Hypertension: diagnosis, assessment and management


Abstract
Hypertension is a serious and common condition, the prevalence of which is set to rise given the increase in the ageing population, sedentary lifestyles and obesity. This article reviews the management of primary hypertension in adults, with reference to the National Institute for Health and Care Excellence guidelines. Diagnosis using clinic, ambulatory and home blood pressure (BP) monitoring, risk factors, BP targets, lifestyle advice, drug treatment and patient education are also discussed.

Aims and intended learning outcomes
This article aims to provide an overview of primary hypertension – high blood pressure (BP) of unknown cause, including risk factors, diagnosis and treatment options. It is not within the remit of the article to focus on hypertension in paediatrics, diabetes, kidney disease, pregnancy or patients who present with hypertension as a clinical emergency.

After reading this article and completing the time out activities you should be able to:
- Explain how hypertension is diagnosed, BP is monitored and BP targets are defined.
- List the contributory factors and risks associated with hypertension.
- Discuss antihypertensive drug treatment.
- Describe a patient education programme, including support for healthy lifestyle choices and medicine adherence, for the management of hypertension.

Complete time out activity

Introduction
BP is the force exerted by circulating blood against the walls of the arteries. Systole is characterised by contraction of the heart, driving blood into the aorta and pulmonary arteries. Diastole is characterised by blood entering the relaxed chambers of the heart. Systolic BP is the maximum pressure in the arteries when the heart contracts. Diastolic BP is the minimum pressure in the arteries between the heart’s contractions. BP is affected by cardiac output and peripheral resistance (Peate and Nair 2011). There is a strong positive association between BP and cardiovascular disease, even within the normal range. Cardiovascular risk increases with a BP of 115/75mmHg and the higher the BP above this level, the greater the risk of heart attack, heart failure, stroke and kidney disease (Chobanian et al 2003). These risks increase with additional risk factors such as smoking...
or if the patient has concomitant disease such as diabetes (Chobanian et al 2003). According to the World Health Organization (WHO) (2009) and Lim et al (2012) sub-optimal BP (BP ≥115/75mmHg) is the most important risk factor contributing to the global burden of disease and is the leading cause of death.

Hypertension is defined as a BP of 140/90mmHg or higher (National Institute for Health and Care Excellence (NICE) 2011a) (Box 1). This is the level above which it is considered that investigation and treatment does more good than harm (Beever et al 2007). Hypertension affects more than 25% of the population in England and more than half of those over 60 years. Prevalence of the condition is expected to rise with increases in the ageing population, sedentary lifestyles and obesity. Approximately 90% of people have primary hypertension where there is no identifiable cause. Secondary hypertension, where a specific cause can be identified, is rare, but should be considered particularly in those under 40 years and where there is resistance to treatment. In developed countries, BP rises with age and most people with hypertension are aged over 40 years. If hypertension is identified in someone aged under 40 years, a particular cause is more likely (NICE 2011a) (Box 2). Patients aged 50 or over are more likely to have a raised systolic BP as a result of atherosclerosis and those under 50 years are more likely to have a raised diastolic BP (Chobanian et al 2003).

Diagnosing hypertension

A well-calibrated and maintained mercury sphygmomanometer is the gold standard for measuring BP. However, because of the toxicity of mercury, causing significant risks to health and the environment, mercury sphygmomanometers are no longer available to purchase in the European Union for routine clinical use. These monitors are being replaced by automatic (oscillometric) monitors and manual non-mercury sphygmomanometers (Medicines and Healthcare products Regulatory Agency (MHRA) 2013).

BP monitors have an inflatable cuff to restrict blood flow, and a mechanical device to measure the pressure when blood flow starts to return (systolic BP), and the level at which the blood flows unhindered (diastolic BP). In manual BP measurement, a stethoscope is used to listen to the blood flow (Korotkoff sounds). The automatic method detects variations in pressure oscillations as a result of arterial wall movement beneath the cuff and calculates and digitally displays the systolic, mean arterial and diastolic BP (MHRA 2013).

Several manual and automatic monitors are available, however, not all have been shown to measure BP accurately and those that have may not always be the best choice. Wear and tear and mechanical shock can damage the mechanism and accuracy of aneroid sphygmomanometers (a manual monitor with a pressure gauge and dial) and, therefore, they require more frequent calibrations. Wrist monitors may be less accurate than upper arm monitors because readings are dependent on the position of the wrist in relation to the heart (MHRA 2013), but can be useful in special circumstances, for example for patients with short upper arms where the cuff is too wide. The MHRA (2013) recommend that only monitors independently validated according to the British Hypertension Society (BHS) protocol (O’Brien et al 1993), the Working Group on Blood Pressure Monitoring of the European Society of Hypertension international protocol (O’Brien et al 2002) or the American National Standards

**BOX 1**

**Defining hypertension**

**Stage 1 hypertension:** Clinic blood pressure (BP) is 140/90mmHg or higher and subsequent ambulatory BP monitoring (ABPM) (non-invasive BP monitoring up to 24 hours) daytime average or home BP monitoring (HBPM) average is 135/85mmHg or higher.

**Stage 2 hypertension:** Clinic BP is 160/100mmHg or higher and subsequent ABPM daytime average or HBPM average is 150/95mmHg or higher.

**Severe hypertension:** Clinic systolic BP is 180mmHg or higher, or clinic diastolic BP is 110mmHg or higher.

(National Institute for Health and Care Excellence 2011a)

**BOX 2**

**Causes of secondary hypertension**

**Main causes:**

- Renal and renovascular disease (renal artery stenosis).
- Phaeochromocytoma.
- Hyperaldosteronism (primary aldosteronism).

**Other identifiable causes:**

- Cushing’s syndrome.
- Hypothyroidism.
- Hyperthyroidism.
- Obstructive sleep apnoea.
- Coarctation of the aorta.
- Acromegaly.
- Drugs: non-steroidal anti-inflammatory drugs, oral contraceptives containing oestrogen, steroids and decongestants found in cold remedies.

(Adapted from National Institute for Health and Care Excellence 2011a)
Institute/Association for the Advancement of Medical Instrumentation SP10-2002 Protocol (2003) should be used to monitor BP.

Some automatic BP monitors can accurately detect an arrhythmia, which could be the result of atrial fibrillation (AF), which requires investigation. If an arrhythmia is detected, BP should be measured manually to ensure accuracy. The BHS (2012a) provides an up-to-date list of independently validated BP monitors that have been tested using approved protocols. To ensure accuracy, BP monitors require regular calibration according to the manufacturer’s instructions or local policy. Malfunctioning BP monitors or cuffs should not be used.

An automatic BP monitor is not suitable for all individuals and for some people, manual measurement using direct auscultation over the brachial artery is required. Manual BP monitoring should be used for patients with arrhythmias, certain vascular diseases, in medical emergencies when BP is too low or too high to record using an automatic monitor, or in very obese patients when even the large BP cuffs are too small (MHRA 2013). An inadequate clinical assessment of the patient can lead to an inappropriate choice of BP monitor and cuff size, resulting in inaccurate measurement, for example a cuff that is either too small or too large may result in over or underestimation of BP respectively. If BP measurement is erroneously low, the patient may be denied drug treatment to prevent stroke and myocardial infarction, whereas if BP measurement is erroneously high, he or she may be prescribed unnecessary medication (O’Brien et al 2010).

**Complete time out activity 2**

### Measuring blood pressure

The patient’s radial or brachial pulse should be palpated before measuring BP. If irregular, then BP should be measured manually using a sphygmomanometer and stethoscope (NICE 2011a). Arrhythmia requires further investigation and possible treatment. Box 3 and Box 4 describe the methods for measuring BP. Systolic BP should be estimated when measuring BP manually because BP sounds can temporarily disappear during cuff deflation (auscultatory gap), leading to potential underestimation of systolic BP. The patient’s BP should be measured when he or she is in a seated or supine position. If the patient has a history of falls or vertigo on standing then BP should be measured in sitting and standing positions since these symptoms may be caused by postural hypotension. Treatment decisions are based on standing BP for patients with symptomatic postural hypotension (NICE 2011a) (Box 5).

### Ambulatory blood pressure monitoring

It is recommended that all patients with suspected hypertension (BP 140/90mmHg or

<table>
<thead>
<tr>
<th>BOX 3</th>
<th>Measuring blood pressure (BP) manually (auscultation method) or using an automatic device</th>
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</thead>
<tbody>
<tr>
<td>- The patient should be seated for at least 5 minutes before commencing BP measurements and should be advised to avoid tea, coffee or other caffeinated drinks for 30 minutes before measurement.</td>
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<tr>
<td>- An independently validated, calibrated BP monitor should be used.</td>
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<tr>
<td>- The radial or brachial pulse should be palpated. If irregular, BP should be measured manually using a stethoscope.</td>
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<tr>
<td>- BP should be measured when the patient is seated.</td>
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<tr>
<td>- BP should be measured when the patient is standing at the initial visit, in older people, those with diabetes and people with symptoms of postural hypotension.</td>
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<tr>
<td>- Tight clothing should be removed and the patient’s arm, which should be relaxed, should be supported at the level of the heart.</td>
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<td>- The patient should be advised not to talk during BP measurements.</td>
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<tr>
<td>- An appropriate cuff size should be used.</td>
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<tr>
<td>- BP should be measured in both arms at the initial visit.</td>
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<tr>
<td>- If the difference in readings between both arms is more than 20mmHg, the measurements should be repeated to confirm the difference.</td>
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<tr>
<td>- If the difference in readings between both arms remains more than 20mmHg on the second measurement, subsequent BP should be measured in the arm with the higher reading. A significant inter-arm difference is an indication for further investigation as this may be a result of underlying vascular disease.</td>
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<tr>
<td>- The patient should be informed of which arm should be used for future BP measurements and this should be documented.</td>
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<tr>
<td>- If BP is &gt;140/90mmHg, measurement should be repeated, with a one-minute interval between measurements.</td>
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<tr>
<td>- If the second measurement is substantially different to the first, a third BP measurement should be done. If the measurements continue to fall, further measurements should be considered. The lower of the last two measurements should be recorded as the clinic BP.</td>
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<tr>
<td>- BP should be measured in the same arm at each subsequent visit, usually the dominant arm unless a clinical condition such as a previous stroke, arm injury or lymphoedema prevents measurement.</td>
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(National Institute for Health and Care Excellence 2011a)
higher) except those with severe hypertension (BP 180/110mmHg or higher) should undergo ambulatory BP monitoring (ABPM) to confirm the diagnosis. Patients with severe hypertension require immediate treatment. ABPM identifies patients with white-coat hypertension, a condition whereby the person’s BP is higher when taken in a medical setting compared with the home setting (NICE 2011a).

ABPM is when a person’s BP is measured using an automatic monitor during activities of daily living. ABPM is, therefore, not suitable for those requiring manual measurement. A BP monitor is attached to a belt or harness and connected to a cuff around the upper arm and BP is measured for up to 24 hours. Patients should carry out their normal daily activities, although they need to keep still and not talk during readings. They should avoid driving and strenuous cardiovascular exercise apart from brisk walking or similar activities. An average of 14 readings taken during usual waking hours is sufficient to diagnose hypertension (NICE 2011a).

If the patient cannot tolerate ABPM, then home BP monitoring (HBPM) can be used (Box 6). Patients may require advice on the choice of monitor, cuff size, measurement technique and calibration to ensure home measurements are accurate. The BHS (2012a) and Blood Pressure UK (2008) provide instruction on clinic, ambulatory and home monitoring.

**Complete time out activity 3**

### Assessment of risk factors

Patients diagnosed with hypertension require a full physical examination and routine investigations to assess target organ damage, contributory and associated risk factors, and comorbidities, and to exclude secondary causes of hypertension. Cardiovascular risk increases with age, and if the patient smokes, has diabetes or hypercholesterolaemia, is male or has a family history of hypertension or cardiovascular disease. Obesity, excess salt intake, excess alcohol consumption, lack of exercise and environmental stress can also contribute to raised BP (Williams *et al* 2004). Hypertension can cause hypertensive retinopathy, which is assessed by fundoscopy. Routine investigations for hypertension include checking the patient’s renal function. Tests include urinalysis for protein and blood, measuring the urine albumin and creatinine ratio, and a blood sample to check the patient’s estimated glomerular filtration rate (eGFR), and creatinine, sodium and potassium levels are within the normal range. Abnormal results may indicate renal disease and warrant further investigation.

A lipid blood test is required to assess the patient’s cardiovascular risk and a fasting blood glucose will identify those who may have diabetes. An electrocardiogram is required to assess for AF and left ventricular hypertrophy, which can occur in patients with hypertension.

### BOX 5

**Measuring blood pressure (BP) in patients with symptoms of postural hypotension**

- BP should be measured with the patient in a seated or supine position.
- The patient should be asked to stand up for at least one minute and the BP should be measured with the patient standing and the arm supported.

If the systolic BP falls by 20mmHg or more between sitting and standing measurements:

- Medication decisions should be based on the standing BP.
- Subsequent BP should be measured with the patient sitting and standing.
- Referral of the patient to specialist care should be considered if symptoms of postural hypotension persist.

(National Institute for Health and Care Excellence 2011a)

### BOX 4

**Measuring blood pressure (BP) using a manual device**

- The cuff should be placed around the patient’s upper arm with the centre of the bladder, which is inside the cuff, over the brachial artery.
- The bladder should encircle at least 80% of the arm, but not more than 100%. If the bladder is too small it will underestimate the BP if it is too large it will overestimate the BP leading to inaccurate measurements, which may lead to an inaccurate diagnosis and the patient may be denied appropriate treatment.
- The systolic BP should be estimated before measuring the BP by palpating the brachial artery and inflating the cuff until pulsation disappears. When the pulsation disappears this is described as the estimated systolic reading. The cuff should then be deflated.

To obtain an accurate systolic and diastolic BP measurement:

- The cuff should be inflated to 20-30mmHg above the estimated systolic level needed to occlude the pulse.
- The diaphragm of the stethoscope should be placed over the brachial artery.
- The cuff should be deflated at a rate of 2-3mm/second until regular tapping sounds can be heard.
- The systolic (first sound) and diastolic (disappearance of sound) BP should be measured to the nearest 2mmHg.

(National Institute for Health and Clinical Excellence 2011a)
and increase the risk of stroke and heart failure respectively (Williams et al 2004). The patient’s prescribed medicines and those bought from a pharmacist, supermarket or internet should also be taken into consideration. Non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen are commonly self-prescribed and can raise BP and interact with some antihypertensive medicines, thereby reducing their efficacy (British National Formulary (BNF) 2013).

The findings of the physical examination and investigations will affect BP targets, treatment decisions and lifestyle modifications. For primary prevention of cardiovascular disease – patients who have not had a heart attack or stroke – NICE (2011a) recommends using a risk assessment tool to estimate the person’s risk of developing cardiovascular disease. A risk of 20% or more over ten years is considered high risk. Such tools help to determine the patient’s prognosis and treatment options. Although NICE (2011a) do not recommend any particular risk calculator, QRISK is one example (Hippisley-Cox et al 2007).

**Management of hypertension**

Lifestyle changes such as losing weight and increasing exercise and where necessary, in combination with antihypertensive drugs, is the most effective means of lowering BP (Williams et al 2004). Alternative treatments, including yoga, are being explored, but further research is required to prove their efficacy. There has been much interest in interventional procedures for lowering BP, such as renal sympathetic denervation (RDN), which involves destroying the nerves in the renal arteries. Early clinical trials have shown that RDN lowers BP. However, evidence suggests that early optimism may have been misplaced. For patients with resistant hypertension – patients who have uncontrolled BP despite taking three or more antihypertensive medicines – adjusting antihypertensive drug treatment appears to be more effective than RDN at improving BP control (Elmula et al 2014). Long-term follow up of patients treated using RDN in another clinical trial indicated that patients did not require fewer antihypertensive drugs following this intervention (Krum et al 2014), and a more recent clinical trial failed to show a significant reduction in BP six months after RDN (Bhatt et al 2014). The Joint UK Societies Working Group on Renal Denervation (2014) have called for a moratorium on RDN use except in clinical trials until further evidence is available. Figure 1 summarises the recommended care pathway for patients with primary hypertension.

**Lifestyle modifications**

Lifestyle modifications can reduce BP and cardiovascular risk (Chobanian et al 2003). The majority of people in England are overweight and an increasing number are obese (Craig and Mindell 2013). Advising patients on healthy food choices and portion sizes can result in weight loss and reduce BP (Chobanian et al 2003). For example, switching a fizzy drink with a sugar-free drink can reduce sugar intake (NHS Choices 2014a). Obese patients with a body mass index of 40 or above who are not able to lose weight by non-invasive means may require bariatric surgery (NICE 2006). A high salt intake has been shown to increase BP (He et al 2013). The recommended daily intake of salt is no more than 6g (one teaspoon) per day, however many people are unaware they may be consuming 9g of salt or more per day as a result of the high quantity in processed food, including ready-meals and takeaways. Reducing salt intake to 6g or less daily will help to lower BP (He et al 2013).

Nurses can help patients by explaining food labels to enable them to avoid foods high in fat, saturated fat, salt and sugar, and by describing what one portion of fruit or vegetables constitutes so they can increase their consumption. Fruit juices and smoothies are popular, but only one glass of fruit juice per day can be included in the portion count (150mL of unsweetened 100% fruit juice). Smoothies need to contain the correct amount of fruit or vegetables to be included in the portion count (NHS Choices 2013).

Exercising for at least 30 minutes per day five times each week can lower BP, and patients require support to develop and maintain a routine appropriate for their age and physical ability (NHS choices 2014b). The link between
alcohol intake and hypertension is well documented (Taylor et al 2009), however over 10 million adults exceed the recommended alcohol limits (National Audit Office 2008), which is 14 units per week for women and 21 units for men (NICE 2011a). Assisting patients to calculate their alcohol intake and stay within the recommended limits can help to reduce BP.

Table 1 is a useful tool to show patients the effect that changing their behaviour can have on BP, leading to long-term health benefits. Although smoking does not cause sustained hypertension (there is a temporary rise in BP when smoking), all patients with hypertension should be supported to cease smoking because of the risk of cardiovascular disease (Primatesta et al 2001). Making lifestyle changes and modifying behaviour can be difficult for patients. Motivational interviewing, where the patient with support from the nurse seeks ways to change his or her behaviour, can be effective in enabling behaviour change (Lundahl et al 2013). Education and health promotion initiatives can help patients to make informed decisions about their health and lifestyle.

Complete time out activity

**Antihypertensive drug treatment**

Antihypertensive medication can reduce the risk of stroke by up to 40%, myocardial infarction by up to 25% and heart failure by more than 50% (Chobanian et al 2003). Treatment is offered as described in Box 7.

The different classes of drug available to treat primary hypertension are angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARB), calcium channel blockers, thiazide-like diuretics, aldosterone antagonists, alpha-blockers and beta-blockers. The average BP reduction with any one drug at the standard dose is about 10/5mmHg and adding another drug class lowers BP further (Wald et al 2009). Most patients need two or more classes of medicines to achieve BP control (Chobanian et al 2003). Where possible, drugs taken once daily should be prescribed to promote adherence. For each major class of antihypertensive drug, there will be indications and contraindications for use in specific patient groups (Williams et al 2004). When none of these considerations apply, drug selection should follow the four steps described in Figure 2. The algorithm is limited to treatment for primary hypertension. Guidelines for drug treatment, BP targets and management of people with chronic kidney disease (NICE 2008), diabetes (NICE 2009a) and hypertension in pregnancy (NICE 2011b) are also available.

**Angiotensin-converting enzyme inhibitors or angiotensin receptor blockers** An ACE inhibitor or ARB is the recommended first-line treatment for people under 55 years with primary hypertension.

**FIGURE 1**

<table>
<thead>
<tr>
<th>Hypertension care pathway</th>
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<tbody>
<tr>
<td>CBPM ≥140/90mmHg and ABPM/HBPM ≥135/85mmHg</td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
</tr>
<tr>
<td>If target organ damage present or 10-year cardiovascular risk &gt;20%</td>
</tr>
<tr>
<td>Offer antihypertensive drug treatment</td>
</tr>
<tr>
<td>If younger than 40 years</td>
</tr>
<tr>
<td>Consider specialist referral</td>
</tr>
<tr>
<td>Offer lifestyle interventions</td>
</tr>
<tr>
<td>Offer patient education and interventions to support adherence to treatment</td>
</tr>
<tr>
<td>Offer annual review to monitor blood pressure, provide support and discuss lifestyle, symptoms and medication</td>
</tr>
</tbody>
</table>

CBPM = clinic blood pressure (BP) monitoring; ABPM = ambulatory BP monitoring; HBPM = home BP monitoring
(National Institute for Health and Care Excellence 2011a)

**TABLE 1**

<table>
<thead>
<tr>
<th>Lifestyle interventions for blood pressure (BP) reduction</th>
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</thead>
<tbody>
<tr>
<td>Intervention</td>
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<tr>
<td>--------------</td>
</tr>
<tr>
<td>Weight reduction</td>
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<tr>
<td>DASH* eating plan</td>
</tr>
<tr>
<td>Dietary sodium restriction</td>
</tr>
<tr>
<td>Physical activity</td>
</tr>
<tr>
<td>Alcohol moderation</td>
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</tbody>
</table>

*DASH = Dietary Approaches to Stop Hypertension (Williams et al 2004)
hypertension (NICE 2011a). Examples of ACE inhibitors include ramipril, lisinopril and perindopril. ARBs include losartan, candesartan and irbesartan. Both classes of drug are well tolerated, but ACE inhibitors may induce a dry cough, which is not dose-related, and angioedema particularly in people of African-Caribbean origin, and an ARB is generally preferred (NICE 2011a). ACE inhibitors and ARBs cause increased serum potassium, which if severe (hyperkalaemia), can lead to cardiac arrhythmias and cardiac arrest (Williams et al 2004). This is a particular risk if the patient has renal impairment, and renal function can decline rapidly in bilateral renal artery stenosis. This occurs when there is clinically relevant occlusion (generally atherosclerotic) of both renal arteries (Williams et al 2004). Renal function should be checked before and within two weeks of commencing treatment (BHS 2012b). Women should be advised that there is an increased risk of congenital abnormalities if ACE inhibitors or ARBs are taken during pregnancy and alternative treatments should be discussed with the GP if they are planning a pregnancy (BNF 2013). Combining an ACE inhibitor with an ARB is not recommended because there is little additional BP lowering, but the risk of side effects, mainly renal impairment and hyperkalaemia, is increased significantly (NICE 2011a).

**Calcium channel blockers** Calcium channel blockers are more effective in lowering BP in those aged over 55 and black people of African-Caribbean origin and are, therefore, recommended as first-line treatment for these patients (NICE 2011a). This class of drugs can be divided into dihydropyridines, which include amlodipine, felodipine and nifedipine, and rate-limiting drugs, which include verapamil and diltiazem. The adverse effects of dihydropyridines include headaches and flushing as a result of peripheral vasodilation and dose-related swelling of the ankles, the risk of which is reduced by combined use with an ACE inhibitor or ARB (Fogari et al 2007). Palpitations and gum hypertrophy can also occur (BNF 2013). Rate-limiting calcium channel blockers cause less ankle oedema, but can cause bradycardia and verapamil can cause constipation (BNF 2013). Rate-limiting calcium channel blockers are contraindicated for anyone with heart block or heart failure and patients taking beta-blockers because there is an increased risk of heart block and heart failure (BHS 2012b). When combining simvastatin with a calcium channel blocker the recommended maximum dose is 20mg as higher doses increase the risk of myopathy and/or rhabdomyolysis (BNF 2013).

**Thiazide-like diuretics** Thiazide-like diuretics include chlorthalidone and indapamide. If BP remains above target levels despite maximally tolerated doses of an ACE inhibitor or ARB and calcium channel blocker, adding a thiazide-like diuretic is recommended (NICE 2011a). A thiazide-like diuretic is also recommended as first-line therapy if a...
calcium channel blocker is not tolerated or the person has oedema, evidence of heart failure or a high risk of heart failure (NICE 2011a). Thiazide diuretics bendroflumethiazide and hydrochlorothiazide are no longer recommended because there is more evidence for the efficacy of thiazide-like diuretics (NICE 2011a). However, if the patient’s BP is controlled using a thiazide diuretic then there is no need to change this regimen. Adverse effects such as a marked fall in serum potassium may indicate primary hyperaldosteronism, which occurs when the adrenal gland produces too much aldosterone causing hypertension, and it is recommended that the patient undergoes further investigations such as a blood test to measure renin and aldosterone levels (Beevers et al 2007). Other adverse effects include raised uric acid increasing the risk of gout and raised glucose levels increasing the risk of new onset diabetes (BHS 2012b).

If the patient’s BP remains uncontrolled on the maximum tolerated doses of an ACE inhibitor or ARB, a calcium channel blocker and a thiazide-like diuretic, he or she is considered to have resistant hypertension. At this stage, the patient’s adherence to his or her medicines should be reviewed and further education regarding treatment provided. It may be necessary to seek advice from a hypertension expert and consider adding a fourth agent. The evidence is currently limited for the optimum fourth-line drug treatment. NICE (2011a) recommend adding a low dose of spironolactone, which is an aldosterone antagonist. Side effects of spironolactone, such as gynaecomastia, are dose related. Spironolactone should be used with caution in older people and if the eGFR is reduced because there is an increased risk of hyperkalaemia (BHS 2012b). A combination of spironolactone and an ACE inhibitor or ARB can also raise serum potassium (McInnes 2000). There is an increased risk of hyperkalaemia and renal failure when taken with NSAIDs (BHS 2012b).

An alpha-blocker such as doxazosin is used as an add-on drug in patients with resistant hypertension or where other drugs are poorly tolerated (NICE 2011a). Adverse effects include first-dose postural hypotension, which can reoccur if patients take drug holidays or adherence is erratic. The use of a sustained-release formulation reduces this risk. Alpha-blockers should be prescribed with caution for patients with a history of postural hypotension (BHS 2012b).

Beta-blockers, such as atenolol or bisoprolol, may be considered as a fourth-line drug and as a first-line option in women of child-bearing potential (usually labetalol) because of concern about fetal maldevelopment with ACE inhibitors or ARBs. If a beta-blocker is used as first-line treatment, NICE (2011a) recommends adding a calcium channel blocker rather than a thiazide-like diuretic, to reduce the person’s risk of developing diabetes. Beta-blockers have a number of adverse effects including bronchospasm. They are contraindicated in patients with asthma, but can be used in patients with chronic obstructive pulmonary disease. Peripheral vasconstriction causing cold hands and feet is common, but beta-blockers do not worsen intermittent claudication (BHS 2012b).

Other drugs used to treat hypertension include centrally-acting agents, such as clonidine and methyldopa, and potent vasodilators such as hydralazine and minoxidil. Although these are effective antihypertensive agents, side effects such as tiredness and depression with centrally-acting agents, oedema and reflex tachycardia with vasodilators, and specific adverse effects such as systemic lupus erythematous with hydralazine and hirsutism with minoxidil, severely limit their use. However, such drugs continue to have a restricted role in patients with difficult to manage hypertension who are being cared for by hypertension specialists (BHS 2012b).

**Complete time out activity 5**

**Blood pressure targets**

Clinic BP measurements are used to monitor the response to antihypertensive treatment with lifestyle modifications and/or drugs. ABPM or HBPM can be used as an adjunct to clinic readings for those diagnosed with white-coat hypertension (NICE 2011a). The recommended BP targets for primary hypertension are summarised in Box 8.

**Complete time out activity 6**

**BOX 8**

**Recommended blood pressure (BP) targets for primary hypertension**

Use clinic BP measurements to monitor response to treatment.

- Aim for a target BP below:
  - 140/90mmHg in people aged under 80.
  - 150/90mmHg in people aged 80 and over.

Daytime average ambulatory BP monitoring or average home BP monitoring during the person’s usual waking hours:

- Lower than 135/85mmHg in people aged under 80.
- Lower than 145/85mmHg in people aged over 80.

(National Institute for Health and Care Excellence 2011a)
Supporting medicine adherence

It is estimated that between one third and half of patients with long-term conditions do not take their medicines as prescribed (NICE 2009b). This is estimated to be even higher (50–80%) for those with hypertension (NICE 2011a). Herttua et al (2013) found that the poorer the adherence, the greater the risk of death and hospitalisation as a result of stroke. Similarly, Chowdhury et al (2013) found that a considerable proportion of all cardiovascular disease events could be attributed to poor adherence to vascular medications, and that the poorer the adherence, the greater the risk of an adverse event. Jung et al (2013) found that poor adherence was the most common cause of poor BP control in patients with resistant hypertension. Poor adherence and non-adherence to antihypertensive medicines leads to increased prescription costs, drug wastage, more frequent surgery and hospital attendances, more investigations for secondary causes, and increased costs of managing the consequences of hypertension (York Health Economics consortium and The School of Pharmacy 2010).

Non-adherence can represent failure on the part of the healthcare professional to agree the prescription with the patient initially. To understand non-adherence it is important to acknowledge the patient’s beliefs and preferences, because these may influence his or her decision to start and/or continue treatment. Adherence should be assessed regularly in a non-judgemental way whenever a medicine is prescribed, dispensed or reviewed, as should the patient’s knowledge, understanding and concerns about the medicine and adherence. Healthcare professionals need to be aware that patients have the right to decide not to take a medicine, as long as the individual has the capacity to make an informed decision and has been advised about the associated risks and benefits (NICE 2009b).

To make an informed decision on hypertension treatment, patients require information about their condition. This includes explaining the

References


British Hypertension Society (2012b) Therapeutics: Descriptions and Usage of the Various Classes of Drugs Most Commonly Used to Treat Hypertension. bhsoc.org/resources/therapeutics (Last accessed: May 20 2014.)


causes, risks and treatment options, and the consequences of failure to adhere to treatment. Adapting the consultation style to individual needs will help to ensure patients have the opportunity to be involved in decisions about their medicines and care at the level they wish. Providing education with written information will enable patients to assess the value of lifestyle changes, and the benefits and side effects of medication (NICE 2009b). An annual review will ensure patients continue to have their BP monitored and enable them to obtain support with lifestyle changes and medication adherence (NICE 2011a). Many people access the internet for health information and providing details about appropriate educational websites and patient associations may be helpful.

Conclusion

Accurate BP measurement and monitoring is essential in diagnosing and treating patients with hypertension. Increased accuracy can be achieved if the correct monitor and cuff size is used and the patient is rested and keeps still without talking during the measurements. Lifestyle changes can be effective in lowering BP and patients should be encouraged to modify their lifestyles where appropriate. Many patients require antihypertensive medicines to control BP and some may find it difficult to adhere to the recommended treatment. Offering on-going support and education to help patients manage this long-term condition can reduce the risk of myocardial infarction and stroke.

The British Hypertension Society membership comprises multidisciplinary clinicians and scientists working to reduce the burden and consequences of hypertension and cardiovascular disease in the UK, Ireland and beyond (www.bhsoc.org).

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