pressure monitoring was not as successful at improving adherence to treatment in primary care as it was in hospital-based or non-clinical (community centre/workplace) settings.[41] Additional support strategies may be needed in primary care.

Cost-effectiveness

Most home blood pressure monitoring devices are relatively cheap (approximately $100), reliable and widely available. There are also lending schemes in some general practice and specialist clinics.

Home monitoring has been shown to be cost neutral, after taking into account the number of consultations, drugs, referrals, equipment and training expenses.[42] It is cost-effective in terms of reducing the drugs needed to maintain blood pressure control.[43] Telemonitoring of the measurements may be more costly, although this may be offset by having better healthcare outcomes.[44]

Adverse effects

Some patients with anxiety may become stressed about their readings, particularly if these are high, and this may affect subsequent measurements. Then there are those patients who change their treatment according to readings without medical consultation,

increasing the risk of adverse consequences. Others may become obsessed and perform excessive numbers of readings.

Conclusion

Ambulatory blood pressure monitoring is the current gold standard for assessing hypertension. Home blood pressure monitoring is a complementary method. Hypertension is diagnosed if the average of twice-daily measurements for at least five days is 135/85 mmHg or higher. Home blood pressure monitoring can help to detect patients who have white-coat or masked hypertension. As the price of blood pressure monitors reduces, home monitoring by patients will become a routine part of their management. An Australian consensus statement on the role of home blood pressure monitoring is being prepared.

Conflict of interest: none declared

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Q:

SELF-TEST QUESTIONS

True or false?

3. Home blood pressure monitoring provides less information than 24-hour ambulatory monitoring about the day-to-day variability in blood pressure.

4. Home blood pressure monitoring cannot distinguish between white-coat hypertension and masked hypertension.

Answers on page 35

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Book review

Therapeutic Guidelines: Endocrinology. Version 5.

Melbourne: Therapeutic Guidelines Limited; 2014
419 pages
Electronic version also available

The strength of this guideline is its concise and yet thorough approach to the management of the more common endocrinological conditions. For example, strategies for the different types of diabetes are explained in great detail. The guidance for diabetic ketoacidosis and hyperosmolar hyperglycaemia is excellent. The numerous tables provided throughout the book are useful and easy to read.

However, there are areas of weakness. There are too many cross references throughout the book, making it difficult to read in parts. Reference to further information in the electronic version of the Therapeutic Guidelines, eTG, is common. This is problematic as not every user has access to the electronic version. I do think a guide needs to be able to stand alone.

The recommendations about blood glucose monitoring are too vague and generalised. Also, the advice on sunlight exposure for patients with vitamin D deficiency lacks detail.

Despite some shortcomings, overall I think this book is excellent. I like its pocket size format, and the treatment recommendations are detailed, practical and easy to follow. I recommend this endocrinology guide to health practitioners working in a hospital or in general practice.

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