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Hypertension

Hypertension is a major risk factor for stroke and heart disease and is therefore one of the most important preventable causes of premature morbidity and mortality in developed and developing countries.

How common is hypertension?

In the UK, hypertension is the third biggest risk factor for premature death and disability, after smoking and diet.[1] In 2010, 1.4 billion people globally had hypertension which contributes to 18 million cardiovascular deaths annually.[2]

Over a quarter of adults in the UK have hypertension. Prevalence is rising as the population ages.[3] The 2018 UK health survey for England reported a prevalence of 30% in men and 26% in women. The proportion of adults in the population with untreated hypertension decreased from 2003 to 2018 for both men (20% to 13%) and women (16% to 10%).[4]

The population average blood pressure in England has fallen over the last decade by almost 3 mm Hg systolic. The proportion of adults with untreated high blood pressure has reduced from 2003 to 2015 for both sexes (from 20% to 15% among men and from 16% to 10% among women). However, other countries are making much speedier progress. In Canada, 65% of adults with high blood pressure are identified and treated to recommended targets, as opposed to only 35% in England.[1]

Hypertension causes[5]

Primary hypertension (occurs in about 90% of people) has no identifiable cause.

Secondary hypertension (about 10% of people) has a known underlying cause - eg, renal, endocrine, or vascular disorder, or the use certain drugs.

- Renal disorders are the most common cause of secondary hypertension. They include chronic pyelonephritis, diabetic nephropathy, glomerulonephritis, polycystic kidney disease, obstructive uropathy, renal cell carcinoma.
- Vascular disorders, including coarctation of the aorta, renal artery stenosis.
- Endocrine disorders, including primary hyperaldosteronism, phaeochromocytoma, Cushing's syndrome, acromegaly, hypothyroidism, hyperthyroidism.
- Pre-eclampsia and hypertension in pregnancy.
- Alcohol misuse may be the most common individual secondary cause of hypertension. Tends to cause variable hypertension that is resistant to commonly used drugs and disappears with complete abstinence.
- Drugs, including ciclosporin, cocaine and other substances of abuse, the combined oral contraceptive, corticosteroids, erythropoietin, leflunomide, (present in some herbal medicines), non-steroidal anti-inflammatory drugs, venlafaxine, decongestants containing ephedrine, and herbal remedies containing licorice or ginseng.
- Other conditions, including connective tissue disorders (scleroderma, systemic lupus erythematosus, polyarteritis nodosa), retroperitoneal fibrosis, obstructive sleep apnoea.

Risk factors [6]

Modifiable risk factors include:

- Excess weight.
- Excess dietary salt intake.
- Lack of physical activity.

- Excessive alcohol intake.
- Stress.

Non-modifiable risk factors include:

- Older age.
- Family history.
- Ethnicity.
- Gender (blood pressure tends to be higher in men than in women up to the age of 65 years, whereas the opposite tends to be true over the age of 65 years).

Defining hypertension[5] [7]

The National Institute for Health and Care Excellence (NICE) recommends the following definitions:

- **Stage 1 hypertension** - clinic BP 140/90 mm Hg to 159/99 mm Hg and subsequent ABPM daytime average or HBPM average blood pressure 135/85 mm Hg to 149/94 mm Hg..
- **Stage 2 hypertension** - clinic BP 160/100 mm Hg or higher but less than 180/120 mm Hg and subsequent ABPM daytime average or HBPM average blood pressure of 150/95 mm Hg or higher..
- **Stage 3 or severe hypertension** - clinic systolic BP 180 mm Hg or higher or clinic diastolic BP 120 mm Hg or higher..
- **Masked hypertension** - BP in surgery/clinic is less than 140/90 mm Hg but average ABPM or HBPM readings are higher.
- **White coat effect** - a discrepancy of more than 20/10 mm Hg between clinic and average daytime ABPM or average HBPM blood pressure measurements at the time of diagnosis.

Screening for hypertension[7]

Hypertension is often symptomless, so screening is vital - before damage is done. All adults should have their BP measured, at least every five years up to the age of 80 years, and at least annually thereafter.

Measuring blood pressure

- Use a correctly calibrated and maintained machine (manual or automatic), with a cuff of appropriate size at heart level.
- When measuring blood pressure in the clinic or in the home, provide a relaxed, temperate setting, with the person quiet and seated, and arm outstretched and supported. Use an appropriate cuff size for the person's arm.
- Because automated devices may not measure blood pressure accurately if there is pulse irregularity, palpate the radial or brachial pulse before measuring blood pressure. If the pulse is irregular, measure blood pressure manually.
- Inflate the cuff whilst palpating the brachial artery, until the pulse disappears. This provides an estimate of systolic pressure. Inflate the cuff until 30 mm Hg above systolic pressure, then place a stethoscope over the brachial artery. Deflate the cuff at 2 mm Hg per second.
- Systolic pressure: the appearance of sustained repetitive tapping sounds (Korotkov I).
- Diastolic pressure: usually the disappearance of sounds (Korotkov V). However, in some individuals (eg, pregnant women) sounds are present until the zero point. In this case the muffling of sounds (Korotkov IV) should be used.
- Record to the nearest 2 mm Hg.

- In people with symptoms of postural hypotension (falls or postural dizziness):
    - Measure blood pressure with the person either supine or seated.
    - Measure blood pressure again with the person standing for at least one minute before measurement.
      If the systolic blood pressure falls by 20 mm Hg or more when the person is standing, review medication, measure subsequent blood pressures with the person standing, and consider referral to specialist care if symptoms of postural hypotension persist.

Diagnosing hypertension[7]

When considering a diagnosis of hypertension, measure blood pressure in both arms:

- If the difference in readings between arms is more than 15 mm Hg, repeat the measurements.
- If the difference in readings between arms remains more than 15 mm Hg on the second measurement, measure subsequent blood pressures in the arm with the higher reading.

If blood pressure measured in the clinic is 140/90 mm Hg or higher, take a second measurement during the consultation. If the second measurement is substantially different from the first, take a third measurement. Record the lower of the last two measurements as the clinic blood pressure.

If clinic blood pressure is between 140/90 mm Hg and 180/120 mm Hg, offer ambulatory blood pressure monitoring (ABPM) to confirm the diagnosis of hypertension. If ABPM is unsuitable or the person is unable to tolerate it, offer home blood pressure monitoring (HBPM) to confirm the diagnosis of hypertension.

While waiting for confirmation of a diagnosis of hypertension, carry out:

- Investigations for target organ damage, and assessment of cardiovascular risk using a cardiovascular risk assessment tool.

When using ABPM to confirm a diagnosis of hypertension, ensure that at least two measurements per hour are taken during the person's usual waking hours. Use the average value of at least 14 measurements taken during the person's usual waking hours to confirm a diagnosis of hypertension.

When using HBPM to confirm a diagnosis of hypertension, ensure that:

- For each blood pressure recording, two consecutive measurements are taken, at least one minute apart and with the person seated.
- Blood pressure is recorded twice daily, ideally in the morning and evening.
- Blood pressure recording continues for at least four days, ideally for seven days.

Discard the measurements taken on the first day and use the average value of all the remaining measurements to confirm a diagnosis of hypertension.

Confirm diagnosis of hypertension in people with:

- A clinic blood pressure of 140/90 mm Hg or higher; and
- An ABPM daytime average or HBPM average of 135/85 mm Hg or higher.

If hypertension is not diagnosed but there is evidence of target organ damage, consider carrying out investigations for alternative causes of the target organ damage (eg, chronic kidney disease or chronic heart failure).

If hypertension is not diagnosed, measure the clinic blood pressure at least every five years subsequently, and consider measuring it more frequently if the person's clinic blood pressure is close to 140/90 mm Hg.

Measure blood pressure at least annually in an adult with type 2 diabetes without previously diagnosed hypertension or renal disease. Offer and reinforce preventative lifestyle advice.

Assessing cardiovascular risk and target organ damage[7]

Use a formal estimation of cardiovascular risk to discuss prognosis and healthcare options with people with hypertension, both for raised blood pressure and other modifiable risk factors. Use clinic blood pressure measurements to calculate cardiovascular risk.

For all people with hypertension:

- Test for proteinuria by estimation of the albumin:creatinine ratio and for haematuria using a reagent strip.
- Take a blood sample to measure glycated haemoglobin (HbA1C), electrolytes, creatinine, estimated glomerular filtration rate, total cholesterol and HDL cholesterol.
- Examine the fundi for the presence of hypertensive retinopathy.
- Arrange for a 12-lead ECG.

Consider the need for specialist investigations in people with signs and symptoms suggesting a secondary cause of hypertension.These investigations may initially include:

- Renal ultrasound scan.
- 24-hour urinary metanephrines.
- Urinary free cortisol and/or dexamethasone suppression test.
- Renin/aldosterone levels.

- Plasma calcium.
- Magnetic resonance imaging of the renal arteries.
- Echocardiography.

Other considerations

- **Hypertensive crisis** - there are two types:
    - **Accelerated (also known as malignant) hypertension**: this is a syndrome characterised by severe hypertension (eg, systolic >200 mm Hg, diastolic >130 mm Hg) accompanied by end-organ damage - eg, encephalopathy, dissection, pulmonary oedema, nephropathy, eclampsia, papilloedema and/or angiopathic haemolytic anaemia. Accelerated hypertension needs urgent (same-day) assessment and immediate treatment to reduce the BP within minutes to hours.[7] This is also termed hypertensive emergency.
    - **Hypertensive urgency**: a systolic blood pressure (SBP) ≥180 mm Hg or a diastolic blood pressure (DBP) ≥120 mm Hg without impending end-organ damage. Treatment should safely reduce BP over a few days. Repeat BP measurement within 7 days.
- **Suspected phaeochromocytoma**: consider this diagnosis if there is labile or postural hypotension, headache, palpitations, pallor and profuse sweating - refer for urgent (same-day) assessment.[8]
- **Systolic or diastolic pressure**: for many years diastolic pressure was considered to be more important than systolic pressure. They are both important determinants of cardiovascular risk.

- **Hypertension in the elderly**: although age-related rise in systolic pressure can be considered part of the 'normal' ageing process, isolated systolic hypertension (ISH) in the elderly should not be ignored as it is associated with significant morbidity and mortality.[8] [9] Uncertainties remain regarding treatment of hypertension in the elderly; however, NICE guidelines in the UK recommend the same treatment in those aged over 80 years as in those aged 55-80 years, taking into account comorbidity.[7] [10]

Hypertension symptoms

High BP is usually asymptomatic, except where there is accelerated hypertension.

All patients need a full history and physical examination. Look for a cause (renal, endocrine, etc, as above), particularly in the young, the severely hypertensive and those with resistant hypertension.[8]

- Take a full medication history (non-steroidal anti-inflammatory drugs (NSAIDs), oral contraceptives, steroids, licorice, sympathomimetics, ie cold cures).
- Ask if they are aware of the hypertension. Episodic feelings 'as if about to die' or headaches, or paroxysmal sweats or palpitations, suggest phaeochromocytoma.
- Consider renal causes: whether there is a present, past or family history of renal disease; whether the kidneys are palpable, or there is an abdominal or loin bruit (renovascular disease) or delayed or weak femoral pulses (coarctation).
- Consider whether the patient looks Cushingoid or whether he or she might have Conn's syndrome (tetany, weak muscles, polyuria, hypokalaemia).
- Look for signs of thyroid disease.

- Consider contributory factors: obesity, excess alcohol, salt intake [11] and lack of exercise, environmental stress, and cardiovascular risk factors (smoking, diabetes, cholesterol and family history) ready for your management plan.

Assess the degree of end-organ damage or complications of hypertension - eg, previous stroke or transient ischaemic attack (TIA), dementia, known left ventricular hypertrophy (LVH)/left ventricular (LV) strain, coronary heart disease (CHD), peripheral arterial disease, or renal impairment. Perform ophthalmoscopy to assess for retinopathy; ideally, dilate the pupils to do so.

Indications for referral to a specialist [7]

- Refer people for specialist assessment, carried out on the same day, if they have a clinic blood pressure of 180/120 mm Hg and higher with:
    - Signs of retinal haemorrhage or papilloedema (accelerated hypertension); or
    - Life-threatening symptoms such as new-onset confusion, chest pain, signs of heart failure, or acute kidney injury.
- Refer people for specialist assessment, carried out on the same day, if they have suspected phaeochromocytoma - eg, labile or postural hypotension, headache, palpitations, pallor, abdominal pain or diaphoresis (excessive, abnormal sweating).
- Possible secondary hypertension: low K+, Na+ elevated (possible Conn's syndrome); elevated creatinine, proteinuria or haematuria; sudden-onset or rapidly worsening or resistant hypertension (ie needs >4 therapeutic agents); young age (consider specialist assessment for those under the age of 40 years). [7]
- Therapeutic problems: unusual BP variability, intolerance to multiple medications or contra-indications, persistent non-adherence or treatment refusal.
- Hypertension in pregnancy. [12]

Hypertension treatment and management

For a full discussion on cardiovascular disease risk assessment, treatment thresholds and their modification dependent on target organ damage and concurrent diseases, see the separate Hypertension Treatment article. See also the separate articles Hypertension in Pregnancy and Hypertension in Childhood.

Further reading

- Hypertension; NICE Quality Standards, March 2013 - last updated September 2015
- Zhou D, Xi B, Zhao M, et al; Uncontrolled hypertension increases risk of all-cause and cardiovascular disease mortality in US adults: the NHANES III Linked Mortality Study. Sci Rep. 2018 Jun 20;8(1):9418. doi: 10.1038/s41598-018-27377-2.
- Ansah JP, Inn RLH, Ahmad S; An evaluation of the impact of aggressive hypertension, diabetes and smoking cessation management on CVD outcomes at the population level: a dynamic simulation analysis. BMC Public Health. 2019 Aug 14;19(1):1105. doi: 10.1186/s12889-019-7429-2.

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