

Hypertension is a major risk factor for coronary heart disease, stroke and heart failure; accurate blood pressure measurement is essential for correct diagnosis

Assessing and managing primary hypertension

In this article...

- **Treatments for primary hypertension**
- **The value of lifestyle interventions**
- **The importance of accurate blood pressure measurement**

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Abstract O'Connell S (2014) Assessing and managing primary hypertension. *Nursing Times*; 110: 14, 12-14.

Hypertension is a major risk factor for coronary heart disease, stroke and heart failure. This article discusses treatments for primary hypertension, including lifestyle interventions and drug therapy, and highlights the importance of accurate blood pressure measurement.

Hypertension (high blood pressure (BP)) is a primary modifiable risk factor for the development of coronary heart disease, heart failure, cerebrovascular disease, peripheral vascular disease and renal disease; its prevalence increases with age in both sexes (British Heart Foundation, 2012).

The development of hypertension is inevitable in most people as they age and, although the cause is often unknown (primary hypertension), genetic factors, foetal environment, obesity, inactivity, smoking, alcohol intake, age, gender, ethnicity and salt intake have been linked to it (Kaplan, 2001). The three stages of hypertension are defined as:

- » Stage 1: clinic BP of $\geq 140/90$ and subsequent ambulatory BP monitoring (ABPM) or home BP monitoring (HBPM) daytime average of $\geq 135/85$
- » Stage 2: clinic BP of $\geq 160/100$ and subsequent ABPM or HBPM daytime average of $\geq 150/95$
- » Severe: clinic systolic BP of ≥ 180 or clinic diastolic BP of ≥ 110 (National Institute for Health and Care Excellence, 2011).

BP is the pressure exerted by blood on the arterial walls (Wilmore and Costil, 2008). Systolic BP is the pressure exerted after ventricular contraction and reflects the workload of the heart, while diastolic BP is exerted during ventricular relaxation and indicates peripheral resistance to blood flow in the blood vessels (McArdle et al, 2007).

BP is measured in millimetres of mercury (mmHg). Normal BP (normotension) is a systolic pressure of ≤ 120 mmHg and diastolic of ≤ 80 mmHg; hypertension is usually defined as systolic pressure >140 mmHg and diastolic >90 mmHg (Wood, 2005). However, Kaplan (2001) states the condition is defined by the risk of adverse clinical events, such as the presence of left-ventricular hypertrophy, retinopathy, stroke, coronary artery disease, heart failure, aortic dissection and renal failure.

Diagnosing hypertension is complicated by the phenomenon of "white coat syndrome", in which BP is raised when measured in the GP surgery or hospital. NICE (2011) emphasises the importance of accurate recording of BP. Box 1 outlines key points for BP measurement.

Management of hypertension

Management of hypertension is aimed at preventing organ damage, including stroke and heart failure, and reducing cardiovascular risk. Lifestyle interventions and pharmacological treatment form the cornerstone of therapy; lifestyle modification has been shown to reduce BP by as much as 10 mmHg (NICE, 2011).

Dietary advice

A diet high in saturated fats and low in fruit and green vegetables has been linked to the

5 key points

1 Hypertension is a primary modifiable risk factor for the development of cardiovascular disease

2 Accurate blood pressure measurement is essential

3 All patients diagnosed with hypertension should be offered lifestyle advice

4 ACE inhibitors are the first drug of choice in most patients aged under 55 years

5 Calcium channel blockers are the first drug of choice in patients of African or Caribbean origin



Blood pressure can be lowered through diet and exercise as well as medication



*“Nursing is a great profession
but it’s not for the faint-hearted”*

Caroline Knott  p26

BOX 1. MEASURING BLOOD PRESSURE: KEY POINTS

- The setting should be standardised as much as possible, relaxed and temperate. The patient should be rested and seated in a chair with back support for at least five minutes before measurement (Dougherty and Lister, 2011)
- The patient's arm should be supported and stretched out in line with the mid-sternum
- The pulse should be checked before an automatic blood pressure (BP) monitor is used; an irregular pulse may affect the device's ability to measure BP accurately
- The correctly sized cuff must be used; one that is too small (under-cuffing) can give a falsely high reading, whereas one that is too big can give a falsely low one
- BP should be recorded on both arms; if the difference between readings is 20mmHg or over, measurements should be repeated in both arms. Subsequent measurements should be taken from the arm with the higher reading

BOX 2. DASH DIET: COMPONENTS

- Fruit
- Vegetables
- Low-fat dairy
- Fish
- Poultry
- Whole grains and nuts
- Reduced portions of red meat
- Reduced portions of sugar-sweetened foods and beverages
- 3g sodium per day

development of obesity, cardiovascular disease and endothelial dysfunction (Lopez-Garcia et al, 2004).

The endothelium (blood vessel lining) plays an important role in the prevention of long-term conditions; endothelial damage has been linked with the development of atherosclerosis (thickening of the arterial walls) (Mensah, 2007).

Obesity may increase the risk of hypertension through overactivation of the sympathetic nervous system (Esler et al, 2006). Increased levels of the neurotransmitter noradrenaline reduce blood flow to the kidneys, leading to activation of the renin-angiotensin-aldosterone system, sodium retention and an increase in heart rate. Skeletal muscle circulation is reduced due to vasoconstriction, suggesting an increase in peripheral resistance; however, the heart rate is relatively unaffected (Esler et al, 2006). Obesity is also associated with raised inflammatory markers, in particular C-reactive protein, which can lead to endothelial dysfunction (Esler et al, 2006) and abnormal lipid profiles.

Halperin et al (2006) found high lipid levels were independently associated with a greater risk of hypertension and could be present for years before its onset. Abnormal lipids can damage the endothelium, leading to impaired production of nitric oxide, a potent vasodilator. This impairs a blood vessel's ability to relax and contract, leading to a raised resting blood pressure (Halperin et al, 2006).

Dietary modification and other lifestyle interventions are crucial in the management of hypertension and prehypertension to improve endothelial function. It could be argued the benefits of dietary modification arise not only from weight loss but also from the antioxidant effects of fruit and vegetables, which may help to protect against endothelial dysfunction.

Dauchet et al (2007) found a diet high in fruit and vegetables was associated with a lower systolic and diastolic BP. The Dietary

Approaches to Stop Hypertension (DASH) diet, which is low in fat and high in fruit and vegetables, has been found to significantly reduce BP in patients with stage 1 systolic hypertension (Moore et al, 2001) (Box 2). In Moore et al's study, pre-hypertension was defined as a systolic BP of 140-159mmHg and diastolic BP of <90mmHg. Participants were randomised to one of three diets, which they agreed to eat for 11 weeks; although the numbers were low, the findings have been corroborated. For example, the PREMIER Trial, involving 399 participants, found the DASH diet was effective in reducing BP in people with metabolic syndrome (Lien et al, 2007).

The Diet, Exercise and Weight-Loss Intervention Trial (DEW-IT) also found lifestyle interventions could significantly reduce BP (Miller et al, 2002); although only 20 participants completed the intervention, the diet protocol was similar to the DASH diet, suggesting the findings could be applicable to the wider population. Participants were also prescribed 30-45 minutes of moderate-intensity supervised exercise such as a treadmill or track-walking three days a week. Those in the DEW-IT intervention group lost more weight than the controls (average 5.5kg compared with 0.6kg); however, those in Moore et al's study did not lose weight.

Exercise

While dietary modification is important in hypertension management, its benefits may be short lived if not undertaken in conjunction with regular exercise.

Hu et al (2004) found regular physical activity was associated with lower BP, regardless of body mass index. This may be explained by the beneficial effects of exercise on the sympathetic nervous system, inflammatory markers and lipid profile, leading to an improvement in endothelial function. Hambrecht et al (2003) found exercise resulted in a rise in endothelial nitric oxide synthase, which is associated

with an improvement in endothelial function. Endothelial nitric oxide is a potent vasodilator, and reduced production is associated with endothelial dysfunction.

Salt intake

The DASH-Sodium Trial (Bray et al, 2004) found a positive link between salt intake and hypertension. Low salt intake may be one reason why the DASH diet (or any diet high in fruit and vegetables) is so effective in reducing BP.

Smoking

Smoking is a major risk factor for CVD, and has been shown to increase levels of C-reactive protein. It is associated with an increase in ankle-to-arm systolic BP index (also known as ankle brachial pressure index, ABPI), which is an indicator of peripheral atherosclerosis (Cui et al, 2006).

Ankle brachial pressure index is calculated by dividing the systolic blood pressure in the ankle by the systolic blood pressure measured at the brachial artery.

Pharmacological management

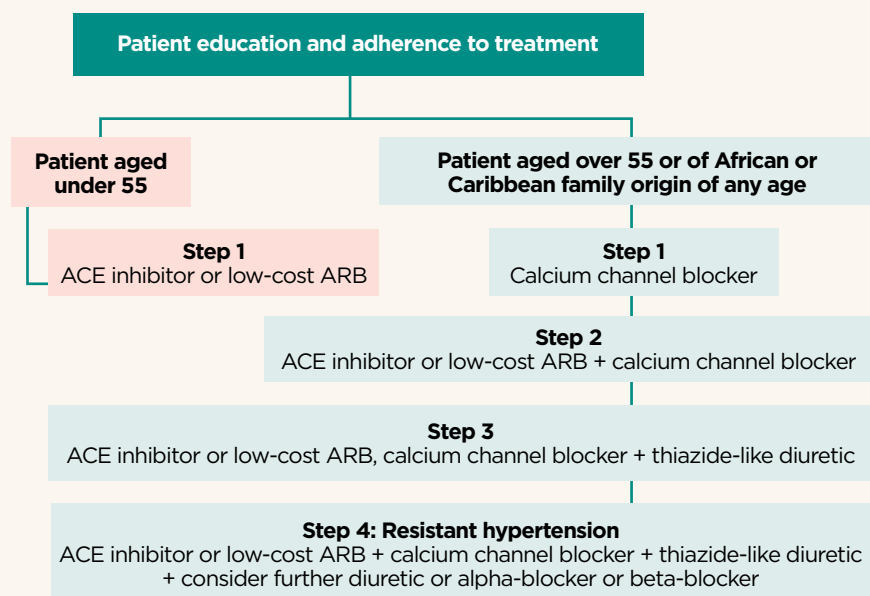
While lifestyle interventions are used in the initial management of hypertension, many patients will need medication to prevent stroke and heart failure. NICE (2011) guidance on pharmacological management uses a step approach (Fig 1).

Angiotensin-converting enzyme inhibitors

The choice for the initial treatment of hypertension in people aged under 55 years should be an ACE inhibitor or a low-cost angiotensin II receptor blocker (ARB) if an ACE inhibitor is not tolerated.

ACE inhibitors inhibit the conversion of angiotensin I to angiotensin II by ACE (Greenstein and Gould, 2004a). This results in vasodilatation through an increase in levels of bradykinin, a peptide that causes blood vessels to dilate and BP to, therefore, fall. ACE inhibitors also affect the

FIG 1. STEPPED APPROACH TO PHARMACOLOGICAL MANAGEMENT



ACE = angiotensin-converting enzyme. ARB = angiotensin II receptor blocker. Source: NICE (2014)

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production of the hormone aldosterone, which regulates water and electrolyte balance, leading to an increase in sodium and water excretion and decrease in BP. In addition, they reduce stroke volume and cardiac output, leading to a lowering of BP.

In the Heart Outcomes Prevention Trial, administration of the ACE inhibitor ramipril reduced cardiovascular morbidity and mortality. A sub-study of the trial suggests this was achieved by reducing 24-hour ambulatory BP – and especially night-time BP – indicating that administration timing is important (Svensson et al, 2001). This has implications for nurses administering ramipril or advising patients on its timing, as Svensson et al's findings suggest it is more effective if taken at bedtime. Ramipril has also been shown to reduce ventricular hypertrophy (enlargement) (Lièvre et al, 1995), which has been linked to an increased risk of death and the development of heart failure.

In patients aged over 55 or in those of African or Caribbean origin of any age, calcium channel blockers are the first drugs of choice. This is because lower levels of circulating rennin in patients of African or Caribbean origin are thought to make ACE inhibitors less effective in lowering blood pressure than in Caucasians.

Calcium channel blockers result in vasodilation and reduced peripheral vascular resistance by inhibiting the movement of calcium ions into the muscle cells of the arterial walls (Greenstein and Gould, 2004a). If a calcium channel blocker is not

tolerated, a thiazide diuretic should be used; these are also recommended for resistant hypertension, used in combination with ACE inhibitors and calcium channel blockers. Thiazide diuretics reduce blood volume by preventing sodium absorption by the kidneys (Greenstein and Gould, 2004b); they also have a vasodilatory effect, thereby reducing peripheral vascular resistance and reducing BP.

Beta-blockers are no longer recommended as a first-line treatment for hypertension but may be considered in younger patients and women of childbearing age (NICE, 2011).

Conclusion

Pharmacological treatment of hypertension, which lowers BP by altering peripheral vascular resistance and cardiac output, is a key part of managing the condition but patients may need a combination of medications. Lifestyle modification is also just as important; a holistic approach is needed. Regular physical activity and a diet that is high in fruit and vegetables, and low in fat and sugar-sweetened food/drinks, improves endothelial function and lowers BP.

Both aspects of management involve working in partnership with the patient, using goal-setting and moving away from a paternalistic approach. **NT**

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